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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	067055-002400
	Application Number	
Title of Invention	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ofer		Saban	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Vienna	State/Province	VA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1983 Horse Shoe Drive		
Address 2			
City	Vienna	State/Province	VA
Postal Code	22182	Country i	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Nissi		Vilcovsky	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Tokyo	Country of Residence i	JP

Mailing Address of Inventor:

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Address 2			
City	Tokyo	State/Province	
Postal Code	150 0013	Country i	JP

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

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Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ **An Address is being provided for the correspondence Information of this application.**			
Customer Number	46188		
Email Address	PatentSV@nixonpeabody.com	Add Email	Remove Email

Application Information:

Title of the Invention	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE		
Attorney Docket Number	067055-002400	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	16	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

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Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation in part of	13843001	2013-03-15
Prior Application Status	Patented		Remove

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	Application Number	
Title of Invention	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13843001	Continuation in part of	13088369	2011-04-17	8624883	2014-01-07
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13088369	Continuation of	11817411	2007-08-30	7948481	2011-05-24
Prior Application Status				Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
11817411	a 371 of international	PCT/IL2006/000281	2006-03-01		
Prior Application Status			Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
PCT/IL2006/000281	non provisional of	60656885	2005-03-01		
Prior Application Status			Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
PCT/IL2006/000281	non provisional of	60656884	2005-03-01		
Prior Application Status			Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
13843001	non provisional of	61738957	2012-12-18		
Prior Application Status			Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
	non provisional of	61892368	2013-10-17		
Prior Application Status			Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
	non provisional of	61862025	2013-08-04		
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.			Add		

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) [i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

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Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Access Code [i] (if applicable)

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

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Applicant Information:

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	Application Number	
Title of Invention	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE	

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(•) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. [X]

Organization Name	EyesMatch Ltd.		
Mailing Address Information:			
Address 1	19 Waterfront Drive, P.O. Box 3540		
Address 2			
City	Road Town, Tortola	**State/Province**	
Country [i]	VG	Postal Code	VG1110
Phone Number		Fax Number	
Email Address			

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Assignee 1

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If the Assignee is an Organization check here. [ ]

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Title of Invention	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

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Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

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Signature:

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Signature	/Joseph Bach/			Date (YYYY-MM-DD)	2014-04-15
First Name	Joseph	Last Name	Bach	Registration Number	37771

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Ofer Saban Date (Optional): 04/05/14

Signature: Ofer Saban

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____

  filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Nissi Vilcovsky Date (Optional) :_____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

CROSS-REFERENCE(S) TO RELATED APPLICATION(S)

[0001] This application claims the benefit of, and priority to, U.S. Provisional Patent Application No. 61/862,025, filed on August 4, 2013, entitled "Provisional of Virtual calibrated camera capable to provide augmented reality features: e.g. Color, texture, shape manipulation of body items or background in virtual mirror or video conference. In addition capable of performing body measurements, body monitoring for commercial, security and healthcare applications," the entire disclosure of which is hereby incorporated herein by reference.

[0002] This application claims the benefit of, and priority to, U.S. Provisional Patent Application No. 61/892,368, filed on October 17, 2013, entitled "Virtual Mirror Flow of Usage Control and User Interface" the entire disclosure of which is hereby incorporated herein by reference.

[0003] This application is Continuation-in-Part of U.S. Application No. 13/843,001, filed March 15, 2013, entitled "DEVICES, SYSTEMS AND METHODS OF CAPTURING AND DISPLAYING APPEARANCES," which is Continuation-in-Part of U.S. Application No. 13/088,369, filed April 17, 2011, which is a continuation of U.S. Application No. 11/817,411, now patent 7,948,481, issued May 24, 2011, and which was a National Phase Application of PCT International Application No. PCT/IL06/000281, International Filing Date March 1, 2006, which claims the benefit of U.S. Provisional Application No. 60/656,884, filed March 1, 2005, and U.S. Provisional Application No. 60/656,885, filed March 1, 2005. U.S. Application No. 13/843,001 further claims the priority benefit of U.S. Provisional Application No. 61/738,957, filed December 18, 2012. The entire disclosures of all of the above listed applications are incorporated herein by reference.

TECHNICAL FIELD

[0004] The invention relates generally to imaging and display systems and, more particularly, to monitors, and interactive displays, e.g., in retail and/or service environments, medical or home situations, video conferencing, gaming, and the like. Specific implementations relate to virtualizing a mirror in situations where users expect to see a mirror, e.g., in trying on

apparel. Another specific implementation relate to situations where a natural appearance is preferable over standard video image, such as in, e.g., video conferencing.

BACKGROUND

[0005] The conventional mirror (i.e., reflective surface) is the common and most reliable tool for an individual to explore actual self-appearance, in real time. A few alternatives have been proposed around the combination of a camera and a screen to replace the conventional mirror. However, these techniques are not convincing and are not yet accepted as a reliable image of the individual as if he was looking at himself in a conventional mirror. This is mainly because the image generated by a camera is very different from an image generated by a mirror.

[0006] In U.S. Application No. 13/843,001, we proposed a novel technology (computerized method) to address the challenges of converting and transforming a still image or 2D/3D video created by one or more cameras, with or without other sensors, into a mirror or video conference experience.

SUMMARY

[0007] The following summary of the disclosure is included in order to provide a basic understanding of some aspects and features of the invention. This summary is not an extensive overview of the invention and as such it is not intended to particularly identify key or critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented below.

[0008] In this disclosure we describe a computerized technique that takes a video, a still, or a group of still images, before or after the transformation described in U.S. Application No. 13/843,001, and continue the computerized method to address additional functionalities, such as user interface, augmented reality, color change, texture change, shape manipulation of an object, body or background, and more. In addition, the calibrated virtual camera approach allows for body line, body curve and body type measurements from a 2D or 3D image or video.

[0009] For the augmented reality capabilities, first a 2D and/or 3D model or mask will be created for one or more items or elements (e.g., shirt, dress, pants, head, shoe, glass,

entire body, and the like), then the model or mask manipulation can enable the augmented reality features like color, texture replacement and manipulation, or geometric measurement, or complete object replacement. The disclosed technique is differentiated from other techniques that are using only 3D camera (IR or dual camera). In the following disclosed techniques one can build the model from a single regular camera and can improve the results with multiple cameras and additional information from IR, 3D camera or other sensors and information regarding the object sought to be manipulated.

[0010] Some embodiments can include multi level user identification. Specifically, the embodiments can include face recognition improvement, user learning, and adaptation. Known methods of face recognition can utilize algorithms that can be very sensitive to face pose. In the present technique, a smooth experience of face pose can be created to accommodate different camera locations and angles.

[0011] Various embodiments can include code identification, e.g., quick recognition (QR) code, 1D Code, hidden code and the like. The embodiments can be adapted to discover codes from a relatively long distance with a relatively small image as compared to the image under projection or under other optic distortion. Also, it may include wireless identification, e.g., NFC, WiFi wideband, microwave 3D, body access network (BAN) chip and the like. Wireless identification can be made from a mobile device, watch glass, microchip or any other carry on device or microchip. Other body measurement techniques may include fingerprinting, body identification, body type, eyes, palm recognition, X-ray correlation, body temperature, body pulse, blood pressure and the like.

[0012] In another aspect a user interface and methods to control and operate manually or automatically the virtual mirror capabilities are described.

[0013] In additional embodiments the product mechanical design and appearance are disclosed, to enhance the usability and functionality and the user experience overall.

[0014] In some embodiments, a non-transitory computer-readable storage medium for operating a monitor, a camera, and a processor, is provided and configured so as to display a mirror-mimicking image on the monitor, and comprising: on a device having the processor and a memory, storing a program for execution by the processor, the program including instructions for: capturing an image or video from the system; calibrating the image or video based on a user

tracking system; detecting an edge of an object present in the captured image or video; measuring a characteristic of the object; and creating a measurement signature of the object.

In some embodiments, computer implemented method for operating a system having a monitor, a camera, and a processor is provided and configured so as to display a user's image on the monitor, and comprising: on a device having the processor and a memory storing a program for execution by the processor, the program including instructions for: capturing an image or video from the system; identifying an element from the image or video; selecting the identified element; rendering an original model of the selected element; selecting a new appearance for the selected element; and rendering a new model based on the original model and the selected new appearance for the element. The processor performs distortion transformation that comprises operation to generate a user experience that simulates the user looking into a traditional reflective mirror. The distortion transformation may include the steps: obtaining a digital image from the camera; flipping the image about a vertical axis so as to reverse right and left sides of the image; applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror; resizing the image to reduce variations caused by changes in the object's distance to the camera; and displaying the image on the monitor after performing the flipping, transformation mapping, and resizing.

[0015] In another aspect, a computerized method includes instructions for at least one from the group consisting of: complex stitching based on a user's point of view and a location in front of the monitor; image or video analyzing to better utilize an inventory of a store and to support an ecommerce platform; correcting optical distortion of the image or video; utilization of multiple cameras to provide additional information; and presentation of the model locally or at a remote location on a mobile device or on a stationary monitor.

[0016] In a further aspect, a method for obtaining measurements of selected object in the image comprises at least one from the group consisting of: measuring in pixels and transforming the measured pixels to a known unit of measurement based on a perimeter model, multiple 2D cuts, a 3D model, statistical optimization, comparison with a previously obtained set of measurements pertaining to the user, determination of a point of focus for the measuring based on one or more characteristics of the user, determination of a point of focus for the measuring based on a height of the user, determination of a point of focus for the measuring based on a gender of the user, determination of a zone corresponding to the likely bust/chest of the user

based on a height and gender of the user, and determination of a zone corresponding to the likely navel of the user based on a height and gender of the user.

[0017] In other aspects, a method for creating of a measurement signature of an object in the image comprises at least one from the group consisting of: storing analyzed data as a vector with weighting allowing for single or multiple attribute scoring comparisons between users, recording a processed image for future comparison, recording a processed image for future deduction of additional information, recording a processed image to allow for future image correlation techniques, addition of pointers to the image to facilitate correlation, and addition of lines to the image to facilitate correlation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The accompanying drawings, which are incorporated into this specification, illustrate one or more exemplary embodiments of the inventions disclosed herein and, together with the detailed description, serve to explain the principles and exemplary implementations of these inventions. One of skill in the art will understand that the drawings are illustrative only, and that what is depicted therein may be adapted based on the text of the specification and the spirit and scope of the teachings herein.

[0019] In the drawings, where like reference numerals refer to like reference in the specification:

[0020] **FIG. 1** illustrates an embodiment for augmented reality to simulate a mirror appearance on a flat screen display;

[0021] **FIG. 2** illustrates an embodiment of an augmented reality module;

[0022] **FIG. 3** illustrates an embodiment of an augmented reality module that can replace a body part, color, orientation and texture of an item or object in the foreground or background of the image;

[0023] **FIG. 4** illustrates an embodiment for computing methods to create a model for color and texture exchange;

[0024] **FIG. 5** illustrates an example of a method to extract a body measurement from an image, multiple images or a short video;

[0025] **FIG. 6** illustrates an example of a security system application for multilevel user learning and authentication;

[0026] **FIG. 7** illustrates an example of a security system application for parallel or in-band camera manipulation;

[0027] **FIGS. 8a-8c** illustrates schematics for sharing mirror experience in a video/voice conference;

[0028] **FIG. 9** illustrates an example for a 2D input to the model generator;

[0029] **FIG. 10** is an example of a 2D model of the upper shirt from the image of FIG. 9;

[0030] **FIG. 11** is a schematic illustrating classification of male body types;

[0031] **FIG. 12** is a schematic illustrating classification of female body types;

[0032] **FIG. 13** depicts an example of the result of additional processes that eliminate the hand from the body and point to different intervals of where to look for particular body measurements;

[0033] **FIG. 14** depicts an example of transformation on a camera stream to create a mirror effect on the background environment;

[0034] **FIG. 15** illustrates an example of a virtual mirror with user recognition and authentication and with user interface;

[0035] **FIG. 16** illustrates an example of a virtual mirror with split screen mode and thumbnails; and

[0036] **FIG. 17** illustrates an embodiment of user flow of usage.

DETAILED DESCRIPTION

[0037] The following examples illustrate some embodiments and aspects of the invention. It will be apparent to those skilled in the relevant art that various modifications, additions, substitutions, and the like can be performed without altering the spirit or scope of the invention, and such modifications and variations are encompassed within the scope of the invention as defined in the claims which follow. The following examples do not in any way limit the invention. For ease of comprehending the various embodiments, the description includes description of various features under specific headings. However, these features may be implemented individually or in a mix-and-match fashion so as to take advantage of specific feature(s) for specific application.

General Overview

[0038] Embodiments of the present invention utilize a camera and a flat panel display to provide the user with the experience of looking at a mirror. That is, the image stream from the camera is manipulated and transformed such that when it is displayed on the screen, it appears to mimic a reflection in a mirror, rather than a recorded video stream. Since the "virtual mirror" image is digitally produced, it can be stored and manipulated to provide further enhancement features. For example, the image can be manipulated to change colors, to enable multi-level user identification and authentication, and to enable body measurements. The system includes a calibrated camera, such that the system is capable of providing augmented reality features, for example, color, texture, shape manipulation of body items or background in, e.g., a virtual mirror or video conference applications. It is also capable of performing body measurements and body monitoring for commercial, security, and healthcare applications.

[0039] Regarding the hardware, various embodiments may include single or multiple cameras from all types of sensors, including but not limited to, CCD, CMOS, IR CMOS and the like, and format protocols including HDMI, Firewire, USB, IP, HDbaseT wireless and the like, and any available resolutions including HD, regular SIF, 4k, 8k and the like. The display can include single or multiple screens or virtual screen, and regular screens in all sizes, shapes and proportions. The display can include mirror like screens, smartphones or tablets, projectors, holograms, 3D screens, Google glass, projector head mount display (HMD), glass (with switchable obscure layer) and the like.

[0040] In the disclosed embodiments the camera can be located anywhere. A best practice is to provide the camera above the screen facing the user. Additional locations can include the bottom of the screen, the sides of the screen or behind the screen if the screen is a bidirectional screen. In the case of 3D, two cameras can, for example, be provided at the top and side by side, which can provide superior results and ease the computerized method. Also, 3D can be manipulated from a single camera once the user is moving and/or rotating.

[0041] The embodiments can include a computerized method to cover a full body or a partial body, and different scaling per user selection (e.g., correction of head and/or eyes, direction of view/point of view and the like).

[0042] Each of the disclosed embodiments can be provided over a 2D or 3D still hard copy image, a 2D or 3D still digital image, over analog/digital video that was recorded by

analog/digital camera or by frame grabber HDMI (or equivalent), IP, USB, Firewire (wired or wireless link) and the like. Each of the disclosed embodiments can be provided over digital streaming video that can be delivered to a computing device over any suitable communication method such as USB, HDMI, IP cat-5/fiber, WLAN, Firewire, HDbaseT, any combination of the above on a single cable or on multiple cables. Each of the disclosed embodiments can be provided when the computing device resides in the camera, in the screen, in the cloud, or in a computer including a workstation, server and the like.

[0043] Each of the disclosed embodiments can be provided when the computing device is distributed between the system elements, e.g., the computerized method can reside partially in the camera, partially in the video acquisition element, partially in the screen graphic processing unit (GPU), partially in the cloud, partially in the user smartphone device or any suitable combination thereof. Each of the disclosed embodiments can be provided when the computing device resides in a smartphone, tablet, notebook, screen, camera, HMD, Google glass and the like.

[0044] Each of the disclosed embodiments can be provided when the video is preprocessed to extract a 3D model of a selected item, where the preselecting can be done manually by the user or automatically by applying rules for selection. The model extraction can be performed locally by DSP/CPU next to the camera, in the cloud or in the user application on the user's device. It is more efficient to extract the model in a GPU (graphics processing unit) for a single object or a still image; in this case, a regular CPU can be sufficient.

[0045] Each of the disclosed embodiments can be provided when the rendering is being performed locally in the augmented reality station, in the cloud, or at the user mobile device. The rendering may be performed in the GPU for a single image or a very short video; in these cases, a CPU can provide sufficient performance.

[0046] Each of the disclosed embodiments can be provided when enhanced rendering techniques are performed to improve video quality, e.g., interpolating the object and the image to higher resolution and decimating after combining to smooth the edges and eliminate an aliasing effect. The present invention can eliminate flickering edges, e.g., by smoothing the model frame by frame, by eliminating the allowed changes per frame on the edges, by smoothing edges per frame, by applying averaging filters on single or multiple frames, and the like. Additional

improvements can be achieved by increasing the frame rate and applying additional smoothing technique on the added frame to smooth the effect that would occur on the original frame rate.

[0047] Each of the disclosed embodiments can be provided regardless of whether screen resides near the camera. For example, the screen can be located in a control room. A camera main stream or recorded information can be accessed via remote control, via other address directly with physical infrastructure, or over the cloud.

[0048] In one embodiment the control on the station functionality can be through a gesture, eye movement, palm movement, finger movement or brain control. The present invention can be controlled with additional accessories like a laser beam pointer, voice control, wireless, or ultrasound tracing.

[0049]

Segmentation

[0050] Accurate segmentation of objects and/or elements out of an image or video is one of the biggest challenges in the present field. Known techniques for solving this problem involved a clear tradeoff between accuracy and speed. Prior to the present invention, there is no satisfactory solution to the problem. Use of an infrared (IR) camera with three-dimensional (3D) depth measurement is one approach in the industry; however, quality of the approach suffers. For example, edges, image distortion, and/or low resolution misalignment between the IR and regular cameras prevent successful and convincing segmentation. Chromatic separation and edge detection techniques are very demanding from a computer resource perspective and do not yield a consistent performance. Some techniques to extract a user or object assume, for example, a green background that is easy to be distinguished, though not applicable in applications where the green background is not available.

[0051] Once a model of the item or items to be manipulated is obtained, a second problem is to create a smooth rendering flow that will update the model and will render it smoothly back into the original video or into other augmented reality video with the new information. The following disclosed embodiments achieve a smooth rendering flow relatively fast with high quality, so the manipulation can be done in real-time, in semi-real-time, or relatively fast, depending on the requirement of the particular application. Also, the embodiments are adapted to manipulate the items (color, texture, shape) in real time, on camera main stream feed, or off-line on user recorded videos.

[0052] Based on the model, the mask, and/or alpha channel per object from a video, user movement is learned and different objects to fit or not to fit with the object shape and form can be installed in a convincing manner. The disclosed embodiments can be distinguished from prior techniques, which attempt to do everything virtually. The embodiments can include manipulation with a mask to cover other changes such as different cloth, the changing face of a user, a change of the user's body type, elimination of a user from an image and the like.

[0053] Another disclosed feature is cloth recognition, which can identify the items and the clothes the user is wearing. For example, it can include a hidden code or information in the fabric.

[0054] Other features and embodiments may include: a microwave scanner, where the microwave sensor is integrated in the screen; body measurement features including, e.g., 2D and 3D body line detection or 2D/3D model/mask generation out of a video; analytic conclusion from the measurements, e.g., body type, origin, sex, age, suggested sizes of clothes, suggested diet or treatment and the like; body line tracking over time for diagnosis, identification of changes, user identification, and the like.

[0055] In some embodiments, the main camera stream can be manipulated in real time to change the appearance of the user, or to completely make him disappear from the video or image. In this scenario, the camera DSP or separate DSP or GPU capable device needs to get the camera stream and process the camera stream via remote control center and package it again as a camera main stream. A parallel computing to the camera main stream (sniffer) is also an option in one embodiment.

[0056] Provided below are several examples of additional applications that can leverage the technology of the present invention. Specifically, base video transformation can be used to create reliable virtual dressing.

[0057] Base video transformation can be used to create a reliable video conference when the user/users on the other side of the line can see the participant as if the participant were looking directly at them, rather than having an image from the viewpoint of the camera. Alternately, transformation can be used to create an image as if a user were looking into the eyes of another user in order to provide a convincing, live experience.

[0058] Base video transformation for augmented reality can be provided for multiple purposes including though not limited to: body manipulation and resizing, body measurements,

medical diagnostic/monitoring/training and/or tracking, gaming, dressing, dating, meetings, security, full body simulators, dancing training, hair dressing, makeup, general training, traveling, and the like.

[0059] The embodiments can be applied for video conference or gaming where the user would like to change his appearance (e.g., skin complexion, dressing, face, and the like). According to the present invention, the model can allow a smooth change into a desired appearance or even create an image whereby the user disappears from the video.

[0060] The embodiments can be used in a security application, with accurate face recognition over calibrated EyesMatch (see, U.S. Application No. 13/843,001) when the camera is located with projection perspective to the user's eyes, with Dynamic QR (quick response) code recognition (e.g., authorization and management of user access via Mobile Application, or badge, QR code can be generated for the mobile application from the cloud and can be verified by user authentication in the application), with full body recognition, scanning, and learning, with item recognition (e.g., clothes, uniform, badge, and the like), with a wireless sniffer (e.g., WiFi, Cellular, ultrasound and the like), with API to a security database, with location systems, with public information and the like. The embodiments can be used with a threat prevention action based on recognition of a specified activity (e.g., lock door, turn on/off a light, release fog, shooting machine, e.g., electrical shock, bullets, paper and the like). Due to the geometry of the calibrated image, the location of the target in the image can be measured very accurately and can be used to operate an accurate attack on a target efficiently without risking others.

[0061] Real time and offline appearance registration and comparison can be provided so a user can follow up appearance changes over time and over the years. These processes can be provided for multiple purposes including medical registration, which can be over a given period of time, between multiple examinations, using multiple/different sensors, e.g., for temperature, blood pressure, and the like.

[0062] In some embodiments, the calibrated camera/multiple cameras with/without complementary information from other sensors can be used for patient diagnostic and patient monitoring. For example, though not limited, the present invention can be used to monitor and alert for skin problems like skin cancer melanoma, breast changes that can suggest further testing for breast cancer, heart rate and blood pressure measurement, temperature of the patient, halo of

the user, skin and finger nail recording monitoring for changes, eye problems, spin, bones, muscles and body flexibility trends and changes.

Augmented Reality Platform

[0063] FIG. 1 is a system block diagram for an augmented reality platform supporting a real-time or recorded video/image processing. The system can include one or a plurality (1:n) of input devices 101, including a video camera, a still camera, an IR camera, a 2D camera or a 3D camera. The input device 101 can be adapted to send information to one or more machine vision augmented reality modules 102, 103, 104, 105, 107, 108 and 109. The one or more machine vision augmented reality modules 102, 103, 104, 105, 107, 108 and 109 can be adapted to send information to one or a plurality (1:m) of screens 106. The one or more machine vision augmented reality modules 102, 103, 104, 105, 107, 108 and 109 can be adapted to send/receive information to/from an interface or user interface module 110. The interface 110 can be adapted to send/receive information to/from one or more of a cloud, a web/store or a user device, e.g., smart phone or tablet.

[0064] The one or more machine vision augmented reality modules 102, 103, 104, 105, 107, 108 and 109 can include an image grabbing module 102, an eyes-match transformation module 103, an augmented reality module 104, a video/still recording module 105, a trigger event module 107, a control element module 108, and a factory calibration module 109.

[0065] The image grabbing module 102 can include one or more of the following features: enhancement filters, format conversion, video frame separation, image cropping, image resizing, image stitching and the like. The image grabbing module 102 can be adapted to send information to the eyes-match transformation module 103. The image grabbing module 102 can be adapted to send/receive information to/from the trigger event module 107.

[0066] The eyes-match transformation module 103 can be adapted to apply on the image the right mapping to match the camera point of view with theoretical mirror point of view (user eyes reflection) and fill the blind pixels if there are any after the mapping. The eyes-match transformation module 103 can be adapted to send information to the augmented reality module 104 and/or the video/still recording module 105. Also, the eyes-match transformation module 103 can be adapted to send/receive information to/from the control element module 108. Further, the eyes-match transformation module 103 can be adapted to send information to the one or plurality of screens 106, to display an image that mimics a reflection of a mirror.

[0067] The augmented reality module 104 can be adapted, for example, to provide virtual color and texture replacement, virtual dressing, object insertion and the like. The augmented reality module 104 can be adapted to send/receive information to/from the control element module 108 and/or the video/still recording module 105. Also, the augmented reality module 104 can be adapted to send information to the one or plurality of screens 106 to display an image that mimics a reflection of a mirror that is modified by the changes produced by the augmented reality module 104.

[0068] The video/still recording module 105 can be adapted to record a single image (frame) or a short take based on software control. The video/still recording module 105 can be adapted to send/receive information to/from the control element module 108. Also, the video/still recording module 105 can be adapted to send information to the one or plurality of screens 106.

[0069] The trigger event module 107 can include one or more of the following features: recognition of a user in front of the mirror, face recognition, recognition of user gesture commands, item recognition, distance measurement, user body measurements/assessments (including, e.g., height, age, weight, ethnic group, sex, and the like) and calculation of user theoretical point of view in theoretical mirror. The trigger event module 107 can be adapted to send/receive information to/from the control element module 108.

[0070] The control element module 108 can include one or more of the following features: control and management for setting the camera to optimize quality, for setting other hardware elements, an interface between algorithm modules and higher code/application/user interfaces, and push calibrated data from factory into the algorithm elements. The control element module can be adapted to send/receive information to/from the factory calibration module 109.

[0071] The factory calibration module 109 can be adapted to define the mapping transformation between the camera and the user point of view in front of the screen. Also, factory calibration module 109 can be adapted to calibrate the image based on distance, a special location (e.g., markings on the floor), user height or any combination thereof.

[0072] FIG. 1 and the following description represents just example of one embodiment of the present invention; other flows or functionalities can be allocated between the modules, represent additional embodiments that are part of the invention. The present inventors

propose two methods to enable the augmented reality capabilities (real-time and offline). Both methods wrap the augmented reality module 104 with real image or video data that is real-time or was taken post processing via, e.g., eyes-match transformation module 103. That is, the image that is operated upon by the augmented reality module 104 may be a transformed image that represents a mirror reflection of a user.

[0073] One feature is that a user can define manually or automatically (via, e.g., interface 110) rules regarding what items the user would like to process and manipulate and what is the expected end result, e.g., an automated rule can be something like automatic identification of a user's shirt, which can be automatically or manually changed to a different color, or a user selecting a shirt via manual selection with a touch screen and manual color selection. Then, the selected object can be processed and extracted/segmented out and recorded to the database linked to the original recorded video or image. The augmented reality module 104 can then process the model/mask in real-time at a given frame rate, which can be at a lower or higher frame rate than the original, and at the same or a different size than the original. Some applications do not require (but can nonetheless include) live augmented reality, like trying-on clothes when the user would like to see himself with the modification (one or more options). Once the extracted object from the live scene is saved, it is easier to render multiple changes (color, texture, size, and the like). In addition, it is easier to perform a longer process, much more accurately, with higher quality and utilizing a process that yields more information, e.g., user movement, body measurements, and quality based on frame integration and the like. For other applications that require real-time processes, like a video conference, the second option is better to use. With the second option, the performance should be adapted to be as close as possible to the actual frame rate of the camera in order to avoid introduction of delay/lagging that can yield frame drops and poor performances. If delays/lagging are encountered, then such delays/lagging can be managed in a way that yields a smooth video without lagging of the frames. Such management can be achieved with buffers, image timestamps plus some delay, or with timestamps and frame reschedules for rendering.

[0074] For video input, it is highly recommended that the rendering process be done in a DSP or GPU device in order to avoid introduction of delay into the video. The creation of the mask/model can be done for the first option (not real-time) in a CPU as well. For the second option, the mask/model can be performed and calculated in the GPU/DSP as well.

[0075] In the trigger event module 107, some of the trigger functionality can be completely automated, e.g., a process can be started if face detection or presence detection is made. Some of the triggers can be performed in a semi-automated fashion from the user interface module 110, which can include any way to control the computerized device. Some of the functionality of the trigger event is to calculate the image transformation based on geometric information, calibration, and/or real-time user tracking, e.g., location of the user, eyes, head, hands, position, movement and the like. The tracking can be done using one or more techniques such as background substation, pattern recognition, color segmentation, and the like. The transformation tracking calculation functionality can also be implemented in the other modules.

[0076] The control element module 108 can be adapted to configure the system setup, camera device, authentication and the like, and can also provide information from the tracking transformation function into actual geometry transformation module or augmented reality module and the like.

[0077] With the factory calibration module 109, some of the information needed to calculate the transformation to be applied on the image/video can be generated during factory calibration or can be calculated based on additional information on the actual orientation of the camera in the field, e.g., height above the floor or desk and the like, 3D point of view, lens field of view (FOV), and the like. The factory information plus the actual geometry of the implementation can be processed and delivered to the right element in the system that will use the information for better calibration and accuracy.

[0078] In addition to application to a local screen for a mirror application, the present invention can be used to send the video plus the means to transform it or the actual manipulated and transformed video to another address in the cloud or locally as a single or bidirectional video conference.

[0079] FIG. 2 depicts an example of an augmented reality module, which can correspond with the augmented reality module 104 described above. Specifically, the augmented reality module can have a function of allowing a user to virtually dress themselves, change appearances, such as color, accessories, etc. In this embodiment, the system obtains input image or video from, for example, the EyesMatch computerized method 201, or from any other image/video source, e.g., user smartphone, security camera, Google glass, mobile camera or stationary camera. Additional embodiments can include additional geometric information that

will help to calculate proportion like user height, gaze and the like. If the user video or image is coming from the EyesMatch module (calibrated image/video), a more comprehensive model can be created that allows for body measurements, object pose, size, highly accurate orientation detection and the like. The additional information that can be calculated from the calibrated object or video can allow for object fitting, object replacement and insertion of new objects into the frame/video, since any distortion introduced by the location and field of view of the camera has been accounted for and corrected. These corrections enable highly accurate measurements of the user height, waist, etc., and fitting of the user's body to generally classified body types.

[0080] The election module 202 can obtain election information from interface 206, manually from the user (X,Y or name of object) or automatically from an electing method, e.g., a mechanism that can automatically detect predefined objects like pants, dress shirts and the like. For example, the interface 206 may enable the user to select a garment to be changed, e.g., change color of fabric type. This election is sent to the election module 202, so that the proper item to be modified is extracted from the rest of the image.

[0081] Extraction of the object is a rather difficult task. For example, if the user is wearing a red shirt, and in the background there's a red chair and the user is standing on a red carpet, the human eye can easily distinguish which red parts belong to the shirt and which do not. However, performing such determination automatically with a computer is very difficult task. Moreover, depending on the lighting and the folds of the shirt, different pixels belonging to the shirt will appear as different colors. Therefore, if one goes by simply choosing all red pixels, some dark pixels belonging to the shirt will not be included, while some pixels belonging to the chair and carper will be selected.

[0082] The extraction module 203 can determine the location of the object (i.e., all of the pixels that belong to the object) and samples the color (or the average color of the object, which can be more than one color). The module 203 can use this information to create a black and white mask that is first used to generate a 2D or 3D textured shaded and colored mask.

[0083] The technique to extract the object is based on 3D color correlation or any other technique such as the closest Euclidian distance between the object average color and the pixel color to separate the pixels of the object from the entire image. The decision as to whether the pixel is in the object or not can be performed in multiple levels and is not limited to the following examples:

[0084] 1. Color correlation and the first decision can be based on Euclidian distance threshold, where the Euclidean distance threshold is in the RGB color space or chromatic color space. That is, for each pixel, a Euclidian distance is measured from the pixel's color to the object color as determined by taking a single or average color of the object. If the pixel's color is at a distance higher than the threshold, it is determined not to belong to the object.

[0085] 2. Filter noise by applying morphological operators like dilution and erosion, which can improve the decision regarding pixels that are "wrongly labeled" as part or are not part of the object. In most implementations, the shape of the object would be known or may be estimated. For example, if the user selects pants, the system would have an estimation of the shape of pants. Thus, the results of the selection in (1) above can be further adjusted by checking whether each excluded pixel is within the estimated shape and should be included in the object and, conversely, whether an included pixel is actually outside of the estimated shape of the pants and should be excluded.

[0086] 3. Decision based on information from previous or forward frames, or from neighboring pixels in a row or around the pixel. This step represents a major decision in the process. In most implementation, it would be unusual for consecutive pixels to be alternatingly selected as belonging and not belonging to the object. Physical object are larger and are covered by more than a single pixel. Therefore, the pixels would be grouped as belonging or not, and a check of neighboring pixels can be used to confirm the selection.

[0087] 4. Object distance from original election, which can be used as a threshold. For example, for each pixel its Cartesian distance to the original selected pixel is calculated and, if it is outside of the expected distance, the pixel is considered to be outside of the object, and vice versa.

[0088] 5. Object surface continuation, whereby, if we know that an object surface continues, then we can filter out some of the noise. For example, sometimes the image may have reflections or shadowing that would cause the pixel color to appear drastically different from the true color and therefore, to be indicated as not belonging to the object. However, an object is generally a continuous surface. Thus, the continuity can be used to eliminate such mislabeling.

[0089] 6. Object edges, whereby we can improve the decision around edges by edge detection that can be done by high pass (HP) filters or other techniques.

[0090] 7. Decision based on color energy. One of the problems of color separation is that color under low light conditions can be seen as black, and the dynamic range of the decision is reduced significantly. Dark/black pixels can be isolated and other techniques can be applied to decide if the dark/black pixels belong to the object or not, e.g., the present invention can determine if the pixel is located inside the object boundary, or the distance of the energy from the object standard deviation (STD) color changes.

[0091] 8. Use previous information on the expected object shape to obtain better results.

[0092] 9. In case the object is a combination of multiple colors or shapes or has logos or other pictures, multiple color correlation and combining can be used. Additionally, any of the multilevel methods specified above can be used to obtain a higher level decision regarding the object.

[0093] 10. The decision can also be based on a majority or a decision pertaining to a neighboring pixel/image as a weighted factor in the decision. In case we are processing the decision on the image as a vector, it can be easier to look at the neighbors in the same row or same column depending on how the image matrix is reshaped into a vector.

[0094] 11. Estimation of the item material/texture color standard deviation (STD) can also add significant information for object segmentation. In some implementation, a database of different fabrics and their textured is stored to assist in such determination.

[0095] 12. Any combination of one or more of steps 1-11 above.

[0096] The mask can be used for rendering as a simple black and white mask. However, in order to create a convincing feeling of an object, additional information from the object's texture or appearance can be maintained. In order to obtain the additional important information, the mask can be applied on the original frame or video, and the RGB or gray scale texture, shade, or brightness scale on the object can be obtained. This information is much more accurate and convincing for color changes since it saves the original object's wrinkle texture, shading, light reflection, material signature, and the like.

[0097] The model mask can be constructed in layers for improved manipulation. Examples of a potential layer structure can be as follows:

[0098] 1. Black and white mask (to segment out the object). The black and white mask can be very important to distinguish between the object and the background or between the

object and another element around the object. Multiple techniques can be used to optimize the object mask/boundaries decision.

[0099] 2. Object edge mask – representing the edge or outline of the object.

[00100] 3. Red color mask – representing red areas of the object.

[00101] 4. Green color mask – representing green areas of the object.

[00102] 5. Blue color mask – representing blue areas of the object.

[00103] 6. Textures that apply to all color masks – representing texture appearance of the object.

[00104] 7. Shade or brightness mask – representing shaded or bright areas of the object. This may be an intensity map of all of the pixels belonging to the object.

[00105] 8. Material light reflection mask – representing light reflection of the object.

[00106] 9. Material light absorption mask – representing light absorbing areas of the object.

[00107] 10. Mask from other sensors like IR, microwave, depth, ultrasound, ultra band and the like.

[00108] 11. Layers similar to those described above.

[00109] Once the mask model has the required information, in order to change color or texture, the rendering module 204 can be used to modify the specific layer/layers and regenerate the object out of the multiple layers resulting in a rendered video 205 that is extremely realistic. For example, if the user wore a red shirt, the red mask can be replaced with a blue mask to render the user wearing a blue shirt. Since all other masks remain the same, the blue shirt will be rendered with all of the shading, brightness, reflection, texture, etc., of the red shirt, thus rendering a very realistic blue shirt having the same folds and following the same body contours as the red shirt. The effect of some layers can be introduced by multiplication or by adding the modified layer to the frame. Subtraction and division can also define relationships between layers. Additional techniques that allow for more complex item manipulation include a registration technique, which can be based on a few points stretch/transform an object or material to fit within the boundaries of the manipulated object.

[00110] The module can obtain the original video/image, the modeled mask multichannel and the required change. The required change can be any combination of color, brightness, material, texture, icon/logo, printing, fabric and the like.

[00111] In one embodiment, the required change can be outside or inside the original object boundaries and a modified mask for the new object boundaries can be created to replace the original mask model.

[00112] In one embodiment, the required change is fabric with specific oriented texture and color that can be inserted in a specific orientation. In this embodiment, the material orientation can be modified and applied accordingly. For example, a database can store masks corresponding to different fabrics, such that a user can change the fabric of an item the user is wearing by simply selecting a different fabric on the user interface. The system would then replace the mask corresponding to the actual item the user is wearing, with a fabric mask corresponding to the selected fabric.

[00113] In one embodiment, the required change can be another user's try-on mask. Using a registration technique, the other user's try-on mask can be applied to fit the new object on the user's similar object to try-on. For example, a user is measured for a shirt and another user is measured for a jacket. In order to show the first user how the jacket from the second user looks, the method can use a registration technique that fits the second user's jacket so as to obtain and apply the correct body line shape of the first user, which can create a more convincing fitting. One benefit of this method is that the jacket will look much more real in that it is rendered so as to preserve all the texture of the second user. To produce these results, the method can register the orientation, location and size of the first user. Registration point may include, for example, midpoint between the eyes, the edges of the shoulders, the edges of the waist, the knees, etc. By stretching or contracting registration point from one user to another user, the garment from one user can be shown as if worn by another user.

[00114] In one embodiment, the mask can be used as pointers for virtual object registration. In one embodiment, the mask plus the background recording in the right transformation as the user can be used to eliminate the user/item from the image/video.

[00115] In one embodiment, election of the single object or multiple (1:n) objects can be obtained that need to be modeled. From the video, a mask is created per frame. If the user is spinning, a 3D or partially 3D frame by frame model can be created. From this frame by frame model, different perspectives can be obtained and used to create a 3D model that includes some or all of the user's movements. Later on, this information can be used to create a more

convincing virtual dressing. That is, the present method can utilize the user's own movements in forming the model.

[00116] In one embodiment, the rendering can be performed in the GPU, CPU, cloud GPU or cloud CPU. The input elements to be rendered can come from the CPU, from the user database in the cloud, or from an active link with the inventory/any other database/3D printing, ecommerce data base, social data base and the like.

[00117] Changes in item color can be based on actual try-on and available inventory or optional 3D printing on site or in the factory for user customization. One advantage relative to regular virtual dressing is that the item is shown draped on the body just as it would in reality, since all of the folds, shading, etc., will be transferred with the appropriate masks. This is a very important feature from many aspects. The user can sense how the item feels on his body, how it may effect and change his body shape and the like.

[00118] In one embodiment, an accessory or any other item can be added by learning the dynamic movement and the mask model of the relevant object. Also, the background can be augmented so as to change or create a different environment by the same technique. Once all the required objects are labeled, the required objects can be masked and the combined mask can be used to change the background.

[00119] In one embodiment, the rendering module can render the object with an enhanced rendering technique of interpolating the object and the frame into higher resolution, can combine the object at high resolution, can smooth the edges, and can decimate the object back to the required resolution with better quality of integration into the frame. Additional techniques include working directly on the edge of the object by averaging with some weighting factor the value of the pixel in order to better blend the object with the background color.

[00120] FIG. 3 depicts an augmented reality module that can replace a body part, color, orientation and texture of an item or object in the foreground or background of the image, e.g., the module can add hair to the user, change the user's eyes, skin and hair color, can change the pose of the eyes and the like.

[00121] Modules 301, 302, 303 and 306 can work in a similar manner as compared to modules 201, 202, 203 and 206 of the previously described general augmented reality module. Module 304 can have the capability of calculating or obtaining additional information like head pose or body direction of movement directly from the EyesMatch module or from module 307

utilizing a dedicated detector for item 3D movement and orientation and can use this information to modify the required body part, e.g., obtaining the head pose will allow for eyes steering correction by modifying the eyes of the mask/model to the required direction. In addition, the head detection can allow for adding hair in the right orientation, a hat and the like.

[00122] In one embodiment where the required mask in some dimensions is smaller than the original mask, module 307 can perform or deliver in real-time or offline EyesMatch transformation of the recorded background image or video. The background transformed image or video can be capable of rendering a part of the body part or item using foreground or background manipulation, e.g., in case one would like to eliminate a user's head or upper body from the video. The transformed background image or video can be applied on the mask that captures the head and upper body, and the result can be rendered with the original transformed or non-transformed video. The result can be a rendered video 305 without the user head and upper body.

[00123] For example, in a more complex case, one might wish to depict a shorter length of a given dress. The mask manipulation in module 304 can be required to create a shorter mask for the new dress, and the difference between the original mask and the mask after manipulation can be a new mask for manipulation. In the new mask, some part will be the estimation of the user's legs and some part will represent background that would be newly visible with the shorter dress length. The new mask can be divided to legs and background, and the new rendered object can take the combination of background image and predicted legs to create a new rendered item. The result after rendering the modified item into the video is a user with shorter dress. Multiple techniques can be used to predict how the legs should look in the useable area.

Colograma

[00124] In order to manipulate color or appearance of an element in the frame, the pixels belonging to that element needs to identified. This is normally done by comparing colors and assuming that pixels of same color belong to the same object. However, such a procedure is not accurate. In the disclosed embodiments, the comparison is done using variables other than color. The method attempts to simulate the human eye, which can distinguish objects even when parts of the objects may be shaded and other parts may be highly illuminated or even reflective.

For example, in one embodiment the object is recognized as a known object with predictable boundaries.

[00125] When implemented as virtual mirror, the objects may include clothing items, such as shirt, pants, jacket, etc. So, when a user selects a shirt for manipulation, the system utilizes a predictive association to predict the location of the pixels that should be included in the object. For example, all pixels above the head of the user and all pixels below the waist of the user should not be related to the shirt. Thus, the search space is reduced. This predictive algorithm is improved when it is applied to a frame which undergone the calibration procedure of the eyesmatch. To provide a striking example of the combination of these methods, if the user elects to change only the color of the user's shoes, when the frame is calibrated using eyesmatch, the approximate location of the shoes is known, and all pixels above the feet of the user may be ignored when searching for the pixels belonging to the shoes. This drastically limits the search field.

[00126] In summary, in order to identify the object for manipulation, in addition to color comparison, the pixels may also be evaluated using the predictive location of the item, the known or approximate geometry of the object, the texture of the object, a standard deviation from the texture, standard deviation from a representative color, etc. Each of these variables can be assigned specific weight in a statistical evaluation of each pixel. Also, each parameter may be assigned a different error or statistical deviation value.

[00127] FIG. 4 depicts computing methods to create a model for color and texture exchange, which can be referred to as a Colograma. This technique is most beneficial for parallel computing that can support a large number of users or a large number of frames/video as opposed to super high quality color exchange techniques that can be found in software programs such as Photoshop. Such methods can take a lot of time and may not be practical to conduct on any large number of user images or video. The description of FIG. 4 is just an example and any derivative of the depicted flow is part of the present invention.

[00128] One challenge to change a color of an object in a video or image is to accurately identify the relevant pixels of the object. In a video file, speed is a limiting factor for applicable transformation. In FIG. 4, a simplified example of a method to segment/extract an object from a video is depicted. The method of Figure 4 may be executed by the systems described with respect to Figures 2 and 3.

[00129] The image or video to be modified is received in 401. In 402, the frame of the color image or video is converted into a line vector, which is optional, although vectorization of the image can speed the process time dramatically. The size of the vector is 1 by n, wherein n is the total number of pixels in the frame, i.e., the total number of pixels in the width times the total number of pixels in the height of the frame, time 3 for each of RGB colors. Also, in 403, the effect of the brightness is eliminated. There are many techniques to eliminate the effect of the brightness. In this example, energy averaging per pixel in the XYZ chromatic space is used, by dividing each pixel by the sum of XYZ. The CIE XYZ color space encompasses all color sensations that an average person can experience. Y is defined as the luminance, and for any given Y value, the XZ plane will contain all possible chromaticities at that luminance. For example, a 3 X 3 matrix can be used to convert RGB to XYZ, using the chromaticity coordinates of an RGB system (x_r, y_r), (x_g, y_g) and (x_b, y_b) and its reference white (X_W, Y_W, Z_W).

[00130] In parallel, at 404 the object selection is performed by first determining a comparison color that can be used for examining all pixels for determination of whether each pixel does or does not belong to the object. The comparison color is determined by using statistical analysis of the color of several K pixels that are believed to be within the object. This may be done by first selecting several points K(x,y) believed to belonging to the object to be transformed, by, e.g., knowin the geometry or the approximate location of the object within the image. K is the number of locations/zones with distinguished color that can be segmented out of the background or out of other objects. In some implementation, for each location, a window, or zone, is selected around the specific point, so as to ensure that the point or pixel is not an anomaly, but rather representative of the particular zone. Then at 405 each point K(x,y) is passed through the same transformation as performed in module 403. At 406, k iterations are performed to find each pixel's color and from that to find the best representative color of the object. This color can be used for the follow up investigation to find all of the pixels that belong to the object. K equals to or is larger than 2 in this technique. For each k, the Euclidian distance 2D or 3D is calculated. The minimum distance and K value is saved and is used as the comparison or representative color. This operation can be done on all pixels at once in a relatively fast process.

$$dist=sqrt((X-xi(k))^2 + (Y-yi(k))^2 + (Z-zi(k))^2)$$

[00131] After K iterations, the labeled image can be obtained. The Euclidian distance "dist" is just an example of a computational method to distinguish between colors; there are other methods to calculate the distance between colors, e.g., a color distance model based on human perception of color (chromatic, saturation and brightness), advanced calibrated techniques to match the sensitivity and the ability to separate color with the human eye like in CIE76, CIE94, CIEDE2000 and the like or any combination with histogram stretching IR/3D depth camera, color integration over time or any other method to improve sensitivity of the color detection (module 411). Applying or crossing the additional information from module 411 can happen at the distance comparison level 406, at the very end of the model creation 409, or any combination depending on the nature of the additional information (deterministic, statistic, time variant, and the like).

[00132] For example, when an IR camera is used, the image of the IR camera can be registered with the image of the standard camera. Then, the image of the IR camera can be used to easily separate the user from the background. This information can be used to limit the pixels of the standard camera that are to be evaluated whether they belong to the object or not. For example, when the comparison is done using a vector, the information from the IR camera can be used to reduce the number of entries in the vector that should be evaluated. Similarly, a texture mask can be used to remove pixels from the evaluation vector. For example, the texture of the carpet can be stored and any section of the image having the same texture can be eliminated from the evaluation since it is known that the user would not be wearing a carpet. Thus, several layers or masks may be used to operate on the vector and increase the accuracy of the results of isolating the object and assigning all of the pixels that belong to the object.

[00133] In addition to color difference we can also use other techniques that can add information about the object to improve the decision such as: zone likelihood (a given pixel needs to have neighbors or some mass of pixels), zone characteristic, boundary filters to isolate the object boundary before making a final decision, depth information (which typically needs to match the contour of the depth information with the end image of the object in 2D or 3D), time integration to determine if pixel is in the object zone over multiple frames, and the like.

[00134] Module 407 is an example of one embodiment of how to distinguish between the required colors and the other color space. In module 407, all the pixels with a distance greater than a threshold are zeroed out as non relevant (a pixel with a color different from any

one of the colors 1 to k), and 1 is assigned to all relevant pixels, thereby generating a binary mask which identifies all of the pixels belonging to the object.

[00135] Module 407 is an example where it is desired to separate a specific color or colors. Here, all the indexes can be zeroed out except the required one. The process proceeds as follows: zero out all the non-relevant indexes, obtain a background and non-relevant colors value = 0, and elect the required color object labeled = 1. If there is more than one color in the object, 1 can be assigned to any elected index 2 to k+1 and zero to all the others.

[00136] In 408 a black and white filter can be used to clean noise and smooth out the shape of the object. Other techniques may be used to improve the decision of which pixels belong to the object. As a result, an index for all the relevant colors starts at 2 to K+1.

[00137] At module 409, the obtained black and white mask is applied on the original color image and the 3D model for color and texture changes is obtained. The model can be 2D alpha channel of gray scale or 3D in the color space. Module 410 can obtain a 2D or 3D model of the object. In case of video from a single camera, it is possible to obtain a 3D model even if the user is moving in front of the camera, e.g., turning around in front of the camera. In this case, it is also possible to obtain object measurement in multiple cuts to estimate the user's 3D body curves.

[00138] An example of a 2D input to the model generator is provided below, where it is desired to create a model of the user's blue shirt shown in FIG. 9. FIG. 10 is an example of a 2D model or mask of the shirt, without the color information. Instead, a grey scale mask of the selected object, in this case the shirt, is generated and can be used later with any applied color. The texture of the shirt is preserved in this manner, so it is relatively easy to manipulate the color or the texture or even change the boundary of the model to create a different object.

[00139] The model based on just color difference is not perfect in terms of quality hence additional information and techniques can be used to improve the quality of the object model (see, module 411). Additional information techniques like interpolation and decimation or edge smoothing can be apply after processing via module 410 in order to improve the quality of the model.

Body Measurements

[00140] FIG. 5 depicts an example of a method to extract a body measurement from an image, multiple images or a short video. The body measurements can be used for various

applications and services, such as, e.g., estimation of weight, determine best fitting clothes, monitor body shape and weight over time, etc. Since the system acquires many images of the user at different stances and orientations, it may be beneficial to select the best image for performing the body measurements. The determination of which image to select may be performed before or as a part of the process illustrated in Figure 5. Specifically, a good body measurement can be obtained when the image is of user's body in perpendicular alignment to the optical axis of the camera. This may be determined by first determining whether the face appear symmetrical along a vertical line passing midway between the eyes. If the face appears symmetrical along this line, a vertical line along the center of the body can be used to confirm that the body is symmetrical along that line. For this step, it may be beneficial to first remove the hands from the image, such that only the center of the body is considered from the symmetrical determination. The process of removing the hands from the image is described more fully below.

[00141] In module 501, the image is analyzed using a body line and Body Mass Indicator (BMI) analysis by first using a process similar to the EyesMatch approach described in U.S. Application No. 13/843,001. In this approach, the image can be rearranged and transformed to compensate for distortion due to the setup geometry of the camera and optic distortion. Example of setup distortion factors include the user distance to the camera, the camera height, camera projection angle, the optics of the camera's FOV and other optic distortions. After the image correction, each pixel area representation can be roughly uniform in area (cm^2). Processing can be done in CPU, GPU, DSP in the camera, local computer near the camera, or remote server.

[00142] Module 502 is an optional element, which can transform a 2D image to a vector conversion to speed up processing. The size of the vector is the image's width, times the height, time three pixels (for RGB). The image inputted into module 501 can also be a vector already. It can be easier to perform some types of image processing on 2D matrix while other types of image processing are better suited for the vector image.

[00143] In module 503, it can be easier to perform the color manipulation to eliminate light and saturation effect on the vector image. This is done in a similar manner to what is described with respect to 403 above.

[00144] In module 506, the image can be made to pass an edge detection filter that can emphasize color changes and enhance the visibility of the body line. The edge detection can support edges of the body line so it can support multiple edge directions. For example, an edge filter with vertical, horizontal and +/- 45° capabilities can yield a good edge detection of the body line.

[00145] Modules 504 and 505 can provide additional information into the algorithm that can help with the image analysis, e.g., sex, age, race and the like of the user and statistical proportions associated with the information. This information can be used later on to focus the search of body parts. The height measurement can be used with complementary body proportion information to focus the search of specific body parts, for example, the bust, navel, waist, hips and the like.

[00146] Module 507 can provide head detection. There are multiple techniques for head detection. For example, one can take the edge emphasized image, flip it along the body length, and perform correlation between the images. The peak of the correlation can indicate the central mass of the body. Another alternative method is centroid center mass calculation of only the edges. Centroid center mass calculation can be less accurate if the light on the user is not uniform enough; however, this technique can be faster. Other techniques can be based on pattern recognition, eye, nose, and shape detection of the head. Once the central mass is found, a relevant window can be cropped to identify the body from the image. Also, the emphasized edge of the tip of head can yield the height of the user in pixels. Since the image has a uniform weight of length per pixel, the total height can be calculated accordingly. The assumption is that the module 501 transformation will yield consistent manipulated images across arrangements, e.g., 1-5 meters (m), where the actual height of the user on the screen in pixels will be proportional to the actual user height. Additional factors can be added if this assumption is not exactly the case per all distances.

[00147] Module 508 can measure the size of body parts in pixels. The technique can be an additional process on a focus area to further emphasize the body part. FIG. 13 depicts an example of the result of additional processes that eliminate the arms and hand from the body and point to different intervals of where to look for particular body measurements. The intervals can be calculated by generating a vertical centerline, 1301, which may pass through the center of gravity or the axis of vertical symmetry of the user's image. Then horizontal section lines can be

added to generate areas fit for body measurements. For example, line 1303 delineates the location where the legs connect to the torso, while lines 1304 and 1305 delineate the narrowest area of the waist.

[00148] Measurements in pixels can be translated into centimeters (cm) according to the predicted curve, e.g., the neck can be modeled as a cylinder so the measured width of the neck in pixels can represent the 2 x radials in pixels, then the radials in pixels can be converted into cm per the calibration. The bust for a man has a more elliptical model, so the translation will be a bit different. If additional side measurements are available, such measurements can be added to provide more accurate information to the model.

[00149] In module 510, the measurement can be deduced from the body type of the user, e.g., a "pear" shape if the hips are wider than the bust and waist (see, FIGS. 11 and 12). In addition, some analysis can suggest the following:

[00150] 1. body condition health risk for heart issue and the like;

[00151] 2. the type of clothing that best fits the user's body type;

[00152] 3. trends in the user's body for historical comparison;

[00153] 4. focused advertising based on the user's body type (e.g., Mesomorph/Endomorph can get focused coupons for the best nutrition that fits their body type);

[00154] 5. body recognition; and

[00155] 6. body diagnosis can monitor body changes over time (spin condition, flexibility, potential tumors, and the like).

[00156] Information on the user's BMI can be learned or estimated from the object model described in FIG. 4 or directly from the image BMI analysis as described in FIG. 5.

[00157] In various applications it is beneficial to "learn" the texture of specific articles in the image. According to various embodiments, to measure texture with a good resolution, the object is first isolated from the image. In one embodiment, after segmenting out an element or body part, additional fine texture reconstruction or measurement can be implemented. Texture measurement can be done with 2D, or 3D sensor (camera).

[00158] In embodiments utilizing a 2D sensor, the following two examples can be implemented. Since the user will be moving in front of the mirror, the system can capture two images (e.g., consecutive images) that will be used to calculate depth or texture. There are multiple ways to do so and, as an example, the system can extract two or more images from the

video and based on central mass detection can calculate the distance and use the distance for the stereoscopic calculation of the texture. That is, when taking a stereoscopic image using two cameras, the distance between the cameras is known, so that triangulation can be performed using the distance between the two cameras and their angle of optical axis. But if there's only one camera, then the system takes two images using the same camera, but separate in time. Consequently, the user would have moved a bit between the two images. The system then calculates the difference between the two pictures and performed reverse triangulation. This can be done by calculating, for example, central mass of each pictures and then calculate the x-y distance between the two central masses (for example, in pixels). This can be used to perform reverse triangulation as if the two images were taken using two cameras. Other pointers can be used to calculate the distance, e.g., the processor can identify the eyes in the two pictures and calculate the distance between the eyes in the two pictures. Another option is to determine rotation of the user, i.e., (r,Θ) and use that to perform the reverse triangulation. In any of these methods, since the camera can be positioned at a height that is above the central mass of the user, e.g., on top of the monitor, the reverse triangulation can be used to calculate depth, thereby acting as a depth sensor.

[00159] Alternatively, the system can find noticeable pointers in both images and try to match them, then eliminate all the pointers without clear identification. This can be done using, e.g., RANSAM Random Sample Matching technique to find from a random set of pointers the group that has similar behavior and use those pointers to find the distance in pixels for texture measurement or 3D construction of an element.

[00160] Another option is to estimate the distance between the mirror based on the distance and the body rotation. For example, if the system can measure the user's body pose, it can estimate the texture.

[00161] With 3D sensor, the system can do the same as in 2D, although in order to improve the dynamic range and the accuracy the system needs to isolate the element to be measured. The background subtraction can be improved by rough depth measurement threshold. The system can estimate the texture every 1 or more frames and just smooth the texture changes between frames by Kalman filter or any other interpolation extrapolation techniques.

[00162] In some embodiments, only a 3D sensor will generate depth measurement that will be used to control a parametric model of the user's avatar. The user can be virtually dressed

and explored in 360^0. In addition the system can be controlled to adapt position movement to the user for mirror application or video conferencing. To match the avatar to the user movement, a registration technique can be used where the registration pointers can be allocated in multiple ways, e.g., automatic noticeable element detection and RANSAM random sampling and matching technique. Once the system has the pointers, it is easier to move the avatar based on the actual user movements. The data from a depth sensor or 3D camera can pass a similar mapping transformation engine and the result can be the base of a more accurate 3D avatar of the user. The avatar can be used fully or partially as a model base to present virtual elements on the user.

[00163] Other technique to fit the registration mapping is to identify element in the image like head, hands, upper body legs and match the movement of the avatar to these elements motion. The motion can be measured and estimated every 1 or more frames and the smooth coarse of the avatar movement can be done by Kalman filter technique. The avatar motion can be done in real-time, semi real-time, or offline.

[00164] In some embodiments, the system receives the stream of images (either from one camera, from two cameras, or from a 3D camera), and use the stream of images to generate virtual reality in real time. The original images from the camera are discarded, and instead the virtual world is presented on the monitor. Since the real time images are used to generate the virtual reality, the virtual reality images faithfully represent the real world as imaged by the cameras. Thus, as noted above, the real time images can be used to generate an avatar in real time, where the avatar faithfully represents the user captured in the images. On the other hand, the background and articles worn by the user can be changed, such that the user's avatar can be displayed as if it is in a different location wearing the same or different articles as the user. For example, if the user tries on a ski coat, the real time images can be used to generate an avatar that corresponds to the user and which wears the same coat, however the background can be changed to display a ski slope, so that the user can imaging himself wearing the coat on a ski slope.

[00165] On the other hand, it is also possible the store the real time images, and then operate on the images off line, such that higher processing capacity is available, so as to generate a movie using avatar based on the user. The movie can then be sent to the user, e.g., over the Internet.

Security and Other Applications

[00166] FIG. 6 is an example of a security system application for multilevel user learning and authentication. This is just one example of possible flow implementation; any combination of the flow or different functional separation between the diagram modules is part of the invention.

[00167] As in the previous figures, stills or video from device 601 can be input into an image grabbing module 602. The image grabbing module 602 can be controlled by a trigger event such as those previously described and processed by trigger event module 607, which can provide tracking information and rules to initiate an image grabbing process. Specifically, the image grabbing module 602 can grab the image from the input 601 and push it into the EyesMatch transformation module 603 with the additional tracking information (real time geometric measurement). Based on the tracking information and the event requirement, the EyesMatch transformation module 603 can calculate a transformation to manipulate with the camera point of view, angle of view, and the like to create a calibrated image of the scene. In addition, the EyesMatch transformation can be performed locally in GPU/CPU/DSP, in the cloud and the like. In one embodiment, advanced information on the user or on the geometric structure of the scene can feed the tracking algorithm and may take part in the calibration. The additional information can be provided as one time geometric information, e.g., user height, distance between his eyes and the like. In that case the additional geometric information can be used to calculate the required transformation. The difference between the distorted image and the known geometric can be used to calculate and calibrate the transformation.

[00168] The calibrated output from the EyesMatch transformation module 603 can then be fed into the security scanner module 604, which can also be called a scene analytic module. The security scanner module 604 can be adapted to learn one or more of the following: body line or body curve scanning based on multiple techniques, e.g., edge detection, statistical edge detection, IR camera, microwave sensor, 3D camera, single camera and multiple cuts when a user is turning around. A complete 3D model of the body can also be taken when the user is turning in front of the video camera and the user's clothes can be extracted to an alpha channel as described in the technique depicted in FIG. 4, i.e., Colograma, and the like.

[00169] Other learning or authentication methods include, for example, cloth detection, whereby a signature to an item is created and sorted in a database. The database can

be updated from the internet, by scanning clothes from multiple databases and ecommerce stores or by actively scanning and updating information by the operator, for example, a uniform of security personnel, the type of fabric and the like can be entered.

[00170] Also, the combination of EyesMatch with face recognition can allow the operator to install a camera above a user's height, for example, above a door facing down about 30-45 degrees; such installation allows the user to move freely below the camera. In this scenario, for example, the detectable face recognition range is about 1-5 meters in front of the camera. This is an advantage since known face recognition systems are not very accurate if the user's head is scanned at an angle of +/- 15 degrees.

[00171] Additional body authentication sensors can include voice, smell, palm, fingerprint, eyes, DNA, skeleton with X-ray sensors or ultrasound, teeth, hair, impression, color, eyes, blood, halo, temperature, skin marks, ears and the like.

[00172] The video, stills or the analyzed data can be recorded with a video/still recording module 605 directly from the camera, from the EyesMatch transformation module 604, from the processed image or from data out of the sensors.

[00173] The visual video/image or analyzed data can be displayed in front of the user screen (full body or smaller), delivered over the cloud or delivered directly to a control center to be displayed on a screen 606 or to a module for further processing and analysis.

[00174] Modules 607, 608, 609 and 610 are similar to modules 107, 108, 109 and 110, respectively (see, FIG. 1 and associated descriptions thereof).

[00175] FIG. 7 depicts an example of a security system application for parallel or in-band camera manipulation.

[00176] The capability of the device in FIG. 7 can reside in a stand-alone device as depicted in FIG. 7 or as part of the camera DSP capability; the control of the feature activation can be done wirelessly or via wired infrastructure. In addition, some of the capability can be supported in a remote location, e.g., measurement and tracking. In addition, the device can be deployed in front of the camera and can project a manipulated image on a small screen to the camera.

[00177] The camera main stream can feed the device or the device can be adapted for taping and sniffing the camera main stream. After processing, the device can be adapted to send parallel data to the operator.

[00178] The device can have multiple image computing capability, EyesMatch geometric capability, e.g., in the EyesMatch transformation module 703, body measurement and user authentication, e.g., in the security scanning module 704, and augmented reality capabilities, e.g., in the augmented reality module 706, where the image can be manipulated on the main stream or in parallel to the main stream, e.g., manipulations can include a change of a user's body type, color, items held by the user, hair style, complete user disappearance and the like. These capabilities are very important for security usage.

[00179] In addition, the video stream can feed another device like a robot, a head mounted display, a user application and the like.

[00180] The interface to control the device functionality can be over the wire or wireless infrastructure or to a local or remote location. The measurement module can reside in the device or in the cloud.

[00181] In one embodiment, the capability, for example, can be done in real-time or offline. The activation of the device can be done, for example, periodically, in response to a trigger event or manually, as needed or desired.

[00182] The device can support real-time control and triggers for other devices, e.g., a projector for changing the image the user may see (camouflage), or a trigger event for an accurate threat eliminating device that needs an accurate coordination in front of the camera.

[00183] Video can be shared real-time with additional stations. There are multiple ways to share the video. Some exemplary scenarios are discussed in detail below.

[00184] Sharing the mirror experience with one or more other users remotely, where the user see himself on a local station and the remote user see the user in the mirror and share with him the experience. The remote user can have any suitable device; the main experience is to see the user who is standing in front of the mirror and is doing something for review. The user will be able to see a mirror image of himself based on EyesMatch or any other technology. FIG. 8a depicts this scenario. The remote user can just see the user broadcast, text the user, speak to the user and/or be seen in a small window on the mirror screen.

[00185] FIG. 8a depicts a sharing mirror experience in a video/voice conference. As shown in FIG. 8a, the mirror experience can be shared live with user/users in the cloud or via another mirror station. In the first case, the user can see himself in a mirror mode though the video stream that goes to the cloud needs to pass an additional mirror flip back to correct the

gaze orientation on the other side. So, when the user (in mirror mode) looks right or left, his eyes/gaze on the other side will move to the right direction as if he looked at the right direction.

[00186] FIG. 8b depicts sharing a full body video conference. As opposed to a regular video conference where the camera can be streamed "as is" to the other side, in mirror station, the image that is being sent to the other side needs to be flipped left-right on the remote location. This can be done by flipping the mirror captured locally or on the remote side.

[00187] In FIG. 8b, when two or more users communicate with each other in the full body stations, the user/users in one station will see the user/users from the other direction in the right orientation as well. As shown in FIG. 8b, the user can see himself standing on the left side of the local screen, and the user can see the other user on the right side of the local screen. In this case the local video is already mirrored, an additional flip/mirror will be needed when streaming the video to the remote location/locations (when broadcasting).

[00188] Any combination of mirroring, flipping, rotation and the like of the local or streamed video to match this experience of the local mirror and gaze correction on the other remote location are part of the invention.

[00189] In one embodiment, both stations are EyesMatched/calibrated to the same geometrics and dimensions; every one of the stations creates a full body mirror and sends it to the remote location/locations. The full-body and EyesMatch experience will occur on the video conference as well, and the user will get the feeling they are looking into each other's eyes.

[00190] In one embodiment, where there is more than one user in one location, the EyesMatch or body distortion correction can be done per user with tracking capability per user or for both simultaneously. In order to eliminate the line effect, in this case, augmented reality capability can replace the background as described above. In the augmented reality mode, Colograma or another technique can be used to replace the background with a plain background. The connection line can be placed between the users to eliminate lines or discontinuity with respect to the users themselves.

[00191] In one embodiment, where there are more than two stations, the screen can be divided to allow multiple users from multiple locations to be displayed at the same time, or multiple screens can be placed one next to the other as depicted, for example, in FIG. 8c. Specifically, FIG. 8c depicts multiple mirrors/full body stations with split screen or multiple screens. As shown in FIG. 8c, the order the users are depicted in the mirror allows for correct

gaze communication. When the user is looking to the right, for example, on the remote screen, after the flip, he will be seeing the user looking left toward the remote user.

[00192] This is just an example and any number of users near the screen or in remote location should be organize to allow for right gaze approach. In one embodiment, further gaze and eye contact improvement can be applied to improve the experience. In one embodiment, the screen can include 3D capability, and 3D capability per user in the screen.

[00193] In one embodiment, in addition to the EyesMatch or any computerized image processing at one side, the remote location can have additional computerized capability to manipulate on the far end video based on the local user tracking, e.g., if the user gets closer to the screen, the far end video or image will be processed to look a bit bigger and projected to provide a better feeling of a live session. Another example is when a user gets closer on one end, he will see a wider FOV of the far end.

User Interface

[00194] The present invention includes virtual mirror control and virtual system features to ease the usability of the virtual mirror. The virtual mirror control and virtual system can include various modes of operation including, for example, on, off, restart, mirror, display, idle, and the like. The virtual mirror control and virtual system can include authentication and registration of users, which can be automatic, manual or a combination of automatic and manual. The virtual mirror control and virtual system can include an optimal flow of operation to ease and enhance the user experience.

[00195] The virtual mirror control and virtual system can include one or more interfaces to control the mirror, e.g., automatic gesture, voice, eye pointing, mobile application, remote expert, local assistance, and the like. The virtual mirror control and virtual system can include a comprehensive combination of interfaces, including the following: playing a recorded video (automatic/manual); advance effects (item color manipulation, augmented reality features, gaming features, background change, 3D effect, lighting effect and the like); screen mode (orientation/full size or split screen); sharing techniques and methods to share the experience with friends/experts in real-time and on the go; mobile user application for controlling display and sharing, for example, sharing of personal videos and images taken from the virtual mirror or the user mobile device; retail or enterprise remote for general management (provide retailer information about the user in real-time with advanced control and analytics capability); and a

module to teach the user how to operate the mirror (animation, video, voice, visual hints and the like).

[00196] FIGS. 14, 15 and 16 depict examples of a virtual mirror user interface (UI) flow that can be sequenced together to simulate a mirror experience. Outside operation hours, the mirror screen and/or the computational device that feed the screen can be turned off or remain on with a screen saver to eliminate rapid aging of the display electronics. The mirror station can be enabled so as to automatically power up. The mirror station can be controlled via remote control locally or through the cloud to reboot and to enter into normal operation.

[00197] When the system is turned on, before a user stands in front of the mirror, the system operates in an idle mode, during which the controller may or may not provide transformation to mimic a mirror reflection. Once the user enters a specified zone in front of the field of view of the camera, the processor is capable of tracking the user in the recorded image. Based on the tracking, the video engine of the processor can calculate a transformation of the image to mimic mirror behavior.

[00198] In the idle mode, normally operable when there is no user in front of the mirror, monitor may display a screen saver, a static image, video clips, and the likes. All of these examples may be referred to as idle image, wherein the term "image" includes video. During idle mode the monitor may also display the background image recorded at that particular instance by the camera. In order to properly display the background image, so that it appears like a mirror reflection, the video engine of the controller can take a default setting (e.g., 2 meter from the monitor) and apply the 2 meter transformation on the camera stream to create a mirror effect on the background environment as depicted, for example, in FIG. 14.

[00199] In various embodiments, the system is capable of autonomously recognize the presence of a user in front of the camera and automatically start mirror mimicking procedure, including user identification, account matching, etc. In one embodiment, the presence of a user is done by continuously analyzing the images captured by the camera to detect changes in the image and identify a user. In one example, a trigger zone can be designated by placing a mat or using a specific indicia on the carpet in front and within the field of view of the camera. The carpet can be designed with a specific pattern and color that improves the tracking and detection of the user. In addition, the colors of the carpet can improve the quality of the video by, e.g., improving the specific contrast. For example, lighter colors can be used to improve lighting

conditions and improve the quality of the resulting video. In one embodiment, the pattern on the carpet can be alternating at around 5-10 cm with lighter and darker colors so that when a user stands with dark or light color shoes, the user shoes will be easily detected and tracked, and the maximum distance error will not be higher than half the color separation, i.e., 5-10/2. In one embodiment, the carpet can include instructions for the user informing the user how to operate the mirror. Alternatively, in one embodiment, an operation device can be provided where a user can step with their feet on a receptive pad to operate the mirror with their feet rather than their hands or voices. In one embodiment, the mirror can prompt the user to stand in the right location, e.g., when a user gets closer, the mirror can switch back to idle mode or the mirror can cut the user legs in the image, and the like.

[00200] The system can be configured so that, when the user steps into the tracking or registration zone in front of the mirror, the video engine of the controller reacts and starts tracking the object. Based on the object location, the video engine can adjust the video transformation to mimic mirror behavior. Additional input to the tracking can include the user's height, spatial location, pose and the like, as described in the EyesMatch process. At this point, the user is still not registered to the system, so an additional process of user identification can be performed. For example, the authentication can include face recognition, a special card that a user can present to the system for scanning, a user mobile device (audio, wireless, QR (Quick Response) code), or other biometric registration feature.

[00201] In one embodiment, since facial recognition is not entirely reliable 100% of the time, additional recognition features can be displayed so as to pop up on the screen for an appropriate amount of time, such as a few seconds. In the current example, a QR bracket 1505 (FIG. 15) is opened and the user can show the mirror a QR badge or QR that was sent to his unique application, e.g., on a smartphone, and effectively communicate to the system that the present facial image is associated with the authenticated user. This technique can be used to allow semi-automatic user merging in the event a particular user has more than one facial account. In addition, once facial information is merged, additional facial measurements and/or improvements can be performed to improve the recognition of the user over time. That is, when the user is authenticated using the QR code, all of the facial information associated with this specific code, from the current and all past sessions, are used to update the face recognition information for this user.

[00202] In one specific example, illustrated in FIG. 15, the image presented on the monitor includes a frame 1505 superimposed on the video image. Thus, the user looking at the monitor sees his artificial "reflection" on the monitor and the superimposed frame or bracket 1505. The user may then present a code, such that the code fits within the frame on the monitor. In one example the code is a printed barcode on a card. According to another example, the user may download an app onto the user's mobile device, e.g., a smartphone. The app includes a barcode, such as a QR code, specifically corresponding to the user or the user's smartphone. When the user sees the frame, the user opens the app and presents the smartphone such that the smartphone fits within the frame. The controller then identifies the code within the frame and thereby identifies the user.

[00203] When the user is identified, the user's account can be opened and the last recordings can be displayed, e.g., in one embodiment, a thumbnail configuration 1510 can be displayed, such as that depicted in FIG. 15. Alternatively, any other image control bar can be displayed. If the user is not identified, a user registration process can commence, then, after a few seconds, a new account can be opened and the mirror can be configured to start recording automatically. For example, if the user is not identified, a code, such as a QR can be displayed on the monitor, such that the user can scan it with a mobile device to download the app. When the app is downloaded and the user completes the registration process, the app on the user's device would include a code that can be presented to the frame in future visits.

[00204] In one embodiment, the system can record and store a video clip of N seconds, e.g., 10-13 seconds is enough time to allow the user to get a good impression on the way a particular item looks and can include, e.g., the user turning around and the like. So, while the user may continue to inspect the current item on the mirror, and the controller may continue to provide transformation for mirror mimicking, the system records only a sub-section of the entire session. This sub-session may be stored in the database, e.g., on the cloud, and be available during future sessions of the same user, be available for download onto the user's device, and/or may be available for sending by the user to other users or devices. For example, the user may be able to upload the session to social media or other applications.

[00205] In one embodiment, although the mirror can be configured to start recording automatically when it recognizes the user, if the user does not want such auto-recognition, the mirror can be configured to locally save the video, the user can trigger one of the previous

thumbnails, the mirror can be configured to switch to a display mode and the mirror can be configured to play the video. That is, the user can be prompted to execute a process by which a particular scene is cut by the user and not saved in the system.

[00206] In one embodiment, one or more thumbnails 1510 can be added on the mirror, which can be useful when the screen is in a narrow configuration, e.g., 21:9, or any other wide screen configuration. In one embodiment, the thumbnail 1510 can be displayed so as to pop up in a separate bar next to the mirror stream or under the mimicked video stream. This feature can be useful when the screen is wider than required or proportioned for the mimicked mirror stream. In one embodiment, six (6) thumbnails 1510 are presented to the user, though any suitable number of thumbnails can be presented. The size of the thumbnails can be configurable to support a reasonable proportion for the display. Each thumbnail 1510 includes a hyperlink to a prior session of the user, which can be accessed by activating the hyperlink. The hyperlink may be activated by various methods, such as, e.g., hand motion, mouse, remote control, etc. In one example, the controller identifies the user's hand in the image. As the user moves the hand up and down, the controller follows the motion and highlights a corresponding thumbnail. When the user closes the user's hand to form a fist, the controller activates the hyperlink corresponding to the thumbnail that was highlighted at that particular moment.

[00207] In one embodiment, as can be seen, for example, in FIG. 15, a recording indicator 1520 can be displayed as well. The recording indicator can include display of a phrase like "REC", a red colored circle and the like.

[00208] Also, text or user's name can be displayed as shown in 1515 in FIG. 15. In one embodiment, an additional password can be associated with the user and displayed as text 1515, and the user can take this password-based authentication and apply it to the registration process. In one embodiment, an employee or the user himself can enter a phone, an email, NFC signaling or any other identification information and obtain a link to the database on the cloud on the spot or later.

[00209] In one embodiment, additional control capability can be added as well, e.g., start recording, erase video, add video effects like lightening, color changes, background selection and the like. In one embodiment, all the videos can be uploaded to the cloud and can be erased from the local station after some preprogrammed period of time. In one embodiment, the videos can be processed after recording with additional effects that improve the video or

change the video to reflect augmented reality effects or for BMI/tailor/body line measurements analysis. In one embodiment, the video recording can include the audio recording of the environment for further analysis. In one embodiment, the video recording can include WLAN recording of the environment to record the MAC of the users and later on with further correlation, can be adapted to associate the MAC of the mobile device to the user.

[00210] The present invention includes a system for facilitating a user's control of the mirror. In one embodiment, if the user is still in the predefined zone and was recognized by the mirror once, as long as he is still standing there and no one else is being recognized, the user will be able to control the mirror, e.g., play, start and stop images/videos, delete images/videos, add augmented reality features and the like. The user can also control the mirror through gesture control or from his device, e.g., smartphone, through a dedicated application or additional control features as part of the retail application. In one embodiment, the gesture control can enable some basic functionality and the user application can be allowed to enable much more functionality relative to the gesture control. In one embodiment, the assistant in the store or an assistant available virtually/remotely in the cloud can assist the user in operating the mirror. In one embodiment, the user can set his own preferences for the UI from his application or from the web. All user dedicated settings can be added to the user's account, e.g., the user can change the time length of a session recording, the number of thumbnails, and the like.

[00211] In a default mode, the user can see his last n videos. The videos may or may not have been taken in the specific mirror location, but may be accessed at a central storage location, e.g., from the cloud. The user can set the appearance of the thumbnails of the local try-on videos. From his application, the user can see all the thumbnails and be able to touch them or any other election method to activate play of the video associated with the specific thumbnail.

[00212] In one embodiment, the thumbnails 1510 are configured so as to pop up on top of the mimicked mirror stream as can be seen, for example, in FIG. 15. The thumbnails can be sent to the background when the real-time mirror-mimicking video is playing or in split mode when there is no gesture control identification as shown, for example, in FIG. 16. The user can also set the screen to a split mode as shown, for example, in FIG. 16. Specifically, FIG. 16 depicts a side-by-side setting where the user can still see himself in real-time on one side of the screen and can play previously recorded videos on the other half.

[00213] In one embodiment, the remote control of the user can obtain the identified user information automatically so the store assistant can send the user link to his account for registration or to help the user with additional capability like changing clothes colors or changing clothes in general.

[00214] In one embodiment, the user can use his mobile device to initiate a video call in the mirror with a remote expert or a friend that can advise him in real time. The call can be from a dedicated application or any other third-party application like Skype. The mirror video stream can be fed to the local Skype and the remote user can get the mirror stream in real time. For example, the real-time or stored mirror-mimicking video can be send to the user's device using, e.g., WiFi connection. The app then enables coupling the downloaded or streamed video to the communication app, such as Skype. On the other hand, the app may enable to user to send a link via, e.g., email or SMS, to enable a third party cloud access to the streaming mirror-mimicking video in real time.

[00215] FIG. 17 depicts one embodiment of a suggested flow of usage. Specifically, FIG. 17 depicts an embodiment of user flow of usage of the additional embodiments depicted in FIGS. 14, 15 and 16 and their associated descriptions. In step 1701 the mirror is in idle position, during which time an idle image is presented on the monitor. The idle image may be, e.g., a screen saver, commercials, slide show, or just an image of the field of view in front of the camera and transposed by the controller to mimic a mirror reflection of the field of view.

[00216] In step 1702, as a user approaches the mirror and the user's presence is sensed, e.g., by motion sensor or by detecting a change in the image seen by the camera, the system initiates operation in mirror mode. That is, the controller perform transformation operation on the image of the user, such that the image presented on the monitor mimics the user's reflection in a mirror. At step 1703, the system initiates authentication procedure to identify and authenticate the user. For example, in one embodiment the system uses face recognition to identify and authenticate the user, while in another embodiment the user may be authenticated using a device such as a smartphone with capabilities such as, WiFi, Bluetooth, NFC, etc. For example, in one embodiment face recognition is used to identify the user, but a second step, e.g., use of QR code is used to authenticate the user. If the user has not been identified, e.g., it is a new user, the user may be prompted to open an account. For example, a QR code may be presented on the monitor, enabling the user to scan the QR code using a mobile

device, to thereby download an app to the user's device. Otherwise, or if the user declines to open an account, the user may proceed as a guest, albeit some features, such as remote access to stored images, may not be available by guest access.

[00217] In step 1704 the user is given user control over the display. In one embodiment, the specific control preferences are saved for each particular user and are activated once the user has been recognized. Otherwise, general user interface is enabled, e.g., a hand gesture activated interface. In one embodiment, when a user has been recognized, or has tried on several outfits in the same session, prior trials are presented as thumbnails on the side of the main display. When the user raises the hand corresponding to the side of the thumbnails, depending on the height of the hand, a corresponding thumbnail is highlighted for selection. As the user raises or lowers the hand, another thumbnail corresponding to the height of the hand is highlighted for selection. Then, when the user closes his fist, the highlighted thumbnail is selected and the corresponding image or video is displayed on the main screen.

[00218] As shown in 1705, the images and video of each session may be stored on the cloud, and may be accessible remotely using, e.g., smartphones, tablets, etc. Thus, a user may converse with friends remotely and get their opinion on the outfit the user is trying. For example, the user may send the friend a link to the recorded trial or to a live streaming video from the system. Thus, the user may share the shopping experience with people located remotely.

[00219] Moreover, as also shown in 1705, since the system is able to identify the user and also calculate parameters of the user, e.g., weight, height, etc., the system may be able to access a database of available items that would be recommended to the user based on these parameters. More specifically, if the user has recorded two trials of two different shirt within the same session, the system can decipher that the user is interested in purchasing a shirt and make either alternative recommendations, i.e., different shirts, or complimentary recommendations, e.g., specific pants that go well with the tried on shirts. Also, since the system can identify the shirt and the brand of the shirt, it may be able to offer specific incentive from that manufacturer, as exemplified in 1706.

[00220] Also, in 1706 the user may be offered the ability to change colors without having to actually change the garment. As explained above, by the use of multiple masks or layers, the system is able to change the color of the article, while maintaining the realistic visual

effect of the fabric as it is worn by the user. Since the system may maintain a layer of shading, a layer of texture, a layer of reflection, etc., the color layer may be changed while maintaining all the other layers, such that the rendered image retains all of the characteristics of the prior image, with only the color changed.

[00221] In order to avoid complication of the flow of the experience in front of the mirror, a complimentary application can enable additional features and settings, e.g., an advanced user that is comfortable with gesture control can enable more gestures that will help to operate advanced features without use of a tactile interface application. For users that are not comfortable with hand gestures, such users can be provided with basic automated features and the mobile application can be used to operate the other advanced functionality.

[00222] In one embodiment, the mirror station can be configured to identify the user's behavior and adapt the gesture control to the way the user is trying to operate it, e.g., some users will point, some users will grab, and some users will push to operate a thumbnail. The system can be adapted to learn and update a profile control per user.

[00223] In one embodiment, the mirror station can support instruction to the user, so that when the system identifies a user that is not controlling the mirror in the correct manner, a short explanation can pop up and guide the user through the process.

[00224] In one embodiment, the mirror can be adapted to demonstrate predetermined characteristics based on information regarding the user's familiarity with the system, e.g., based on whether the user is a first time user, based on the number of videos in the system for the user, based on the last time the user required the system to enable instructions, can be adapted to provide relatively simpler functionality voice assistance, can be adapted to provide remote expert assistance and the like.

[00225] In one embodiment, the concept of a pre-defined number of thumbnails, as shown in FIGS. 15 and 16, can be replaced with a slide menu of thumbnails.

[00226] In the normal operation mode as depicted, for example, in FIGS. 15 and 16, the user can move his hands up and down to select thumbnails, once the user's hand stops, the closest thumbnail can be elected and can be designated such that the user will get feedback for the selection. For example, blue shade can be provided around the selected thumbnail to signify its election. When the user grabs, pushes, or points his hands/fingers at the thumbnail, the video can start playing based on the display mode setting, and the user can also stop the video and

perform other operations and the like. Once the user, for example, stops the played video, a hold bar can be displayed on the thumbnail to designate the status of the played video and to acknowledge back to the user that his command was accepted by the mirror station.

[00227] In one embodiment, to simplify the operation further, the gesture control by hand can be configured to detect a jump between a thumbnail even if the user is moving his hands left and right instead of up and down or any other direction. The system can be configured to adapt itself to the user's span and velocity of hand movements, so that the user can see the election so he can adapt his speed and span of movement as well.

[00228] The embodiments may be implemented in a non-transitory computer-readable storage medium for operating a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, comprising: on a device having the processor and a memory storing a program for execution by the processor, the program including instructions for: sensing for a user; initiating a mirror-mimicking mode for displaying the mirror-mimicking image on the monitor; initiating an authentication process; and prompting the user to control the monitor.

Augmented Merchandizing

[00229] The mirror system can be used to provide augmented merchandizing by enabling better service to users, promoting merchandize, and providing feedback to merchandizers. The mirror can be configured to complement and augment the business process. Since the mirror station according to the present invention is a new device in the marketplace, uses of the mirror to create a revenue stream is unique as well. The next few embodiments include details providing examples as to how an active mirror can be used to augment the business and to create new a revenue streams.

[00230] For example, in one embodiment, the logo of a specific brand or partner or any other logo can be added to the recorded video, so the user will get, e.g., video with the logo of the brand, and the user can share the resulting video with his friends. Consequently, a single session in front of the system may be used to promote a certain item and/or brand. For example, if the user uploads the session to a social network site, the session may be seen by many people, all of who would be exposed to the superimposed logo.

[00231] In one embodiment, the mirror can be configured to provide convincing augmented reality capability by an item that was previously tried on by another user with a

similar body type. This matching technique yields a much more convincing experience and provides better recommendations to the user.

[00232] The mirror can insert commercials, coupons and logos into the mirror in idle mode, within a specified portion of the mirror, or via split screen mode. The mirror can also introduce commercials, coupons and logos into recorded videos so a user can view the video with the commercial/coupon/logo. These displays can be sold as advertising. The user can share the commercial/coupon/logo by e.g., uploading a session to social network sites. The user can be offered an incentive in exchange for sharing the commercial/coupon/logo.

[00233] The user's try-on session of clothing can be analyzed for measurements and/or characteristics such as BMI, sex, origin, age, body measurements, facial expression, voice expression, recommended sizes and the like. This data can be incorporated into ecommerce applications. This data is of high value and can be shared with brands, the user, a third party based on an agreement with the user and the brands, etc. Utilizing the present invention, a revenue stream can be generated from the analyzed data regarding the user, for example, by presenting the user with focused and accurate advertising according to recorded sessions.

[00234] The mirror can be configured as a service that allows a user to engage experts, a friend or an advisor when the user contemplates a particular purchase. Additional revenue can be generated using the present invention by promoting up sale opportunities related to the advice of the remote expert. The experts can be rated by the user, and user can pick his own favorite expert or select an expert designated by the brand.

[00235] The user can be presented with a display including a suggestion and/or incentive for a particular item tried on by the user, for example, with different colors. This method presents a further opportunity to promote up-selling. Augmented reality can be used to promote up-sales. Specifically, based on information obtained by the mirror and other user tries, a more compelling augmented reality display can be generated based on a combination of information about the user and similar users that have a similar body type.

[00236] In one embodiment, the social network of the user can be integrated in a manner to help the user and/or comment on the user's contemplation of the item. The system can be configured to share the user's videos. The social networking features can be used to enlarge the database of addressable customers.

[00237] In one embodiment, the user can upload their own photos, the video engines can be configured to process the images and provide similar analysis of BMI, face, origin and the like. The system can provide recommended sizes for ecommerce applications. The system can show the item that was bought in different colors. In this manner, the mirror can be used to obtain marketing information for an appropriate database even when the user isn't physically standing in front of the mirror itself.

[00238] In one embodiment, the user can see his predicted size in the application and update the measurements, which can be used to improve the size prediction model and include adjustments for particular brands.

Physical Design

[00239] The present invention includes the mechanical design and appearance design of the equipment. The screen can be mounted so as to stand on the wall either vertically or horizontally or can be switchable between vertical and horizontal (by a larger or similar mechanical solution, the screen can be tilted, rotated and the like). The screen can be mounted on a dedicated stand, mounted on a wall or mounted behind the wall. When the screen is inside the wall, thermal ventilation duct should be provided to support the screen and the computing device.

[00240] In one embodiment, the screen can have a proportion of a mirror, e.g., 21:9.

[00241] In one embodiment, the screen can have a regular proportion, i.e., 16:9, and the setting of the display can be split screen or dark bars on the sides to yield the mirror proportion, i.e., 21:9.

[00242] In one embodiment, the screen can come in a matte finish to eliminate reflections that can be seen on dark colors. In other words, when the user wears black, and the screen is not matte-finished, the user can see his own true mirror reflection; this effect is not wanted and can diminish, distort or completely ruin the virtual mirror effect.

[00243] The frame can be presented in a manner as depicted in FIGS. 14, 15 and 16. A minimal frame can be used or the frame can be hidden behind a wall.

[00244] In one embodiment, the cameras or the controlled cameras can be located in the frame. The camera can be mounted above the screen frame, can be hidden and can be mounted on the wall. The camera can be provided with a shade that can be filtered out from the

image. Since the camera is facing down, a cover that will hide most of the camera body can block the view from a distance.

[00245] The screen can be LED, LCD, plasma, glass, projector and the like.

[00246] A background can be used that enables better white balancing that results in higher quality videos.

[00247] Lighting can include a combination of white, yellow or any combination in a spot or a projector combination and can be configured to improve the video quality and the colors.

[00248] A dedicated carpet can be used to allow background changes, to define a user zone, to improve user detection and tracking in front of the mirror, to instruct the user where to stand and to instruct the user on how to operate the mirror.

Conclusion

[00249] Each of the above identified modules or programs corresponds to a set of instructions for performing a function described above. These modules and programs (i.e., sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. In some embodiments, memory may store a subset of the modules and data structures identified above. Furthermore, memory may store additional modules and data structures not described above.

[00250] The illustrated aspects of the disclosure may also be practiced in distributed computing environments where certain tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules can be located in both local and remote memory storage devices.

[00251] Moreover, it is to be appreciated that various components described herein can include electrical circuit(s) that can include components and circuitry elements of suitable value in order to implement the embodiments of the subject innovation(s). Furthermore, it can be appreciated that many of the various components can be implemented on one or more integrated circuit (IC) chips. For example, in one embodiment, a set of components can be implemented in a single IC chip. In other embodiments, one or more of respective components are fabricated or implemented on separate IC chips.

[00252] What has been described above includes examples of the embodiments of the present invention. It is, of course, not possible to describe every conceivable combination of components or methodologies for purposes of describing the claimed subject matter, but it is to be appreciated that many further combinations and permutations of the subject innovation are possible. Accordingly, the claimed subject matter is intended to embrace all such alterations, modifications, and variations that fall within the spirit and scope of the appended claims. Moreover, the above description of illustrated embodiments of the subject disclosure, including what is described in the Abstract, is not intended to be exhaustive or to limit the disclosed embodiments to the precise forms disclosed. While specific embodiments and examples are described herein for illustrative purposes, various modifications are possible that are considered within the scope of such embodiments and examples, as those skilled in the relevant art can recognize.

[00253] In particular and in regard to the various functions performed by the above described components, devices, circuits, systems and the like, the terms used to describe such components are intended to correspond, unless otherwise indicated, to any component which performs the specified function of the described component (e.g., a functional equivalent), even though not structurally equivalent to the disclosed structure, which performs the function in the herein illustrated exemplary aspects of the claimed subject matter. In this regard, it will also be recognized that the innovation includes a system as well as a computer-readable storage medium having computer-executable instructions for performing the acts and/or events of the various methods of the claimed subject matter.

[00254] The aforementioned systems/circuits/modules have been described with respect to interaction between several components/blocks. It can be appreciated that such systems/circuits and components/blocks can include those components or specified sub-components, some of the specified components or sub-components, and/or additional components, and according to various permutations and combinations of the foregoing. Sub-components can also be implemented as components communicatively coupled to other components rather than included within parent components (hierarchical). Additionally, it should be noted that one or more components may be combined into a single component providing aggregate functionality or divided into several separate sub-components, and any one or more middle layers, such as a management layer, may be provided to communicatively couple

to such sub-components in order to provide integrated functionality. Any components described herein may also interact with one or more other components not specifically described herein but known by those of skill in the art.

[00255] In addition, while a particular feature of the subject innovation may have been disclosed with respect to only one of several implementations, such feature may be combined with one or more other features of the other implementations as may be desired and advantageous for any given or particular application. Furthermore, to the extent that the terms "includes," "including," "has," "contains," variants thereof, and other similar words are used in either the detailed description or the claims, these terms are intended to be inclusive in a manner similar to the term "comprising" as an open transition word without precluding any additional or other elements.

[00256] As used in this application, the terms "component," "module," "system," or the like are generally intended to refer to a computer-related entity, either hardware (e.g., a circuit), a combination of hardware and software, software, or an entity related to an operational machine with one or more specific functionalities. For example, a component may be, but is not limited to being, a process running on a processor (e.g., digital signal processor), a processor, an object, an executable, a thread of execution, a program, and/or a computer. By way of illustration, both an application running on a controller and the controller can be a component. One or more components may reside within a process and/or thread of execution and a component may be localized on one computer and/or distributed between two or more computers. Further, a "device" can come in the form of specially designed hardware; generalized hardware made specialized by the execution of software thereon that enables the hardware to perform specific function; software stored on a computer-readable medium; or a combination thereof.

[00257] Computing devices typically include a variety of media, which can include computer-readable storage media and/or communications media. Computer-readable storage media generally can be any available storage media that can be accessed by the computer, is typically of a non-transitory nature, and can include both volatile and nonvolatile media, removable and non-removable media. By way of example, and not limitation, computer-readable storage media can be implemented in connection with any method or technology for storage of information such as computer-readable instructions, program modules, structured data,

or unstructured data. Computer-readable storage media can include, but are not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disk (DVD) or other optical disk storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or other tangible and/or non-transitory media which can be used to store desired information. Computer-readable storage media can be accessed by one or more local or remote computing devices, e.g., via access requests, queries or other data retrieval protocols, for a variety of operations with respect to the information stored by the medium.

[00258] Communications media typically embody computer-readable instructions, data structures, program modules or other structured or unstructured data in a data signal that can be transitory such as a modulated data signal, e.g., a carrier wave or other transport mechanism, and includes any information delivery or transport media. The term "modulated data signal" or signals refers to a signal that has one or more of its characteristics set or changed in such a manner as to encode information in one or more signals. By way of example, and not limitation, communication media include wired media, such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared and other wireless media.

[00259] In view of the exemplary systems described above, methodologies that may be implemented in accordance with the described subject matter will be better appreciated with reference to the flowcharts of the various figures. For simplicity of explanation, the methodologies are depicted and described as a series of acts. However, acts in accordance with this disclosure can occur in various orders and/or concurrently, and with other acts not presented and described herein. Furthermore, not all illustrated acts may be required to implement the methodologies in accordance with the disclosed subject matter. In addition, those skilled in the art will understand and appreciate that the methodologies could alternatively be represented as a series of interrelated states via a state diagram or events. Additionally, it should be appreciated that the methodologies disclosed in this specification are capable of being stored on an article of manufacture to facilitate transporting and transferring such methodologies to computing devices. The term article of manufacture, as used herein, is intended to encompass a computer program accessible from any computer-readable device or storage media, e.g., stored on a server coupled to the cloud.

[00260] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not

intended to be exhaustive or to be limiting to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The embodiments were chosen and described in order to best explain the principles of the aspects and its practical applications, to thereby enable others skilled in the art to best utilize the aspects and various embodiments with various modifications as are suited to the particular use contemplated.

Samsung/Google, EX1002, p. 61

We claim:

1. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:

operating the camera to generate a stream of images of the user;

operating the processor to detect the presence of the user in the stream of images;

operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and,

displaying the modified images on the monitor.

2. The method of claim 1, wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera.

3. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.

4. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.

5. The method of claim 4, wherein the body part comprises one of legs, face, eyes, and hands.

6. The method of claim 1, wherein during mirror tracking mode the processor estimates the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.

7. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.

8. The method of claim 7, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.

9. The method of claim 1, further comprising operating the processor to generate an avatar having body characteristics corresponding to body characteristics of a user appearing in the images.

10. The method of claim 9, further comprising operating the processor to display on the monitor the modified images and an image of the avatar.

11. The method of claim 9, further comprising operating the processor to augment the modified images by overlaying virtual objects on the avatar.

12. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.

13. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.

14. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.

15. The method of claim 1, further comprising providing data from a depth sensor to the processor, and operating the processor to measure a texture of the image from the data.

16. The method of claim 15, further comprising operating the processor to generate an avatar using the data from the depth sensor.

17. The method of claim 15, wherein the processor generate the avatar by analyzing registration pointers on the images of the camera.

18. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.

19. The method of claim 18, wherein the replacement segments comprise virtual background or background that was captured in a different setting.

20. The method of claim 1, wherein the processor resides in the remote location, and the method proceeds by transmitting the images from the camera over a network to the processor, and transmitting the modified images back from the processor to the monitor over the network.

ABSTRACT

Computerized method for image transformation, augmented reality and telepresence. A camera generates a stream of images of the user; a processor detects the presence of the user in the stream of images and applies adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. The modified images are displayed on a local and/or remote monitor for telepresence. The processor can also generate an avatar having body characteristics corresponding to body characteristics of a user appearing in the images. The processor may generate the avatar by analyzing registration pointers on the images of the camera. The processor may reside in the remote location, and the camera images transmitted over a network to the processor, and the modified images transmitted back from the processor to the monitor.

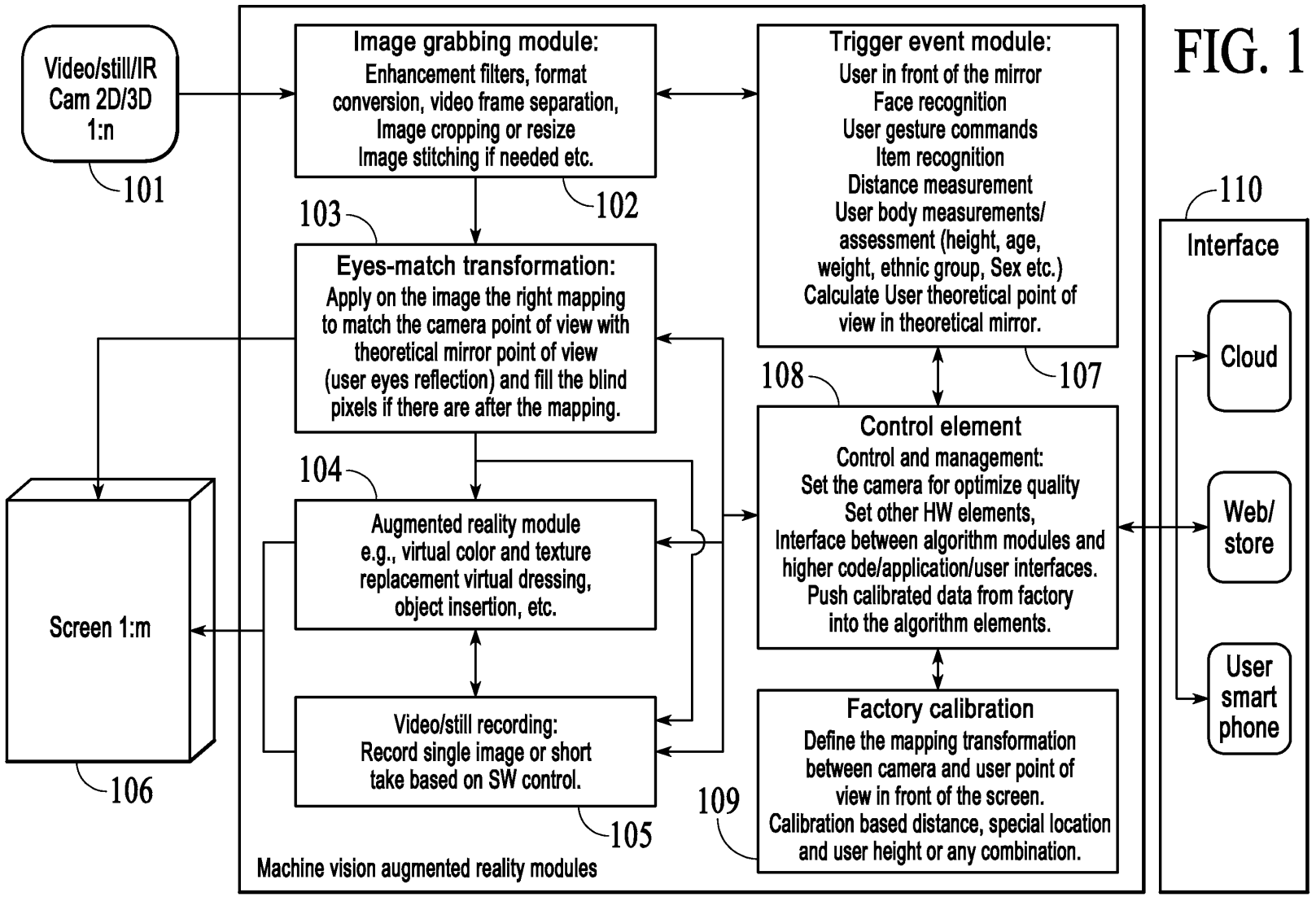


FIG. 1

SHEET 1/16

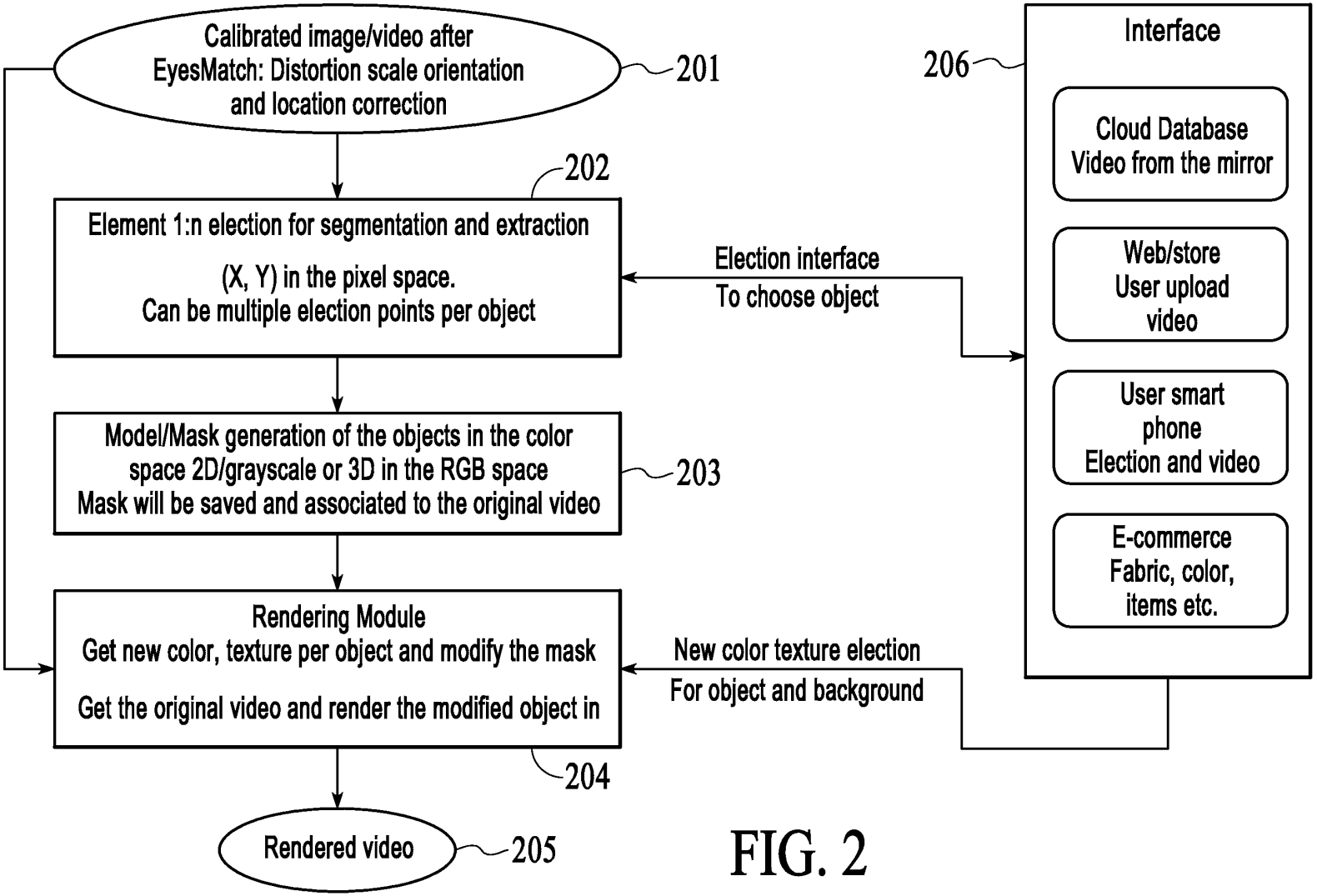

Calibrated image/video after
EyesMatch: Distortion scale orientation
and location correction
201
202
Element 1:n election for segmentation and extraction
(X, Y) in the pixel space.
Can be multiple election points per object
Model/Mask generation of the objects in the color
space 2D/grayscale or 3D in the RGB space
Mask will be saved and associated to the original video
203
Rendering Module
Get new color, texture per object and modify the mask
Get the original video and render the modified object in
204
Rendered video
205
Election interface
To choose object
New color texture election
For object and background
206
Interface
Cloud Database
Video from the mirror
Web/store
User upload
video
User smart
phone
Election and video
E-commerce
Fabric, color,
items etc.

FIG. 2

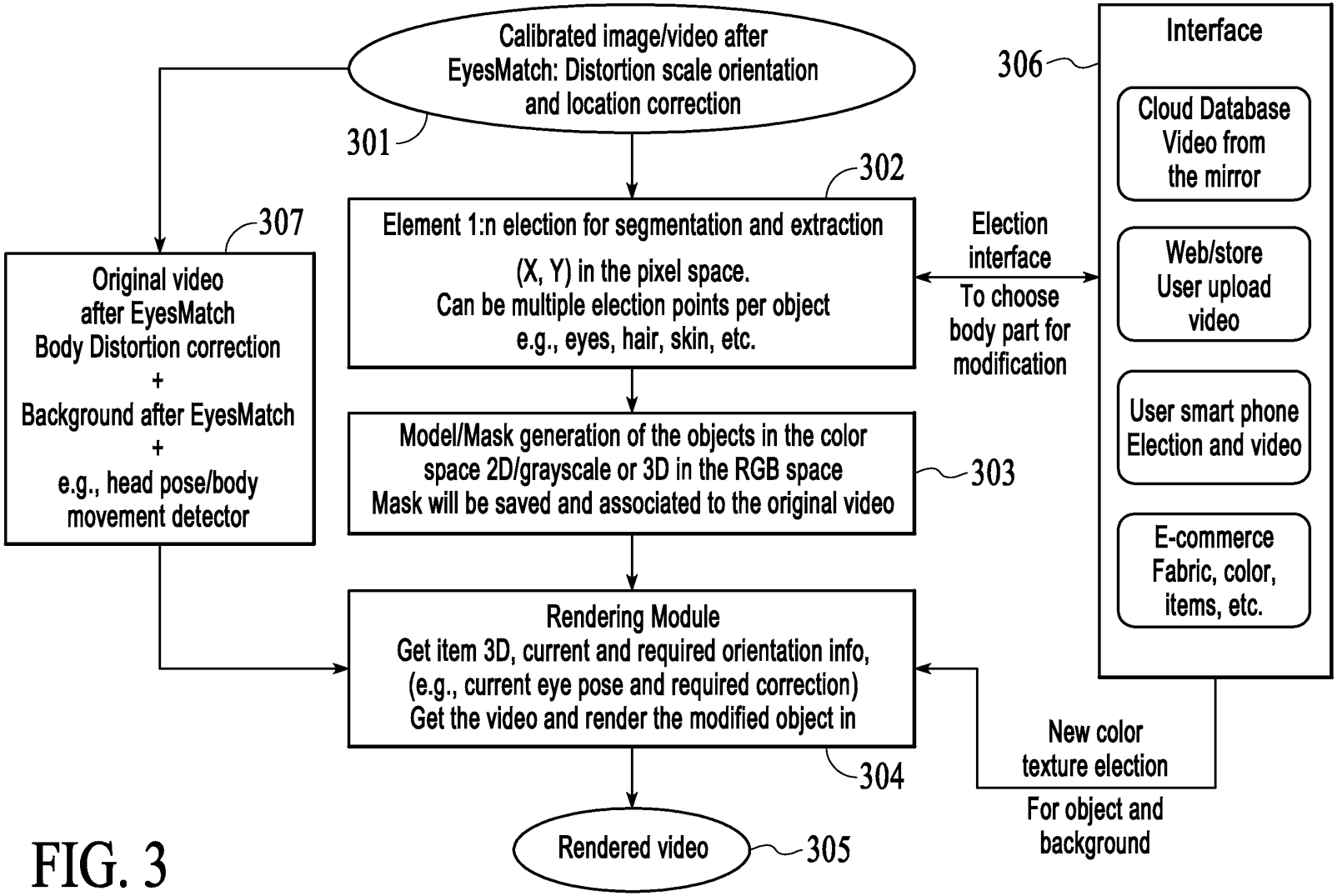


FIG. 3

SHEET 3/16

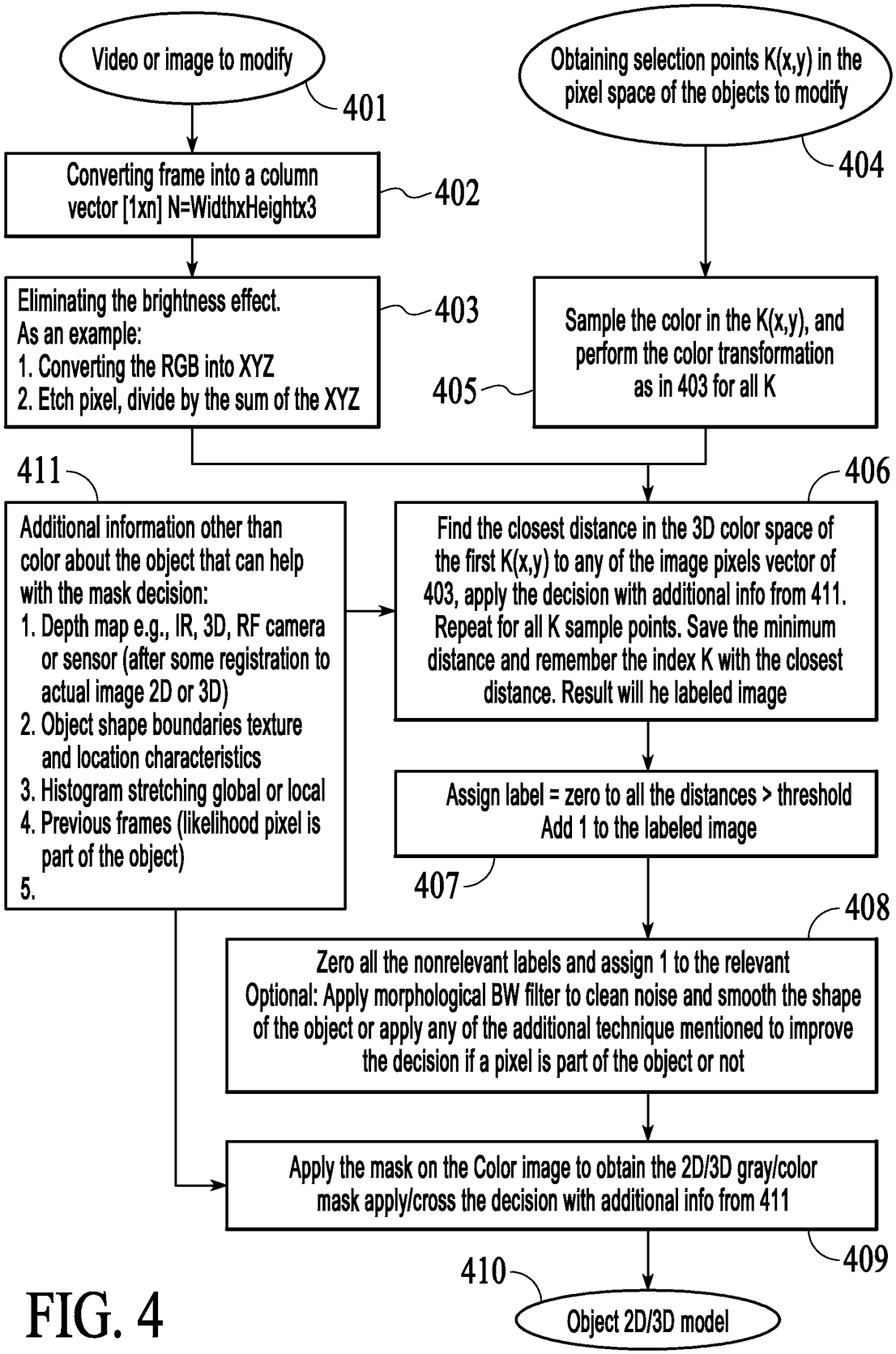
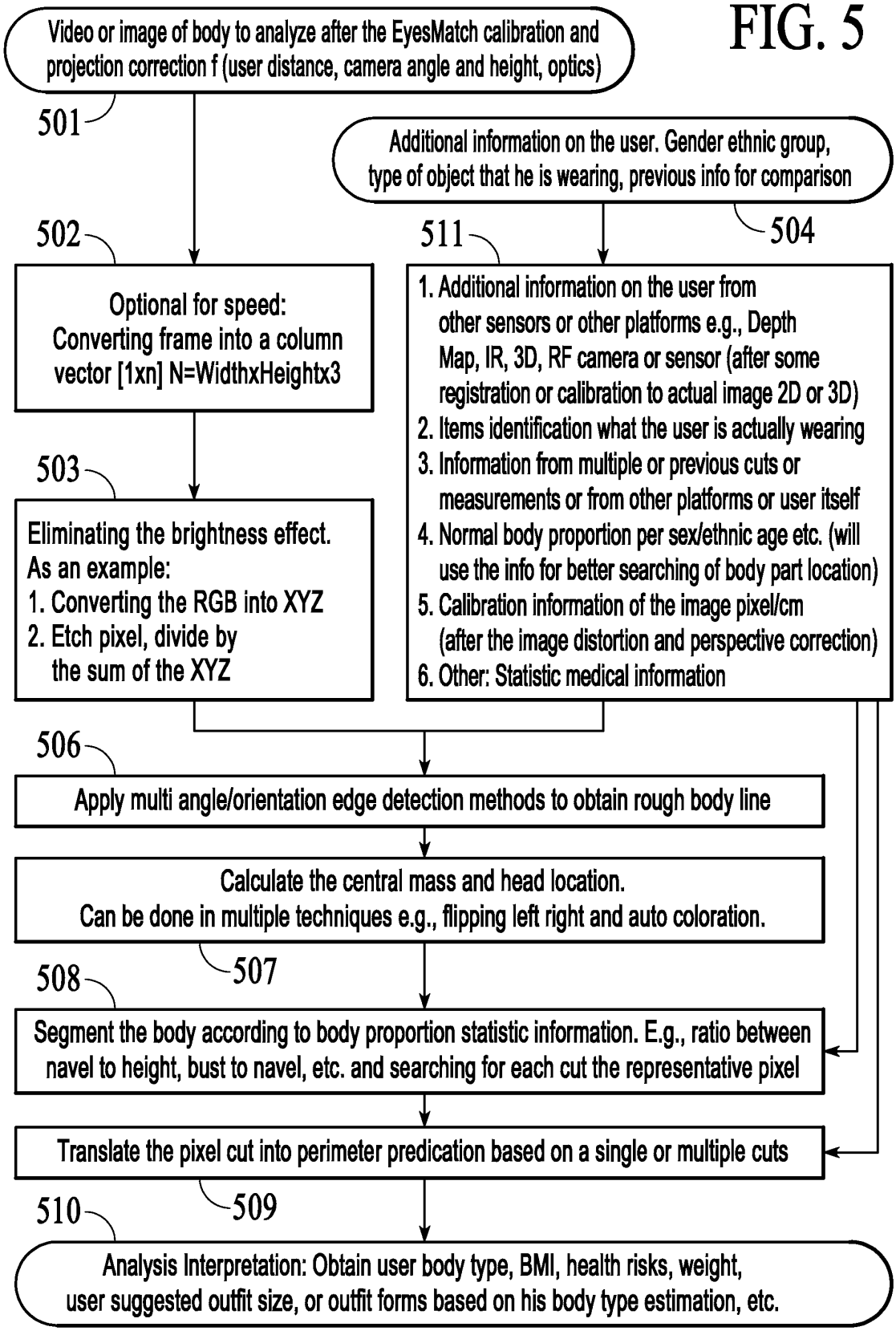

Video or image to modify
401
Converting frame into a column vector [1xn] N=WidthxHeightx3
402
Eliminating the brightness effect.
As an example:
1. Converting the RGB into XYZ
2. Etch pixel, divide by the sum of the XYZ
403
Obtaining selection points K(x,y) in the pixel space of the objects to modify
404
Sample the color in the K(x,y), and perform the color transformation as in 403 for all K
405
411
Additional information other than color about the object that can help with the mask decision:
1. Depth map e.g., IR, 3D, RF camera or sensor (after some registration to actual image 2D or 3D)
2. Object shape boundaries texture and location characteristics
3. Histogram stretching global or local
4. Previous frames (likelihood pixel is part of the object)
5.
406
Find the closest distance in the 3D color space of the first K(x,y) to any of the image pixels vector of 403, apply the decision with additional info from 411. Repeat for all K sample points. Save the minimum distance and remember the index K with the closest distance. Result will he labeled image
Assign label = zero to all the distances > threshold
Add 1 to the labeled image
407
408
Zero all the nonrelevant labels and assign 1 to the relevant
Optional: Apply morphological BW filter to clean noise and smooth the shape of the object or apply any of the additional technique mentioned to improve the decision if a pixel is part of the object or not
Apply the mask on the Color image to obtain the 2D/3D gray/color mask apply/cross the decision with additional info from 411
409
410
Object 2D/3D model

FIG. 4

FIG. 5


Video or image of body to analyze after the EyesMatch calibration and projection correction f (user distance, camera angle and height, optics)
501
Additional information on the user. Gender ethnic group, type of object that he is wearing, previous info for comparison
504
502
Optional for speed: Converting frame into a column vector [1xn] N=WidthxHeightx3
511
1. Additional information on the user from other sensors or other platforms e.g., Depth Map, IR, 3D, RF camera or sensor (after some registration or calibration to actual image 2D or 3D)
2. Items identification what the user is actually wearing
3. Information from multiple or previous cuts or measurements or from other platforms or user itself
4. Normal body proportion per sex/ethnic age etc. (will use the info for better searching of body part location)
5. Calibration information of the image pixel/cm (after the image distortion and perspective correction)
6. Other: Statistic medical information
503
Eliminating the brightness effect.
As an example:
1. Converting the RGB into XYZ
2. Etch pixel, divide by the sum of the XYZ
506
Apply multi angle/orientation edge detection methods to obtain rough body line
Calculate the central mass and head location.
Can be done in multiple techniques e.g., flipping left right and auto coloration.
507
508
Segment the body according to body proportion statistic information. E.g., ratio between navel to height, bust to navel, etc. and searching for each cut the representative pixel
Translate the pixel cut into perimeter predication based on a single or multiple cuts
509
510
Analysis Interpretation: Obtain user body type, BMI, health risks, weight, user suggested outfit size, or outfit forms based on his body type estimation, etc.

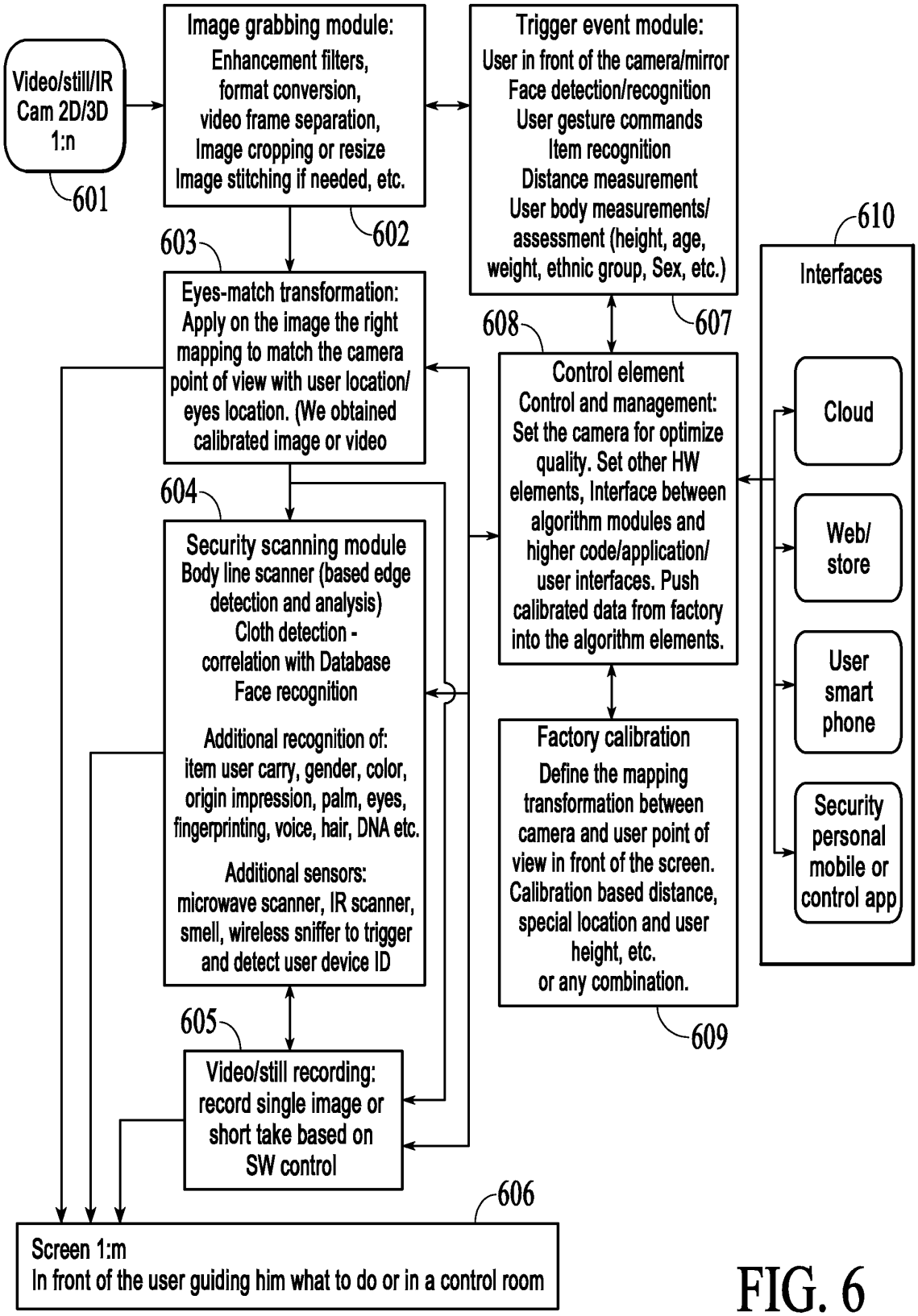

Video/still/IR Cam 2D/3D 1:n
601
Image grabbing module:
Enhancement filters, format conversion, video frame separation, Image cropping or resize Image stitching if needed, etc.
602
Trigger event module:
User in front of the camera/mirror
Face detection/recognition
User gesture commands
Item recognition
Distance measurement
User body measurements/ assessment (height, age, weight, ethnic group, Sex, etc.)
607
603
Eyes-match transformation: Apply on the image the right mapping to match the camera point of view with user location/ eyes location. (We obtained calibrated image or video
604
Security scanning module
Body line scanner (based edge detection and analysis)
Cloth detection - correlation with Database
Face recognition
Additional recognition of: item user carry, gender, color, origin impression, palm, eyes, fingerprinting, voice, hair, DNA etc.
Additional sensors: microwave scanner, IR scanner, smell, wireless sniffer to trigger and detect user device ID
605
Video/still recording: record single image or short take based on SW control
608
Control element
Control and management: Set the camera for optimize quality. Set other HW elements, Interface between algorithm modules and higher code/application/ user interfaces. Push calibrated data from factory into the algorithm elements.
Factory calibration
Define the mapping transformation between camera and user point of view in front of the screen. Calibration based distance, special location and user height, etc. or any combination.
609
610
Interfaces
Cloud
Web/ store
User smart phone
Security personal mobile or control app
606
Screen 1:m
In front of the user guiding him what to do or in a control room

FIG. 6

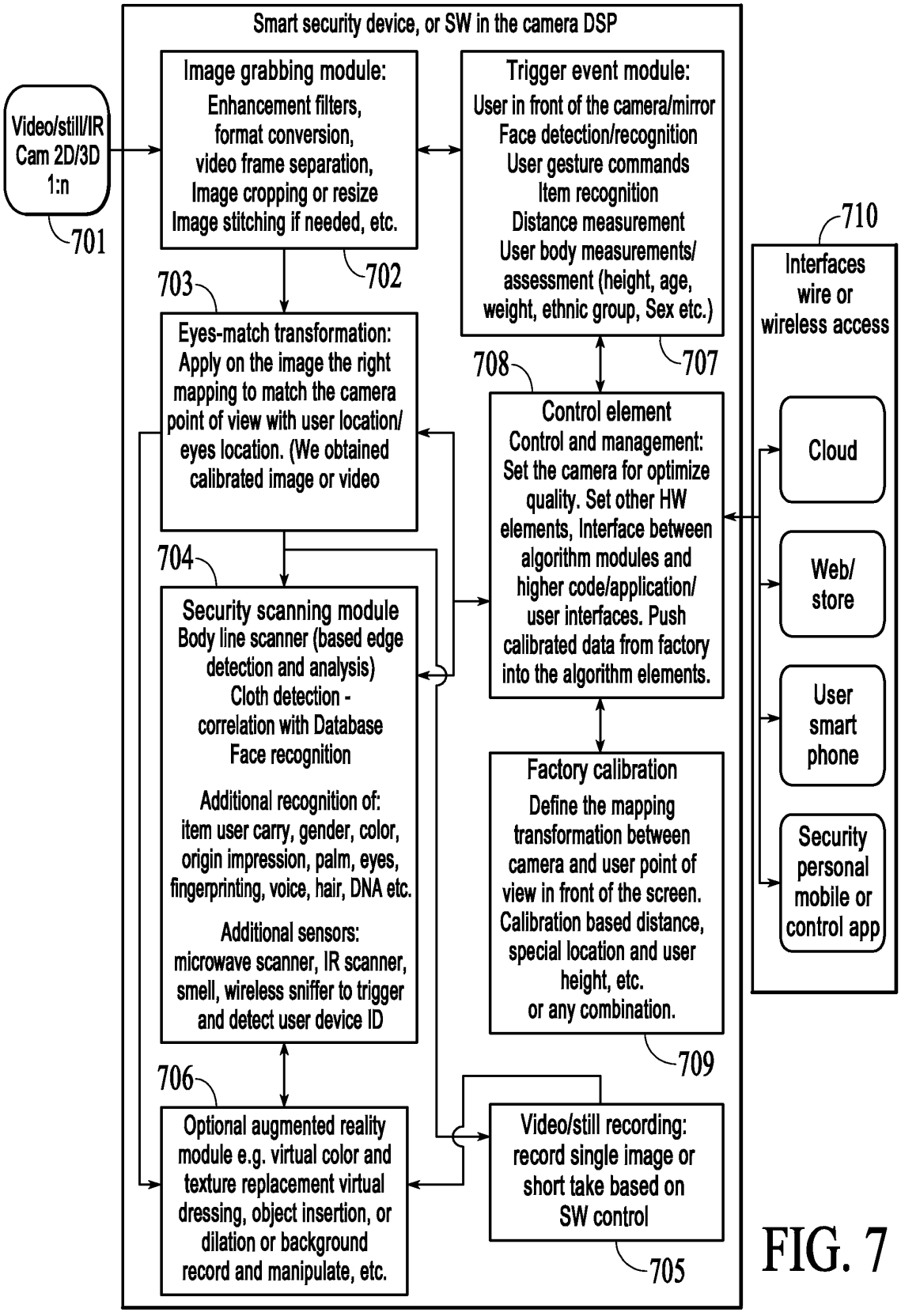

Smart security device, or SW in the camera DSP
Video/still/IR Cam 2D/3D 1:n
701
Image grabbing module:
Enhancement filters, format conversion, video frame separation, Image cropping or resize Image stitching if needed, etc.
702
Trigger event module:
User in front of the camera/mirror
Face detection/recognition
User gesture commands
Item recognition
Distance measurement
User body measurements/ assessment (height, age, weight, ethnic group, Sex etc.)
707
703
Eyes-match transformation: Apply on the image the right mapping to match the camera point of view with user location/ eyes location. (We obtained calibrated image or video
708
Control element
Control and management: Set the camera for optimize quality. Set other HW elements, Interface between algorithm modules and higher code/application/ user interfaces. Push calibrated data from factory into the algorithm elements.
704
Security scanning module
Body line scanner (based edge detection and analysis)
Cloth detection - correlation with Database
Face recognition
Additional recognition of: item user carry, gender, color, origin impression, palm, eyes, fingerprinting, voice, hair, DNA etc.
Additional sensors: microwave scanner, IR scanner, smell, wireless sniffer to trigger and detect user device ID
Factory calibration
Define the mapping transformation between camera and user point of view in front of the screen. Calibration based distance, special location and user height, etc. or any combination.
709
706
Optional augmented reality module e.g. virtual color and texture replacement virtual dressing, object insertion, or dilation or background record and manipulate, etc.
Video/still recording: record single image or short take based on SW control
705
710
Interfaces wire or wireless access
Cloud
Web/ store
User smart phone
Security personal mobile or control app

FIG. 7

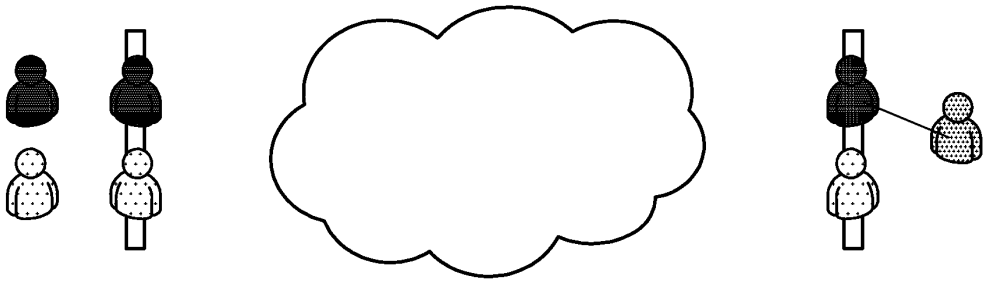


FIG. 8a

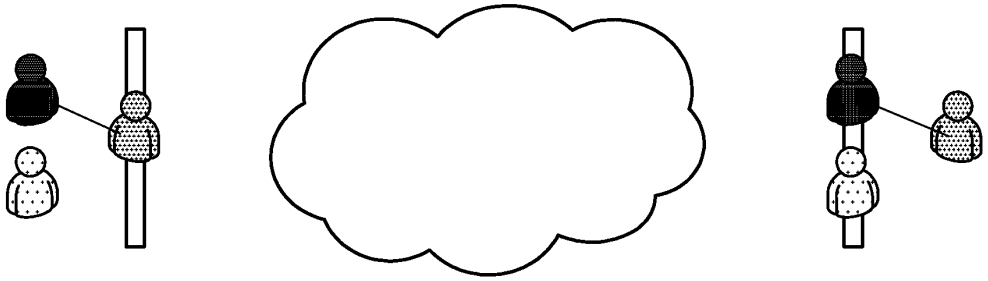


FIG. 8b

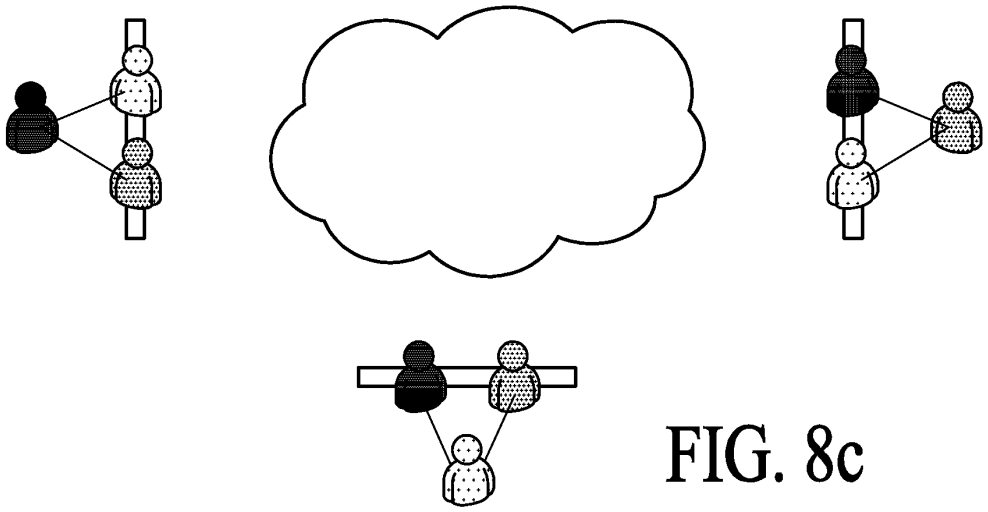


FIG. 8c

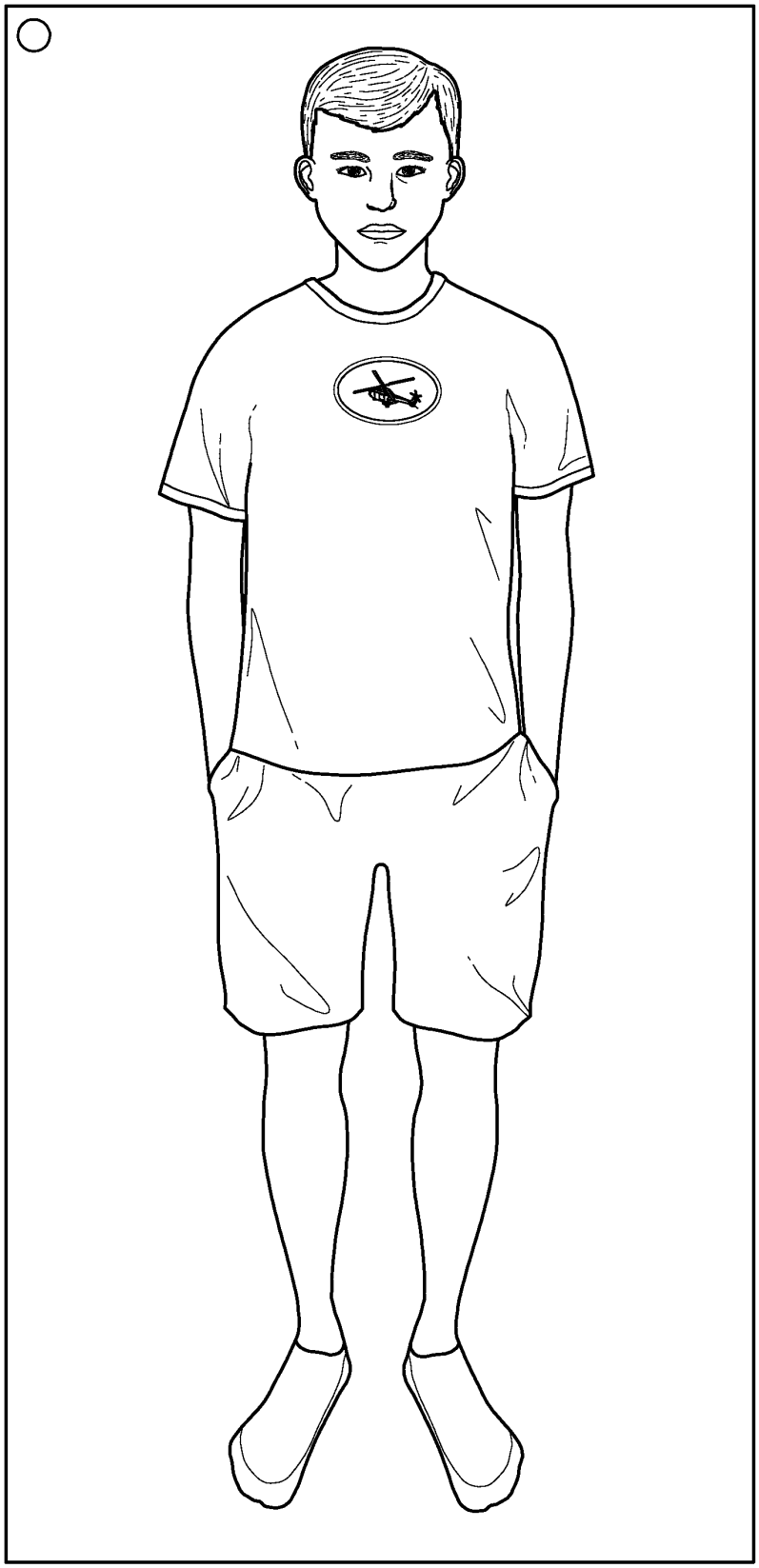


FIG. 9

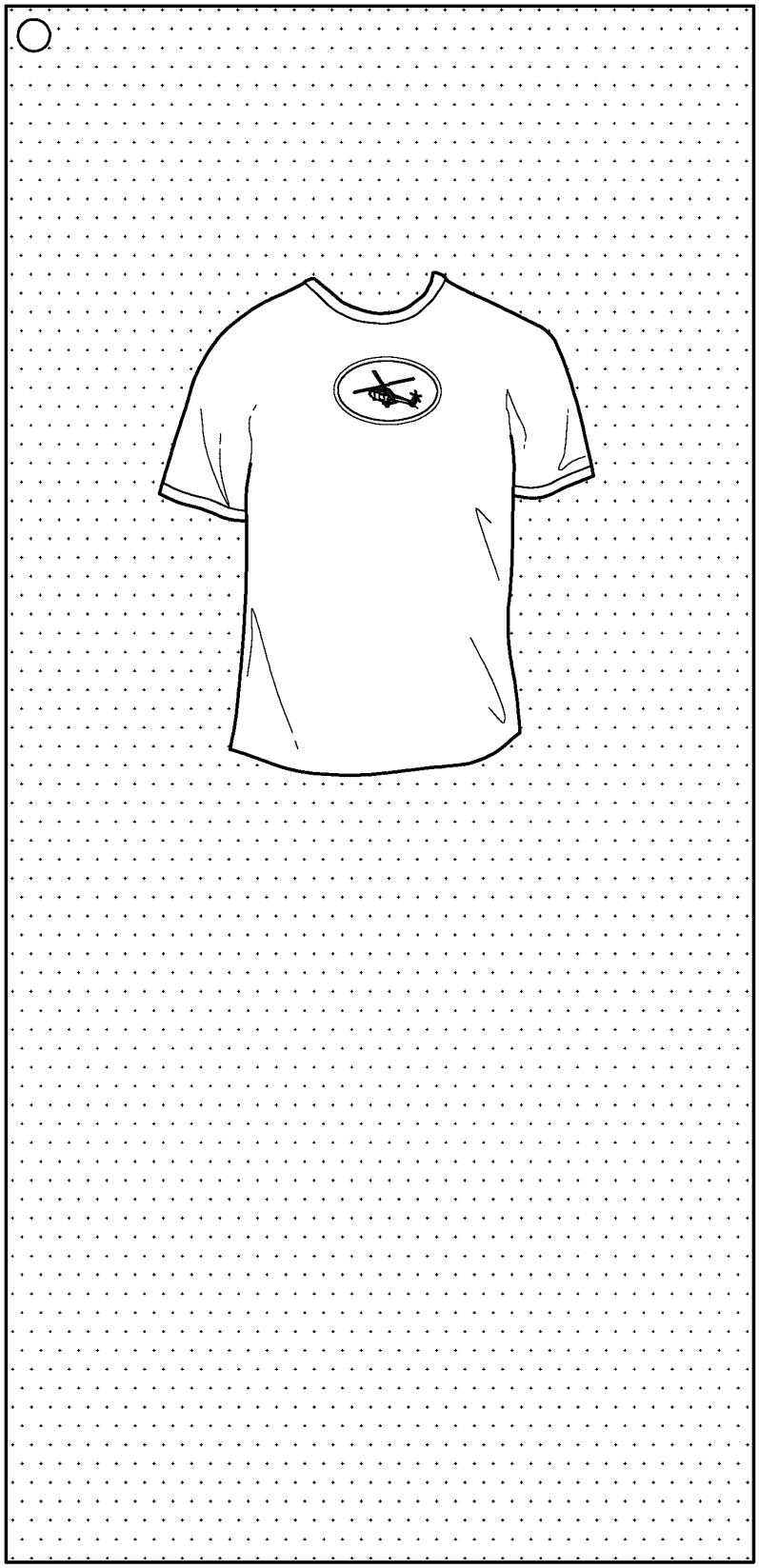


FIG. 10

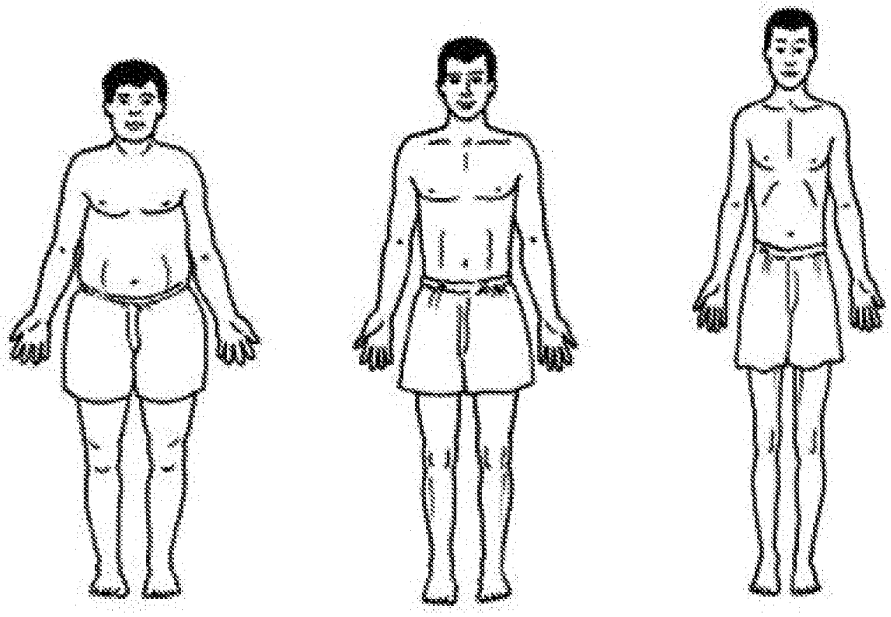

Endomorph
Mesomorph
Ectomorph

FIG. 11

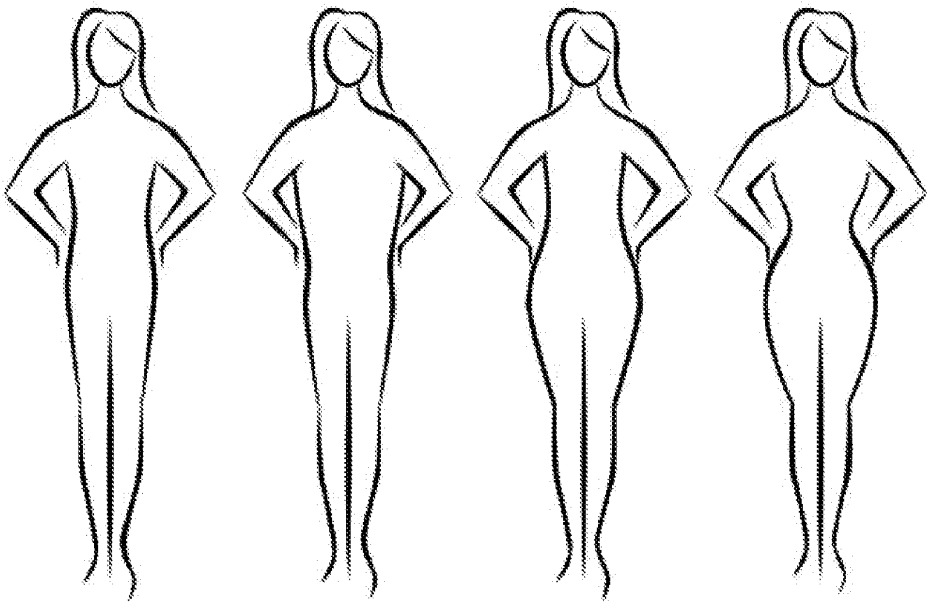

Banana
Apple
Pear
Hourglass

FIG. 12

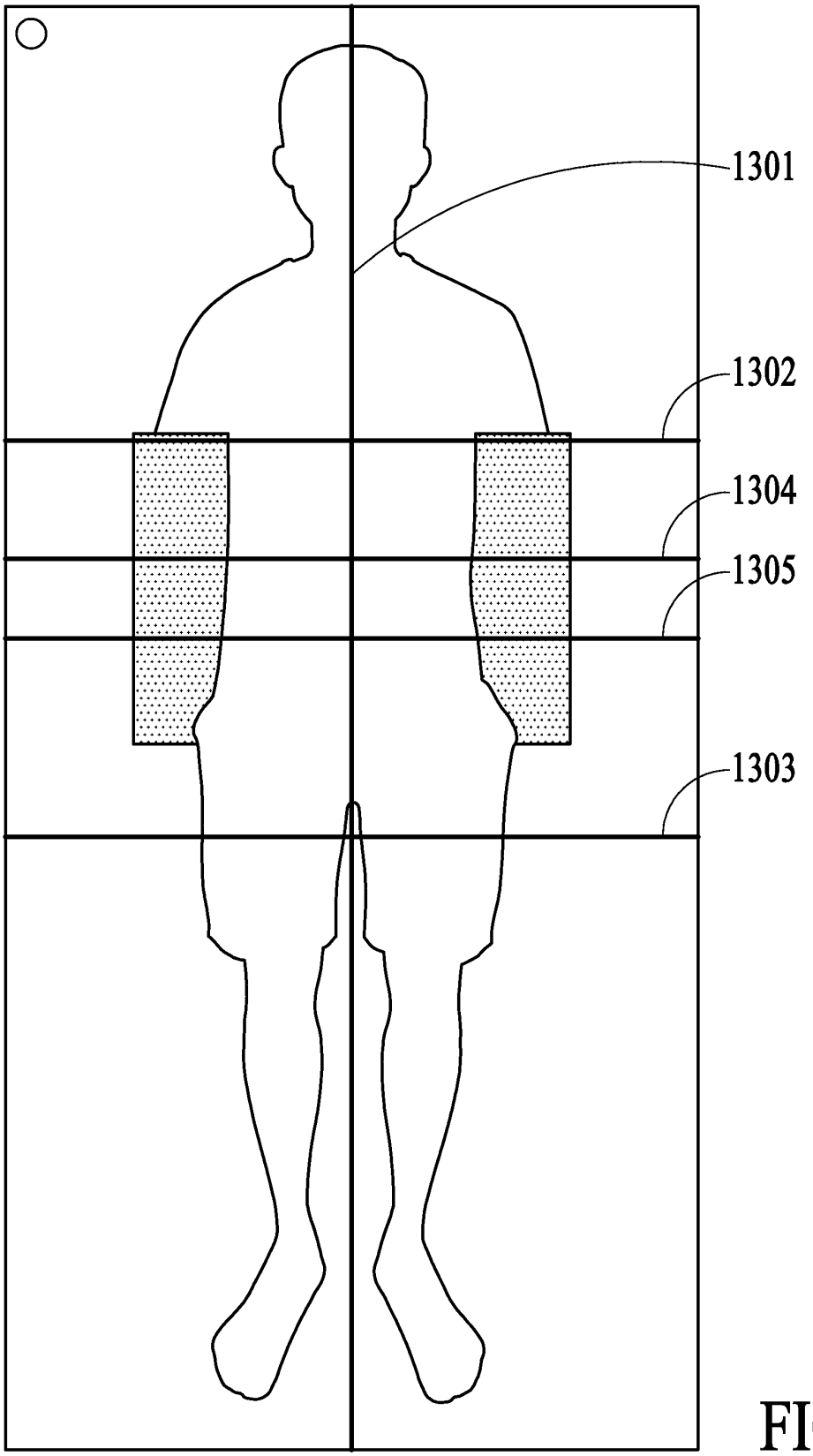


FIG. 13

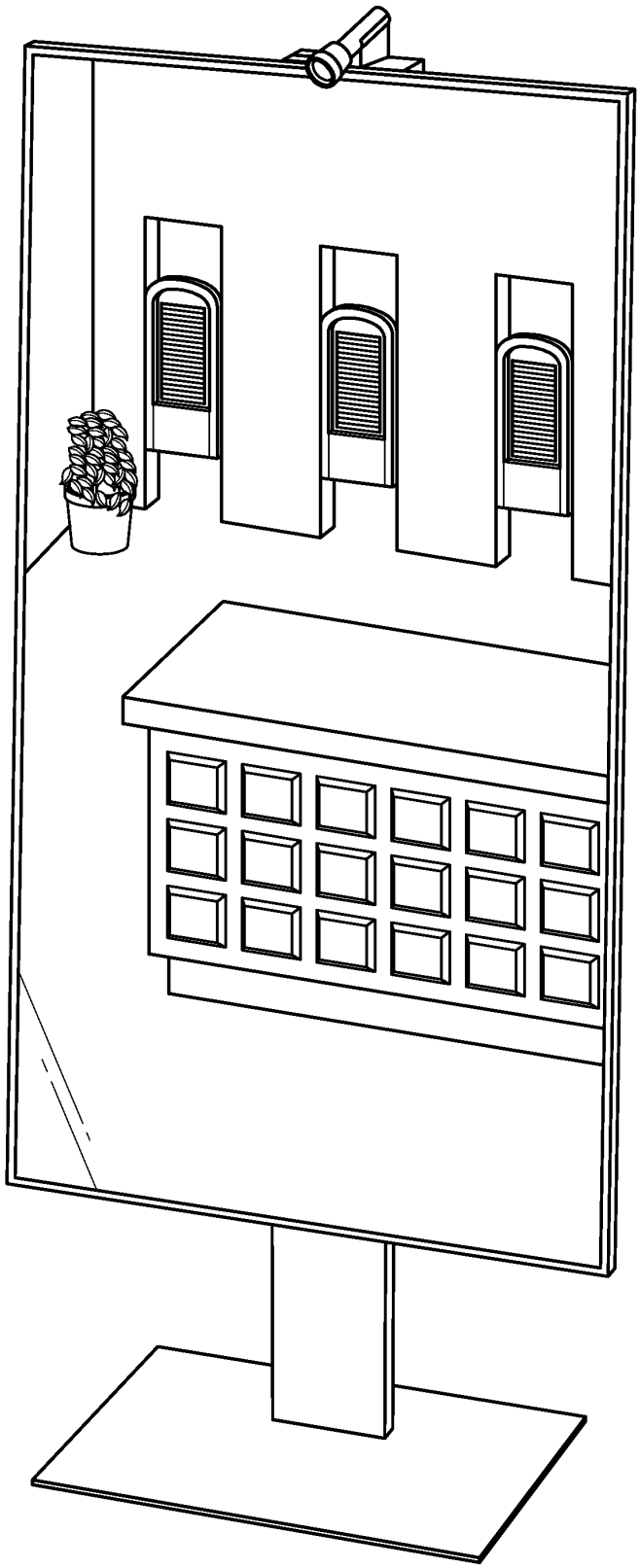


FIG. 14

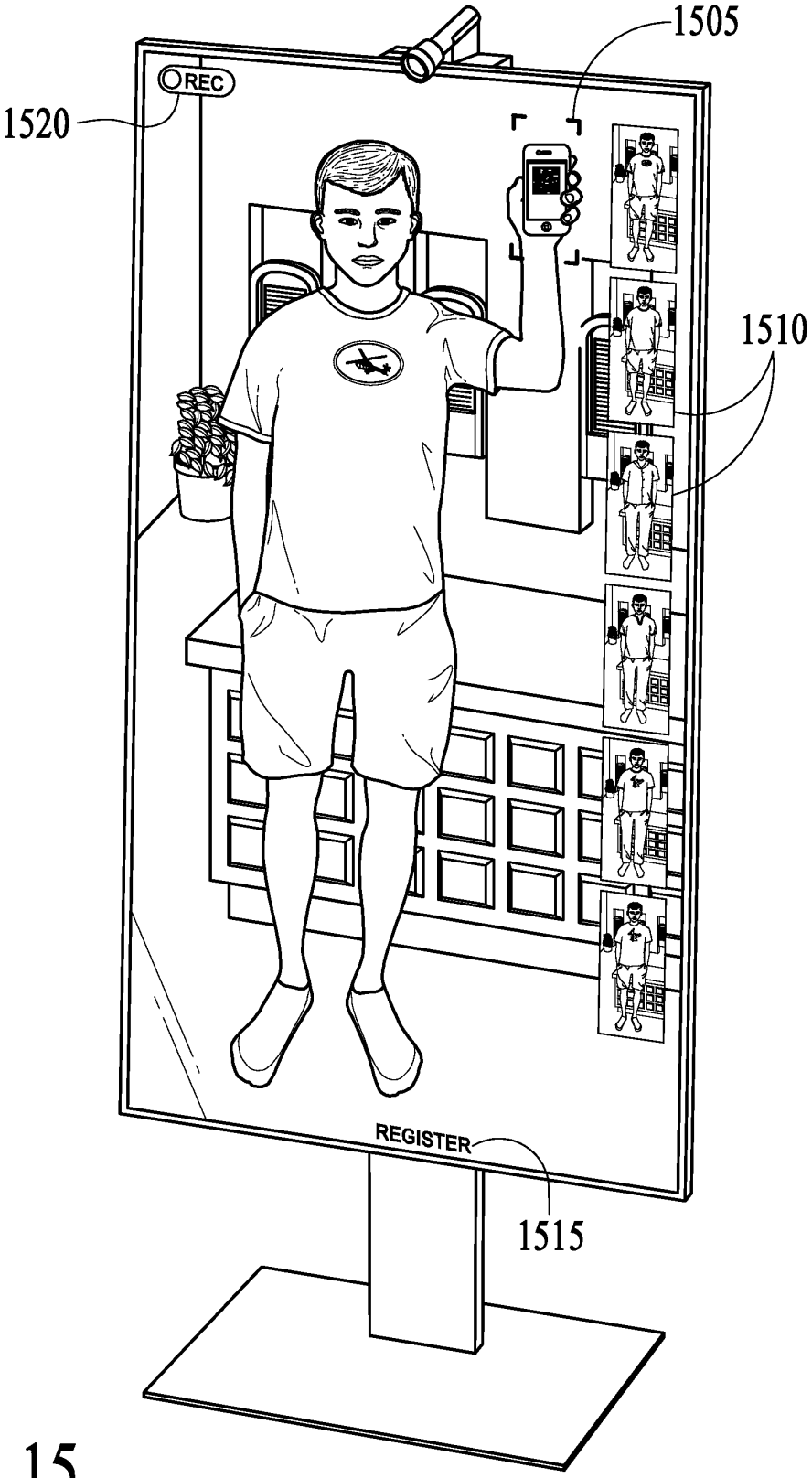


FIG. 15



FIG. 16

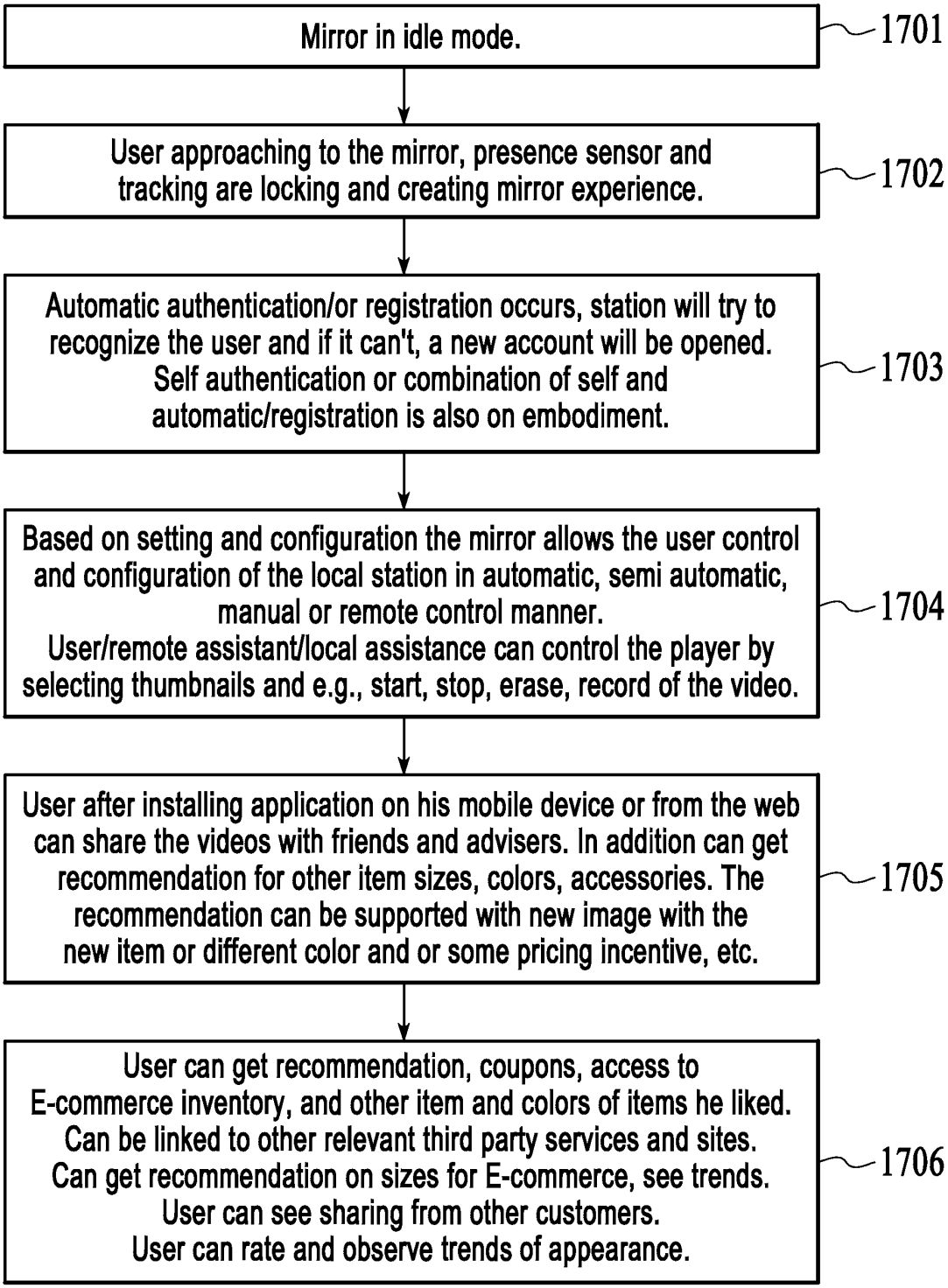

Mirror in idle mode.
1701
User approaching to the mirror, presence sensor and tracking are locking and creating mirror experience.
1702
Automatic authentication/or registration occurs, station will try to recognize the user and if it can't, a new account will be opened. Self authentication or combination of self and automatic/registration is also on embodiment.
1703
Based on setting and configuration the mirror allows the user control and configuration of the local station in automatic, semi automatic, manual or remote control manner. User/remote assistant/local assistance can control the player by selecting thumbnails and e.g., start, stop, erase, record of the video.
1704
User after installing application on his mobile device or from the web can share the videos with friends and advisers. In addition can get recommendation for other item sizes, colors, accessories. The recommendation can be supported with new image with the new item or different color and or some pricing incentive, etc.
1705
User can get recommendation, coupons, access to E-commerce inventory, and other item and colors of items he liked. Can be linked to other relevant third party services and sites. Can get recommendation on sizes for E-commerce, see trends. User can see sharing from other customers. User can rate and observe trends of appearance.
1706

FIG. 17

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Filer:	Joseph Bach/Monica Moreno
Attorney Docket Number:	067055-002400

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**730**

Electronic Acknowledgement Receipt	
EFS ID:	18773472
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Monica Moreno
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	15-APR-2014
Filing Date:	
Time Stamp:	22:09:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$730
RAM confirmation Number	7236
Deposit Account	503557
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	067055_002400_ADS.pdf	1504291 72be7d9c1d0c2036804884342fd3c4c56c59092a	no	7
Warnings:					
Information:					
2	Oath or Declaration filed	067055_002400_Declarations.pdf	186693 0ac1429951ffd1dc04de516de3a65d42a8c831a2	no	2
Warnings:					
Information:					
3		067055_002400_Specification.pdf	326760 ca47c0cf3ff3fd30ff6b849d7dba21f9d834f2a9	yes	56

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Specification	1	52
Claims	53	55
Abstract	56	56

Warnings:					
Information:					
4	Drawings-only black and white line drawings	067055_002400_Drawings.pdf	2393391 7e13ec7b895d08b69ef8f7aeaadbebd929addc6c	no	16
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	33087 a71ffd2c5b7c40e7dbba3dc287d5d2bebd708f78	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	4444222		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/253,831	04/15/2014	2661	730	067055-002400	20	1

CONFIRMATION NO. 3426

46188
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

FILING RECEIPT

OC000000068206391

Date Mailed: 05/06/2014

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ofer Saban, Vienna, VA;
Nissi Vilcovsky, Tokyo, JAPAN;

Applicant(s)

EyesMatch Ltd., Road Town, VIRGIN ISLANDS, BRITISH

Assignment For Published Patent Application

EyesMatch Ltd., Road Town, VIRGIN ISLANDS, BRITISH

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 13/843,001 03/15/2013
which is a CIP of 13/088,369 04/17/2011 PAT 8624883
which is a CON of 11/817,411 08/30/2007 PAT 7948481
which is a 371 of PCT/IL2006/000281 03/01/2006
which claims benefit of 60/656,885 03/01/2005
and claims benefit of 60/656,884 03/01/2005
and said 13/843,001 03/15/2013
claims benefit of 61/738,957 12/18/2012
This application 14/253,831
claims benefit of 61/892,368 10/17/2013
and claims benefit of 61/862,025 08/04/2013

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 05/02/2014
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/253,831**
Projected Publication Date: 08/14/2014
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

Preliminary Class

348

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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Samsung/Google, EX1002, p. 90

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/253,831

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	x 210 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	730		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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Document Description: Power of Attorney

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Application Number	14/253,831
Filing Date	April 15, 2014
First Named Inventor	Ofer Saban
Title	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
Art Unit	2656
Examiner Name	KUNTZ, CURTIS A.
Attorney Docket Number	067055-002400

SIGNATURE of Applicant or Patent Practitioner

Signature	/Joseph Bach/	Date (Optional)	July 21, 2014
Name	Joseph Bach	Registration Number	37,771
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

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☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

46188

OR

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OR

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Address					
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Country					
Telephone		Email			

I am the Applicant:

☒ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature		Date	04/16/18
Name	Ofer Saban	Telephone	52/4289995
Title and Company	Inventor		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

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Application Number	14/253,831
Filing Date	April 15, 2014
First Named Inventor	Ofer Saban
Title	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
Art Unit	2656
Examiner Name	KUNTZ, CURTIS A.
Attorney Docket Number	067055-002400

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Signature	/Joseph Bach/	Date (Optional)	July 21, 2014
Name	Joseph Bach	Registration Number	37,771
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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OR

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OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant:

☒ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature		Date	04/15/15
Name	Nissi Vilcovsky	Telephone	+972549443487
Title and Company	Inventor		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

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Electronic Acknowledgement Receipt

EFS ID:	19640763
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Monica Moreno
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	21-JUL-2014
Filing Date:	15-APR-2014
Time Stamp:	23:20:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	067055_002400_POA.pdf	435155 4bf7ae35f1711d069a618f2112966ab7e60bef47	no	4

Warnings:	
Information:	

Total Files Size (in bytes):	435155

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/253,831	04/15/2014	Ofer Saban	067055-002400

CONFIRMATION NO. 3426

46188
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

IMPROPER CPOA LETTER

OC000000069766597

Date Mailed: 07/25/2014

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 07/21/2014. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney from the inventors has not been accepted because the power of attorney must be signed by the applicant for patent. See 37 CFR 1.32(b)(4).

/tnguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/253,831	04/15/2014	Ofer Saban	067055-002400

CONFIRMATION NO. 3426

46188
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

PUBLICATION NOTICE

OC000000070184824

Title:METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

Publication No.US-2014-0225978-A1
Publication Date:08/14/2014

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Samsung/Google, EX1002, p. 99

PTO/AIA/80 (07-12)
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

☒ Practitioners associated with Customer Number: 46188

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

☒ The address associated with Customer Number: 46188

OR

☐

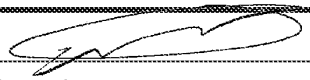
Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address: EYESMATCH LTD
19 WATERFRONT DRIVE, P.O. BOX 3540
ROAD TOWN, TORTOLA
BRITISH VIRGIN ISLANDS VG1110

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	18 Oct 2014
Name	Nissi Vilcovsky	Telephone	650-7999655
Title	Representative		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: EYESMATCH LTD

Application No./Patent No.: 14/253,831 Filed/Issue Date: April 15, 2014

Titled: METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

EYESMATCH LTD, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 033378, Frame 0564, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

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This collection of information is required by37 CFR3.73(b). The information is required toobtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentialityis governed by35 U.S.C. 122and 37 CFR1.11 and1.14. Thiscollection is estimated to take 12 minutes to complete, including gathering, preparing, and submittingthe completed application form to the USPTO.Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent tothe Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.**SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

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STATEMENT UNDER 37 CFR 3.73(c)

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6. From: _____ To: _____

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☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Joseph Bach/	November 5, 2014
Signature	Date
Joseph Bach	37,771
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that yoube given certain informationin connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, pleasebe advised that: (1) the general authority forthe collection of thisinformation is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and(3) the principal purpose forwhich the information isused by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent applicationor patent. If you do not furnish the requested information,the U.S. Patent and Trademark Office may not be able to process and/or examineyour submission,which may result in termination of proceedings or abandonment of the applicationor expiration of the patent.

The informationprovided by you in this form will be subject to the following routine uses:

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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5. A record related to an InternationalApplication filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from thissystem of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	20619749
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Monica Moreno
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	05-NOV-2014
Filing Date:	15-APR-2014
Time Stamp:	20:06:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	067055_POA.pdf	63474 37347a604a93d7efb12f8e5ff6c6a0ac23ffd443	no	1

Warnings:	
Information:	

2	Assignee showing of ownership per 37 CFR 3.73.	067055_002400_Statement373c.pdf	118100 3ab8447c236868a2a6c16f05761ed88cf9156c16	no	3

Warnings:	
Information:	
Total Files Size (in bytes):	181574

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	14253831
Filing Date	2014-04-15
First Named Inventor	Ofer Saban
Art Unit	2656
Examiner Name	KUNTZ, CURTIS A.
Attorney Docket Number	067055-002400

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6417850	B1	2002-07-09	Kang	
	2	7948481	B2	2011-05-24	Vilcosky	
	3	8624883	B2	2014-01-07	Vilcosky	

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	1	20020196333	A1	2002-12-26	Gorischek	
	2	20030085866	A1	2003-05-08	Bimber et al.	
	3	20050018140	A1	2005-01-27	Ishizaki et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2656
	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

	4	20050047629	A1	2005-03-03	Farrell et al.	
	5	20050259158	A1	2005-11-24	Jacob et al.	
	6	20060007303	A1	2006-01-12	Milton	
	7	20060178902	A1	2006-08-10	Vicars et al.	
	8	20070120954	A1	2007-05-31	Allen et al.	
	9	20070132863	A1	2007-06-14	Deguchi	
	10	20080151092	A1	2008-06-26	Vilcovsky	
	11	20090051779	A1	2009-02-26	Rolston	
	12	20090091710	A1	2009-04-09	Huebner	
	13	20100097442	A1	2010-04-22	Lablans	
	14	20100190510	A1	2010-07-29	Maranhas et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2656
	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

	15	20100191578	A1	2010-07-29	Tran et al.	
	16	20110199294	A1	2011-08-18	Vilcovksy	
	17	20110210970	A1	2011-09-01	Segawa	
	18	20120169850	A1	2012-07-05	Kim et al.	
	19	20120177284	A1	2012-07-12	Wang	
	20	20130229482	A1	2013-09-05	Vilcovsky et al.	
	21	20140225977	A1	2014-08-14	Vilcovsky et al.	
	22	20140226000	A1	2014-08-14	Vilcovsky et al.	
	23	20140226900	A1	2014-08-14	Saban et al.	

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	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2656
	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

	1	10031965	DE	A1	2002-01-10	Eberhard Floegel		☐
	2	19943355	DE	A1	2001-03-15	Markus Benesch		☐
	3	1372092	EP	A1	2003-12-17	Accenture Global Services GmbH		☐
	4	1376207	EP	A1	2004-01-02	Seiko Epson Corporation		☐
	5	1859432	EP	A2	2007-11-28	Nissi Vilcovsky		☐
	6	00/22955	WO	A1	2000-04-27	Eric Fischer		☐
	7	2006/092793	WO	A2	2006-09-08	Nissi Vilcovsky		☐
	8	2014/100250	WO	A2	2014-06-26	Nissi Vilcovsky, et al.		☐

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	Extended Search Report for European Patent Application No. 06711263.1 dated August 18, 2011.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2656
	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

	2	Office Action for European Patent Application No. 06711263.1 dated June 21, 2012.	☐
	3	Office Action for European Patent Application No. 06711263.1 dated June 25, 2013.	☐
	4	Decision to Refuse for European Patent Application No. 06711263.1 dated November 4, 2014.	☐
	5	Office Action for U.S. Patent Application No. 13/088,369 dated November 2, 2012.	☐
	6	Office Action for U.S. Patent Application No. 13/088,369 dated April 9, 2013.	☐
	7	Notice of Allowance for U.S. Patent Application No. 13/088,369 dated September 3, 2013.	☐
	8	International Search Report and Written Opinion for PCT/IL2006/000281 dated June 12, 2007.	☐
	9	International Preliminary Report on Patentability for PCT/IL2006/000281 dated September 20, 2007.	☐
	10	Office Action for U.S. Patent Application No. 11/817,411 mailed on July 21, 2010.	☐
	11	Notice of Allowance for U.S. Patent Application No. 11/817,411 mailed on February 3, 2011.	☐
	12	International Search Report and Written Opinion for PCT/US2013/076253 dated May 6, 2014.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2656
	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

	13	Notice of Allowance for U.S. Patent Application No. 14/253,800 dated October 24, 2014.	☐
	14	Invitation to Pay Additional Fees And, Where Applicable, Protest Fee for PCT/US2014/034333 dated August 8, 2014.	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2656
	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Joseph Bach/	Date (YYYY-MM-DD)	2014-11-06
Name/Print	Joseph Bach	Registration Number	37,771

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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Espacenet

Bibliographic data: DE10031965 (A1) — 2002-01-10

Electric mirror has visual display screen with greater than 30-inch diameter mounted on end and with digital camera preferably integrated into housing, uses computer technology for display

Inventor(s): FLOEGEL EBERHARD [DE] ± (FLOEGEL, EBERHARD)

Applicant(s): FLOEGEL EBERHARD [DE] ± (FLOEGEL, EBERHARD)

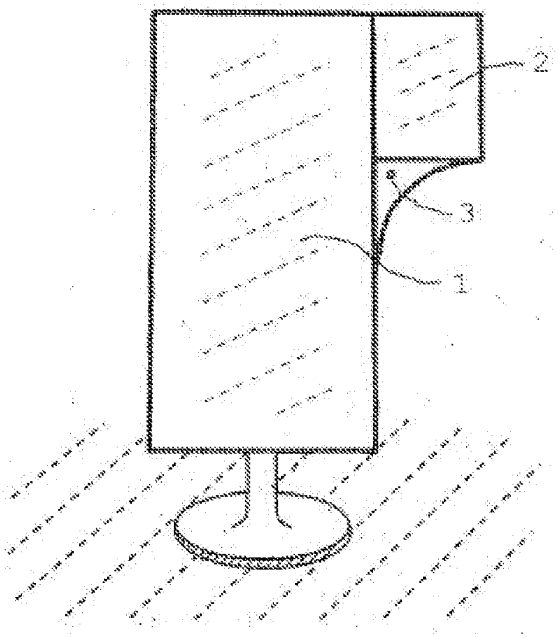
Classification: **- international:** ***H04N7/18;*** (IPC1-7): H04N1/00
- cooperative: **H04N7/18;** A47F2007/195

Application number: DE2000131965 20000630

Priority number(s): DE2000131965 20000630

Abstract of DE10031965 (A1)

The device has a visual display screen (1) with a greater than 30 inch diameter mounted on end and with a digital camera (3) preferably integrated into its housing so that using computer technology the image sequence acquired by the camera can be shown on the screen and the device can be used as a replacement for a mirror or as an electric mirror for use in trying on clothes. Independent claims are also included for the following: a visual display screen for an electric mirror.



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(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENT- UND MARKENAMT

(12) **Offenlegungsschrift**

(10) **DE 100 31 965 A 1**

(51) Int. Cl.[7]: **H 04 N 1/00**

(21) Aktenzeichen: 100 31 965.3
(22) Anmeldetag: 30. 6. 2000
(43) Offenlegungstag: 10. 1. 2002

DE 100 31 965 A 1

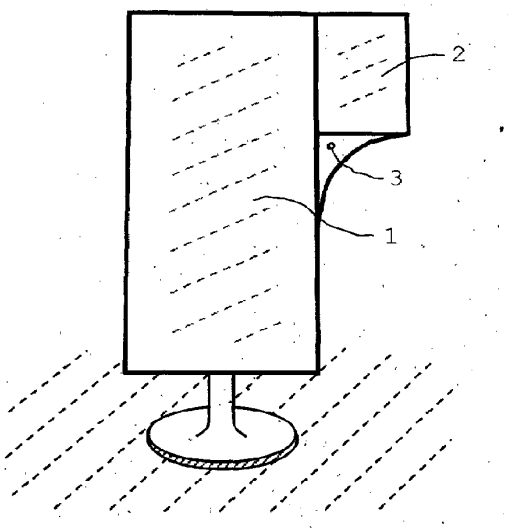
(71) Anmelder:
Floegel, Eberhard, 30161 Hannover, DE

(72) Erfinder:
gleich Anmelder

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

(54) Elektrospiegel

(57) Die Erfindung bezieht sich auf Bildschirme (1), die mittels einer eingebauten Kamera (3) als Spiegelersatz eingesetzt werden - insbesondere in Bekleidungsgeschäften und Kaufhäusern.
Über die Spiegelfunktion hinaus kann die Darstellung durch eine entsprechende Software u. a. bezüglich Farbe, Muster, Stoffart und Schnitt des getragenen Kleidungsstückes manipuliert werden. Ebenso kann die Farbdarstellung auf Tageslicht umgestellt werden.
Die Software sorgt auch dafür, daß die sich betrachtende Person stets in der vollen möglichen Größe auf dem Bildschirm dargestellt wird, unabhängig von der Entfernung zum Bildschirm.
Die Darstellung wird gespeichert, so daß vorhergehende Anproben jederzeit eingeblendet werden können. Diese gespeicherten Anproben können ebenfalls wie vorstehend manipuliert werden.
In einem zweiten Schritt kann die dargestellte Person per Software mit anderen Kleidungsstücken gezeigt werden. Informationen zum Kleidungsstück können zusätzlich auf einem kleineren Display (2) angezeigt werden.
Alle Funktionen sind über eine Fernbedienung steuerbar.
Die Erfindung eignet sich insbesondere auch für Production-on-demand.



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Samsung/Google, EX1002, p. 115

Beschreibung

[0001] Die Erfindung bezieht sich auf Bildschirme die mittels einer eingebauten Kamera als Spiegelersatz eingesetzt werden – insbesondere in Bekleidungsgeschäften und Kaufhäusern.

[0002] Derartige Spiegel – hier Elektrospiegel genannt – sind bis dato nicht bekannt. Bekannt sind dagegen PC-Programme, die z. B. in Frisiersalons den Kunden verschiedene Frisurvorschläge auf dem Bildschirm darstellen können.

[0003] Die Aufgabe dieser Erfindung ist es jedoch, die Anprobe von Bekleidungsstücken zu erleichtern und zu unterstützen.

[0004] Dabei wird bei der erfindungsgemäßen Lösung die Funktion eines Ganzkörperspiegels durch einen Bildschirm im Hochformat nicht nur vollständig ersetzt, sondern durch die folgende Möglichkeiten wesentlich erweitert:
Das getragene Kleidungsstück kann auf dem Bildschirm mittels entspr. Software in Farbe, Muster, Stoffart und Schnitt abgeändert dargestellt werden – letzteres gilt z. B. auch für erforderliche Längenänderungen. Ebenso kann die Farbdarstellung unter Tageslichtbedingungen simuliert werden.

[0005] Die Software sorgt auch dafür, daß die sich betrachtende Person stets in der vollen möglichen Größe auf dem Bildschirm dargestellt wird, unabhängig von der Entfernung zum Bildschirm.

[0006] Die Darstellung wird gespeichert, so daß vorhergehende Anproben jederzeit eingeblendet werden können. Diese gespeicherten Anproben können ebenfalls wie vorstehend manipuliert werden.

[0007] In einem zweiten Schritt kann die dargestellte Person per Software mit anderen Kleidungsstücken gezeigt werden.

[0008] Informationen zum Kleidungsstück können zusätzlich auf einem kleinen Display angezeigt werden.

[0009] Die Bedienung erfolgt über dieses Display oder über eine Fernbedienung.

[0010] Aus dieser erweiterten Funktionalität ergeben sich zahlreiche Vorteile:

verschiedene Versionen eines Kleidungsstückes erfordern kein mehrfaches Anprobieren;
– Stoffversionen, die nicht am Lager oder in der betr. Größe vorhanden sind, können trotzdem quasi anprobiert werden;
in der erweiterten Version ist auch die Darstellung von Kleidungsstücken ohne das Anprobieren möglich;
– erforderliche Längenänderungen können in ihrer Auswirkung sofort dargestellt und vom Kunden begutachtet werden;
– die Wiederholbarkeit der Aufzeichnungen einer vorhergehenden Anprobe ermöglicht dem Kunden den direkten Vergleich;
– dadurch, daß die gesamte Funktionalität auch auf eine gespeicherte Anprobe angewendet werden kann, ist eine Darstellung der gewünschten Kleidungsstücke auch ganz ohne neuerliche Anprobe möglich.

[0011] Mit der betr. Software kann insbesondere auch Production-on-demand unterstützt werden, indem die Bestelldaten direkt elektronisch weitergeleitet werden. Hierzu wäre es dann zusätzlich erforderlich, daß die Kundenmaße im System gespeichert sind möglichst ermittelt durch einen Ganzkörper-Scanner.

[0012] Anhand der Zeichnung wird ein derartiger Elektrospiegel – auf rein schematische Weise bezüglich seiner äußeren Form – näher veranschaulicht:

Dabei ist der Elektrospiegel **1** – nach heutiger Technik vorzugsweise ein Plasmabildschirm – auf einem Drehgestell **4** hochkant montiert, und trägt seitlich ein kleineres Display **2** unter dem auch die Kamera **3** plaziert ist.

[0013] Die Größe des Plasmabildschirmes **1** beträgt vorzugsweise zumindest 45 × 90 cm.

[0014] Die Erfindung ist nicht auf die dargestellte Ausführungsform beschränkt. Insbesondere kann Form, Größe und Plazierung des Elektrospiegels – z. B. auch in Wandaufhängung – variiert werden.

Patentansprüche

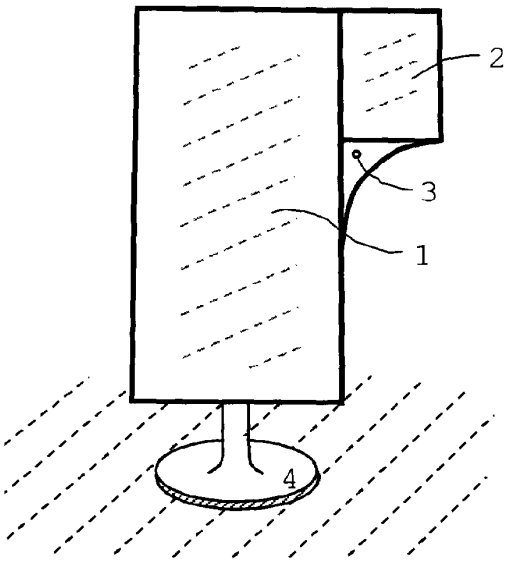
1. Bildschirm mit vorzugsweise mehr als 30-Zoll-Diagonale, **dadurch gekennzeichnet**, daß dieser (**1**) hochkant montiert ist und eine vorzugsweise im Gehäuse integrierte digitale Kamera (**3**) aufweist, derart, daß mittels Computertechnik die von der Kamera aufgenommene Bildsequenz so auf dem Bildschirm (**1**) dargestellt wird, daß dieser als Spiegelersatz – hier Elektrospiegel genannt – dienen kann, insbesondere für Bekleidungsanproben.
2. Elektrospiegel nach Anspruch 1, dadurch gekennzeichnet, daß die sich betrachtende Person vorzugsweise stets so groß wie möglich auf dem Bildschirm (**1**) dargestellt wird, unabhängig von der Entfernung zwischen dieser Person und dem Bildschirm.
3. Elektrospiegel nach Anspruch 1, dadurch gekennzeichnet, daß eine auf diese Weise gefilmte Anprobe gespeichert und wiederholt auf dem Bildschirm (**1**) eingeblendet werden kann.
4. Elektrospiegel nach Anspruch 1, dadurch gekennzeichnet, daß die Farbdarstellung auf dem Bildschirm (**1**) entsprechend den Tageslichtbedingungen erfolgen kann.
5. Elektrospiegel nach Anspruch 1, dadurch gekennzeichnet, daß ein Kleidungsstück der auf dem Bildschirm (**1**) dargestellten Person bezüglich Farbe und/oder Muster und/oder Stoffart und/oder Schnitt und/oder erforderlicher Längenänderungen geändert auf dem Bildschirm (**1**) dargestellt werden kann.
6. Elektrospiegel nach Anspruch 1, dadurch gekennzeichnet, daß die betr. Person auch mit anderen Kleidungsstücken als sie gerade trägt auf dem Bildschirm (**1**) dargestellt werden kann.
7. Elektrospiegel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die in diesen Ansprüchen beschriebenen Funktionen zumindest teilweise auch für gespeicherte Anproben entsprechend durchgeführt werden können.
8. Elektrospiegel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß Informationen zu den dargestellten Kleidungsstücken auf einem zusätzlichen kleineren Display (**2**) angezeigt werden können.
9. Elektrospiegel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß vorzugsweise alle Funktionen auch über eine Fernbedienung gesteuert werden können.

Hierzu 1 Seite(n) Zeichnungen

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- Leerseite -

Nummer: **DE 100 31 965 A1**
Int. Cl.[7]: **H 04 N 1/00**
Offenlegungstag: 10. Januar 2002



Samsung/Google, EX1002, p. 118

Espacenet

Bibliographic data: DE19943355 (A1) — 2001-03-15

Display material is formed by front partially-reflective layer and rear layer carrying information made visible by backlighting, hence forming composite acting as mirror or display

Inventor(s): BENESCH MARKUS [DE] ± (BENESCH, MARKUS)

Applicant(s): BENESCH MARKUS [DE] ± (BENESCH, MARKUS)

Classification: **- international:** ***G09F13/12;*** (IPC1-7): G09F9/00
- cooperative: **G09F13/12**

Application number: DE1999143355 19990910

Priority number(s): DE1999143355 19990910

Abstract of DE19943355 (A1)

The front layer (1) is partially-reflective layer. Behind it is a display layer (2), on which information is seen when illuminated actively or passively. Light incident on the reflective layer from the front, is largely reflected, as from a mirror. Illumination of the display layer, reveals its information to a viewer at the front.

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(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENT- UND MARKENAMT

(12) **Offenlegungsschrift**

(10) **DE 199 43 355 A 1**

(51) Int. Cl.[7]: **G 09 F 9/00**

(21) Aktenzeichen: 199 43 355.0
(22) Anmeldetag: 10. 9. 1999
(43) Offenlegungstag: 15. 3. 2001

DE 199 43 355 A 1

(71) Anmelder:
Benesch, Markus, 80538 München, DE

(74) Vertreter:
Schwabe, Sandmair, Marx, 81677 München

(72) Erfinder:
gleich Anmelder

(56) Für die Beurteilung der Patentfähigkeit in Betracht zu ziehende Druckschriften:

DE	94 01 801 U1
GB	21 41 280 A
US	56 57 563
US	47 47 223
WO	95 23 401 A1

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

(54) Reflektierendes Material mit Displayfunktion, Vorrichtung, die ein solches Material umfaßt

(57) Die Erfindung betrifft ein Material, insbesondere Verbundmaterial, mit Doppelfunktion, das zugleich als Spiegel und als Informationsanzeigevorrichtung verwendet werden kann.
Das reflektierende Material mit Displayfunktion umfaßt eine reflektierende Schicht und eine auf einer Rückseite der reflektierenden Schicht angeordnete Informationsanzeigeschicht, um mittels aktiver oder passiver Ausleuchtung Information darzubieten, bei welchem Material die reflektierende Schicht zumindest abschnittsweise ein partielles Reflexionsvermögen aufweist, das so gewählt ist, daß die reflektierende Schicht Licht, das von der Vorderseite auf die reflektierende Schicht auftrifft, überwiegend reflektiert, um als Spiegel zu wirken, daß jedoch bei Ausleuchtung der Informationsanzeigeschicht Information von der Vorderseite der reflektierenden Schicht her sichtbar ist.

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Beschreibung

Die vorliegende Erfindung betrifft ein reflektierendes Material mit Displayfunktion und bevorzugte Verwendungsformen eines solchen Materials, insbesondere in Vorrichtungen mit elektrischer Ausleuchtung.

Spiegel und Materialien mit reflektierender Oberfläche finden in der Technik und im Design vielfach Anwendung. In der Regel sind Spiegel bzw. Materialien mit reflektierender Oberfläche nur für den Zweck ausgelegt, einfallendes Licht geeignet zu reflektieren. Für moderne Bürogebäude sind auch verspiegelte Oberflächen bekannt, die zwar im sichtbaren Spektralbereich überwiegend reflektierend sind, die jedoch im infraroten Spektralbereich weitgehend intransparent sind. Übliche Materialien mit reflektierender Oberfläche sind somit in ihrer Funktionalität erheblich eingeschränkt.

In der Technik sind auch viele Arten von Informationsanzeigevorrichtungen bekannt, beispielsweise Bildschirme, LED-Displays, LCD-Displays etc. Die dem Betrachter sichtbare Oberfläche solcher Informationsanzeigevorrichtungen genügt jedoch häufig nicht den Anforderungen des modernen Designs und können insbesondere nicht als Spiegel eingesetzt werden.

Aufgabe der vorliegenden Erfindung ist es, ein Material, insbesondere Verbundmaterial, zu schaffen, das zugleich als Spiegel und als Informationsanzeige verwendet werden kann. Eine weitere Aufgabe der vorliegenden Erfindung ist es, bevorzugte Anwendungen des erfindungsgemäßen Materials zu schaffen.

Diese Aufgabe wird gelöst durch ein Material mit den Merkmalen nach Anspruch 1 sowie durch eine Vorrichtung nach einem der Ansprüche 23 bis 26, 28, 29 und 31. Vorteilhafte Weiterbildungen sind Gegenstand der rückbezogenen Unteransprüche.

Gemäß der Erfindung wird ein Material, insbesondere ein Verbundmaterial, geschaffen, das eine reflektierende Schicht und eine Informationsanzeigeschicht umfaßt. Die reflektierende Schicht dient als Spiegel, um insbesondere im sichtbaren Spektralbereich Licht, das von einer Vorderseite bzw. Betrachtungsseite aus auf das Material einfällt, zurück zu reflektieren. Die Informationsanzeigeschicht ist gemäß der Erfindung auf der Rückseite der reflektierenden Schicht angeordnet, d. h. bei bestimmungsgemäßer Verwendung des Materials auf der der Betrachtungsseite des Materials abgewandten Seite des Materials.

Die Informationsanzeigeschicht bietet mittels aktiver oder passiver Ausleuchtung Information in Form eines Lichtmusters mit Helligkeits- und/oder Farbunterschieden dar, die insbesondere im sichtbaren Spektralbereich dargeboten werden.

Die reflektierende Schicht des erfindungsgemäßen Materials weist ein partielles Reflexionsvermögen auf, d. h. Licht, das auf die reflektierende Schicht auftrifft, wird von dieser nur zum Teil reflektiert, der übrige Teil des Lichts wird transmittiert. Somit kann das Lichtmuster, das von der Informationsanzeigeschicht dargeboten wird, die reflektierende Schicht teilweise durchdringen, um auf der Oberfläche der reflektierenden Schicht als Information wahrgenommen werden zu können.

Gemäß der Erfindung wird deshalb ein Material mit doppelter Funktion geschaffen. Das Material kann einerseits als Spiegel verwendet werden und andererseits als Informationsanzeige. Gemäß der Erfindung können beide Funktionen auf engstem Raum und mit ein- und demselben Material realisiert werden, so daß Platz und Herstellungs- und Betriebskosten eingespart werden können.

Das erfindungsgemäße Material kann vielfältig dort eingesetzt werden, wo aus funktionellen Gründen eine Informationsanzeige gewünscht ist, wo aber gleichzeitig, beispielsweise aus ästhetischen Gründen, eine spiegelnde Oberfläche gewünscht ist.

Diese Doppelfunktion kann vielfältig ausgenutzt werden. Viele in der Technik eingesetzten Informationsanzeigen wirken insbesondere im ausgeschalteten Zustand unästhetisch. Dies gilt beispielsweise für LED-Anzeigen, auf denen man selbst im ausgeschalteten Zustand die Ziffernfelder ohne weiteres erkennen kann. Gemäß der Erfindung ist die Oberfläche solcher Informationsanzeigevorrichtungen verspiegelt, was den ästhetischen Gesamteindruck deutlich verbessert. Gemäß der Erfindung entfällt somit der störende ästhetische Gesamteindruck von Informationsanzeigen vollständig.

Gemäß der vorliegenden Erfindung kann auf der verspiegelten Oberfläche des Materials Information völlig unerwartet für einen Betrachter eingeblendet werden. Dies gilt umso mehr, als es ungewöhnlich ist, daß auf einer reflektierenden Oberfläche Information dargestellt wird. Diese überraschende Wirkung kann dazu genutzt werden, um die Aufmerksamkeit des Betrachters umso mehr auf die dargestellte Information zu lenken. Das erfindungsgemäße Material eignet sich deshalb insbesondere zu Werbezwecken oder Warnzwecken.

Unter dem Begriff passive Ausleuchtung wird nachfolgend insbesondere die Ausleuchtung der Informationsanzeigeschicht mittels einer auf der Rückseite der Informationsanzeigeschicht befindlichen Lichtquelle verstanden, die zweckmäßig zu jedem beliebigen Zeitpunkt zuschaltbar ist und vorzugsweise Licht mit variabler Intensität bereitstellen kann. Bei dieser Ausführungsform bietet die Informationsanzeigeschicht zur Darstellung von Information Abschnitte unterschiedlicher Transmission und/oder unterschiedlichem spektralem Absorptionsvermögen dar, die Licht, das von der Lichtquelle auf die Informationsanzeigeschicht auftrifft und diese durchdringt, in der Intensität und/oder Farbe unterschiedlich modulieren.

Unter dem Begriff aktive Ausleuchtung wird nachfolgend insbesondere verstanden, daß zumindest einzelne Abschnitte der Informationsanzeigeschicht aufgrund eines elektrischen Mechanismus selbsttätig Licht emittieren können, wie dies beispielsweise für LED-Arrays bekannt ist.

Weitere Einzelheiten zur aktiven oder passiven Ausleuchtung der Informationsanzeigeschicht werden nachfolgend unter Bezugnahme auf bevorzugte Ausführungsformen noch ausführlicher beschrieben werden.

Damit Licht von der Rückseite des Materials, d. h. von der der Betrachtungs- bzw. Vorderseite abgewandten Seite des Materials, zur Betrachtungsseite gelangen kann, weist die reflektierende Schicht gemäß der vorliegenden Erfindung ein partielles Reflexionsvermögen auf, d. h. ein Reflexionsvermögen von weniger als 100 Prozent. Die reflektierende Schicht braucht jedoch nicht auf der gesamten Oberfläche ein solches partielles Reflexionsvermögen aufweisen. Ein partielles Reflexionsvermögen ist nur an solchen Abschnitten erforderlich, an denen Information tatsächlich dargestellt werden soll.

Infolge der aktiven oder passiven Ausleuchtung der Informationsanzeigeschicht fällt Licht von der Seite der Informationsanzeigeschicht her auf die reflektierende Schicht auf, durchdringt diese teilweise und kann dann von der Betrachtungsseite des Materials aus bzw. auf der reflektierenden Schicht wahrgenommen werden.

Als Information kann gemäß der Erfindung jegliche Bewegt- und/oder Standbildinformation dargestellt werden. Beispiele für Bewegtbildinformation sind Videobildsequenzen, Fernsehbildinformation, technische Anzeigen mit zeit-

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lich variablem Inhalt, beispielsweise Zeichen- und/oder Ziffernanzeigen oder Datums- und/oder Zeitinformation, jeweils in schwarzweiß und/oder Farbe. Beispiele für Standbildinformation sind statische Darstellungen von Motiven in schwarzweiß und/oder Farbe, technische Informationen, wie beispielsweise Zeichen- und/oder Ziffernanzeigen, aber auch Texturen oder Strukturierungen von Materialien, die hinter der reflektierenden Schicht angeordnet sind.

Das Reflexionsvermögen der reflektierenden Schicht wird zumindest in dem Spektralbereich, in dem die Information mittels Licht einer vorgegebenen Wellenlänge bzw. Wellenlängenverteilung dargestellt werden soll, so gewählt, daß Licht, das von der Vorder- bzw. Betrachtungsseite des Materials aus auf die reflektierende Schicht auftrifft, ausreichend reflektiert wird, so daß die reflektierende Schicht als Spiegel mit einem zufriedenstellenden Reflexionsvermögen funktioniert. Andererseits ist das Reflexionsvermögen der reflektierenden Schicht auch so gewählt, daß ausreichend viel Licht, das die darzustellende Information verkörpert, die reflektierende Schicht von der Materialrückseite aus durchdringen kann und auf der Vorder- bzw. Betrachtungsseite des Materials deutlich als Information wahrgenommen werden kann. Das Reflexionsvermögen der reflektierenden Schicht unterliegt insofern einem gewissen Kompromiß, was von verschiedenen Faktoren abhängt, beispielsweise davon, wie lichtstark die Ausleuchtung der Informationsanzeigeschicht ist, wie hell der Vordergrund des Materials beim bestimmungsgemäßen Gebrauch ist und wie lichtstark die Information auf der reflektierenden Schicht eingeblendet werden soll.

Vorzugsweise liegt das Reflexionsvermögen der reflektierenden Schicht zumindest in dem Spektralbereich, in dem die Information mittels Licht einer vorgegebenen Wellenlänge bzw. Wellenlängenverteilung dargestellt werden soll, im Bereich von 75 bis 95 Prozent, insbesondere im Bereich von 85 bis 95 Prozent.

Bevorzugt ist das Reflexionsvermögen der reflektierenden Schicht im gesamten sichtbaren Spektralbereich im wesentlichen konstant. Ein solches Reflexionsvermögen kann durch metallisches Bedampfen einer Oberfläche oder durch Beschichten mit einer dielektrischen Vielfachbeschichtung, insbesondere mit einer Anzahl von dielektrischen Schichten mit einer Dicke von jeweils etwa einem Viertel der Wellenlänge von Licht im relevanten Spektralbereich, erreicht werden.

Das im sichtbaren Spektralbereich gewählte Reflexionsvermögen kann sich auch bis in den infraroten Spektralbereich fortsetzen. Es kann jedoch auch bevorzugt sein, daß die reflektierende Schicht im infraroten Spektralbereich sehr viel durchlässiger als im sichtbaren Spektralbereich ist, um einer übermäßigen Erwärmung der Informationsanzeigeschicht bei der Ausleuchtung entgegenzuwirken.

Damit das Reflexionsvermögen der reflektierenden Schicht nicht durch Hintergrundreflexionen hinter der reflektierenden Schicht beeinträchtigt wird, wird es bevorzugt, daß zumindest die der reflektierenden Schicht zugewandte Oberfläche der Informationsanzeigeschicht mit einer Antireflexionsbeschichtung, wie sie beispielsweise von Brillen her bekannt ist, insbesondere mit dielektrischen Mehrfachschichten, versehen ist. Bevorzugt wird ferner, daß die Informationsanzeigeschicht dann, wenn diese nicht ausgeleuchtet wird, einen dunklen Hintergrund darbietet, so daß möglichst kein störendes Licht von der Rückseite der reflektierenden Schicht her zu deren Vorderseite gelangen kann. Zu diesem Zweck kann die Rückseite der Informationsanzeigeschicht auch mit einer Licht diffus streuenden Oberfläche versehen sein.

Bevorzugt ist die reflektierende Schicht unmittelbar mit der Informationsanzeigeschicht zu einem Verbundmaterial mit Sandwich-Struktur verbunden. Es kann jedoch auch ein Spalt zwischen den beiden Schichten vorgesehen sein. Bei letztgenannter Ausführungsform wird es bevorzugt, daß der Spalt stirnseitig lichtdicht abgeschlossen ist, so daß in den Spalt im wesentlichen kein Licht seitlich einfallen kann, das sonst durch die Abschnitte der reflektierende Schicht mit dem partiellen Reflexionsvermögen auf der Materialvorderseite sichtbar wäre.

Bei einer ersten Ausführungsform, insbesondere mit passiver Ausleuchtung der Informationsanzeigeschicht, ist die Informationsanzeigeschicht als transparentes bzw. semitransparentes Material ausgebildet, daß zur Darstellung von Information Abschnitte mit unterschiedlicher Transmission aufweist. Wird eine solche Schicht rückseitig mittels einer Lichtquelle ausgeleuchtet, so wird das die Informationsanzeigeschicht durchdringende Licht von den Abschnitten mit unterschiedlicher Transparenz intensitätsmoduliert, so daß dem Lichtstrom eine Information aufgeprägt wird. Die Transparenz des Materials kann für alle Wellenlängen im sichtbaren Spektralbereich gleichmäßig sein, sie kann jedoch auch spektral verschieden sein, so daß dem Lichtstrom neben Graustufeninformation zusätzlich auch ein Farbmuster als Information aufgeprägt werden kann.

Besonders bevorzugt umfaßt das transparente bzw. semitransparente Material der Informationsanzeigeschicht einen geeigneten Kunststoffilm, beispielsweise in der Art von Schwarweiß- oder Farbnegativfilmen, insbesondere einen sogenannten Backlightfilm. Bei dem transparenten bzw. semitransparenten Material der Informationsanzeigeschicht kann es sich jedoch auch um eine Glas- oder Kunststoffschicht handeln, die entweder oberflächlich mit einem Graustufen- oder Farbmuster versehen ist, beispielsweise durch Anätzen und/oder Einfärben der Oberfläche, oder die im Material selbst Graustufen- oder Farbmuster aufweist, beispielsweise hervorgerufen durch Einlagerungen. Eine solche Glas- oder Kunststoffschicht weist vorzugsweise eine Licht diffus streuende Oberfläche auf, so daß Licht, das durch die reflektierende Schicht hindurchgelangt, nicht direkt zurückreflektiert wird. Schließlich kann die Informationsanzeigeschicht auch ein anderes transparentes bzw. semitransparentes Material umfassen, das einem Lichtstrom Intensitäts- oder Farbmuster aufprägen kann, beispielsweise ein vergleichsweise grobmaschiges Textil mit einer Gewebestrukturierung oder eine vergleichsweise dünne eingeschwärzte und/oder eingefärbte Pappenbahn.

Bei einer weiteren Ausführungsform umfaßt die Informationsanzeigeschicht eine Matrix bzw. einen Array aus lichtemittierenden Polymeren. Von solchen Polymeren ist bekannt, daß diese ähnlich wie Halbleiter eine Bandlücke aufweisen, so daß bei Anlegen einer geeigneten Spannung von dem Kunststoff Licht emittiert wird. Im Stand der Technik sind auch bereits Arrays aus lichtemittierenden Polymeren bekannt, die einzeln ansteuerbare Felder in der Art einer LED-Matrix aufweisen, denen jeweils eine Steuerelektrode zugeordnet ist. Vorzugsweise weist die Rückseite einer solchen Matrix eine Licht diffus streuende Oberfläche auf.

Die vorgenannten Materialien für die Informationsanzeigeschicht können auch plastisch, beispielsweise durch Wärmebeaufschlagung, zu einer beliebigen dreidimensionalen Form geformt sein. Besonders bevorzugt wird eine plastische Verformung bei Lampenschirmen oder Lampensäulen, die mit einem erfindungsgemäßen Material beschichtet bzw. versehen sind.

Bei dieser Ausführungsform kann die reflektierende Schicht in Form einer metallischen oder dielektrischen Beschichtung unmittelbar auf die Informationsanzeigeschicht aufgebracht sein, beispielsweise unmittelbar auf einen

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Kunststoffilm oder eine Matrix aus lichtemittierenden Polymeren. Auf diese Weise können die Herstellungskosten des Materials noch weiter gesenkt werden.

Die reflektierende Schicht kann auch auf einem separaten transparenten Material aufgebracht sein, das mit der Informationsanzeigeschicht zu einem flächigen Verbundmaterial verbunden ist, beispielsweise einem Laminat mit Sandwich-Struktur. Insbesondere kann die reflektierende Schicht unmittelbar auf der Oberfläche einer Kunststoffschicht ausgebildet ist, beispielsweise durch Bedampfen mit einer Metallschicht oder einer dielektrischen Vielfachschicht. Vorzugsweise ist die Kunststoffschicht mit der Informationsanzeigeschicht thermoverschweißt oder mittels Verkleben als Laminatmaterial ausgebildet.

Bei einer anderen bevorzugten Ausführungsform ist die Informationsanzeigeschicht so ausgelegt, daß zumindest ein Abschnitt von dieser aktiv ausleuchtbar ist. Beispiele für aktiv ausleuchtbare Informationsanzeigeschichten sind Bildschirme, insbesondere lichtstarke Plasmabildschirme, LCD-Displays, die für Durchlichtbetrieb mit Hintergrundausleuchtung ausgelegt sind, wie diese beispielsweise von der Ansteuerung von Overhead-Projektoren mittels Computer her bekannt sind, eine Schicht, die eine Matrix bzw. ein Array aus LEDs umfaßt, etc.

Bei dieser Ausführungsform kann die reflektierende Schicht, insbesondere eine metallische oder dielektrische Vielfachbeschichtung, unmittelbar auf der Oberfläche der Informationsanzeigeschicht ausgebildet sein. Weil solche Informationsanzeigen jedoch häufig als Fertigkomponenten zugekauft werden soll, wird es bevorzugt, daß die reflektierende Schicht auf der Oberfläche einer Glas- oder Kunststoffschicht oder einer anderen geeigneten transparenten Schicht ausgebildet ist. Diese Schicht ist dann beispielsweise durch Verkleben, Laminieren oder eine andere geeignete Verbindungstechnik mit der Informationsanzeigeschicht verbunden.

Für LEDs aber auch lichtemittierende Polymere ist es charakteristisch, daß die Lichtemission in einem vergleichsweise schmalbandigen Spektralbereich erfolgt, beispielsweise im roten Spektralbereich. Deshalb wird bei einer weiteren bevorzugten Ausführungsform das spektrale Reflexionsvermögen der reflektierenden Schicht gerade so gewählt, daß dieses in dem schmalbandigen Emissionswellenlängenbereich ein vergleichbar schmalbandiges Minimum aufweist, wohingegen das Reflexionsvermögen im übrigen Spektralbereich, wie auch bei den vorgenannten Ausführungsformen, einen vergleichsweise hohen und vorzugsweise annähernd konstanten Wert annimmt. Insbesondere kann im übrigen Spektralbereich das Reflexionsvermögen des Spiegels möglichst nahe an 100 Prozent gewählt werden. Auf diese Weise wird sichergestellt, daß noch mehr Licht von der Informationsanzeigeschicht die reflektierende Schicht durchdringen und von einem Betrachter wahrgenommen werden kann, daß jedoch in den übrigen Spektralbereichen das Material als hochwertiges Spiegelmaterial eingesetzt werden kann. Das hohe Transmissionsvermögen in einem relativ schmalbandigen Spektralbereich wird jedoch von Betrachtern nicht als störend empfunden. Dies führt vielmehr nur zu einem geringfügig herabgeminderten Reflexionsvermögen des Spiegels.

Ein solches Reflexionsvermögen läßt sich durch Vielfachbeschichten mit dielektrischen Lambda-Viertelschichten ohne weiteres erreichen. Bevorzugt liegt das minimale Reflexionsvermögen der reflektierenden Schicht im Bereich des schmalbandigen Minimums im Bereich von 50 bis 85 Prozent, insbesondere im Bereich von 50 bis 65 Prozent.

Bevorzugt ist bei sämtlichen vorgenannten Ausführungsformen zumindest die reflektierende Schicht von einer Schutzschicht überzogen, die als mechanischer Schutz und/oder Oxidationsschutz für die üblicherweise empfindliche reflektierende Schicht dient. Solche Schutzschichten sind im Stand der Technik beispielsweise zum Schutz von Spiegeln oder Brillengläsern bekannt.

Nachfolgend wird die Erfindung in beispielhafter Weise und unter Bezugnahme auf die beigefügten Zeichnungen bevorzugter Ausführungsbeispiele erläutert. Dabei werden weitere Merkmale und Vorteile der Erfindung ersichtlich werden. Die Figuren stellen dar:

Fig. 1 eine schematische Querschnittsansicht eines erfindungsgemäßen Materials gemäß einer ersten Ausführungsform mit passiver Ausleuchtung der Informationsanzeigeschicht;

Fig. 2 eine schematische Querschnittsansicht eines erfindungsgemäßen Materials gemäß einer zweiten Ausführungsform mit aktiver Ausleuchtung der Informationsanzeigeschicht;

Fig. 3 eine schematische Querschnittsansicht einer Lampe mit einem erfindungsgemäßen Material gemäß der ersten Ausführungsform; und

Fig. 4 eine schematische Ansicht eines Spiegels, der ein erfindungsgemäßes Material gemäß der zweiten Ausführungsform aufweist, um wahlweise Information anzuzeigen oder als Spiegel zu dienen.

In den Figuren bezeichnen gleiche Bezugszeichen identische oder gleichwirkende Elemente bzw. Merkmale.

Fig. 1 zeigt eine schematische Querschnittsansicht eines erfindungsgemäßen Materials gemäß einer ersten Ausführungsform. Das Material umfaßt eine reflektierende Schicht **1** und eine Informationsanzeigeschicht **2**. Wie durch die unterschiedlich gepunkteten Abschnitte der Informationsanzeigeschicht **2** schematisch angedeutet ist, umfaßt diese eine Anzahl von Abschnitten unterschiedlicher Transparenz für Licht, insbesondere in dem Spektralbereich, in dem Information dargestellt werden soll. Dies ist üblicherweise der sichtbare Spektralbereich, kann jedoch beispielsweise auch der infrarote Spektralbereich sein. Auf der Rückseite der Informationsanzeigeschicht **2**, d. h. auf der der reflektierenden Schicht **1** abgewandten Seite, ist eine Lichtquelle **4** angeordnet, die wahlweise an- und abgeschaltet werden kann und vorzugsweise auch hinsichtlich der Intensität gesteuert werden kann. Es kann auch vorgesehen sein, daß einzelne Abschnitte der Informationsanzeigeschicht **2** mittels gesonderter, unabhängig ansteuerbarer Lichtquellen ausgeleuchtet werden können.

Licht, das von der Vorderseite bzw. bestimmungsgemäßen Betrachtungsseite, d. h. in **Fig.** 1 vom linken Rand aus, auf die reflektierende Schicht **1** auftrifft, wird von dieser partiell reflektiert. Der reflektierte Anteil R hängt von dem Reflexionsvermögen der reflektierenden Schicht **1** ab und liegt bei einer besonders bevorzugten Ausführungsform im Bereich von 85 bis 95 Prozent, so daß der größte Teil des einfallenden Lichts wieder reflektiert wird. Somit kann die reflektierende Schicht als Spiegel für einen auf der Vorderseite des Materials befindlichen Betrachter dienen.

Licht, das von der Lichtquelle emittiert wird, gelangt durch die Informationsanzeigeschicht **2**. Dabei wird dem Lichtstrom aufgrund der Abschnitte mit unterschiedlicher Transparenz Information aufgeprägt. Die Transparenz kann im gesamten Emissionswellenlängenbereich der Lichtquelle **4** nahezu konstant sein. In diesem Fall wird dem Licht Information in Form von Graustufenwerten aufgeprägt. Die Transparenz kann jedoch auch über den Emissionswellenlängenbereich der Lichtquelle **4** variieren. In einem solchen Fall wird dem Licht Information auch in Form von Farbstufenwerten aufgeprägt.

Nach Durchqueren der Informationsanzeigeschicht **2**

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trifft das Licht schließlich auf die Rückseite der reflektierenden Schicht **1** auf. Von dieser wird ein Teil T, abhängig vom gewählten Reflexionsvermögen der reflektierenden Schicht **1**, zur Vorder- bzw. Betrachtungsseite des Materials hin durchgelassen. Dort ist die dem Licht aufgeprägte Information schließlich auf der Oberfläche des Materials sichtbar.

Durch wahlweises An- und Abschalten und Variieren der Intensität der Lichtquelle kann die Information wahlweise zugeschaltet und in der Helligkeit variabel auf der Oberfläche der reflektierenden Schicht **1** angezeigt werden.

Als Materialien für die Informationsanzeigeschicht **2** kommen Glas- oder Kunststoffschichten in Frage, auf deren Oberfläche oder in deren Volumen Information in Form von grauen oder farbigen Bereichen aufgeprägt oder eingelagert ist. Es kommen auch jegliche andere transparente Materialien in Frage, die Abschnitte mit unterschiedlicher Transparenz aufweisen, beispielsweise vergleichsweise grobmaschige Textilien, wo die Struktur des Gewebes der darzustellenden Information entspricht. Bei diesen Materialien wird die Information überwiegend nur in Form von Standbildern, d. h. zeitlich nicht variablen Bildern bzw. Zeichen, dargeboten.

Als Material für die Informationsanzeigeschicht **2** kann jedoch auch ein Projektionsschirm mit Hintergrundausleuchtung oder ein LCD-Display mit Hintergrundausleuchtung verwendet werden.

Fig. 2 zeigt eine schematische Querschnittsansicht eines erfindungsgemäßen Materials gemäß einer zweiten Ausführungsform. Bei diesem Material wird die Informationsanzeigeschicht aktiv ausgeleuchtet. Zu diesem Zweck umfaßt die Informationsanzeigeschicht **5** eine Anzahl von Abschnitten, deren Helligkeit unabhängig voneinander binär und/oder in beliebigen Abstufungen variiert werden kann. Dies ist in **Fig.** 2 schematisch durch die schraffierten und nicht schraffierten Felder **5**a bzw. **5**b angedeutet.

Beispiele für eine solche Informationsanzeigeschicht sind insbesondere LED-Arrays, Arrays aus lichtemittierenden Polymeren oder Bildschirme. Solche Anzeigen eignen sich sowohl für die Darstellung von Bewegtbildern als auch von Standbildern.

Die Ausleuchtung der Informationsanzeigeschicht **5** führt zu einem Lichtstrom, dem Information in Form von Helligkeits- und/oder Farbmustern aufgeprägt ist. Dieser Lichtstrom trifft auf die Rückseite der reflektierenden Schicht **1** auf und wird von dieser teilweise zur Vorder- bzw. Betrachtungsseite hin durchgelassen. Dort ist die Information in Form von Helligkeits- und/oder Farbmustern auf der Oberfläche der reflektierenden Schicht **1** sichtbar.

Fig. 3 zeigt schematisch eine Querschnittsansicht einer Lampe **6** mit einem erfindungsgemäßen Material gemäß der ersten Ausführungsform.

Die Lampe ist bei dem dargestellten Beispiel säulenartig ausgebildet und umfaßt im oberen Bereich einen Lampenschirm, der um die Lichtquelle **4** herum angeordnet ist. Der Lampenschirm umfaßt das erfindungsgemäße Material mit der reflektierenden Schicht **1** und der Informationsanzeigeschicht **2**, **5** oder besteht voll und ganz aus diesem. Die Lampe umfaßt außerdem einen Lampenfuß **9**, eine Standfläche **8**, die vorzugsweise geschlossen ausgebildet ist, und ein oberes Ende **7**, das beim dem dargestellten Ausführungsbeispiel nach oben hin offen ist. Grundsätzlich kann die Lampe oder der Lampenschirm auch beliebig anders gestaltet sein.

Ist die Lichtquelle **4** ausgeschaltet, so wirkt der Lampenschirm als reflektierender Spiegel. Wird die Lichtquelle **4** eingeschaltet, so wird dem Licht beim Durchqueren der Informationsanzeigeschicht **2**, **5** Information in Form von abschnittsweise unterschiedlichen Helligkeits- und/oder Farbänderungen aufgeprägt. Das modulierte Licht durchquert die reflektierende Schicht **1** mit dem partiellen Reflexionsvermögen und kann auf der Oberfläche des Lampenschirms als Information wahrgenommen werden.

Zur Anzeige von Standbildinformation kann das Material der Informationsanzeigeschicht **2** unterschiedlich geschwärzte und/oder gefärbte Abschnitte auf der Oberfläche oder im Materialvolumen aufweisen. Beispiele für Materialien des Lampenschirms sind dünne Pappenbahnen, Kunststoffilme, einfache Glas- oder Kunststoffformen, Maschenstrukturen, beispielsweise aus Textilien, etc. Insbesondere kann das Material des Lampenschirms auch mit einer semitransparenten Druckfarbe, beispielsweise im Siebdruckverfahren, oberflächlich eingefärbt sein.

Die reflektierende Schicht **1** kann unmittelbar auf das Material der Informationsanzeigeschicht **2** aufgebracht sein. Die reflektierende Schicht kann jedoch auch auf einem Überzug aus einem transparenten Material, beispielsweise Kunststoff oder Glas, aufgebracht sein. In letzterem Fall wird es bevorzugt, daß der Überzug mit dem Material der Informationsanzeigeschicht zu einem Verbundmaterial zusammengefügt ist. Als Verbindungsverfahren eignet sich insbesondere für Kunststoffmaterialien Thermo-Verschweißen.

Zur einfacheren Montage kann der Lampenschirm, nachdem er zunächst aus dem erfindungsgemäßen Material als rechteckförmige Bahn zurechtgeschnitten wurde, mit einem Verbindungsstreifen, beispielsweise einem selbstklebenden Streifen oder mit einem Klettband, versehen und dann durch Verbinden des Verbindungsstreifens mit einem anderen Ende der Bahn zu einer geeigneten dreidimensionalen Form zusammengefügt werden.

Der Lampenschirm kann auch mit Versteifungsringen etc. versehen sein, um die dreidimensionale Form zu wahren und um für eine geeignete mechanische Stabilität zu sorgen. Nach dem Zusammenfügen kann der Lampenschirm auch plastisch zu einer geeigneten dreidimensionalen Form weitergeformt werden, beispielsweise durch Wärmebeaufschlagung und Überziehen über eine geeignete Form.

Ein Aufbau von der in **Fig.** 3 gezeigten Anordnung läßt sich vielfältig auch für andere Zwecke einsetzen. Beispielsweise als Reklame-Litfaßsäule mit geschlossenem oberen Ende. Um die Aufmerksamkeit der Betrachter zu steigern, können Teile der Litfaßsäule eine spiegelnde Oberfläche aufweisen, was für Litfaßsäulen ungewöhnlich ist, und kann auf anderen Teilen nach Bedarf Werbeinformation oder auch andere nützliche Hinweise, beispielsweise Textinformation, angezeigt werden.

Durch Ausschalten der Lichtquelle **4** können alle Werbeinformationen auf einmal ausgeblendet und wieder eingeblendet werden. Beim plötzlichen Einblenden werden Passanten unwillkürlich die Litfaßsäule genauer fixieren, um festzustellen, was sich da im Gesichtsfeld gerade geändert hat. Somit kann in einfacher Weise die gewünschte erhöhte Aufmerksamkeit des Publikums für Werbeinformation bewerkstelligt werden. Um diesen Effekt noch weiter zu steigern, kann jedem Informationsanzeigeabschnitt eine eigene und selbsttätig schaltbare Lichtquelle zugeordnet sein.

In einzelnen oder sämtlichen Feldern der Litfaßsäule können auch Bewegtbilder dargestellt werden, wenn man hinter der reflektierenden Schicht **1** geeignete aktive Informationsanzeigevorrichtungen verwendet, wie diese vorstehend beschrieben wurden.

Die Steuerung der Lichtquelle und der Informationsanzeigeschicht **5** erfolgt mit Hilfe eines Computers oder einer geeigneten Steuereinheit.

Fig. 4 zeigt schließlich ein tafelförmiges Flächenelement **10**, das zumindest abschnittsweise ein Material gemäß der vorliegenden Erfindung umfaßt.

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Das Flächenelement **10**. umfaßt einen Randbereich **11**, einen Zentralbereich **12** und einen kleineren Abschnitt **13**. Zur nachfolgenden Beschreibung sei der Übersichtlichkeit halber angenommen, daß der Randbereich **11** und der kleinere Abschnitt **13** ein erfindungsgemäßes Material umfaßt, während der Zentralbereich ausschließlich als Spiegel funktioniert. Die Erfindung ist jedoch nicht auf eine solche Anordnung beschränkt.

Sofern die Informationsanzeigeschicht des Materials in den Bereichen **11** und **13** nicht ausgeleuchtet wird, weisen auch diese Bereiche eine reflektierende Oberfläche auf. Somit wirkt das gesamte Flächenelement **10** als Spiegel.

Bei Ausleuchtung kann in den Bereichen **11** und **13** Information eingeblendet werden. Beispielsweise ließe sich im Randbereich **11** bei Bedarf ein ornamentaler Rahmen, beispielsweise ein barocker Zierbildrahmen, einblenden. Ein solches Ornament kann in eine auf der Rückseite befindliche Kunststoffschicht eingefärbt und/oder eingeschwärzt sein. Ein solches Ornament kann auch mittels einer aktiven Informationsanzeigevorrichtung dargestellt werden, beispielsweise mit einer LCD-Anzeige mit Hintergrundausleuchtung.

Mit einer aktiven Informationsanzeigevorrichtung lassen sich auch benutzerspezifisch unterschiedliche Informationen im Randbereich einblenden, beispielsweise ein Zierrahmen das eine mal und aktuelle Börsenkurse als Laufband das andere mal.

Das erfindungsgemäße Material kann auch an einer beliebigen anderen Stelle des Flächenelements **10** angeordnet sein, beispielsweise in einem vergleichsweise kleinen Zentralfeld **13**. Mittels einer auf der Rückseite angeordneten Informationsanzeigevorrichtung können beliebige Bildinformationen eingeblendet werden.

Eine bevorzugte Anwendung betrifft die Einblendung von Stockwerksangaben und/oder weiteren Bedienhinweisen im Spiegel eines Fahrstuhls. Eine weitere bevorzugte Anwendung betrifft die Anzeige von kurzen Hinweis- oder Warntexten in einem Spiegel, beispielsweise einem Hotelzimmerspiegel.

Eine weitere bevorzugte Anwendung betrifft die Einblendung von Text- oder Zahleninformationen auf die reflektierende Oberfläche von Zierelementen von Gegenständen, insbesondere Elektrogeräten. Beispielsweise kann eine Stereoanlage mit einem Bedienfeld versehen sein, das im nichtaktiven Zustand der Stereoanlage eine verspiegelte Oberfläche aufweist. Oder der Rahmen eines Monitors kann mit dem erfindungsgemäßen Material bestückt sein.

Beim Anschalten des Elektrogeräts oder beim Feststellen von Erschütterungen durch einen herannahenden Benutzer schaltet sich eine hinter der verspiegelten Oberfläche des Materials befindliche Informationsanzeige an und stellt dem Benutzer nützliche Bedieninformation dar. Nach Ausschalten des Elektrogeräts weist das Material wiederum eine verspiegelte Oberfläche auf. Bei der Informationsanzeige kann es sich um LED-Displays, LCD-Displays mit Hintergrundausleuchtung oder beliebige Bildschirmtypen handeln.

Für diese Anwendung eignen sich insbesondere auch geeignet reflexionsbeschichtete Kunststoffolien, beispielsweise verchromte Folien aus lichtemittierenden Polymeren in Matrixanordnung.

Zur Informationsanzeige ist das erfindungsgemäße Material zweckmäßig mit einer Steuereinheit, beispielsweise mit einem Computer, verbunden, der die Informationsanzeige mittels der Informationsanzeigeschicht geeignet steuert.

Mit Hilfe des in **Fig.** 4 dargestellten spiegelnden Flächenelements läßt sich noch eine weitere bevorzugte Anwendung realisieren. Es sei der Fall betrachtet, daß der gesamte zentrale Bereich **12** des Flächenelements **10** aus dem erfindungsgemäßen Material ausgebildet ist, mit einer aktiven Informationsanzeigeschicht, und daß das Flächenelement als Spiegel in einem Bekleidungsgeschäft verwendet werden soll.

Die Körperstatur eines Betrachters werde erfaßt oder eine typische Körperstatur sei in einer Speichervorrichtung einer Steuereinheit abgespeichert. Außerdem seien in die Steuereinheit Parameter eingespeichert, die die Darstellung von Bekleidungsstücken mit Hilfe der Informationsanzeige steuern können.

Anstatt daß der Betrachter Bekleidungsstücke mühsam anprobiert, stellt sich der Betrachter einfach vor den Spiegel. Dabei wird sein Blickwinkel auf den Spiegel und seine aktuelle Beobachtungsposition erfaßt und in die Steuereinheit eingegeben. Außerdem wird in die Steuereinheit eingegeben, welches Bekleidungsstück und in welcher Farbe, Größe etc. der Betrachter elektronisch anzuprobieren wünscht. Auf Befehl wird mittels der Steuereinheit die hinter dem Spiegel befindliche Informationsanzeige aktiviert und in Abhängigkeit von vorstehend genannten Parametern geeignet angesteuert, um dem Betrachter auf dem Spiegel die Illusion elektronisch darzustellen, er habe das Bekleidungsstück tatsächlich anprobiert.

Bei dieser Anwendung erblickt der Betrachter auf dem Spiegel Körperpartien, die nicht von dem anzuprobierenden Bekleidungsstück verdeckt werden, in Reflexion, während Körperpartien, die von dem anzuprobierenden Bekleidungsstück verdeckt werden, mit Hilfe der Informationsanzeigeschicht für den Benutzer an geeigneten Abschnitten des Spiegels elektronisch und in Transmission durch die reflektierende Schicht hindurch eingeblendet werden.

Weitere mögliche Anwendungsformen des erfindungsgemäßen Materials umfassen:

- Große Spiegel oder ganze Schaufenster wechseln zwischen Reflexion und projizierter Information;
- Kaufhausspiegel verwandeln sich gänzlich in eine von hinten projizierbare Fläche, z. B. mit Video- oder Werbefilmprojektion;
- Verkaufstheken oder Bartheken sind als verspiegelte Körper ausgebildet und werden bei Bedarf durchlässig, so daß man den Thekeninhalt sehen kann (dies ist insbesondere sinnvoll bei Gütern, die man vor Hitze oder vor unbefugtem Zugriff schützen will);
- Lampen, Lampenschirme, Beleuchtungskörper und dergleichen können gänzlich aus dem erfindungsgemäßen Material gefertigt sein;
- Verformte Körper mit einer Oberfläche aus dem erfindungsgemäßen Material lassen sich realisieren;
- Zimmerspiegel können eine Uhr mit Weckfunktion enthalten, wobei sich der Spiegel bei Aktivierung der Weckfunktion in einen Spiegel mit eingeblendeter Uhr- und/oder Bild- und/oder Videoinformation verwandelt;
- Gerätedeckel, Displays von Stereoanlagen und dergleichen können mit einer Folie gemäß der vorliegenden Erfindung beschichtet sein;
- Verchromte Kunststoffteile können mit folierten Teilen gemäß der vorliegenden Erfindung kombiniert werden, z. B. Bildschirme, Laptops, Taschenrechner, Telefone und dergleichen;
- Kulissen für die Filmproduktion können mit dem Material realisiert werden.

Es ist offensichtlich, daß die vorliegende Erfindung nicht auf die vorstehend angeführten speziellen Ausführungsbeispiele und Anwendung beschränkt ist, sondern daß vielmehr zahlreiche Variationen und Modifikationen ausgeführt werden können, ohne vom Schutzbereich der beigefügten Pa-

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tentansprüche abzuweichen.

Patentansprüche

1. Reflektierendes Material mit Displayfunktion, zumindest umfassend:
   - eine reflektierende Schicht (**1**) und
   - eine auf einer Rückseite der reflektierenden Schicht angeordnete Informationsanzeigeschicht (**2**; **5**), um mittels aktiver oder passiver Ausleuchtung Information darzubieten,

bei welchem Material
   - die reflektierende Schicht zumindest abschnittsweise ein partielles Reflexionsvermögen aufweist, das so gewählt ist,
   - daß die reflektierende Schicht (**1**) Licht, das von der Vorderseite auf die reflektierende Schicht (**1**) auftrifft, überwiegend reflektiert, um als Spiegel zu wirken,
   - daß jedoch bei Ausleuchtung der Informationsanzeigeschicht (**2**; **5**) Information von der Vorderseite der reflektierenden Schicht (**1**) her sichtbar ist.

2. Material nach Anspruch 1, bei dem die reflektierende Schicht (**1**) mit der Informationsanzeigeschicht (**2**; **5**) so verbunden ist, daß in einen Spalt (**3**) zwischen den beiden Schichten im wesentlichen stirnseitig kein Licht einfällt.

3. Material nach einem der vorhergehenden Ansprüche, bei dem das Reflexionsvermögen der reflektierenden Schicht (**1**) im sichtbaren Spektralbereich im wesentlichen konstant ist.

4. Material nach Anspruch 5, bei dem das Reflexionsvermögen vorzugsweise im Bereich von 75 bis 95 Prozent, insbesondere im Bereich von 85 bis 95 Prozent, liegt.

5. Material nach einem der vorhergehenden Ansprüche, bei dem die Informationsanzeigeschicht (**2**) als transparentes oder semitransparentes Material, insbesondere als Kunststoff-, Glas- oder Textilschicht, mit transparenten und weniger transparenten und auf diese Weise Information darstellenden Abschnitten ausgebildet ist, insbesondere als Filmschicht, die rückseitig passiv ausleuchtbar ist.

6. Material nach Anspruch 5, bei dem die der reflektierenden Schicht (**1**) abgewandte Seite des transparenten oder semitransparenten Materials eine Licht diffus streuende Oberfläche aufweist.

7. Material nach einem der Ansprüche 1 bis 4, bei dem die Informationsanzeigeschicht (**5**) einen Array (**5**) von lichtemittierenden Polymeren umfaßt oder aus diesem besteht.

8. Material nach Anspruch 7, bei dem die Rückseite des Arrays (**5**) von lichtemittierenden Polymeren eine Licht diffus streuende Oberfläche aufweist.

9. Material nach einem der vorhergehenden Ansprüche, bei dem die reflektierende Schicht durch Aufdampfen einer metallischen Beschichtung oder einer dielektrischen Beschichtung, insbesondere Vielfachbeschichtung, unmittelbar auf die Informationsanzeigeschicht (**2**; **5**) aufgebracht ist.

10. Material nach einem der Anspruche 1 bis 9, bei dem die reflektierende Schicht (**1**) als Kunststoffschicht ausgebildet ist, die reflektierend beschichtet ist.

11. Material nach Anspruch 10, bei dem die reflektierende Schicht (**1**) mit der Informationsanzeigeschicht (**2**) durch Thermo-Verschweißen verbunden ist.

12. Material nach einem der Ansprüche 4 bis 11, bei dem die reflektierende Schicht (**1**) und/oder die Informationsanzeigeschicht (**2**; **5**) plastisch verformt ist.

13. Material nach einem der Ansprüche 1 bis 4, bei dem die Informationsanzeigeschicht (**5**) so ausgelegt ist, daß zumindest ein Abschnitt von dieser aktiv ausleuchtbar ist.

14. Material nach Anspruch 13, bei dem die Informationsanzeigeschicht (**5**) als Bildschirm, insbesondere als lichtstarker Plasmabildschirm, ausgebildet ist.

15. Material nach Anspruch 13, bei dem die Informationsanzeigeschicht (**5**) als Flüssigkristallanzeige (LCD) ausgebildet ist, die für Durchlichtbetrieb mit Hintergrundausleuchtung ausgelegt ist.

16. Material nach Anspruch 13, bei dem die Informationsanzeigeschicht (**5**) als LED-Array (**5**) ausgebildet ist.

17. Material nach einem der Ansprüche 13 bis 16, bei dem die reflektierende Schicht (**1**) als Glas- oder Kunststoffschicht ausgebildet ist, die reflektierend beschichtet ist.

18. Material nach Anspruch 17, bei dem die Informationsanzeigeschicht (**5**) mit der reflektierenden Schicht durch Verkleben verbunden ist.

19. Material nach einem der Ansprüche 13 bis 18, bei dem die reflektierende Schicht (**1**) durch Aufdampfen einer metallischen Beschichtung oder einer dielektrischen Beschichtung, insbesondere einer Vielfachbeschichtung, aufgebracht ist.

20. Material nach einem der Ansprüche 13 bis 16, bei dem die reflektierende Schicht (**1**) durch Aufdampfen einer metallischen Beschichtung oder einer dielektrischen Beschichtung, insbesondere Vielfachbeschichtung, unmittelbar auf die Informationsanzeigeschicht (**5**) aufgebracht ist.

21. Material nach einem der Ansprüche 7, 8 oder 16, bei dem das Reflexionsvermögen der reflektierenden Schicht (**1**) ein schmalbandiges Minimum im Bereich der Emissionswellenlänge des Arrays (**5**) aus LEDs bzw. lichtemittierenden Polymeren aufweist.

22. Material nach Anspruch 21, bei dem das minimale Reflexionsvermögen im Bereich des schmalbandigen Minimums vorzugsweise im Bereich von 50 bis 85 Prozent, insbesondere im Bereich von 50 bis 65 Prozent, liegt.

23. Lampenschirm, dadurch gekennzeichnet, daß dieser zumindest abschnittsweise ein Material nach einem der Ansprüche 1 bis 6 umfaßt.

24. Lampe, gekennzeichnet durch einen Lampenschirm nach Anspruch 23.

25. Spiegel, dadurch gekennzeichnet, daß dieser zumindest abschnittsweise ein Material nach einem der Ansprüche 1 bis 6 und eine Lichtquelle (**4**) umfaßt, um das transparente oder semitransparente Material von der der reflektierenden Schicht (**1**) abgewandten Seite des Materials her auszuleuchten.

26. Spiegel, dadurch gekennzeichnet, daß dieser zumindest abschnittsweise ein Material nach einem der Ansprüche 7 bis 22 umfaßt.

27. Spiegel nach Anspruch 26, weiterhin umfassend eine elektrische Steuereinheit, um die Anzeige von Information mit Hilfe der Informationsanzeigeschicht (**5**) zu steuern.

28. Informationsanzeigevorrichtung, zumindest umfassend:
   - ein Material nach einem der Ansprüche 1 bis 6 und
   - eine Lichtquelle (**4**), um das transparente oder semitransparente Material von der der reflektie-

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renden Schicht (**1**) abgewandten Seite des Materials her auszuleuchten.

29. Informationsanzeigevorrichtung, gekennzeichnet durch ein Material nach einem der Ansprüche 7 bis 21 auf einer Vorderseite der Vorrichtung, um als Spiegel und/oder Display zur Anzeige von Information auf der Vorderseite der Vorrichtung zu dienen.

30. Informationsanzeigevorrichtung nach Anspruch 29, weiterhin umfassend eine elektrische Steuereinheit, um die Anzeige von Information mit Hilfe der Informationsanzeigeschicht (**5**) zu steuern.

31. Elektrogerät, umfassend einen Spiegel nach einem der Ansprüche 25 bis 27 und/oder eine Informationsanzeigevorrichtung nach einem der Ansprüche 28 bis 30.

Hierzu 2 Seite(n) Zeichnungen

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Int. Cl.[7]: G 09 F 9/00
Offenlegungstag: 15. März 2001

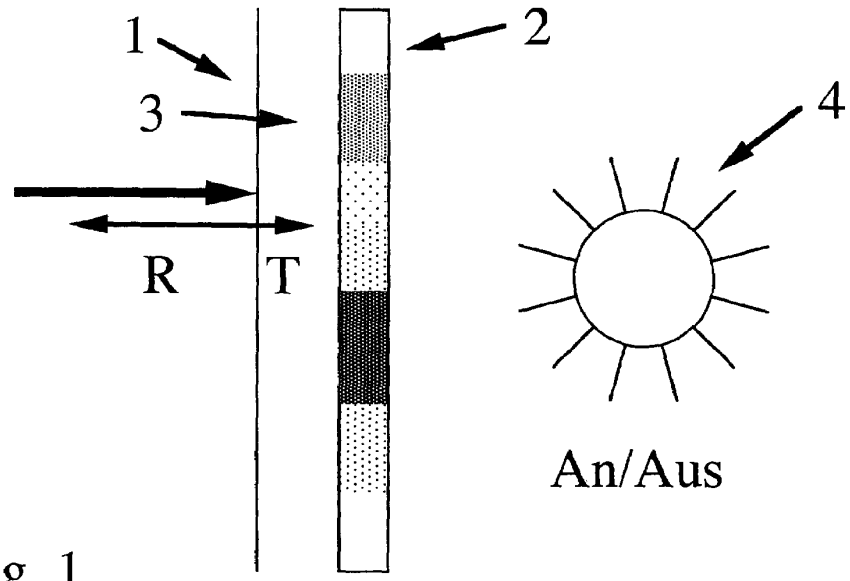


Fig. 1

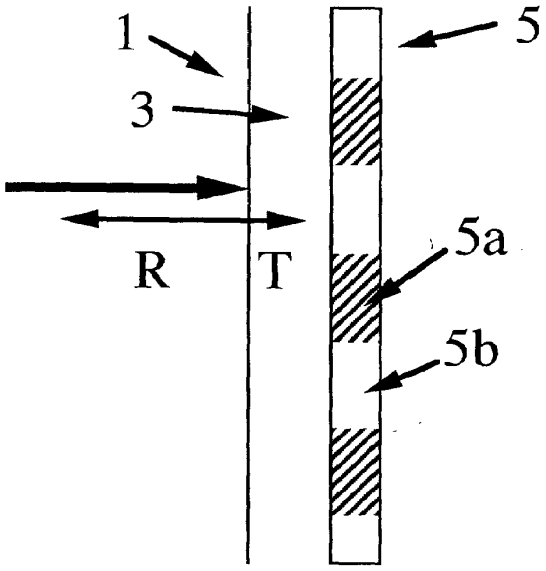


Fig. 2

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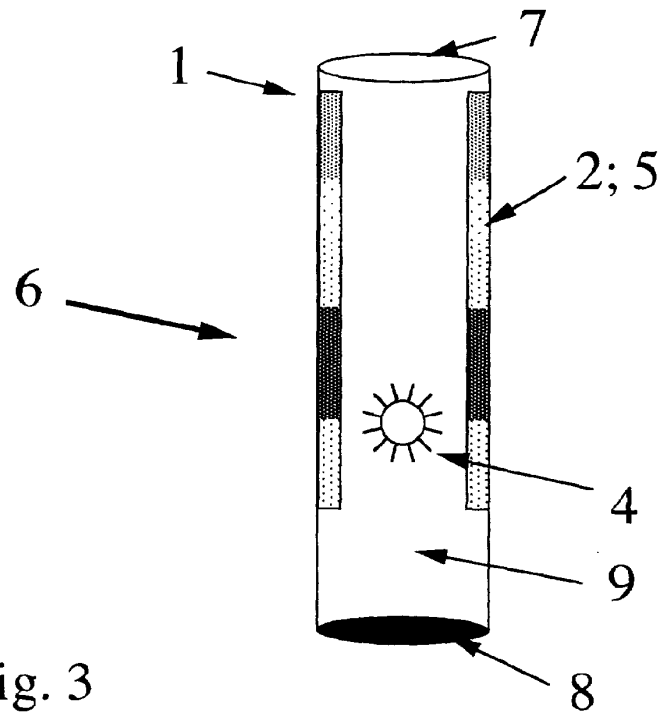


Fig. 3

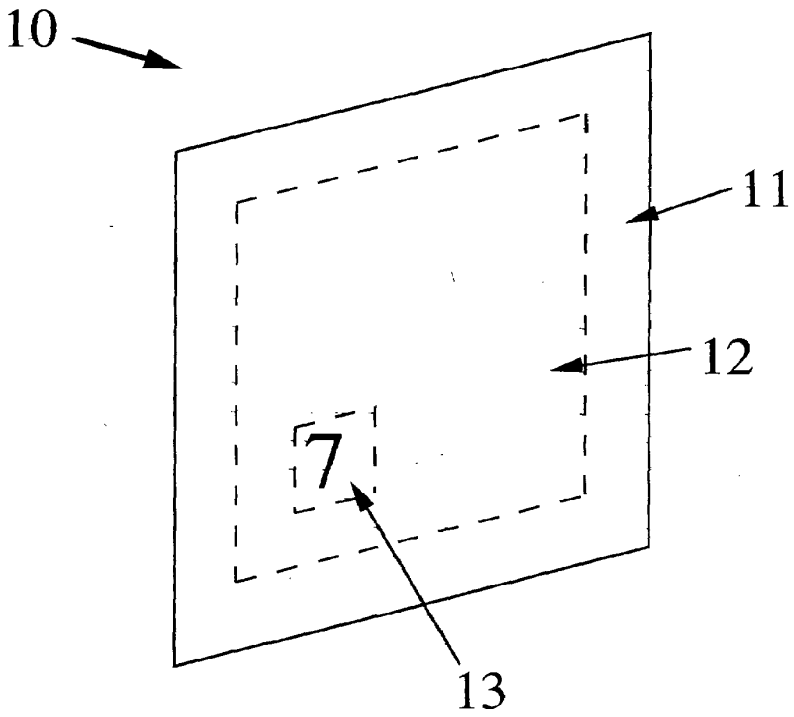


Fig. 4

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(54) Interactive trying-on cubicle

(57) The present invention relates to a system for reproducing a preceding picture of a user wearing clothes or analog, comprising: a screen (4) to display at least a pre-registered picture of the user; a clothes type detector (8) to automatically identify the kind of clothes currently worn by the user; and a search unit (14) to extract automatically, from at least one central remote database (13), at least one pre-registered picture in which the user wears at least one article of clothing similar to or matchable with the current one.

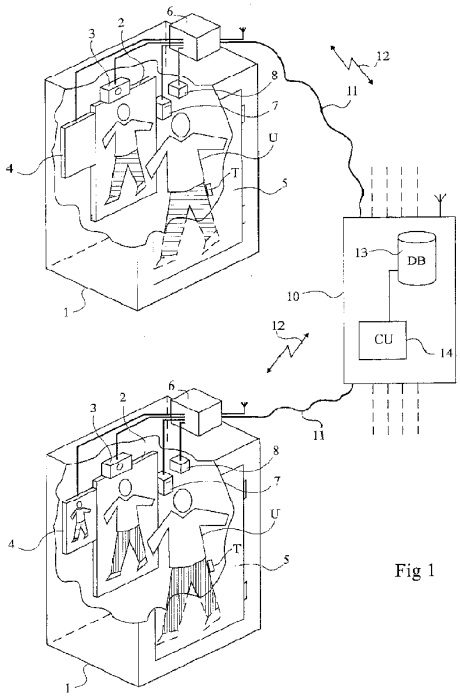


Fig 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to trying-on cubicles or rooms which are usually provided in clothes shops or analog.

BACKGROUND

[0002] As shoppers go from one changing room or trying-on cubicle of a shop to another, they have little way of remembering what they looked like in the clothes that they tried on in the first shop. Further, a shopper may try a first article of clothing in a first shop (for example a shirt or trousers), and another one in a second shop (for example a jacket), and may want matching these clothes.

[0003] There is a technical problem in giving the possibility for a shopper to compare or match some clothes that he tries in a current shop with respect to other clothes that he tried in a former one.

[0004] There is another technical problem in selecting, among an important number of pictures taken in a trying-on cubicle and representing the same shopper, some pictures to be compared with clothes of the same type tried by the shopper in another shop or to allow the shopper to match different types of clothes tried in different shops. Indeed, when trying clothes in a shop, a shopper usually wears several clothes and only some of these are to be compared with other clothes tried in another shop.

[0005] A purpose of the present invention is to provide a changing or trying-on cubicle or room giving a shopper the possibility to see what he looked like when trying on a former article of clothing and/or to compare or match at least one article of clothing he wore in a former shop.

[0006] Another purpose of the invention is to provide an automatic selection of pictures in which a shopper wears the same kind of clothes.

[0007] Another purpose of the invention is to provide a trying-on room or cubicle adapted to communicate with at least a central system in order to give to a shopper the possibility of comparing clothes of different shops.

BRIEF SUMMARY OF THE INVENTION

[0008] To attain the above purposes and others, the present invention provides a system for producing at least one picture of a person wearing clothes. Such a system comprises a screen to display at least one pre-registered picture; a mirror to reflect the current appearance of the user; a detector to identify the kind of clothes worn by the user; and a search unit to extract from a central remote database the pre-registered picture in which the user wore similar or matchable kind of clothes.

[0009] A trying-on room according to the invention is provided with a camera or the like to take preferably fixed pictures to be displayed in other locations. According to the invention, a trying-on cubicle or room is provided with not only a mirror to reflect the current picture of an user wearing clothes, but also a screen to display a preceding picture. Such a picture is preferably taken in another location, i.e. in another trying-on cubicle, for example of another shop. However, the system of the present invention also works for a shopper trying on successively or not different clothes in a same shop (in a same trying-on room or not).

[0010] According to a preferred embodiment, the changing room comprises a detector to identify at least the type of clothes worn by the user. For example, such a detector can be a magnetic detector of transponder or any other kind of tag providing a wireless identification of the clothes.

[0011] The user may select between a comparison of clothes of the same kind or a matching of clothes to be wore together based, for example, on their color or kind. The system is then able to select among all the pictures of the user taken previously, a limited number of pictures corresponding to the choice of that user.

[0012] A communication between the trying-on rooms and the central system comprising the database in which are stored the pictures can be a wireless link or a wired link.

DESCRIPTION OF THE DRAWINGS

[0013] These purposes, features, and advantages of preferred, non limiting, embodiments of the present invention will be described by way of examples with reference to the accompanying drawings, in which:

Fig. 1 schematically represents trying-on rooms and the main elements of a central system according to one exemplary embodiment of the present invention; and

Fig. 2 illustrates, with a flowchart, the main steps of an exemplary implementation of the present invention.

[0014] For clarity, only the elements useful to the understanding of the invention have been shown in the drawings and will be disclosed hereafter. More specifically, the programming steps for implementing the invention will not be detailed as it will readily occur to those skilled in the art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Fig. 1 schematically represents a system according to one exemplary embodiment of the present invention. In Fig. 1, two trying-on rooms, or cubicles 1 have been shown. However, according to the invention, the number of trying-on rooms is not limited.

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[0016] According to the invention, each room 1 is provided with a mirror 2 (which equips most of the conventional trying-on rooms). The mirror 2 is associated with a camera 3 to take a picture of a user looking in the mirror and wearing clothes. Alternatively, the mirror may be replaced with a screen in which are displayed the current picture taken by the camera 3. In this embodiment, the camera is able to take moving pictures.

[0017] According to the invention, each room 1 also comprises at least one screen 4 to display picture(s) of the current user taken in a previous trying-on room. Screen 4 may be separated from the mirror or screen 2, or be combined therewith. Rooms 1 are closable with a door or curtain 5.

[0018] Trying-on rooms according to the present invention are also provided with a control unit 6. Control unit 6 is preferably a computerized device for controlling the camera 3, the screen 4 and all the devices and elements that also comprise the system. An input device 7 such as a card reader (for loyalty cards or more generally any kind of identification cards), or a keyboard or analog, is provided so that the user can select some functionality of the system and for authentication.

[0019] Further, the system also comprises a detector 8 (preferably a wireless detector) able to identify the kind of clothes worn by the user.

[0020] According to a preferred embodiment of the present invention, the detector 8 is an electromagnetic transponder reader which is able to detect a tag or any analog passive or active label fixed to an article of clothing. Thus, one takes benefit of the fact that the clothes in a shop are most often equipped with electromagnetic labels or tags which can be used by the present invention to identify at least the kind of clothes. Tags may contain the type of clothes, its color, pattern, etc. The kind of product automatically detected by the system is used either to select pictures showing the user wearing clothes of the same type, or to select pictures in which the user wears clothes which may be matched with the current one.

[0021] Each trying-on room according to the present invention communicates with a central system 10 through wired 11 or wireless 12 links. The central system according to the invention includes at least a database 13 (DB) for storing the pictures taken in the different changing rooms. Indeed, once the user has tried an article of clothing in a first changing room, the system cannot know where a user will try another article of clothing to be compared with the previous one. The system 10 also comprises a central control unit 14 (CU) for controlling and synchronizing all the operation of the system. Alternatively, more than one database and more than one central system can be used. These systems then share the information.

[0022] A user U wearing clothes is represented in Fig. 1 with a silhouette in dotted lines. In a first trying-on room 1 (upper in the figure), the user U is wearing trousers with horizontal stripes. In the other trying-on room 1 (lower in the figure), the user U is wearing trousers with vertical stripes.

[0023] The operation of a system according to the present invention will be described hereafter in connection with Fig. 2, which illustrates, by way of a flowchart, an exemplary implementation of the invention.

[0024] Let us assume that, in a trying-on room according to the present invention, a user wears the clothes he chooses in a current shop, for example trousers with horizontal stripes (CLOTHES1, block 21) as shown in Fig. 1 (in the upper changing room).

[0025] If the user plans to compare or match the current article of clothing with another one, he enters an authentifiant in the system. The authentication of the user can be made through a keyboard in which the user enters a specific code or through a loyalty card or smart card containing, for example, in a chip or on a magnetic track, the identification of the user. The system not only identifies the user but also the clothes that he wears (block 22, IDENTIFY USER/CLOTHES). The identification of the article of clothing concerns at least the kind of article of clothing (shirt, trousers, jacket, etc.) but preferably also the color and/or the pattern (striped, plain, etc.) and is contained, for example, in a label T (FIG. 1) attached to the article of clothing.

[0026] The authentication of the user is important not only to recognize this user in another trying-on room, but also because it is not desired that pictures can be taken without the agreement of the user.

[0027] Then, the system takes a picture (block 23, PICTURE), with camera 3 and stores that picture (block 24, STORE) with the identification of the user. The storage of the picture can be temporarily made in the control device 6 of the changing room which comprises a memory before transmission to the central system 10 for storing in the database 13.

[0028] Alternatively, the picture can be sent to the user's home, for example, through the Internet, to allow the user seeing the picture on its own computer.

[0029] Several pictures of the user wearing several clothes can be made in a same changing room before the user goes out to another shop. However, for simplicity, the invention will be described in case only one article of clothing is tried on in the first changing room.

[0030] When the user comes into another shop (or in the same shop, but after having wore another article of clothing), he may want comparing or matching the current article of clothing with a previous one. For example, supposing that the user U wears trousers having vertical stripes as shown in the lower room of Fig. 1 (block 25, CLOTHES2), he may want comparing the trousers with vertical stripes to the trousers with horizontal ones.

[0031] According to the invention, the user must then identify himself either with a keyboard or any entering device of the changing room or by introducing his authentication card in the reader 7. Further, the current article of clothing worn by the user has to be identified by the system (block 26, IDENTIFY USER/CLOTHES). As

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previously, the system identifies the article of clothing (kind, color, and pattern) by detecting its label T.

[0032] The user then selects (block 27, COMPARE/MATCH) if he wants to compare the current article of clothing he wears to a previous one of the same kind, or if he wants to match the current article of clothing with another kind of article of clothing tried in a previous changing room. Such a selection can be done with a selection device (for example a two-buttons keyboard 9), which may be combined with the identification device 7, to indicate to the system 10 which kind of picture is desired. The central system 10 then searches the corresponding pictures (block 28, SEARCH). The selected pictures are transmitted to the control device 6 of the current room and the pictures are displayed (block 29, DISPLAY) on the screen 4. If there is more than one picture to display, one can either provide a scrolling display with a predetermined timing for each picture, or share the screen into several areas in which the different pictures are displayed.

[0033] To match the different types and/or colors and/or patterns of clothes, the central system 10 (alternatively the control device 6 of the current room) contains dressing rules. Such rules may be lists of clothes to be worn together, color matching or any rules which can be translated to be interpreted by a computerized system.

[0034] The current article of clothing worn by the user is also to be stored in the central system for a next comparison. Therefore, the camera 3 of the trying-on room also takes a picture (block 23') and transmits this picture to the central system to be stored (block 24').

[0035] An advantage of the present invention is that a shopper can not only see himself normally in a mirror with clothes on, but also view a picture of himself with other clothes on.

[0036] Another advantage of the present invention is that, with the automatic detection of the clothes worn by the user, the system is then able to automatically select the kind of pictures to be displayed.

[0037] The central system 10 of the invention or the control devices 6 of each trying-on room are accordingly able to select clothes depending on their type. For example, a list of clothes of same kind is stored in the central system 10 or in the control devices 6. Further, according to the preferred embodiment of the present invention in which the user can also match clothes of different kinds, the system also comprises lists or tables with the kinds of clothes which can be matched (for example, trousers with a jacket). Of course, if the pictures available for the user only contain one kind of clothes, the system does preferably not wait for a selection between matching and comparison, and considers a comparison mode.

[0038] A further advantage of the present invention is that, having stored different pictures of the user, these pictures can also be displayed on the own computer of the user (for example, transmitted through Internet).

[0039] Having thus described at least one illustrative embodiment of the invention, various alterations, modifications and improvements will readily occur to those skilled in the art. In particular, implementing the invention with computerized devices in the ability of one with an ordinary skill in the art. Further, other elements having the same function thus described in the present specification can be provided in replacement. For example, the screen 4 and the mirror 2 can be combined, or more than one screen may be associated with a single mirror. With this respect, the size of the mirror and of the screen may be the same or different.

[0040] Furthermore, other detection devices may be provided either for identifying the user or for detecting the kind of the clothes. It should also be noted that a single picture can be taken with a user wearing more than one article of clothing. Then, the matching is preferably invalidated for the next changing room. Finally, the present invention may also apply to other wearing articles than clothes. For example, shoes, hats, glasses, etc.

[0041] Such alterations, modifications, and improvements are intended to be within the spirit and scope of the invention. Accordingly, the foregoing description is by way of example only and is not intended to be limiting. The invention is limited only as defined in the following claims and the equivalents thereto.

Claims

1. A system for reproducing a preceding picture of a user wearing clothes or analog, comprising:

   a screen (4) to display at least a pre-registered picture of the user;
   a clothes type detector (8) to automatically identify the kind of clothes currently worn by the user; and
   a search unit (14) to extract automatically, from at least one central remote database (13), at least one pre-registered picture in which the user wears at least one article of clothing similar to or matchable with the current one.

2. The system of claim 1, further comprising a mirror (2) or analog for reproducing the current appearance of the user.

3. The system of claim 1, further comprising:

   a camera (3) to take a picture of the user wearing clothes; and
   a storage element (6) to store the picture with an identification of the user and an identification of the kind of article of clothing.

4. The system of claim 1, also comprising selecting tools (9) for the user between a comparison and a

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matching of clothes.

5. The system of claim 1, also comprising a card reader (7) for identifying the user.

6. The system according to claim 1, wherein the database comprises a table with dressing rules.

7. The system of claim 1, also comprising a link (11, 12) to a central remote system (10) comprising said central database (13).

8. A trying-on room comprising a system according to any of claims 1 to 7.

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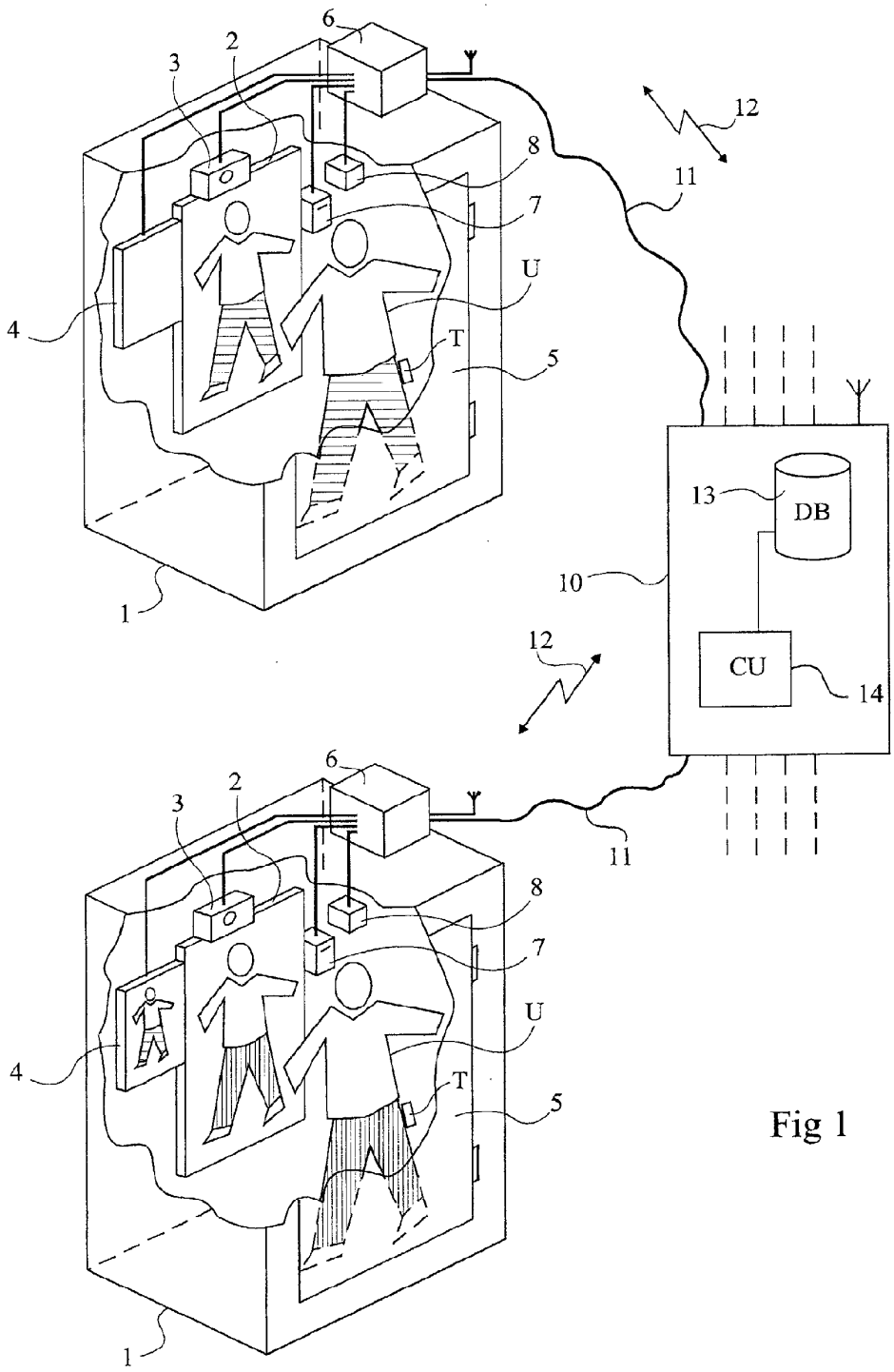


Fig 1

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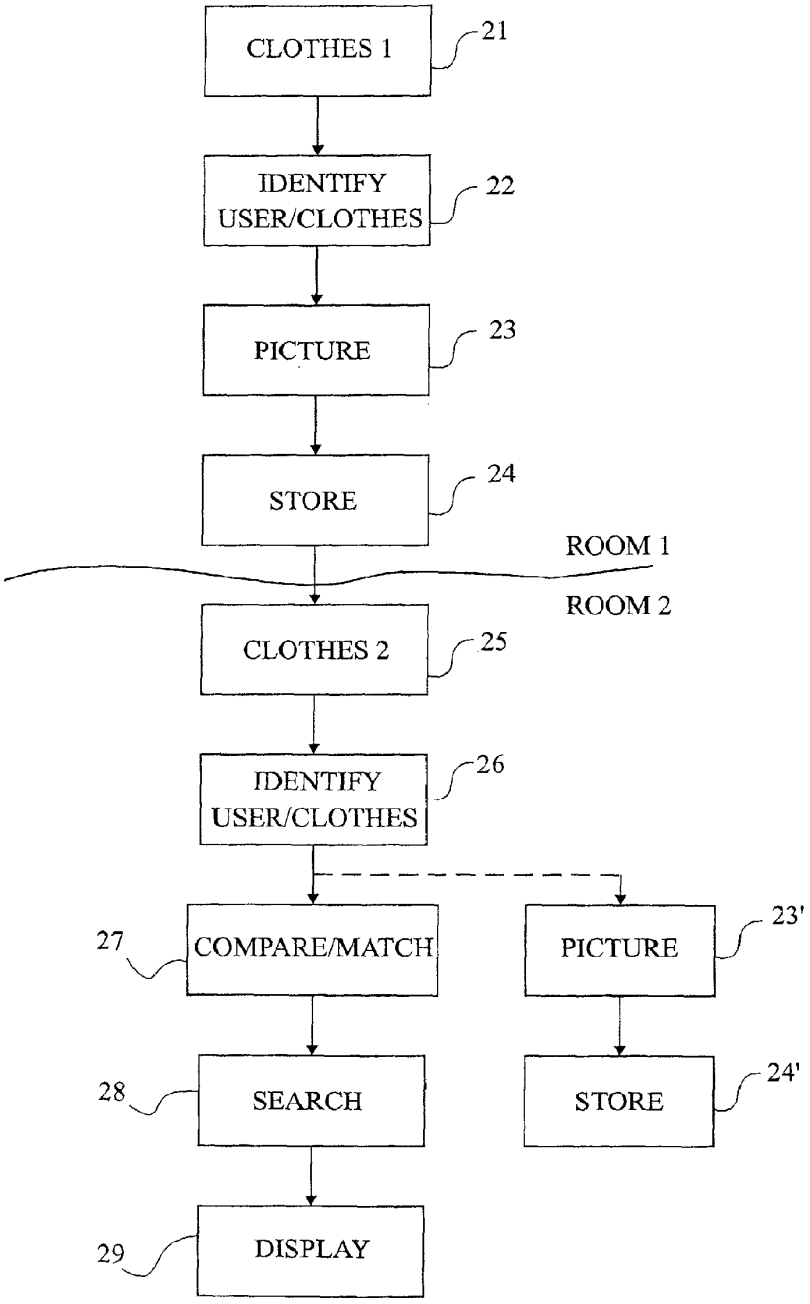


Fig 2

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 35 4094

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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X	DE 100 31 965 A (FLOEGEL EBERHARD) 10 January 2002 (2002-01-10) * the whole document *	1-8	
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A	WO 01 45029 A (LENNON JERRY W) 21 June 2001 (2001-06-21) * page 4, line 5 - page 5, line 9 * * page 5, line 19 - page 6, line 8 * * page 13, line 12 - page 14, line 10 * * figure 1 *	1-8	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 January 2003	Papastefanou, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 35 4094

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10-01-2003

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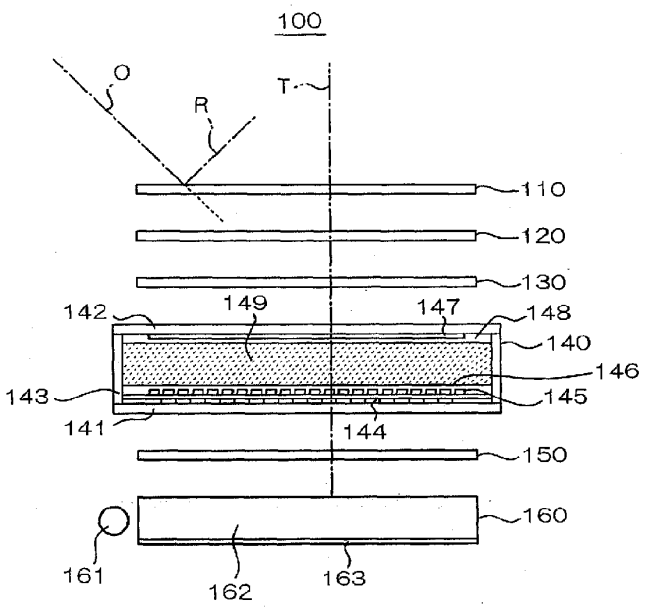
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(54) Display device with display and mirror modes, and electronic device comprising the same

(57) In a display device capable of switching between a display mode and a mirror mode, a novel configuration of the display device capable of enhancing display quality and being low-profile and light-weight is provided. In a display device (100), a reflective polarizer (110), a polarizer (120), a retarder (130), a liquid crystal panel (140), a polarizer (150), and a backlight (160) are disposed sequentially from the viewing side. When the liquid crystal panel (140) is set in a light blocking state or the backlight (160) is switched off, the reflection of an outside light "O" turns the display screen into the mirror state. When the backlight (160) is switched on to illuminate the liquid crystal panel (140), a transmitted light "T" allows the displayed screen image to be visually recognized.

FIG. 1



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Description

[0001] The present invention relates to a display device and an electronic device having the same, particularly to a configuration suitable for a display capable of switching a display screen between a display mode and a mirror mode.

[0002] Traditionally, a display device has been known in which two liquid crystal panels are overlaid to switch between the display mode to perform normal display and the mirror mode to change the whole piece into a mirror surface state. For example, there is a display device in which a display switching part is disposed on the viewing side of a display part having the same structure as the general liquid crystal display device and the display switching part is disposed with a reflective type polarizer, a liquid crystal panel and an absorption type polarizer sequentially from the display part side to the viewing side. In this display device, the reflective type polarizer (hereafter, it is simply called reflective polarizer) of the display switching part transmits a first polarized light, and reflects a second polarized light having a polarization axis orthogonal to the first polarized light. The liquid crystal panel is configured to allow switching between the state that the first polarized light is changed to the second polarized light for transmission and the state that the polarization axis is not changed for transmission. The absorption type polarizer transmits the first polarized light and absorbs the second polarized light, for example. The display part emits the first polarized light to the display switching part, and the first polarized light forms a predetermined display image.

[0003] In the display device configured as above, when the liquid crystal panel of the display switching part is in the state that the polarization axis is not changed for transmission, the first polarized light emitted from the display part passes through the reflective polarizer to enter the liquid crystal panel and passes through the absorption type polarizer as the first polarized light for observation. Thus, the display condition of the display part can be visibly recognized (the display mode). When the liquid crystal panel is in the state that the first polarized light is changed into the second polarized light for transmission, the first polarized light emitted from the display part passes through the reflective polarizer to enter the liquid crystal panel, and it is changed into the second polarized light. Thus, it is absorbed by the absorption type polarizer and the display condition is not visually recognized. At this time, when an outside light enters the device, the outside light passes through the absorption type polarizer to be a first polarized light and passes through the liquid crystal panel to be a second polarized light. Therefore, it is reflected by the reflective polarizer, and it passes through the liquid crystal panel again to be changed into the first polarized light, and it passes through the absorption type polarizer. Accordingly, the display plane is visibly recognized as a mirror surface (the mirror mode).

[0004] In the traditional display device, the light having passed through the liquid crystal panel, disposed in the display switching part, is visibly recognized in both the display mode and the mirror mode. Therefore, problems tend to occur : a reduction in contrast due to the interface reflection in the front and back sides of the display switching part, coloring, the deterioration of the viewing angle property, and a blurred display image due to the optical property of the display switching part. In any case, in the traditional display device, degraded display quality is inevitable due to the double structure of the display part and the display switching part.

[0005] Furthermore, in the configuration described above, the display switching part including the liquid crystal panel is further disposed on the viewing side of the normal display part. Thus, there is a problem that the device becomes thicker and heavier. This problem becomes a great disadvantage because portability is impaired, particularly, when the device is mounted in a portable electronic device.

[0006] To solve the problems, the present invention is to provide a novel configuration of a display device capable of suppressing the degradation of display quality such as a reduction in contrast, coloring, a narrowed viewing angle and blur due to the existence of the display switching part, and of being formed to be low-profile and light-weight.

[0007] In order to solve the problems, a first display device of the invention is a display device characterized by having:

a display unit adapted to allow a first polarized light to be emitted as display light; and
a control unit adapted to control the display unit,

wherein the display unit has a polarized light selecting unit on a viewing side thereof,

the polarized light selecting unit transmits the first polarized light and reflects a second polarized light having a polarization axis crossing a polarization axis of the first polarized light, and

the control unit is allowed to switch between a display mode, in which the first polarized light is emitted from the display unit as display light, and a mirror mode, in which the first polarized light is not emitted from the display unit.

[0008] According to the invention, the display unit includes the polarized light selecting unit disposed on the viewing side. The polarized light selecting unit is configured to transmit the first polarized light and reflect the second polarized light.

[0009] Therefore, the first polarized light passing through the polarized light selecting unit is emitted from the display unit as display light. In addition, the first polarized light included in the outside light passes through the polarized light selecting unit to enter the opposite side of the viewing side, and the second polarized light included in the outside light is reflected by the polarized

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light selecting unit.

[0010] The high intensity light in the outside light generally enters in the direction different from the viewing direction of a viewer. Thus, the specular reflection of the high intensity outside light is hard to enter the viewer's eye. Therefore, in the display mode that display light is visibly recognized from the display unit through the polarized light selecting unit, the display condition, based on the display light emitted from the display unit, can be visibly recognized. On the other hand, when the mirror mode is set by control of the control unit, the first polarized light is not emitted from the display unit. Thus, the light emitted from the display unit does not reach the viewing side. Therefore, the surface on the viewing side of the polarized light selecting unit is visibly recognized as a mirror surface by the reflected light of the outside light.

[0011] As described above, in the invention, the polarized light selecting unit is simply disposed on the viewing side as a component included in the display unit. Therefore, the configuration can be formed in which a transmitting polarization axis varying unit is not disposed on the viewing side of the polarized light selecting unit.

[0012] Accordingly, as compared with the case where the transmitting polarization axis varying unit, such as a liquid crystal panel, is disposed on the viewing side of the traditional display unit, the degradation of display quality such as a reduction in contrast due to the interface reflection, coloring, deterioration of the viewing angle property, and blurred display images due to the optical property of the display switching part can be avoided. Furthermore, a simple structure can be formed without the double panel structure. Therefore, the thickness of the device can be reduced and the weight can be decreased.

[0013] The control unit preferably stops the light emission from the display unit in the mirror mode. Accordingly, the display unit does not emit light, thus the mirror surface quality in the mirror mode can be further enhanced.

[0014] Moreover, a polarized light selecting area of the polarized light selecting unit is preferably extended beyond an area overlapping with a display area of the display unit. The polarized light selecting area of the polarized light selecting unit is extended beyond the area overlapping with the display area of the display unit. Thus, the display unit (an electro-optical panel such as a liquid crystal panel) generally requires the structure portion extending beyond its display area (so-called frame area). Therefore, in the area overlapping with the structure portion, the polarized light selecting area of the polarized light selecting unit can be extended without increasing the plan dimension of the display device. Accordingly, the space inside the display device can be utilized effectively, and the range (area) to be visibly recognized as a mirror in the mirror mode can be expanded relatively with respect to the outer dimensions of the display device.

[0015] The light amount emitted in the direction of the normal is preferably greatest in the emission angle distribution of the display light of the display unit. The light amount emitted in the direction of the normal is set greatest, and thus the ratio of light entering the user's eye for supporting display can be enhanced in the display light. Therefore, the influence of external light reflection by the polarized light selecting unit can be reduced, and display quality can be enhanced.

[0016] In this case, the display light is desirably distributed mainly at an emission angle ranging from zero (0) to forty (40) degrees. In this range of the emission angle, an amount of the emitted outside light is relatively small. Thus, display quality can be enhanced with no influence of external light reflection.

[0017] In addition, the display light in the range exceeding an emission angle of forty five (45) degrees is desirably one fiftieth (1/50) or below of the light amount in the direction of the normal. The light in the range exceeding the emission angle of forty five (45) degrees hardly supports display. Therefore, unnecessary light is reduced to efficiently configure the display condition.

[0018] In each embodiment, the display unit is preferably configured of an electro-optical device. By configuring the display unit with electro-optical devices, a low-profile structure can be allowed and a display device also applicable to a portable device can be realized. Particularly, the display device of the invention can configure the display screen as a mirror surface in the mirror mode by switching. Therefore, it can also be utilized as a hand mirror configured of a portable device.

[0019] Next, a second display device of the invention is a display device having a transmitting polarization axis varying unit characterized by including:

a first polarized light selecting unit disposed on a viewing side of the transmitting polarization axis varying unit; and

a second polarized light selecting unit disposed on a backside of the transmitting polarization axis varying unit,

wherein the first polarized light selecting unit transmits a first polarized light and reflects a second polarized light having a polarization axis crossing a polarization axis of the first polarized light,

the second polarized light selecting unit transmits a third polarized light and absorbs or reflects a fourth polarized light having a polarization axis crossing a polarization axis of the third polarized light, and

the transmitting polarization axis varying unit is allowed to convert at least a part of the third polarized light to the first polarized light.

[0020] According to the invention, the first polarized light selecting unit (reflective polarizer) disposed on the viewing side reflects the outside light. Thus, the display screen is allowed to be set in the mirror mode, when the

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liquid crystal panel does not emit light. When the liquid crystal panel emits light, the display screen is allowed to be set in the display mode. The outside light has a greater light amount incident, incidenting obliquely with respect to the user. Thus, a high intensity specular reflection light generated in the first polarized light selecting unit due to the outside light is not visually recognized by the user. Therefore, by intensifying the emitting light from the liquid crystal panel to some extent, display quality in the display mode can be secured. In addition, the mirror mode can be substantially realized only by the first polarized light selecting unit. Accordingly, the degraded display quality due to the double panel structure can be avoided, and the display device can be formed to be low-profile and light-weight.

[0021] In the invention, another transmitting polarization axis varying unit is not preferably disposed on the viewing side of the first polarized light selecting unit. A reduction in visibility can be suppressed in the display mode by not disposing another transmitting polarization axis varying unit (a liquid crystal panel, for example) on the viewing side of the first polarized light selecting unit.

[0022] In the invention, a third polarized light selecting unit, adapted to transmit the first polarized light and to absorb the second polarized light, is preferably disposed between the first polarized light selecting unit and the transmitting polarization axis varying unit. Generally, the polarized light selectivity of a member available as the first polarized light selecting unit (reflective polarizer) is lower than the polarized light selectivity of the absorption type polarizer. Thus, a contrast in the display mode drops when the member is used as it is, but a disposition of the third polarized light selecting unit (absorption type polarizer) enhances the polarized light selectivity. Therefore, display contrast can be enhanced.

[0023] Preferably, this case has a lighting device on the backside of the second polarized light selecting unit,

wherein the second polarized light selecting unit transmits the third polarized light and absorbs the fourth polarized light,

a fourth polarized light selecting unit is disposed between the second polarized light selecting unit and the lighting unit, and

the fourth polarized light selecting unit preferably reflects the fourth polarized light as well as transmits the third polarized light. Accordingly, display contrast and brightness can be further enhanced.

[0024] In the invention, the second polarized light selecting unit preferably transmits the third polarized light and reflects the fourth polarized light. The second polarized light selecting unit is formed to transmit the third polarized light and to reflect the fourth polarized light (reflective polarizer). Consequently, the light not passing through the second polarized light selecting unit can be reflected to return to the backside in the luminous light when the liquid crystal panel is lit from the backside. Because it is possible to convert the polarization state of the reflected light by scattering or reflection to return to the viewing side, a brighter display can be configured.

[0025] In the invention, the surface on the viewing side of the first polarized light selecting unit is preferably flat. By flattening the surface on the viewing side of the first polarized light selecting unit, a further excellent mirror surface state in the mirror mode can be realized, and the scattered light other than the specular reflection light of the outside light entering the user's eye can be reduced in the display mode. Therefore, the visibility of the display condition can be enhanced. This characteristic is similarly applicable to the above-mentioned first and second display devices, considering that the polarized light selecting unit is equivalent to the first polarized light selecting unit.

[0026] In the invention, a transparent protective film is preferably formed on the surface on the viewing side of the first polarized light selecting unit. Accordingly, the surface on the viewing side of the first polarized light selecting unit can be prevented from being directly scratched or from being adhered with dust and dirt. Desirably in this case, the surface of the protective film is hardened or a transparent hard film is formed thereon. Furthermore, this characteristic is similarly applicable to the first and second display devices, considering that the polarized light selecting unit is equivalent to the first polarized light selecting unit.

[0027] In the invention, a lighting unit adapted to emit light to the viewing side is preferably disposed on the backside of the second polarized light selecting unit. Disposing the lighting unit surely realizes the image display state in the display mode.

[0028] In this case, a light reflection component for reflecting outside light to the viewing side in the form of supporting display is preferably not disposed between the first polarized light selecting unit and the lighting unit. Accordingly, the light reflection component is not disposed inside the display to form a transmissive type display. Consequently, the light utilization efficiency of the lighting unit for display can be enhanced. Therefore, the display condition can be visually surely recognized regardless of the existence of external light reflection by the first polarized light selecting unit. The light reflection component includes a reflective layer or a reflective plate disposed in the pixel area, in which the reflected light is supportable for display, but it does not include a metal shading film, which generates the reflected light not supporting display.

[0029] The transmitting polarization axis varying unit is desirably in the state not to emit the first polarized light when the lighting unit is not lit. The mirror mode can be realized in either states that the lighting unit is not lit or the light of display is blocked. However, by setting the lighting unit in the unlit state and the display in the light blocking state, light leakage can be further reduced. Therefore, the mirror surface state in the mirror mode can be formed more excellently.

[0030] In the invention, a polarized light selecting area of the first polarized light selecting unit is preferably ex-

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tended beyond the area overlapping with a transmitting polarization axis varying area of the transmitting polarization axis varying unit. When the polarized light selecting area of first polarized light selecting unit is extended beyond the area overlapping with the transmitting polarization axis varying area of the transmitting polarization axis varying unit, the transmitting polarization axis varying unit (liquid crystal panel) generally requires the structure portion (so-called frame area) extended beyond the transmitting polarization axis varying area (display area). Therefore, the polarized light selecting area of the first polarized light selecting unit can be extended correspondingly to the structure portion without upsizing the display device. Accordingly, the inner space of the display device can be utilized efficiently, and the range (area) to be visibly recognized as a mirror in the mirror mode can be expanded relatively with respect to the outer dimensions of the display device. In addition, this characteristic is similarly applicable to the first and second display devices, considering that the polarized light selecting unit is equivalent to the first polarized light selecting unit and the display area of the display unit is equivalent to the transmitting polarization axis varying area.

[0031] In the invention, the light amount emitted in the direction of the normal is preferably greatest in the emission angle distribution of luminous light of the lighting unit. By setting the light amount emitted in the direction of the normal at greatest, the ratio of the light entering the user's eye for supporting display in the luminous light can be increased in the display mode. Therefore, the influence of external light reflection due to the first polarized light selecting unit can be decreased, and display quality can be enhanced.

[0032] In this case, the luminous light of the lighting unit is desirably distributed mainly at an emission angle ranging from zero (0) to forty (40) degrees. In the range of the emission angle, the amount of specular reflection of outside light is relatively small. Therefore, display quality can be enhanced with no influence of external light reflection.

[0033] Furthermore, the luminous light of the lighting unit within the range exceeding an emission angle of forty five (45) degrees is desirably one fiftieth (1/50) or below of a light amount in the direction of the normal. The light in the range exceeding an emission angle of forty-five (45) degrees does not support display so much. Thus, unnecessary light is reduced to efficiently realize the display state in the display mode.

[0034] In the invention, a color filter is preferably disposed on the backside of the first polarized light selecting unit. By disposing the color filter on the backside of the first polarized light selecting unit, color display in the display mode can be realized.

[0035] In the invention, a retarder is preferably disposed between the first polarized light selecting unit and the transmitting polarization axis varying unit. The retarder can be used as an optical compensator for reducing coloring, or a viewing angle compensator for improving the viewing angle property.

[0036] In the invention, it is preferable that a transparent member is disposed on the viewing side of the first polarized light selecting unit, and the first polarized light selecting unit is directly or indirectly closely contacted with the transparent member. The first polarized light selecting unit is closely contacted with the transparent member, which allows the surface on the viewing side of the first polarized light selecting unit to be protected and the first polarized light selecting unit can surely be positioned and held. This characteristic is similarly applicable to the first and second display devices, considering that the polarized light selecting unit is equivalent to the first polarized light selecting unit.

[0037] In this case, the first polarized light selecting unit is desirably bonded to the transparent member via a transparent substance.

[0038] As the form that the first polarized light selecting unit is fixed to the transparent member, two cases are named: the case where only the first polarized light selecting unit is fixed to the transparent member, and the case where the display unit or the transmitting polarization axis varying unit is fixed along with the first polarized light selecting unit. In the latter case, it is preferable to fix the transparent member via a transparent bonding layer having elasticity. Accordingly, the influence of an external stress (such as shock) on the display unit and the transmitting polarization axis varying unit can be relaxed, and the shock-resistance of the display device can be enhanced. In addition, this characteristic is similarly applicable to the first and second display devices, considering that the polarized light selecting unit is equivalent to the first polarized light selecting unit.

[0039] Furthermore, the surface of the transparent member on the first polarized light selecting unit is desirably flat. Accordingly, the surface on the backside of the transparent member is made flat. Therefore, the surface on the viewing side of the first polarized light selecting unit closely contacted with the surface can be formed flat. Particularly, the first polarized light selecting unit is available as a sheet material having flexibility. Thus, the surface on the backside of the transparent member is formed flat and the first polarized light selecting unit is closely contacted or bonded to the surface, which allows the first polarized light selecting unit to be kept flat. Therefore, the mirror surface state in the mirror mode can be high quality. Furthermore, this characteristic is similarly applicable to the first and second display devices, considering that the polarized light selecting unit is equivalent to the first polarized light selecting unit.

[0040] Moreover, the surface on the viewing side of the transparent member is desirably a curved surface. Accordingly, the transparent member can be used as an optical lens, which allows the display screen to be visibly recognized in a properly enlarged or reduced state. This characteristic is similarly applicable to the first and second display devices, considering that the polarized light

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selecting unit is made equivalent to the first polarized light selecting unit.

[0041] Next, an electronic device of the invention is provided with the display device according to any one of the above. As described above, the display device is configured to be switchable between the display mode and the mirror mode by only disposing the polarized light selecting unit on the viewing side of the display unit. Therefore, degraded display quality can be avoided, and also the electronic device can be reduced in size and weight. Accordingly, the electronic device is preferably configured as portable electronic devices such as a mobile phone and a personal information terminal.

[0042] In addition, another electronic device of the invention has the display device according to any one of the above and a display drive unit adapted to drive the transmitting polarization axis varying unit. The display device is switchable, as described above, between the display mode and the mirror mode without disposing another transmitting polarization axis varying unit on the viewing side. Therefore, display quality in the display mode can be improved. Particularly, the display device can be formed to be low-profile and light-weight, and thus the electronic device is preferably configured as portable electronic devices such as a mobile phone and a personal information terminal.

[0043] Furthermore, another electronic device of the invention has:

a display device with a lighting unit;
a display drive unit adapted to drive the transmitting polarization axis varying unit; and
a lighting control unit adapted to control the lighting unit. Particularly, by configuring the display drive unit and the lighting control unit to operate together, it is possible to set lighting unit in the unlit state and at the same time, it is possible to set the light blocking state by controlling the transmitting polarization axis varying unit. Accordingly, light leakage can be reduced in the mirror mode, and the mirror surface state can be configured in a further excellent form.

[0044] Moreover, still another electronic device of the invention is characterized by having a display unit adapted to allow light emission,

wherein the display unit has a polarized light selecting unit adapted to transmit a first polarized light and to reflect a second polarized light having a polarization axis crossing a polarization axis of the first polarized light on a viewing side thereof, and

a transmissive display mode, in which the first polarized light is emitted from the polarized light selecting unit to the viewing side of the display unit to allow the first polarized light to be observed on the viewing side, and a mirror mode, in which the first polarized light is not emitted from the polarized light selecting unit to the viewing side of the display unit, and the polarized light selecting unit is used as a mirror on the viewing side of the display unit, are switchable.

[0045] Preferably, the electronic device further has an input part for allowing an operation of the display device or performing data input to the display in the display device,

wherein the input part is preferably manually operated to allow switching between the transmissive display mode and the mirror mode.

[0046] Manually operating the input part of the electronic device allow switching between the transmissive display mode and the mirror mode. Therefore, any one of the transmissive display mode and the mirror mode can be implemented at any time at the user's wish. Here, as the input part, various manual operation buttons such as a data input key button, various operation switches such as a power switch, and operation members such as a operation dial can be named.

[0047] Embodiments of the present invention will now be described by way of further example only and with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic diagram illustrating the configuration of the display device of the first embodiment in the invention;
Fig. 2 is a schematic diagram illustrating the configuration of the display device of the second embodiment in the invention;
Fig. 3 is a schematic diagram illustrating the configuration of the display device of the third embodiment in the invention;
Fig. 4 is a schematic diagram illustrating the configuration of the display device of the fourth embodiment in the invention;
Fig. 5 is a schematic diagram illustrating the configuration of the display device of the fifth embodiment in the invention;
Fig. 6 is a schematic diagram illustrating the configuration of the display device of the sixth embodiment in the invention;
Fig. 7 is a schematic diagram illustrating the configuration of the display device of the seventh embodiment in the invention;
Fig. 8 is a schematic diagram illustrating the configuration of the display device of the eighth embodiment in the invention;
Fig. 9 is a schematic diagram illustrating the configuration of the display device of the ninth embodiment in the invention;
Fig. 10 is an enlarged vertical cross-sectional view illustrating the enlarged EL panel structure of the ninth embodiment;
Fig. 11 is a graph illustrating the luminance of the backlight against the emission angle distribution of the tenth embodiment in the invention;
Fig. 12 is a schematic block diagram illustrating the configuration of the display control system in the electronic device provided with the display device;
Fig. 13 is a schematic perspective view illustrating

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the appearance of the electronic device (mobile phone); and

Fig. 14 is a schematic perspective view illustrating another electronic device (mobile phone).

[First embodiment]

[0048] First, the configuration of a first embodiment in the invention will be described with reference to Fig. 1. In a display device 100 shown in Fig. 1, a reflective polarizer 110, a polarizer 120, a retarder 130, a liquid crystal panel 140, a polarizer 150, and a backlight 160 are sequentially disposed from the viewing side (the upper side in the drawing).

[0049] The reflective polarizer 110 transmits a polarized light component having a vibration plane in parallel to the transmitting polarization axis, and reflects a polarized light component having a vibration plane in parallel to the direction crossing (preferably orthogonal) the transmitting polarization axis . As the reflective polarizer, a multilayer product having birefringent polymer films different from each other laminated, that is the multilayer product described in PCT/A/WO95/27919, or a product having a quarter (1/4) wavelength plates disposed on the front and back sides of a cholesteric liquid crystals can be used. As the multilayer product, there is a multilayer film, whose trade name is DBEF, provided by Minnesota Mining & Manufacturing Co.

[0050] As the polarizers 120 and 150, a publicly-known absorption type polarizer is used, which transmits the polarized light component having the vibration plane in parallel to the transmitting polarization axis and absorbs the polarized light component having the vibration plane in parallel to the direction crossing the transmitting polarization axis (preferably orthogonal). The polarizer 120 and the polarizer 150 are arranged in a required configuration of the liquid crystal device (for example, they are arranged in the crossed Nicols when the liquid crystal panel 140 is a TN liquid crystal cell having a twisted angle of ninety (90) degrees).

[0051] The polarizer 120 is disposed so that the transmitting polarization axis is matched with the transmitting polarization axis of the reflective polarizer 110. The crossed axes angle between the transmitting polarization axis of the reflective polarizer 110 and the transmitting polarization axis of the polarizer 120 is not necessarily zero degree. However, display contrast is reduced as the crossed axes angle becomes greater. Therefore, the crossed axes angle is desirably fifteen (15) degrees or below, particularly five (5) degrees or below.

[0052] Optically, the polarizer 120 can be omitted. However, the polarized light selectivity of the reflective polarizer 110 (the ratio of the polarized light component having the vibration plane in parallel to the transmitting polarization axis in the transmitted light with respect to the incident natural light) is generally lower than that of the absorption type polarizer. Thus, when the polarizer 120 is omitted, a contrast in the display mode is reduced. Inversely, when the polarization degree of the reflective polarizer (the polarized light selecting unit or first polarized light selecting unit) does not cause a problem, the absorption type polarizer (the third polarized light selecting unit) included in the display unit can be omitted for configuration. In this case, the function is served by the reflective polarizer (the polarized light selecting unit or first polarized light selecting unit). In addition, this is similarly applicable to all the embodiments including the absorption type polarizer described below (the third polarized light selecting unit).

[0053] Furthermore, as the polarizer 150, a reflective polarizer similarly configured to the reflective polarizer 110 can be used, instead of the absorption type polarizer.

[0054] The retarder 130 functions as an optical compensator for reducing display coloring, particularly, when the liquid crystal panel 140 is the STN mode. It can also be configured to function as a viewing angle compensator for improving the viewing angle dependency of liquid crystal display. Display itself is feasible without disposing the retarder 130.

[0055] The liquid crystal panel 140 includes two substrates 141 and 142 formed of a transparent substrate such as glass or plastic. Over the inner surface of the substrate 141, a color filter 144 is formed. In the color filter 144, a plurality of colored layers, for example, red, green and blue, are arranged in a predetermined array pattern (such as a stripe array, a delta array, and a diagonal mosaic array). These colored layers are preferably covered with a transparent protective film.

On the color filter 144, a transparent electrode 145 configured of ITO or the like is formed corresponding to the array of the colored layer. Over the transparent electrode 145, an alignment layer 146 configured of polyimide resin is formed. In addition, over the inner surface of the substrate 142, a transparent electrode 147 and an alignment layer 148 similar to the above are formed.

[0056] In the panel structure, it is acceptable that a pair of substrates forming the panel structure is any of those using glass as the material (including silica), those using resins (plastic), or those using glass for one substrate and a resin for the other substrate. Particularly, by using a resin material for the material of the substrates, the device can be formed low-profile and can enhance the shock-resistance as well.

[0057] The substrates 141 and 142 are bonded by a sealing material 143, and liquid crystal 149 are disposed inside thereof. As the liquid crystal mode of the liquid crystal panel 140 thus configured, the TN (Twisted Nematic) mode, the STN (Super Twisted Nematic) mode, and the ECB (Electrically Controlled Birefringence) mode are preferable. In all the display method according to these liquid crystal modes, the liquid crystal panel is configured to realize the display condition with the use of the polarizer. Thus, high display quality can be obtained at a relatively low drive voltage, which is particularly desirable when it is mounted in a portable

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electronic device.

[0058] Furthermore, as the drive mode of the liquid crystal panel 140, any of the active drive mode including the active matrix drive using an active device such as a TFT (Thin Film Transistor) and a TFD (Thin Film Diode), or the passive drive mode including the simple drive without using the active device or the multiplex drive, is acceptable.

[0059] Moreover, in the embodiment, the liquid crystal panel 140 is a transmissive type panel with no reflective layer or reflector inside or outside. More specifically, the embodiment does not have a light reflection component (reflecting surface) for reflecting the outside light to the viewing side in the pixel, which is different from a reflective type panel or a semi-transmissive reflective type panel. The above mentioned light reflection component means a component having a light reflecting function inside the area for supporting display (in the pixel), which is a concept not containing a metal light blocking layer that does not support display. Of course, the light reflection component not supporting display such as a metal shading film desirably does not exist.

[0060] It is acceptable to use a backlight 160 that can light the liquid crystal panel 140 from behind with nearly uniform illuminance. For example, an edge emitting type backlight including a light guide plate and a light source disposed in the end face part of the light guide plate, and a back emitting type backlight including a light guide plate and a light source disposed on the backside of the light guide plate, are named. In the example shown in the drawing, it has a light source 161 and a light guide plate 162 having the light source 161 disposed to its end face. Preferably, a light reflection component, such as a metal layer or a printed layer for nearly uniformly guiding the light incident from the light source 161 to the liquid crystal panel 140 side, or a scattering component 163, is disposed in the light guide plate 162.

[0061] In the embodiment, the polarizer 120, the retarder 130, the liquid crystal panel 140, the polarizer 150 and the backlight 160 configure the display unit. Basically, this display unit emits only the first polarized light to the reflective polarizer 110. In the display mode, the first polarized light is controlled to be emitted or not to be emitted, or an amount of the first polarized light to be emitted is controlled on each of a plurality of pixels formed in the liquid crystal panel 140. Consequently, a predetermined display image is formed.

[0062] In the display device 100 of the embodiment, the backlight 160 is set in the lit state and a voltage applied between the transparent electrodes 145 and 147 of the liquid crystal panel 140 is controlled. Thus, predetermined display is performed in a liquid crystal display formed of the polarizer 120, the retarder 130, the liquid crystal panel 140 and the polarizer 150. Therefore, the display mode that the light emitted from the polarizer 120 passes through the reflective polarizer to be visibly recognized can be realized.

In addition, by setting the liquid crystal display in the off (light blocking) state, that is, setting all the pixels of the liquid crystal display in the light blocking state, or setting the backlight 160 in the unlit state, the mirror mode that a display plane is visibly recognized as a mirror can be realized.

[0063] In the display device 100, an outside light "O" enters from the viewing side in the normal service conditions. However, a portion of the outside light "O", that is the polarized light component having the vibration plane in parallel to the transmitting polarization axis of the reflective polarizer 110 passes through the reflective polarizer 110, and is guided to inside. The polarized light component having the vibration plane orthogonal to the transmitting polarization axis of the reflective polarizer 110 is reflected by the reflective polarizer 110, and is returned to the viewing side as a reflected light "R." On the other hand, the luminous light radiated from the backlight 160 passes through the polarizer 150 to be a linear polarized light. Its polarization state is converted in the liquid crystal panel 140, or the light passes as it is without being converted. Only the polarized light component having the vibration plane in parallel to the transmitting polarization axis of the polarizer 120 is emitted from the polarizer 120. This polarized light component also passes thorough the reflective polarizer 110 as it is, and it is visibly recognized on the viewing side. Accordingly, when the liquid crystal display is in the state of displaying a particular image, the light passes in the transparent area formed according to the display image, and it passes through the reflective polarizer 110 to be visibly recognized as a transmitted light "T."

[0064] In the display mode, the particular display image is visually recognized by the transmitted light "T," but the reflected light "R" due to the outside light "O" exists at this time. Thus, the visibility of the display image seems to be reduced. However, the outside light "O" usually enters the display device 100 from the direction different from the user's viewing direction. Therefore, the light amount of the reflected light "R" (the specular reflection light), generated in the reflective polarizer 110 and directly entering the user's eye, is small, and most of it is reflected in the direction different from the user's eye as shown in the drawing. Accordingly, when the transmitted light "T" is intense enough, a reduction in the visibility of the display image due to the reflected light "R" can be limited.

[0065] In the mirror mode, the liquid crystal display is in the light blocking state, or the backlight 160 is in the unlit state, thus the transmitted light "T" is almost eliminated. Therefore, the reflected light R is felt more intense correspondingly, and the entire display plane is visibly recognized as a mirror.

[0066] Furthermore, when the mirror mode is configured, it is preferable to set the backlight 160 in the unlit state as well as to set the liquid crystal display in the light blocking state. When this is done, light leakage can be prevented nearly perfectly. Accordingly, the transmitted light "T" can be further reduced, and a more excel-

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lent mirror surface state can be obtained.

[0067] In the embodiment, the reflective polarizer 110 is disposed on the viewing side. Thus, a significantly excellent mirror surface state can be obtained. In addition to this, another liquid crystal panel does not exist on the viewing side of the liquid crystal display, and therefore the influence on the display image can be reduced as well. Accordingly, display quality can be kept excellently as well. Moreover, the embodiment does not have the double layer panel structure. Therefore, the display device can be formed to be low-profile and light-weight can be achieved as well.

[0068] Moreover, the surface on the viewing side of the reflective polarizer 110 is preferably flat. When the surface on the viewing side of the reflective polarizer 110 is flat, the mirror surface state can be configured more excellently, and quality as a mirror can be enhanced. Thus the situation that the specular reflection light of the outside light "O" having high intensity tends to enter the user's eye in the display mode will not occur. (Such a situation may occur when the surface is not flat.) Therefore, the visibility of the display image can be prevented from being reduced. Preferably, the surface is optically flat (optical flat), particularly, in the visible light area.

[Second embodiment]

[0069] Next, a second embodiment in the invention will be described with reference to Fig. 2. In this embodiment, the same components as the first embodiment are designated the same numerals and signs, and omitting the description for them. In the embodiment, a reflective polarizer 110, a polarizer 120, a retarder 130, a liquid crystal panel 140, a polarizer 150, and a backlight 160 are sequentially disposed from the viewing side. The different point from the first embodiment is in that a reflective polarizer 170 is further disposed between the polarizer 150 and the backlight 160. This reflective polarizer 170 is the same as the reflective polarizer 110, but its transmitting polarization axis is disposed in the attitude matched with the transmitting polarization axis of the polarizer 150.

[0070] In the embodiment, the reflective polarizer 170 reflects the polarized light component of the luminous light emitted from the backlight 160, which does not pass through the polarizer 150, to the backlight 160 side. The reflected polarized light component enters the light guide plate 162, and the polarization state of at least a part of light is changed and reflected to the viewing side again. A part thereof passes through the reflective polarizer 170 and the polarizer 150 to be a part of the transmitted light "T." Accordingly, a part of light not utilized for display in the first embodiment can be reused. Thus, the brightness of the display image can be enhanced, and display quality in the display mode can be enhanced.

[0071] In the embodiment, it is also possible that the polarizer 150 is omitted to allow display of the liquid crystal display only by the reflective polarizer 170. However, in this case, the polarized light selectivity of the reflective polarizer 170 (the transmittance of the polarized light component having the vibration plane in parallel to the transmitting polarization axis, or the reflectance of the polarized light component having the vibration plane orthogonal to the transmitting polarization axis) is lower than that of the absorption type polarizer. Thus, display contrast is reduced, or display brightness is deceased. In addition, at least a part of the light in the outside light "O" having transmitted through the reflective polarizer 110 on the viewing side (for example, the light to enter a pixel in the light blocking state) is likely to be reflected on the reflective polarizer 170. And, it can be considered that the reflection causes the visibility of the display image to be reduced.

[Third embodiment]

[0072] Next, a third embodiment in the invention will be described with reference to Fig. 3. In this embodiment, the same components as the second embodiment are designated the same numerals and signs, and omitting the description for them. In the embodiment, a reflective polarizer 110, a polarizer 120, a retarder 130, a liquid crystal panel 140, a polarizer 150, a reflective polarizer 170, and a backlight 160 are disposed sequentially from the viewing side. A transparent protective film 111 is further formed on the surface on the viewing side of the reflective polarizer 110.

[0073] The protective film 111 can be formed of a thin film such as acryl resin, SiO_2 and TiO_2. Particularly, it is preferably a hard protective film having a hardness equal to or greater than inorganic glass such as SiO_2 and TiO_2. It is acceptable that the protective film is a product bonded with a film or sheet formed of a transparent material, or a product directly deposited on the surface of the reflective polarizer 110 by coating, evaporation, and sputtering.

[0074] In the embodiment, the transparent protective film 111 is formed on the surface on the viewing side of the reflective polarizer 110. Therefore, the surface of the reflective polarizer 110 can be prevented from being scratched, or a foreign matter can be prevented from adhering thereto. Accordingly, the mirror surface state can be configured excellently in particular.

[Fourth embodiment]

[0075] Next, a fourth embodiment in the invention will be descried with reference to Fig. 4. In this embodiment, the same components as the second embodiment are designated the same numerals and signs, and omitting the description for them. In the embodiment, a reflective polarizer 110, a polarizer 120, a retarder 130, a liquid crystal panel 140, a polarizer 150, a reflective polarizer 170, and a backlight 160 are disposed sequentially from the viewing side.

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[0076] In the embodiment, the mirror area (polarized light selecting area) "B" occupied by the reflective polarizer 110 is configured to cover an area wider than the display area "A" (that is, the display area of the liquid crystal display formed of the polarizer 120, the liquid crystal panel 140 and the polarizer 150) of the display unit. More specifically, the mirror area "B" is configured to extend beyond the area two-dimensionally overlapping with the display area "A" for further extension.

[0077] For the liquid crystal panel 140, it is needed to provide the area bonded with a sealing material 143 and the area formed with input terminals (not shown in the drawing) on the outside the area around the display area "A." Consequently, a frame-like portion (so-called frame area) exists to some extent around the display area "A" as the display device 100. However, by covering this portion with the reflective polarizer 110, a wider mirror area can be formed without upsizing the display device.

[0078] In addition, the configuration of the fourth embodiment is applicable to any of the first embodiment to the third embodiment.

[Fifth embodiment]

[0079] Next, a more specific configuration of the first embodiment will be described as a fifth embodiment with reference to Fig. 5. In the embodiment, as shown in Fig. 5, a transparent plate 180 is disposed on the viewing side of a reflective polarizer 110. Then, the reflective polarizer 110 is closely contacted with the transparent plate 180. As the transparent plate 180, for example, a display window member (a display window exposed to outside) of the display part of an electronic device (described later) is named, for example. The transparent plate 180 can be formed of a transparent material such as acryl resin or glass. For example, the reflective polarizer 110 is bonded to the transparent plate 180 with a transparent adhesive 181. The surface on the backside of the transparent plate 180 (the under side in the drawing) is formed to be flat. Accordingly, the surface on the viewing side of the closely contacted reflective polarizer 110 is formed to be flat.

[0080] In the embodiment, a polarizer 120 and a retarder 130 are also directly or indirectly fixed to the transparent plate 180 along with the reflective polarizer 110. For example, the polarizer 120 is bonded to the reflective polarizer 110, and furthermore, the retarder 130 is bonded to the polarizer 120.

[0081] In the embodiment, a liquid crystal panel 140 and a backlight 160 are not fixed to the transparent plate 180 or to the polarizer 120 or the retarder 130 fixed thereto. In this case, the liquid crystal panel 140 can be fixed inside the device separately (for example, fixed on a circuit board) from the transparent plate 180, and a gap can be provided between the liquid crystal panel 140 and the multilayer structure fixed to the transparent plate 180. When this is done, the liquid crystal panel 140 is disposed inside the device separately from the multilayer structure including the reflective polarizer 110. Thus, product yields can be improved in the fabrication processes. Of course, the liquid crystal panel 140 and a polarizer 150 can also be fixed and integrated to the transparent plate 180.

[0082] Furthermore, the polarizer 150 is preferably bonded over the outer face of a substrate 141 on the backside of the liquid crystal panel 140. Moreover, the liquid crystal panel 140 and the backlight 160 are disposed with a gap in the drawing, but it is acceptable that they are closely contacted or bonded to each other. More specifically, it is acceptable that the polarizer 150 is closely contacted or bonded to the viewing side of a light guide plate 162.

[0083] The fixing structure to the transparent plate 180 can be applicable not only to the first embodiment but also to any of the second embodiment to the fourth embodiment in completely the same manner.

[Sixth embodiment]

[0084] Next, a sixth embodiment in the invention will be described with reference to Fig. 6. In this embodiment, a transparent plate 180 is disposed as similar to that in the fifth embodiment. Then, a reflective polarizer 110 is bonded to the transparent plate 180 by a transparent adhesive 181 such as acryl resin. The surface on the backside of the transparent plate 180 is formed to be flat, and the reflective polarizer 110 fixed to the surface exerts the same effect and advantage as the fifth embodiment. In this embodiment, a polarizer 120, a retarder 130, a liquid crystal panel 140 and a polarizer 150 are fixed to the transparent plate 180 along with the reflective polarizer 110.

[0085] In the embodiment, the transparent adhesive 181 is preferably formed to have a thickness of 0.3 mm or greater. Accordingly, the fixing structure of the transparent plate 180 to the liquid crystal panel 140 is allowed to have sufficient elasticity when the transparent plate 180 is fixed to a case of an electronic device. Therefore, the liquid crystal panel 140 can be protected against impact or the like.

[0086] In addition, the configuration of the embodiment is applicable to any of the first to fourth embodiments.

[Seventh embodiment]

[0087] Next, a seventh embodiment in the invention will be described with reference to Fig. 7. This embodiment depicts the configuration of the second embodiment more specifically. In the embodiment, a reflective polarizer 110 is closely contacted with a transparent plate 190. The reflective polarizer 110 is fixed to the transparent plate 190. Particularly, the reflective polarizer 110 is preferably bonded to the transparent plate 190 by a transparent adhesive 191 the same as that in the above described embodiments. The transparent

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plate 190 can be formed of the same material as the transparent plate 180 shown in the first embodiment. The surface on the backside of the transparent plate 190 is formed to be flat, and the reflective polarizer 110 fixed to this surface exerts the same effect and advantage as the first embodiment. In addition, a polarizer 120 and a retarder 130 are closely contacted with the reflective polarizer 110. They are also preferably bonded to each other by an adhesive layer or an adhesive.

[0088] A polarizer 150 and a reflective polarizer 170 are fixed to a liquid crystal panel 140. The polarizer 150 and the reflective polarizer 170 are preferably bonded to each other by an adhesive layer or an adhesive.

[0089] In the transparent plate 190, at least a portion of the surface corresponding to the display area is a curved surface 190A in the surface on the viewing side. Accordingly, the transparent plate 190 has the same function as an optical lens, which allows the display screen formed of a display device 100 to be visibly recognized in an enlarged or reduced state. For example, the curved surface 190A is formed into a convex curve as shown in the drawing, and thus the display screen can be visibly recognized in the enlarged state. Therefore, letters can be enlarged to enhance visibility when the display area of the display device is small.

[0090] Also in this case, not only the reflective polarizer 110, but also the polarizer 120 and the retarder 130 can be fixed to the transparent plate 190. Moreover, the liquid crystal panel 140 and the polarizer 150 (the reflective polarizer 170 as well) can also be fixed to the transparent plate 190 as integrated parts as similar to the sixth embodiment. The configuration including the transparent plate 190 can of course be applicable to the first to fifth embodiments and the other embodiments shown below.

[Eighth embodiment]

[0091] Next, an eighth embodiment in the invention will be descried with reference to Fig. 8. In this embodiment, a reflective polarizer 110 is closely contacted with the backside of a transparent plate 180 the same as that in the fifth embodiment. The reflective polarizer 110 is fixed to the transparent plate 180 by a transparent adhesive 181 similar to that in the fifth embodiment. In the embodiment, only the reflective polarizer 110 is fixed to the transparent plate 180. A polarizer 120, a retarder 130, a liquid crystal panel 140, a polarizer 150 and a backlight 160, which configure a display unit, are disposed with gap to the transparent plate 180 and the reflective polarizer 110.

[0092] In this embodiment, the display unit is fixed inside as similar to typical electronic devices, and the reflective polarizer 110 is fixed to the inner surface of the transparent plate 180 disposed on the viewing side of the display unit. Accordingly, it is configured completely the same as the electronic device incorporating a normal display unit, and the reflective polarizer 110 is only fixed to the inner surface of the transparent plate 180. Thus, the embodiment in the invention can be realized. Therefore, it can be fabricated significantly simply at low costs.

[Ninth embodiment]

[0093] Next, a ninth embodiment in the invention will be described with reference to Figs. 9 and 10. In a display device 200 in this embodiment, a reflective polarizer 210, a polarizer 220 and a retarder 230 are sequentially disposed from the viewing side, as shown in Fig. 9. An electroluminescent panel (hereafter, it is simply called EL panel) 240, which is an electro-optical device equivalent to the display unit is disposed behind them. The reflective polarizer 210 and the polarizer 220 are completely the same as those in the other embodiments. In this embodiment, the retarder 230 is a quarter (1/4) wavelength plate.

[0094] In the EL panel 240, an electrode 242 configured of a transparent conductor such as ITO is formed on a substrate 241, and a light emitting element 244 is disposed on the electrode 242. Furthermore, a counter electrode 245 is formed on the light emitting element 244.

The counter electrode 245 is preferably configured as a reflecting electrode formed of aluminium or other metals. In the example shown in the drawing, an example is depicted in which the sash-like electrode 242 arranged side by side in plurals in a stripe shape and the sash-like counter electrode 245 similarly arranged side by side in the stripe shape are disposed orthogonal to each other (the electrode structure corresponding to the passive matrix drive system). However, the electrode structure is arbitrary, and it is acceptable to have a proper electrode structure required for display, such as the electrode structure corresponding to the active matrix drive system.

[0095] Fig. 10 depicts a more specific configuration of the EL panel 240. As shown in Fig. 10, the EL panel 240 of the embodiment can be configured to allow color display by forming light emitting elements 244R, 244G and 244B. These light emitting elements 244R, 244G and 244B are configured of a hole injection layer 244A, and a red light emitting layer 244r, a green light emitting layer 244g, or blue light emitting layer 244b.

[0096] As materials for the hole injection layer, phthalocyanine based compounds such as copper phthalocyanine, and aromatic amine based compounds are named. In addition, as materials for the light emitting layer, aromatic ring compounds such as distyrylbenzene derivatives (blue light emission), heterocyclic compounds such as organic fluorescent materials based on aluminium complex (Alq complex) of 8-hydroxyquinoline of metal complex, and compounds containing specific elements such as a mixed ligand complex, one kind of Alq complex derivatives that one of hydroxyquinolines is substituted to triphenyl silicanol (Si compound) for co-

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ordination (blue green light emission) are named. As other light emission materials other than blue color, nitrobenzothiazole azo compounds of red color, europium complexes of red color, distyrylpyrazine of yellow color, and aromatic dimethylidyne of green color are named.

[0097] In the embodiment, the light emitting element 244R is formed of the hole injection layer 244A, the red light emitting layer 244r and the blue light emitting layer 244b, and the blue light emitting layer 244b functions as a layer for securing flatness and an electron injection transport layer. In addition, the light emitting element 244G is formed of the hole injection layer 244A, the green light emitting layer 244g and the blue light emitting layer 244b, and the blue light emitting layer 244b functions as a layer for securing flatness and an electron injection transport layer. Furthermore, the light emitting element 244B is formed of the hole injection layer 244A and the blue light emitting layer 244b.

[0098] In the embodiment, a bank 243 is formed on the substrate 241 with insulating resin (such as acryl resin, epoxy resin and photosensitive polyimide), and each of the light emitting elements is formed in each pixel area partitioned by the bank 243. By adapting such a configuration, each of the light emitting elements can be formed by arranging liquid materials, liquefied by adding a solvent to each material, in each pixel area by liquid drop discharge and by drying and curing the arranged liquid materials.

[0099] In the embodiment, a predetermined voltage is applied between the electrode 242 and the counter electrode 245 of the EL panel 240 to allow the each light emitting elements to emit light. Accordingly, the light emitted from the each light emitting elements passes through the retarder 230, and then enters the polarizer 220. The polarized light component having the vibration plane in parallel to the transmitting polarization axis of the polarizer 220 is passed through, whereas the polarized light component having the vibration plane orthogonal to the transmitting polarization axis is absorbed. Moreover, the polarized light component having passed through the polarizer 220 enters the reflective polarizer 210, which is a first polarized light selecting unit. The reflective polarizer 210 is disposed so as to direct its transmitting polarization axis toward the same direction as that of the transmitting polarization axis of the polarizer 220. Therefore, the polarized light component having passed through the polarizer 220 travels through the reflective polarizer 210 as it is, and it is visibly recognized as the transmitted light "T" on the viewing side (the display mode).

[0100] On the other hand, when the outside light "O" enters the display device 200, the polarized light component having the vibration plane in parallel to the transmitting polarization axis of the reflective polarizer 210 passes through, but the polarized light component having the vibration plane orthogonal to the transmitting polarization axis is reflected. This reflected polarized light component "R" is unobservable when the display light emitted from the EL panel 240 passes through the reflective polarizer 210 in the display mode, and a predetermined display image formed of the display light of the EL panel 240 is visibly recognized. However, when it is configured that the light emission from the EL panel 240 is stopped not to emit light from the backside of the reflective polarizer 210, the visible mode recognition by the external light reflection of the reflective polarizer 210 becomes dominant to visibly recognize the display screen as a mirror (the mirror mode).

[0101] In addition, among the outside light "O," the polarized light component having the vibration plane in parallel to the transmitting polarization axis of the reflective polarizer 210 passes through the reflective polarizer 210 and the polarizer 220 having the transmitting polarization axis in the same direction, and enters the retarder 230. In the retarder 230, this polarized light component travels a quarter (1/4) phase to be right-handed circular polarized light, for example, and enters the EL panel 240 to be reflected by the reflecting electrode 245. This reflected light is turned to be left-handed circular polarized light. Thus, it again passes thorough the retarder 230 to be the polarized light component having the vibration plane orthogonal to the transmitting polarization axes of the reflective polarizer 210 and the polarizer 220. Therefore, the polarized light component is absorbed by the polarizer 220 as it is, and is not released to the viewing side.

[0102] Accordingly, since polarized light components of the outside light "O", which are not the polarized light components that are reflected on the surface of the reflective polarizer 210, will not return to the viewing side, the amount of the observed outside light can be reduced in the display mode. Thus, the deterioration of visibility can be reduced, and the light reflected other than in the surface of the reflective polarizer can be eliminated in the mirror mode. Therefore, a viewable mirror state with no blur can be realized.

[Tenth embodiment]

[0103] Next, an embodiment of the display device with a preferable backlight applied to the first to fourth embodiments will be described. The configuration of this embodiment can adopt any configurations of the first to ninth embodiments. Fig. 11 is a graph illustrating the luminance of the backlight against the emission angle distribution. In the embodiment, a backlight is desired that has high intensity luminance in the range of small emission angle centering the direction of the normal of the display screen (emission angle = 0), and has low luminance in the range of large emission angle, which is remote from the direction of the normal, in order to enhance the visibility of the display image. The range of small emission angle is an emission angle ranging from zero (0) to forty (40) degrees, and the range of large emission angle is the range exceeding an emission angle of forty (40) degrees. In the example shown in the

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drawing, a luminance of about 2000 [cd/m^2] is obtained in the light of a zero degree emission angle, whereas the luminance is dropped to 20 to 30 [cd/m^2] in the light of a fifty (50) degree emission angle.

[0104] As for the emission angle distribution of luminous light from the backlight (lighting unit) for the embodiment, it is configured to have much light amount in the range of small emission angle and to have less light amount in the range of large emission angle. Thus, the light amount of the transmitted light "T" entering the user's eye can be increased in the display mode. Therefore, a reduction in the visibility of the display screen due to the reflected light "R" can be further suppressed. In order to enhance the visibility of the display screen in the display mode and to suppress the light amount of the backlight to reduce power consumption, the light emission property of the backlight is preferably configured to have a luminance (light amount) of one fiftieth (1/50) or below of the luminance (light amount) in the direction of the normal for the range of large emission angle exceeding an emission angle of forty (40) degrees.

[0105] The emission angle distribution of luminous light of the backlight can be properly configured according to the shape of the light guide plate 162, the structure of the light reflection component or the light scattering component 163, and a filter or a scattering plate (diffuser) disposed separately.

[0106] The emission angle distribution of luminous light of the backlight is applicable to the emission angle distribution of display light in the EL panel 240 of the ninth embodiment as it is. More specifically, by configuring the emission angle distribution of display light of the EL panel 240 as that shown in Fig. 11, the display light can be configured to be visibly recognized efficiently with no increase in power consumption, and the visibility in the display mode can be enhanced regardless of the existence of the specular reflection light by the reflective polarizer.

[Eleventh embodiment]

[0107] Next, an electronic device 1000 of an eleventh embodiment in the invention will be described with reference to Figs. 12 and 13. This electronic device 1000 is provided with the display device 100 of the first embodiment. Fig. 12 is a schematic block diagram illustrating a display control system for the display device 100 to be disposed inside the electronic device 1000 in a form of combining with a function implementing unit. Fig. 13 is a schematic perspective view illustrating the exemplary configuration of the electronic device 1000 (a mobile phone).

[0108] The electronic device 1000 is provided with a display drive part 140X for driving the liquid crystal panel 140 disposed in the display device 100, a light control part 160X for controlling the backlight 160, and a control part 100X for controlling the display drive part 140X and the light control part 160X. By the way, the configuration shows the display control system in a form of combining with the function implementing unit, and does not depict an actual circuit configuration or the packaging structure of circuit devices. Therefore, it is acceptable that all the parts are formed in the display device 100, or formed outside the display device 100, that is, formed inside the electronic device 1000 instead of the display device 100. Furthermore, it is acceptable that a portion is formed inside the display device 100, and other portions are formed inside the electronic device 1000 instead of the display device 100.

[0109] The display drive part 140X is for feeding drive voltage to drive each of a plurality of pixel areas formed in the liquid crystal drive area of the liquid crystal panel 140. For example, it synchronously feeds scan signals and data signals corresponding to the scan signals to a common terminal (scan line terminal) and a segment terminal (data line terminal) of the liquid crystal panel 140 in the multiplex drive system or the active drive system. Display data such as image data is sent to the display drive part 140X from the main circuit of the electronic device 1000 via the control part 100X.

[0110] The light control part 160X controls power supply to the backlight 160. For example, it switches the backlight 160 between the lit state and the unlit state.

[0111] The control part 100X controls the display drive part 140X and the light control part 160X, and performs control instruction to each part and data sending. For example, when the display device 100 is to be set in the display mode, the display drive part 140X drives the liquid crystal panel 140 to display, and the light control part 160X allows the backlight 160 in the lit state simultaneously. When the display device 100 is to be set in the mirror state, the display drive part 140X controls the liquid crystal panel 140, and the liquid crystal display including the liquid crystal panel 140 is set in the full blocked state (shutter closed state). Alternatively, the light control part 160X turns off the backlight 160 to be in the unlit state. Preferably, the liquid crystal display is in a fully blocked state and the backlight 160 is in the unlit state in the mirror state.

[0112] As shown in Fig. 13, the electronic device 1000 of the embodiment can be configured as a mobile phone having a main body part 1001 and a display part 1002. In this case, it is configured that the display device 100 is disposed inside the display part 1002 to visibly recognize a display screen 1003 in the display part 1002. By configuring in this way, a predetermined display screen can be visibly recognized in the display screen 1003, or the mirror surface state can be visibly recognized depending on various manual operations and various situations. Accordingly, the electronic device 1000 such as the mobile phone can be used as a mirror.

[0113] In addition, when the electronic device 1000 is applied to a mobile phone 2000, the configuration is acceptable in which another display screen 2004, other than the main display screen (the same one as 1003)

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shown in Fig. 13, is disposed on the outer face of a display part 2002, folded over a main body part 2001 as shown in Fig. 14. And the display screen 2004 allows predetermined display to be visually recognized without opening the display part 2002 from the main body part 2001. In this case, the display device 100 is disposed in addition to the main display device depicted by dotted lines in Fig. 12, and thus the structure is formed in which the display screen 2004 can be visually recognized by the display device 100 other than the main display screen. In the mobile phone 2000 of the embodiment, display can be visually recognized in the folded state, and also it can be used as a mirror in the folded state.

[0114] In the embodiment, the electronic device 1000 and the mobile phone 2000 are preferably provided with an input part (control member) such as a control switch, a operation button, and a control dial for exclusively switching between the display mode (transmissive display mode) and the mirror mode, or for serving also as the input part for other functions. For example, it is configured that the control member for exclusive use or for dual purpose disposed on the main body part 1001 of the electronic device 1000 is manually operated and thus the operated state is sent to the control part 100X to switch between the display mode (transmissive display mode) and the mirror mode. Furthermore, the mobile phone 2000 is configured in which a control member, manually operable in the folded state shown in Fig. 14, is disposed and the control member is operated to send the operated state to the control part 100X for switching between the display mode (transmissive display mode) and the mirror mode. As for the dual purpose control member for forming the input part, for example, a data input key button and a power on/off button in various electronic devices such as a mobile phone and personal computer are named.

[0115] When the display device 200 having the EL panel 240 of the ninth embodiment is disposed inside the electronic device, the light control part is not needed. Instead, a control unit including functions of the control part and the display drive part can realize predetermined display states in the display mode and the mirror surface state in the mirror mode. In the mirror mode, the control unit stops light emission of the EL panel 240.

[0116] The display device and the electronic devices of the invention are not limited to the examples shown in the drawings, which can of course be modified variously within the scope of the invention. For example, in the embodiments, the case where the invention is applied to the liquid crystal device as one kind of electro-optical device, has been mainly described. However, the invention is not limited to this, but can be applied to various electro-optical devices such as the electroluminescent device as the ninth embodiment, particularly an organic electroluminescent device, an inorganic electroluminescent device, a plasma display device, an FED (field emission display) device, an LED (light emitting element) display device, an electrophoretic image display device, a small-sized TV using a low-profile CRT and a liquid-crystal shutter, and a device using a digital micromirror device (DMD).

[0117] As described above, according to the invention, display quality can be enhanced in the display device, which allows the display part to be switched between the display mode and the mirror mode. In addition, the display device can be formed to be low-profile and light-weight.

Claims

1. A display device comprising:

   a display unit adapted to allow a first polarized light to be emitted as display light; and a control unit adapted to control the display unit,

   wherein the display unit has a polarized light selecting unit on a viewing side thereof,

   the polarized light selecting unit transmits the first polarized light and reflects a second polarized light having a polarization axis crossing a polarization axis of the first polarized light, and

   the control unit is allowed to switch between a display mode, in which the first polarized light is emitted from the display unit as display light, and a mirror mode, in which the first polarized light is not emitted from the display unit.

2. The display device according to claim 1, wherein the control unit stops light emission from the display unit in the mirror mode.

3. A display device having a transmitting polarization axis varying unit, the display device including:

   a first polarized light selecting unit disposed on a viewing side of the transmitting polarization axis varying unit; and
   a second polarized light selecting unit disposed on a backside of the transmitting polarization axis varying unit,

   wherein the first polarized light selecting unit transmits a first polarized light and reflects a second polarized light having a polarization axis crossing a polarization axis of the first polarized light,

   the second polarized light selecting unit transmits a third polarized light and absorbs or reflects a fourth polarized light having a polarization axis crossing a polarization axis of the third polarized light, and

   the transmitting polarization axis varying unit is allowed to convert at least a part of the third polarized light to the first polarized light.

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4. The display device according to claim 3, wherein another transmitting polarization axis varying unit is not disposed on the viewing side of the first polarized light selecting unit.

5. The display device according to claim 3, wherein a third polarized light selecting unit adapted to transmit the first polarized light and to absorb the second polarized light is disposed between the first polarized light selecting unit and the transmitting polarization axis varying unit.

6. The display device according to claim 5 comprising:

a lighting device on the backside of the second polarized light selecting unit,

wherein the second polarized light selecting unit transmits the third polarized light and absorbs the fourth polarized light,

in which a fourth polarized light selecting unit is disposed between the second polarized light selecting unit and the lighting unit, and

the fourth polarized light selecting unit transmits the third polarized light and reflects the fourth polarized light.

7. The display device according to claim 3, wherein the second polarized light selecting unit transmits the third polarized light and reflects the fourth polarized light.

8. The display device according to claim 3, wherein a surface on the viewing side of the polarized light selecting unit is flat.

9. The display device according to claim 3 or 8, wherein a transparent protective film is formed on a surface on the viewing side of the first polarized light selecting unit.

10. The display device according to claim 3, wherein a lighting unit adapted to emit light to the viewing side is disposed on the backside of the second polarized light selecting unit.

11. The display device according to claim 10, wherein a light reflection component for reflecting outside light to the viewing side in a form of supporting display is not disposed between the first polarized light selecting unit and the lighting unit.

12. The display device according to claim 10 or 11, wherein the transmitting polarization axis varying unit is in a state not to emit the first polarized light when the lighting unit is not lit.

13. The display device according to claim 3, wherein a polarized light selecting area of the first polarized light selecting unit is extended beyond an area overlapping with a transmitting polarization axis varying area of the transmitting polarization axis varying unit.

14. The display device according to any one of claims 10 to 12, wherein a light amount emitted in a direction of the normal is greatest in an emission angle distribution of luminous light of the lighting unit.

15. The display device according to claim 14, wherein the luminous light of the lighting unit is distributed mainly at an emission angle ranging from zero (0) to forty (40) degrees.

16. The display device according to claim 14, wherein the luminous light of the lighting unit is one fiftieth (1/50) or below of a light amount in the direction of the normal for a range exceeding an emission angle of forty five (45) degrees.

17. The display device according to claim 3, wherein a color filter is disposed on the backside of the first polarized light selecting unit.

18. The display device according to claim 3, wherein a retarder is disposed between the first polarized light selecting unit and the transmitting polarization axis varying unit.

19. The display device according to claim 3, wherein a transparent member is disposed on the viewing side of the first polarized light selecting unit, and the first polarized light selecting unit is directly or indirectly closely contacted with the transparent member.

20. The display device according to claim 19, wherein the first polarized light selecting unit is bonded to the transparent member by a transparent substance.

21. The display device according to claim 19 or 20, wherein a surface of the transparent member on the first polarized light selecting unit is flat.

22. The display device according to claim 19 or 20, wherein a surface on the viewing side of the transparent member is a curved surface.

23. An electronic device comprising the display device according to clam 1 or 2.

24. An electronic device comprising:

the display device according to any one of claims 3 to 22; and

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a display drive unit adapted to drive the transmitting polarization axis varying unit.

25. An electronic device comprising:

the display device according to any one of claims 10 to 12, and 14 to 16;
a display drive unit adapted to drive the transmitting polarization axis varying unit; and
a lighting control unit adapted to control the lighting unit.

26. An electronic device comprising a display unit adapted to allow light emission,

wherein the display unit has a polarized light selecting unit adapted to transmit a first polarized light and to reflect a second polarized light having a polarization axis crossing a polarization axis of the first polarized light on a viewing side thereof, and

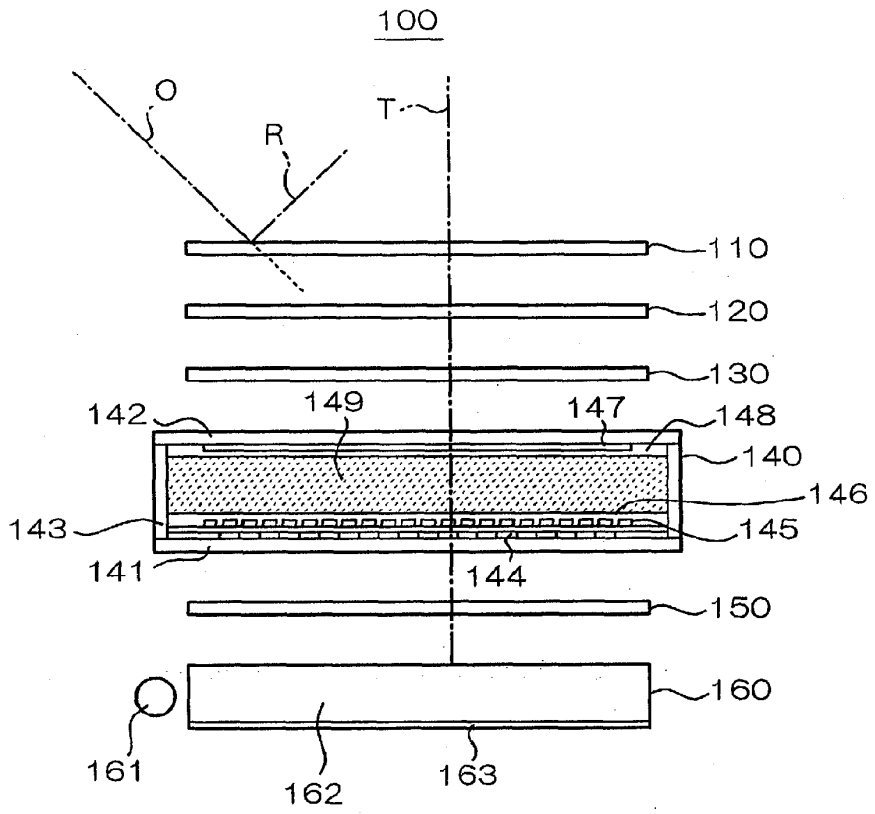
a transmissive display mode, in which the first polarized light is emitted from the polarized light selecting unit on the viewing side to allow the first polarized light to be observed on the viewing side, and a mirror mode, in which the first polarized light is not emitted from the polarized light selecting unit and the polarized light selecting unit is used as a mirror on the viewing side of display unit, are switchable.

27. The electronic device according to claim 26 further comprising an input part for allowing an operation of the display device or for allowing data input to display in the display device,

wherein the input part is operated to allow switching between the transmissive display mode and the mirror mode.

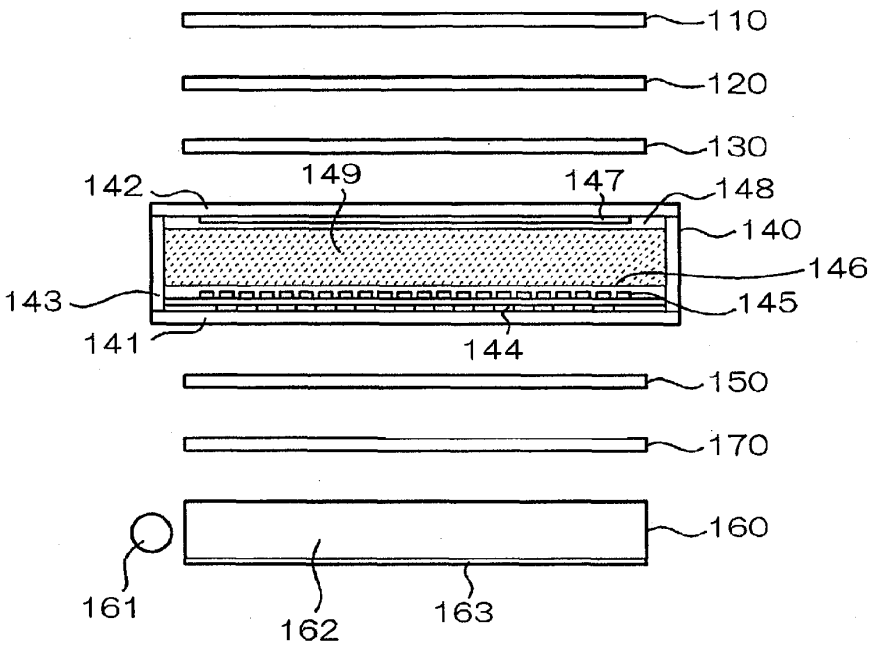
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FIG. 1



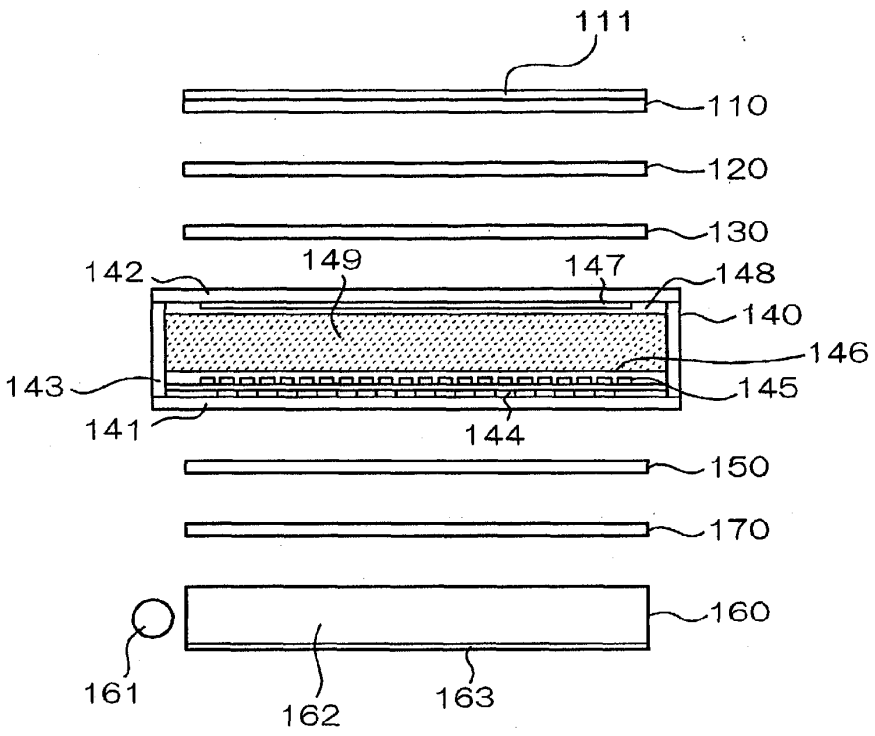
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FIG. 2



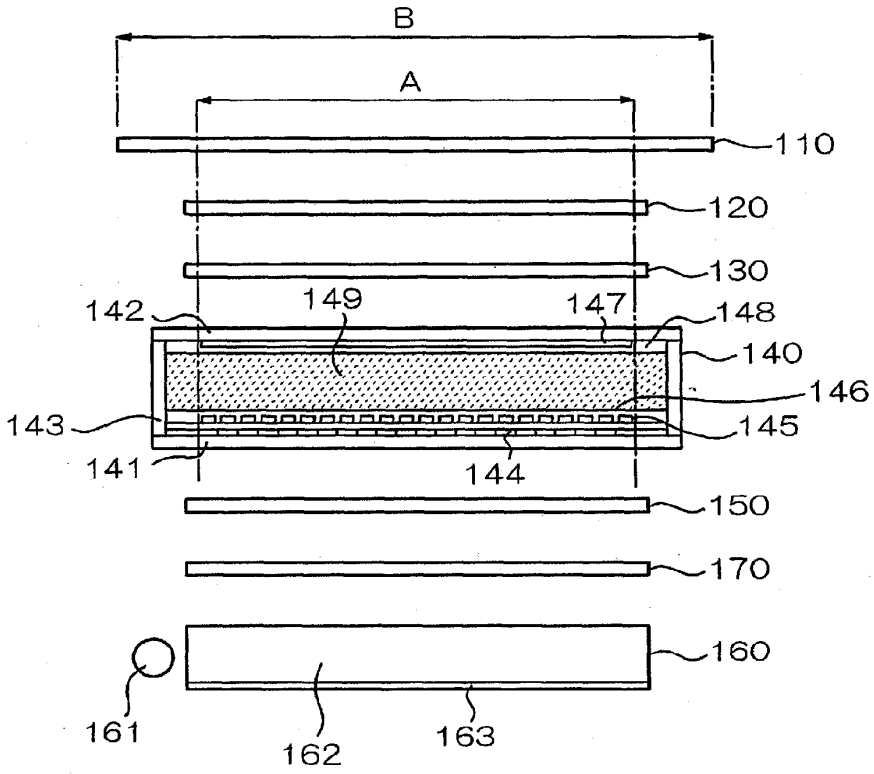
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FIG. 3



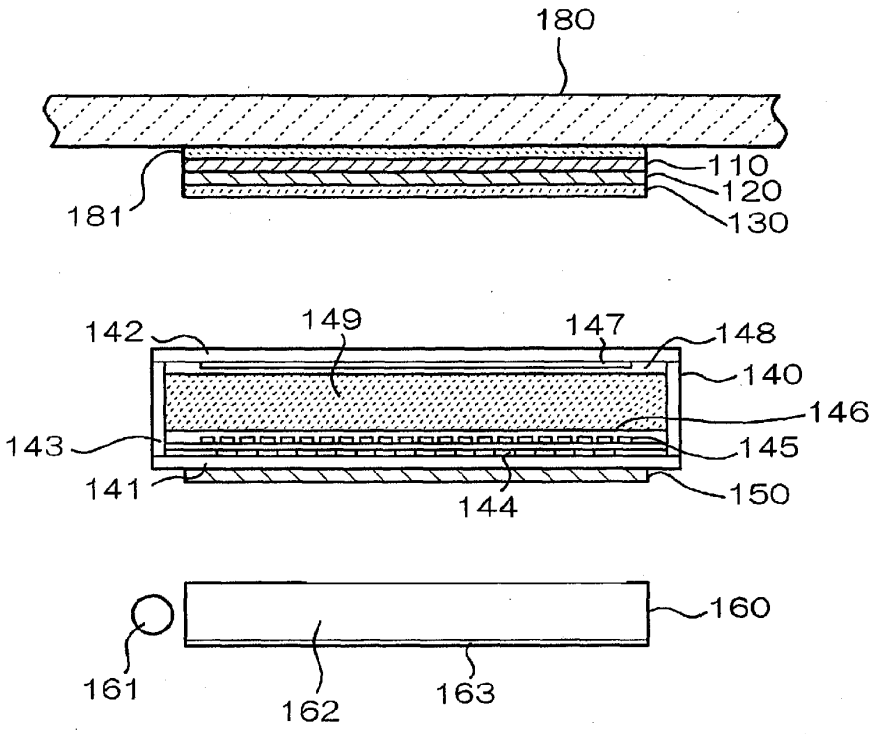
Samsung/Google, EX1002, p. 157

FIG. 4



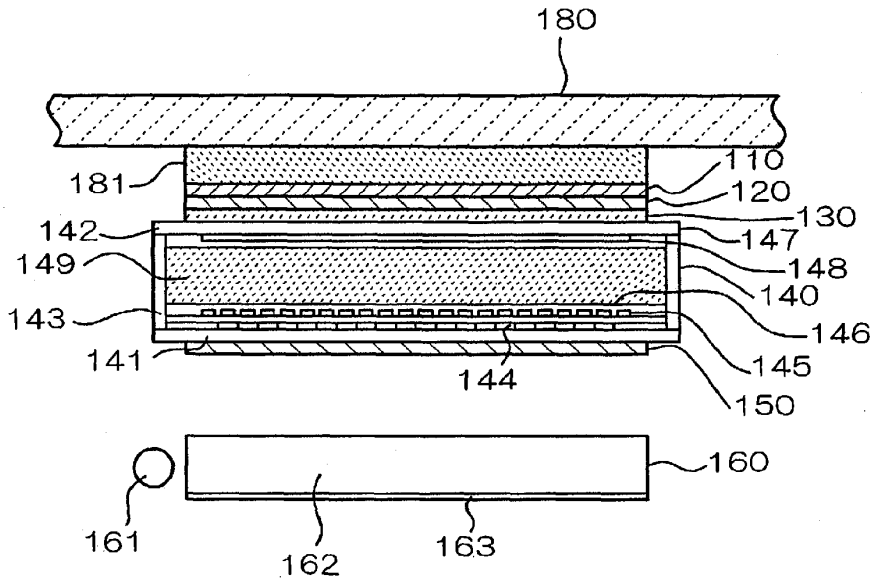
Samsung/Google, EX1002, p. 158

FIG. 5



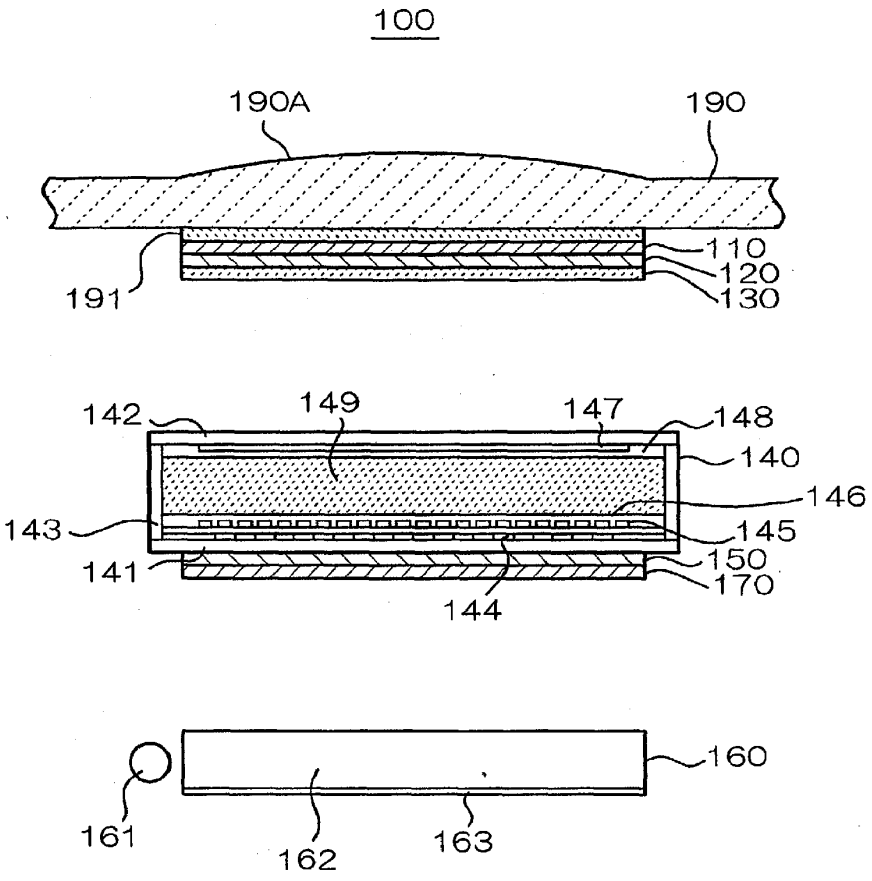
Samsung/Google, EX1002, p. 159

FIG. 6



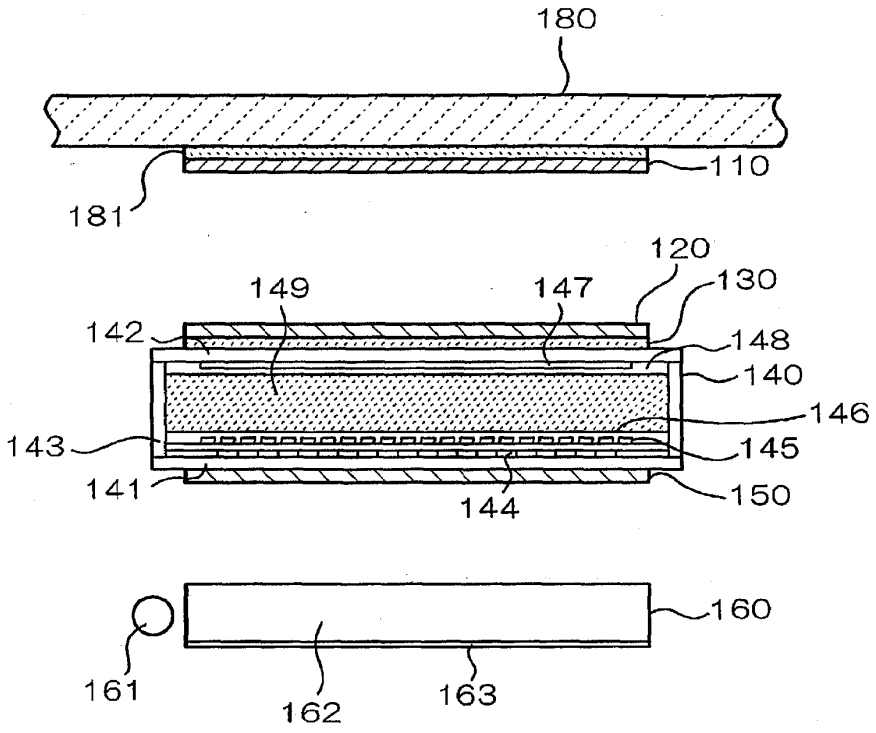
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FIG. 7



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FIG. 8



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FIG. 9

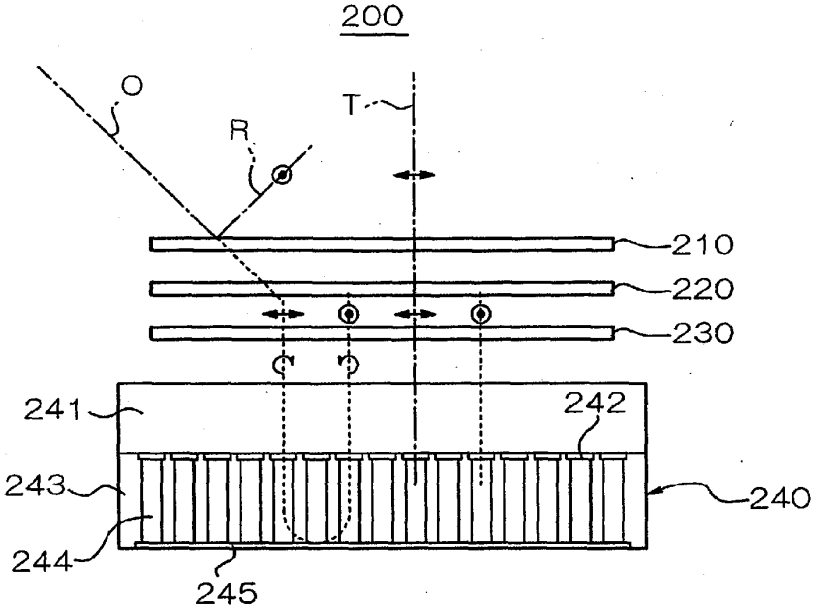
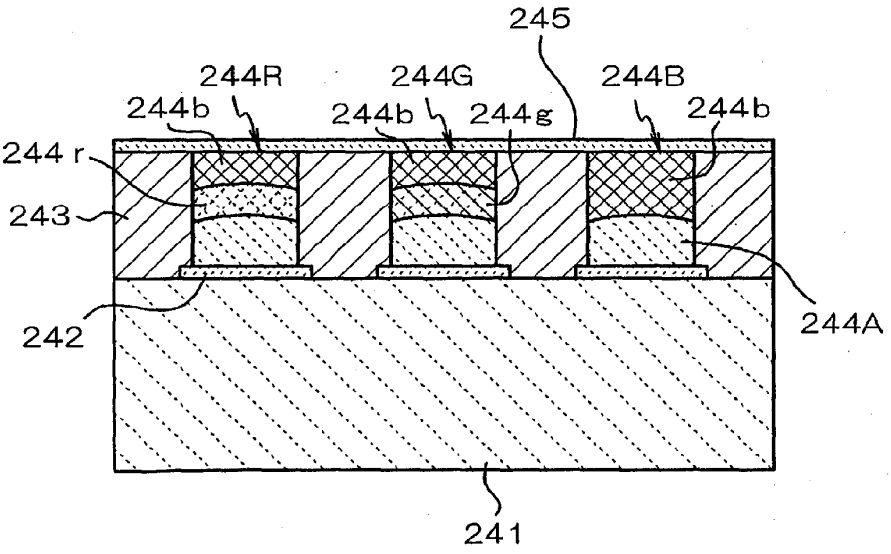
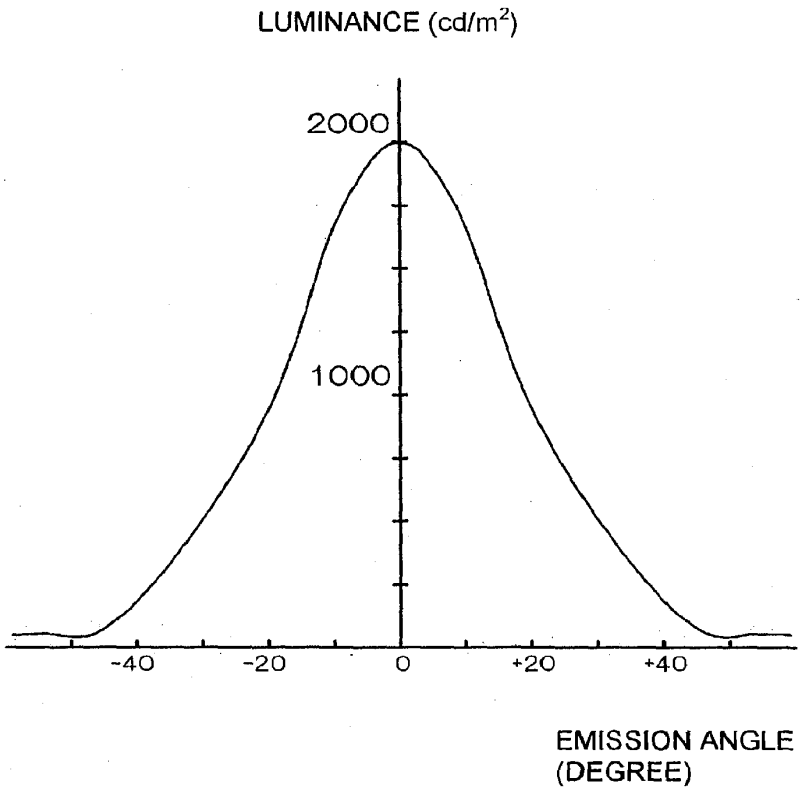


FIG. 10



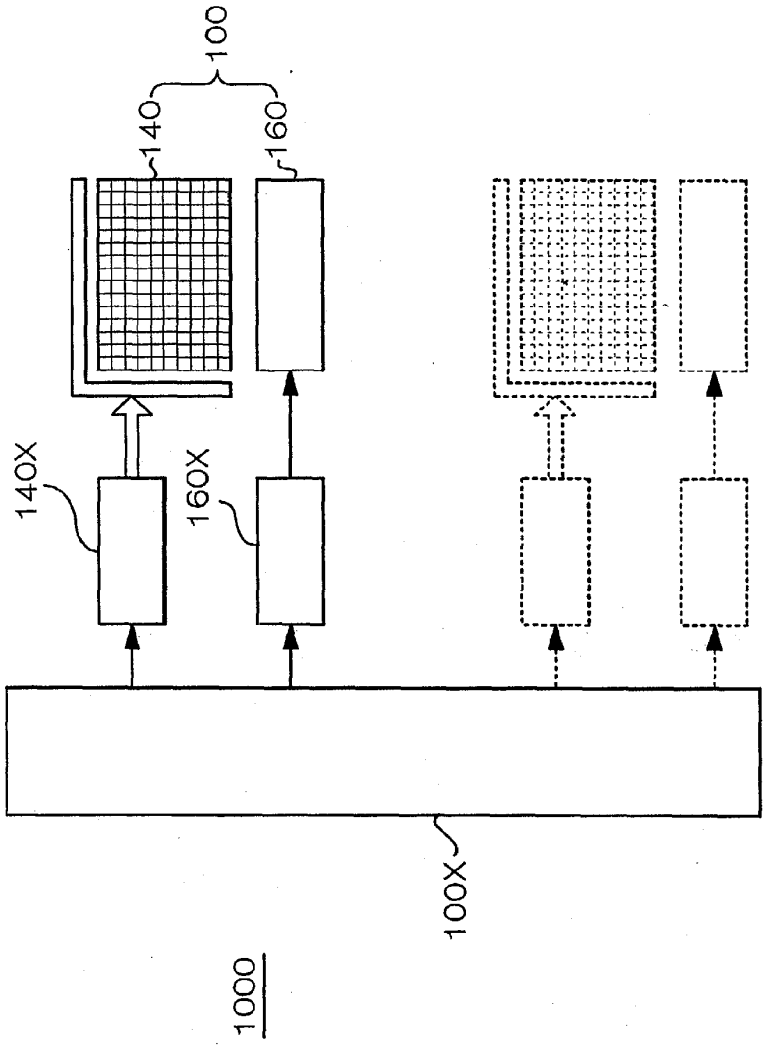
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FIG. 11



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FIG. 12



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FIG. 13

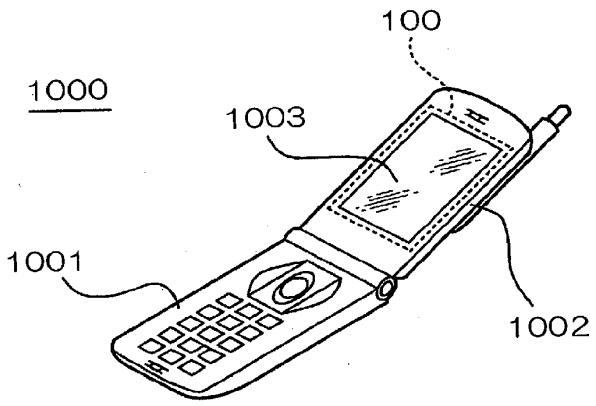
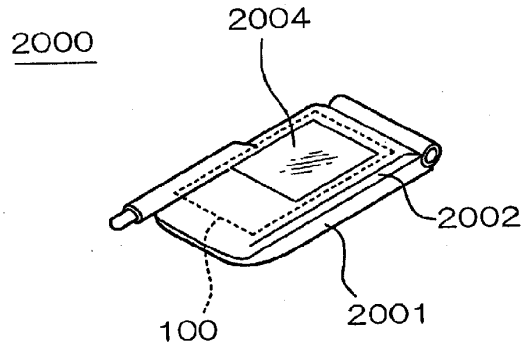


FIG. 14



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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 25 3912

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 03, 3 April 2002 (2002-04-03) -& JP 2001 318374 A (HITACHI LTD), 16 November 2001 (2001-11-16) * abstract * * paragraph [0008] - paragraph [0014] * * paragraph [0073] - paragraph [0134]; figures 7,8,10,11 * * paragraph [0278] - paragraph [0285]; figures 37,38 * ---	1-27	G02F1/1335 G02F1/13357 G09F13/12 H04M1/02 H04M1/21
X	EP 0 933 663 A (CITIZEN WATCH CO LTD) 4 August 1999 (1999-08-04) * paragraph [0052] - paragraph [0069]; figure 4 * * paragraph [0109] * -----	3,7-11, 14-21, 24,25	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

G02F
H04M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	12 September 2003	Frank, W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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D : document cited in the application
L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 25 3912

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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12-09-2003

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Espacenet

Bibliographic data: EP1859432 (A2) — 2007-11-28

DEVICES, SYSTEMS AND METHODS OF CAPTURING AND DISPLAYING APPEARANCES

Inventor(s): VILCOVSKY NISSI [IL] ± (VILCOVSKY, NISSI)

Applicant(s): VILCOVSKY NISSI [IL] ± (VILCOVSKY, NISSI)

Classification: - international: *G06F3/01; G06Q30/00; H04N5/262; H04N7/18*
- cooperative: **G02B5/08**; **G09F19/16**; **G09F27/00**; **H04N5/2624**; A47F2007/195; H04N2005/2726

Application number: EP20060711263 20060301

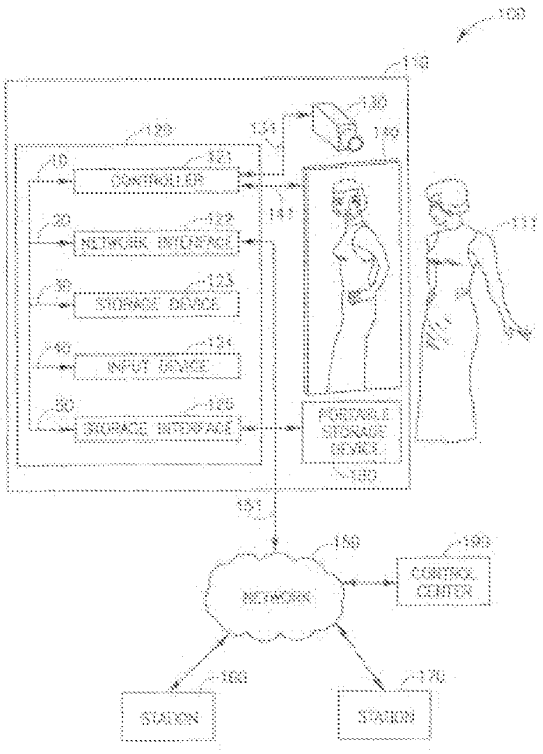
Priority number (s): WO2006IL00281 20060301 ; US20050656885P 20050301 ; US20050656884P 20050301

Also published as: EP1859432 (A4) WO2006092793 (A2) WO2006092793 (A3) US2011199294 (A1) US8624883 (B2) more

Abstract not available for EP1859432 (A2)
Abstract of corresponding document: WO2006092793 (A2)

Some demonstrative embodiments of the invention include systems, devices and/or methods enabling appearance comparison. The system, according to some demonstrative embodiments, may include at least one interactive imaging and display station. The station may include, for example, a mirror-display device capable of selectably operating in either or both a mirror mode or a display mode; an imaging device to capture one or more appearances appearing in a filed of view in front of the mirror-display device; and/or an image control unit to select the mode of operation of the mirror-display device according to a user command. Other embodiments are described and claimed.

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100
110
130
120
140
CONTROLLER
NETWORK INTERFACE
STORAGE DEVICE
INPUT DEVICE
SOURCE INTERFACE
PORTABLE STORAGE DEVICE
150
NETWORK
160
CONTROL CENTER
180
STATION
170
STATION

(19) Europäisches Patentamt
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(11) Veröffentlichungsnummer:
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Internationale Anmeldung veröffentlicht durch die Weltorganisation für geistiges Eigentum unter der Nummer:

WO 2006/092793 (art. 158 des EPÜ).

International application published by the World Intellectual Property Organisation under number:

WO 2006/092793 (art. 158 of the EPC).

Demande internationale publiée par l'Organisation Mondiale de la Propriété sous le numéro:

WO 2006/092793 (art. 158 de la CBE).

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Internationales Büro
INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) **Internationale Patentklassifikation** 7 :
A45D 44/00, G09B 19/00

A1

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(30) **Prioritätsdaten:**

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198 52 876.0	16. November 1998 (16.11.98)	DE
199 01 719.0	18. Januar 1999 (18.01.99)	DE
199 04 284.5	3. Februar 1999 (03.02.99)	DE

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(81) **Bestimmungsstaaten:** AU, JP, US, europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Veröffentlicht
Mit internationalem Recherchenbericht.
Vor Ablauf der für Änderungen der Ansprüche zugelassenen Frist; Veröffentlichung wird wiederholt falls Änderungen eintreffen.

(54) **Title:** SYSTEM FOR SUPPORTING THE SELECTION OF ARTICLES WITH THE AID OF A VIDEO CAMERA

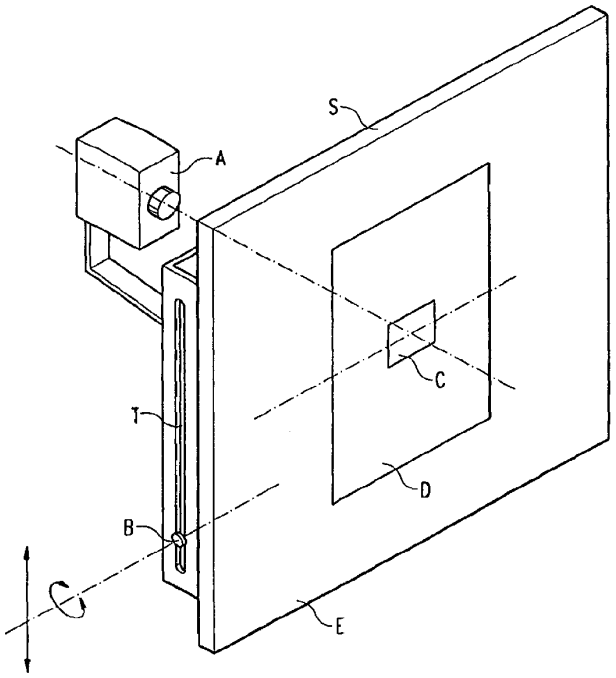
(54) **Bezeichnung:** SYSTEM ZUM UNTERSTÜTZEN DER AUSWAIIL VON ARTIKELN MIT HILFE EINER VIDEOKAMERA

(57) **Abstract**

Disclosed is a sales system comprising a mirror, in which a customer can see himself with a sales object, e.g. a pair of glasses, a garment, a piece of jewelry or the like. Said system includes a video camera that is mounted in relation to the mirror in such a way that the customer can be picked up by the video camera when the customer is looking at himself in the mirror, a storage device that may be actuated by the customer or a third person for storing and playing back images recorded by the video camera and an image playback device for playing back the recorded images to be viewed by the customers.

(57) **Zusammenfassung**

Es wird ein Verkaufssystem mit einem Spiegel beschrieben, in welchem ein Kunde sich mit einem Verkaufsobjekt, z.B. einer Brille, einem Kleidungsstück, Schmuck oder dergleichen, betrachten kann, und das aufweist: eine Videokamera, welche relativ zum Spiegel so angeordnet ist, daß der Kunde, wenn er sich im Spiegel betrachtet, von der Videokamera aufnehmbar ist; eine Speichereinrichtung, die vom Kunden oder einer dritten Person zum Speichern und Wiedergeben von Bildern, die von der Videokamera aufgenommen wurden, betätigbar ist, und eine Bildwiedergabeeinrichtung zum Wiedergeben der aufgenommenen Bilder zur Betrachtung durch den Kunden.



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SYSTEM ZUM UNTERSTÜTZEN DER AUSWAHL VON ARTIKELN MIT HILFE EINER VIDEOKAMERA

Beschreibung

Die Erfindung betrifft ein Verkaufssystem mit einem Spiegel, in dem sich ein Kunde mit einem Verkaufsobjekt betrachten kann, wobei er gleichzeitig durch eine Videokamera aufgenommen wird.

Es ist bekannt, im Verkauf Videogeräte einzusetzen, mit denen der Kunde mit verschiedenen Gegenständen, die er möglicherweise kaufen möchte, abgelichtet wird. Solche Videogeräte können im Self-Service, oder auch durch Verkaufspersonal bedient werden. Der Kunde kann sich das von der Videokamera aufgenommene Bild in einem Monitor betrachten. Da der Kunde sein Bild im Monitor betrachtet, wird er auch, während er verschiedene Verkaufsobjekte anprobiert, seine Aufmerksamkeit dem Monitor und dem darin gezeigten Bild zuwenden. Durch die Konzentration auf den Monitor besteht aber die große Gefahr, daß das Auftreten des Kundens und damit sein Erscheinungsbild zusammen mit dem anzuprobierenden Verkaufsobjekt nicht mehr natürlich wirkt und der unerwünschte sogenannte „Off-Set"-Blickwinkel entsteht.

Aufgabenstellung der vorliegenden Erfindung ist es, diese bisher im Zusammenhang mit der Verwendung von Videokameras beim Verkauf verbundenen Nachteile zu vermeiden, und insbesondere den sogenannten „Off-Set"-Effekt, und vom Kunden während der Anprobe ein „vertrautes" Bild von sich selbst zu machen.

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Diese Aufgabenstellung wird mit dem Gegenstand der vorliegenden Erfindung gelöst.

Gegenstand der Erfindung ist ein Verkaufssystem nach Patentanspruch 1.

Zweckmäßige Ausgestaltungen dieses Systems sind Gegenstand der Ansprüche 2 bis 17.

Weiterer Gegenstand ist die Verwendung des erfindungsgemäßen Verkaufssystems zur Überwachung von Räumen, Raumabschnitten oder dergleichen Gebäudeteilen nach Anspruch 18.

Ein weiterer Gegenstand der Erfindung ist auch ein Spiegel, der sich zur Verwendung in einem erfindungsgemäßen Verkaufssystem eignet, nach Anspruch 19. Zweckmäßige Ausgestaltungen davon sind Gegenstand der Ansprüche 20 bis 22.

Erfindungsgemäß wird ein Verkaufssystem mit einem Spiegel bereitgestellt, in welchem ein Kunde sich mit einem Verkaufsobjekt, z.B. einer Brille, einem Kleidungsstück, Schmuck oder dergleichen, betrachten kann, und das gekennzeichnet ist durch eine Videokamera, welche relativ zum Spiegel so angeordnet ist, daß der Kunde, wenn er sich im Spiegel betrachtet, damit aufgenommen werden kann, eine Speichereinrichtung, die vom Kunden oder einer dritten Person zum Speichern und/oder Wiedergeben von Bildern, die von der Videokamera aufgenommen wurden, betätigbar ist, und eine Bildwiedergabeeinrichtung zum Wiedergeben der aufgenommenen Bilder zur Betrachtung durch den Kunden.

Durch dieses erfindungsgemäße Verkaufssystem ist es möglich, ein unnatürliches Verhalten (z.B. eine unnatürliche Blickrichtung, Augenstellung und Körperhaltung) und eine

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unnatürliche Abbildung durch die Videokamera, und insbesondere den „Off-Set"-Effekt zu vermeiden.

Beim erfindungsgemäßen Verkaufssystem wird, wenn der Kunde sich mit einem Verkaufsobjekt im Spiegel betrachtet, das Bild durch die vorzugsweise hinter dem Spiegel und für den Kunden nicht sichtbare Videokamera festgehalten, und als „Live-Spiegelbild" in der Bildwiedergabeeinrichtung gezeigt. Die Aufmerksamkeit des Kunden richtet sich also, so wie bei einer normalen Anprobe vor einem Spiegel, auf sein Spiegelbild im Spiegel, und nicht auf den Monitor, wodurch das normale und natürliche Verhalten während einer solchen traditionellen Anprobe vor einem Spiegel erhalten bleibt, und der Kunde seine Aufmerksamkeit nicht dem Monitor zuwendet, sondern seinem „Live-Spiegelbild". Durch die erfindungsgemäß vorgesehene, mit der Videokamera operativ verbundene Speichereinrichtung und die Bildwiedergabeeinrichtung kann der Kunde dann in Ruhe nach der „natürlichen Anprobe vor dem Spiegel" die gespeicherten Bilder oder Bildsequenzen beliebig abrufen und miteinander vergleichen.

Als Spiegel lassen sich im allgemeinen solche verwenden, wie sie für bestimmte Verkaufsobjekte, z.B. Kleidungsstücke, Schmuck, Brillen usw., üblicherweise verwendet werden.

Vorzugsweise ist der Spiegel zusammen mit der Videokamera derart einstellbar, daß der Kunde unabhängig von seiner Körpergröße, einem zu betrachtenden Körperabschnitt und/oder der Position (z.B. sitzend oder stehend) den Spiegel nach seinem Blickfeld einstellen kann; dadurch wird wieder das natürliche Verhalten, wie es der Kunde vor für bestimmte Verkaufsobjekte angepaßten Spiegeln gewohnt ist, erhalten.

Besonders zweckmäßig ist es, wenn die erfindungsgemäß verwendeten Spiegel mit einem semitransparenten Bereich

ausgestattet sind. Die Videokamera befindet sich dann hinter dem Spiegel und ist mit dem Spiegel zusammen beweglich so montiert, daß sie durch den semitransparenten Bereich hindurch Bilder vom Kunden aufnehmen und der Kunde sich auch im semitransparenten Bereich des Bilds betrachten kann. Der Spiegel kann dabei auch so ausgestaltet sein, daß die Grenzen des semitransparenten Bereichs des Spiegels vom Kunden nicht oder kaum bemerkt werden. Der Kunde nimmt die hinter dem Spiegel befindliche Videokamera gar nicht wahr, und führt die Anproben wie auf bisher gewohnte Weise durch, wodurch das natürliche Verhalten erhalten bleibt, und die Gefahr eines unnatürlichen Betrachtungswinkels und insbesondere die des „Off-Set"-Effekts weitgehend ausgeschaltet ist.

Gegenstand der Erfindung ist auch ein Spiegel, der zur Verwendung in einem erfindungsgemäßen Verkaufssystem geeignet ist, dadurch gekennzeichnet, daß der Spiegel einen für den Betrachter erkennbaren Bereich aufweist, auf der der Betrachter seine Aufmerksamkeit lenkt und der auf diese Weise zur Zone des Augenkontaktes des Betrachters wird.

Vorzugsweise liegt dieser Bereich eines optimalen Augenkontaktes in einem zentralen Bereich des Spiegels. Dieser Bereich kann zweckmäßigerweise durch Einfärben, Tönen oder änliche Markierungseinrichtungen markiert werden, um für den Betrachter leicht erkennbar zu sein. Dadurch wird der Betrachter dann auch veranlaßt werden, seine Aufmerksamkeit und damit die Blickrichtung diesem Bereich zuzuwenden, wodurch der Bereich zu einer Zone eines optimalen Augenkontakts vom Betrachter wird, was wieder zu einer natürlichen Erscheinungsform des Gesamtbildes beitragen kann.

In einer erfindungsgemäßen Ausführungsform, insbesondere für den Fall, daß sich im erfindungsgemäßen Verkaufssystem die

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Kamera hinter dem Spiegel befindet ist, dieser Bereich semitransparent ausgestaltet.

Als Materialien für den Spiegel und die semitransparenten Bereiche des Spiegels können bekannte und übliche Materialien für Spiegel und semitransparente Spiegel verwendet werden. Als semitransparente Spiegelmaterialien können z.B. solche mit 50 % Durchlässigkeit und 50 % Reflektion des Lichtes verwendet werden; die Verringerung der Lichtdurchlässigkeit um 50 % kann z.B. durch Tönen des Glases, üblicherweise unter Verwendung eines Grau- oder Brauntones, bewirkt werden. Semitransparente Spiegel lassen z.B. 30 % des auffallenden Lichtes hindurch, und reflektieren 70 % davon, obwohl auch andere Bereiche und deren Kombinationen möglich sind.

Insbesondere abhängig von der Art der Verkaufsobjekte kann es zweckmäßig sein, den gesamten Spiegel oder vorzugsweise bestimmte Teile davon, wie z.B. die Außenränder, mit Grautönen oder Farbtönen, zu versehen. Der semitransparente Bereich des Spiegels ist vorzugsweise in einem zentralen Bereich des Spiegels ausgebildet, und insbesondere in einer Zone eines optimalen Augenkontaktes.

Vorzugsweise wird der semitransparente Bereich des Spiegels von seiner Fläche her minimiert und zwar derart, daß der von der Kamera erfaßbare Bildausschnitt von den Rändern des semitransparenten Bereiches „umrahmt" wird, also keine Verkleinerung erfährt. Bei einem vom Durchmesser her kleinen Objektiv, das noch dazu nahe am Spiegel montiert ist, kann darum der semitransparente Bereich sehr klein sein. Dies hat zur Folge, daß selbst bei starkem Umgebungslicht, wie es beispielsweise im Freien auf der Straße vorherrscht, das Spiegelbild optimal ist und der transparente Bereich praktisch nicht stört. Dann nämlich, wenn ein sehr großer transparenter Spiegel bei sehr heller Umgebung benutzt wird,

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verblaßt das Spiegelbild, so daß für den Kunden eine sehr unnatürliche Situation entsteht.

Unter den vorgenannten „Außenrändern" des Spiegels ist der Bereich des Spiegels zu verstehen, in welchem sich der Kunde zwar sehen kann, der aber nicht von der Videokamera aufgenommen wird. Es wird somit in dem Spiegel ein „mittelgroßes" Feld durch die Außenränder definiert, das gerade so groß ist wie der Aufnahmebereich der Kamera, der durch die Brennweite ihres Objektivs usw. bestimmt ist. Der Kunde sieht dadurch, ob der ihn interessierende Bildausschnitt auch tatsächlich aufgenommen wird. Darüberhinaus wird durch die Abgrenzung, die natürlich auch als einfacher Rahmen ausgebildet sein kann, der Kunde unwillkürlich dazu gebracht, sich so zu positionieren, daß die ihn interessierenden Bereiche gut als Spiegelbild sichtbar und damit auch gleichzeitig exakt von der Kamera aufnehmbar sind. Andererseits wird dadurch, daß das Gesamt-Spiegelbild erheblich größer ist als der aufgenommene Bildausschnitt, sichergestellt, daß der Kunde trotz Konzentration auf die ihm wichtigen Bildbereiche einen natürlichen Eindruck von seiner Gesamterscheinung erhält und nicht versucht ist, weiter zurückzutreten, um eben diese Gesamterscheinung zu sehen. Dies ist insbesondere deshalb so wichtig, weil die hier gezeigte Erfindung besonders für den Self-Service-Bereich Verwendung finden kann, also kein mit dem Umgang der Vorrichtung erfahrener Verkäufer anwesend ist bzw. sein muß.

Die Speichereinrichtung, die vom Kunden oder einer dritten Person zur Speicherung und/oder zur Wiedergabe von Bildern, die von der Videokamera aufgenommen wurden, bedient werden kann, ist vorzugsweise so ausgestaltet, daß das Bild (Standbild) und/oder Bildsequenzen beliebig zeitlich versetzt und/oder gleichzeitig („Bild im Bild") abgerufen und

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miteinander verglichen werden können. Auf diese Weise ist es möglich, daß mehrere während einer „natürlichen Anprobe" vor dem Spiegel getestete Verkaufsobjekte in Ruhe miteinander verglichen werden können; der Kunde kann also die einzelnen Anproben, die er in gewohnter Weise im Spiegel zeitlich versetzt durchgeführt hat, gleichzeitig betrachten und damit direkt und gleichzeitig vergleichen.

Mit der Speichereinrichtung ist operativ eine Bildwiedergabeeinrichtung zum Wiedergeben der aufgenommenen Bilder zur Betrachtung durch den Kunden verbunden. Die Bildwiedergabeeinrichtung zum Wiedergeben der aufgenommenen Bilder und zur Betrachtung durch den Kunden ist z.B. als Monitor ausgestaltet. Auf dem Monitor werden die Bilder (einzelne Standbilder (Stillstandprojektion) und/oder Bildsequenzen ausgewählter Länge) gezeigt und können auf diese Weise direkt verglichen werden; das Abrufen von in der Speichereinrichtung gespeicherten Bildern kann z.B. durch einen Monitor, der als Berührungsschirm ausgestaltet ist, oder durch Bedienungstasten erfolgen. Auf diese Weise ist es möglich, Bilder mehrmals zu betrachten, dann z.B. eine engere Auswahl zu treffen, und dann nach einem nochmaligen Vergleich innerhalb der engeren Auswahl eine endgültige Auswahl zu treffen.

In einer weiteren Ausführungsform ist die Möglichkeit vorgegeben, die Wiedergabe der aufgenommenen Bilder als (seitenverkehrtes) Spiegelbild oder als echtes Abbild (entsprechend einem Foto) zu bewirken. Im ersten Fall sieht sich der Kunde auf dem Monitor (bzw. auf einem ausgedruckten Bild) so, wie er sich normalerweise im Spiegel sieht, im anderen Fall sieht sich der Kunde so, wie ihn eine andere Person wahrnimmt oder wie er auf einer Fotografie erscheint. Diese Seitenumkehr kann beispielsweise durch ein an sich bekanntes Vertauschen der einzelnen Bildelemente entlang

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einer vertikalen Symmetrieachse geschehen. Diese Möglichkeit ist besonders für solche Kunden wichtig, die sich nicht gerne in Film- oder Fotoaufnahme sehen sondern lieber nach Art des ihnen geläufigen Spiegelbilds betrachten.

In einer Ausführungsform kann die Bildwiedergabeeinrichtung auch als Druckeinrichtung zum Ausdrucken einzelner Standbilder ausgestaltet sein, die mit der Speichereinrichtung operativ verbunden ist. In einer bevorzugten Ausführungsform besteht die Bildwiedergabeeinrichtung aus einem Monitor und einer Druckeinrichtung; dadurch ist es möglich, zunächst Bilder oder Bildsequenzen im Monitor zu betrachten und zu vergleichen, und dann nach einer gegebenenfalls engeren Auswahl durch die Druckeinrichtung Bilder auszudrucken, die dann z.B. nach Hause mitgenommen werden können, um dort in Ruhe eine endgültige Entscheidung zu treffen.

Bildwiedergabeeinrichtungen, z.B. Monitor und/oder Druckeinrichtung, sind vorzugsweise so ausgestaltet, daß sie auch Ausschnitte, Vergrößerungen und/oder Verkleinerungen, oder Bilder mit veränderter Helligkeit, bereitstellen können, sowie seitenverkehrte Bilder.

Für den Fall, daß sich die Videokamera hinter dem Spiegel befindet, ist sie in einem die Kamera umschließenden Raum hinter dem Spiegel montiert, der lichtdicht abgeschlossen werden kann. Zweckmäßigerweise befindet sie sich in einem hinter dem Spiegel angebrachten Gehäuse, das lichtdicht abgeschlossen werden kann und zusammen mit der Kamera eine Einheit bildet, die als solche bewegt und entfernt werden kann.

Das erfindungsgemäße Verkaufssystem weist vorzugsweise auch eine Beleuchtungseinrichtung auf, die zum Beleuchten der von

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der Videokamera aufzunehmenden Situation, d.h. also des Kundens in verschiedenen Anprobesituationen, dient, und die vorzugsweise steuerbar und/oder einstellbar ausgebildet und angebracht ist.

Der Kunde soll sich zweckmäßigerweise, insbesondere auch abhängig von der Art der Verkaufsobjekte, unter einer kontrollier- und steuerbaren Beleuchtung befinden, die nicht nur dem Zweck dienen soll, richtig belichtete und gut ausgeleuchtete Bilder des Kunden aufnehmen zu können, sondern auch, die anzuprobierenden Verkaufsobjekte im richtigen Licht betrachten zu können. Dazu ist sowohl die Art und Stärke der Beleuchtungsquelle, als auch die Position der Beleuchtungsquelle innerhalb des Verkaufssystems, und insbesondere zum Kunden (z.B. eine seitliche Beleuchtung) von Bedeutung. Sowohl die Beleuchtungsstärke als auch die Position sollen vom Kunden und/oder dem Verkaufspersonal steuerbar sein, damit die günstigste Beleuchtung in verschiedenen Situationen möglich ist. Dabei kann auch die Videokamera so ausgestaltet sein, daß sie mit einer automatischen Einstellung versehen ist, die, abhängig von der jeweiligen Situation, die Beleuchtungsstärke und/oder die Position des Beleuchtungskörpers automatisch einstellt, um die günstigsten Werte für z.B. die Helligkeit, den Kontrast, die Farbschattierung, Farbnuance, Schärfe usw. zu erhalten.

Für eine optimale Bildwiedergabe, aber auch für eine optimale Wirkung der anzuprobierenden Verkaufsobjekte, ist die Distanz des Kunden zur Videokamera von großer Bedeutung. Zweckmäßigerweise enthält das erfindungsgemäße Verkaufssystem auch eine Distanzvorgabeeinrichtung zum Einstellen der günstigsten Distanz des Kundens zur Videokamera; diese Distanzvorgabeeinrichtung, mit der insbesondere ein Mindestwert der Distanz eingehalten werden soll, kann z.B. aus einer geeignet angebrachten Markierung, einem Stab, z.B.

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mit Entfernungsangaben, einer Schranke, usw., bestehen, die von der Videokamera aber zweckmäßigerweise nicht aufgenommen werden.

Vorzugsweise ist auch eine Bedienungseinrichtung zum Steuern und/oder Bedienen aller Systemelemente, die vom Kunden und/oder dem Verkaufspersonal gesteuert und/oder bedient werden sollen, vorgesehen, die zweckmäßigerweise so ausgebildet und angebracht ist, daß der Kunde die Bedienungseinrichtung in seiner natürlichen Körperhaltung betätigen kann. Die Bedienungseinrichtung ist deshalb insbesondere als bewegbare drahtlose oder drahtgebundene Fernsteuerung ausgebildet.

Die Einstellung der Brennweite der Videokamera kann, insbesondere abhängig von der Natur der Verkaufsobjekte, automatisch oder durch Hand eingestellt werden. Zur Anprobe von Modellkleidern, die meist mit Bewegungsabläufen verbunden ist, und Bildsequenzen erfordert, ist eine automatische Foccussierung zweckmäßig, während z.B. für die Anprobe von Brillen oder Schmuck eine fixierte Brennweite verwendet werden kann.

Die Art und Weise der Anordnung der Verkaufssystemelemente hängt auch von den für die Anprobe vorhandenen Umgebungsbedingungen ab. So kann es z.B., wenn ein Verkauf in einer offenen oder nicht einzeln abgeschlossenen Umgebung stattfindet, wie z.B. auf Messen, Jahrmärkten usw., zweckmäßig sein, die Systemelemente, also insbesondere Spiegel, Videokamera, Speichereinrichtung, Bildwiedergabeeinrichtung, Beleuchtungseinrichtung usw., innerhalb einer transportablen Einheit, z.B. einer stoßunempfindlichen Kabine, anzubringen, während ein abgeschlossener Verkaufsraum, z.B. eine Modeboutique, zweckmäßigerweise mit Systemkomponenten arbeitet, die

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entsprechend der jeweiligen Gegebenheiten und dem jeweiligen Zweck angeordnet werden. Die Anordnung und insbesondere der Abstand zwischen den einzelnen Verkaufssystemelementen ist auch stark von der Art der Verkaufsobjekte abhängig; wenn z.B. eine genaue Betrachtung erforderlich ist, wie z.B. bei einem Optiker, wird eine andere Anordnung/Distanz und Beleuchtungsart verwendet werden, als z.B. zur Anprobe von Kleidungsstücken. Für eine genauere Betrachtung, wie z.B. bei einem Optiker, kann es deshalb z.B. auch zweckmäßig sein, den als Berührungsschirm ausgebildeten Monitor, oder den Monitor mit Bedienungstasten, geneigt anzubringen, um ihn der Höhe des Kundens, z.B. in sitzender Position, anzupassen.

In einer transportablen Einheit können die einzelnen Verkaufssystemelemente z.B. auf einer Plattform entsprechender Größe, die z.B. mit aufklappbaren Wänden versehen sein kann, so montiert sein, daß innerhalb bestimmter Grenzbereiche noch eine Veränderung der gegenseitigen Stellung zueinander möglich ist.

Eine weitere Verwendungsmöglichkeit der Erfindung besteht darin, daß das System dann, wenn es an sich abgeschaltet ist und z.B. nach Ladenschluß „inaktiv" in der Ecke steht, gleichzeitig als Überwachungskamera, also im Rahmen eines Sicherheitssystems verwendet werden kann. Selbstverständlich ist es auch möglich, das System bei geöffnetem Geschäft in dieser Art und Weise zu verwenden, um beispielsweise Ladendiebstahl zu verhindern bzw. zu dokumentieren.

Gegenstand der Erfindung ist deshalb auch die Verwendung eines erfindungsgemäßen Verkaufssystems zur Überwachung von Räumen, Raumabschnitten oder dergleichen Gebäudeteilen.

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Das erfindungsgemäße Verkaufssystem wird nun unter Bezugnahme auf die Zeichnung beispielhaft erläutert, ohne den Rahmen der Erfindung darauf zu beschränken.

Hierbei zeigen:
Figur 1 eine schematische Darstellung eines erfindungsgemäß verwendeten Spiegels mit dahinter befindlicher Videokamera;
Figur 2 eine schematische Darstellung der Anordnung einzelner Elemente des Verkaufssystems.

In Figur 1 ist eine Videokamera (A) mit einem teilweise semitransparenten Spiegel (S) verbunden. Der Spiegel ist an einer drehbaren und in einer Führung (T) höhenverstellbaren Achse (B) befestigt, wodurch eine Höhen- und/oder Neigungsverstellung ermöglicht wird, und der Spiegel z.B. leicht der Länge und Größe des Kundens angepaßt werden kann (z.B. sitzend oder stehend). Die Kamera (A) ist um die gleiche Achse (B) drehbar beweglich, wodurch sichergestellt wird, daß sich die Kamera (Objektivachse) in einem Winkel von 90 ° zur Spiegelebene befindet. Der Spiegel besteht aus den drei Bereichen (C), (D) und (E), die einen verschiedenen Reflektionsgrad und eine verschiedene Transparenz besitzen.

Die Bereiche (C), (D) und (E) sind so angeordnet, daß der Bereich (C) im Zentrum/Augenhöhe, und damit vorzugsweise im Bereich der Augenkontaktzone liegt, und (D) und (E) in den äußeren Bereichen einer optimalen Betrachtungszone. Durch eine verschiedene Einfärbung/Tönung der Bereiche (C), (D) und (E), oder eine sichtbare Begrenzung dieser Bereiche, wie in der Figur 1 dargestellt, bekommt der Kunde den Eindruck eines qualitativ hochwertigen Spiegels, der insbesondere zur Anprobe der Verkaufsobjekte ausgestaltet wurde, wobei dem Kunden auch gleichzeitig ein Hinweis auf den besten Aufnahmebereich, der sich im Bereich (D), und insbesondere in und in der Nähe des Bereiches (C) befindet, gegeben wird.

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(C) ist der Bereich des teilweise semitransparenten Spiegels, der groß genug ist, um es der Kamera zu ermöglichen, das Bild aufzunehmen. Im Hinblick auf die Spiegelwirkung muß die Qualität des semitransparenten Bereichs (C) des Spiegels nicht die von üblichen Silberspiegeln aufweisen;

(D) ist ein Silberspiegel hoher Qualität, wie er insbesondere beim Modellstehen verwendet wird;

(E) ist ein Silberspiegel, der mit Grau- oder Farbtönen schwach eingefärbt sein kann.

In der Anordnung der Figur 2 befindet sich der Kunde in einer optimalen Position, was durch eine Kombination der verschiedenen Bereiche des Spiegels (C), (D) und (E) nach Figur 1 und dem Abstand zwischen dem Kunden und dem Spiegel bewirkt wird. Die Mindestdistanz (G) wird durch einen Stab oder einen Ablagetisch (F), der sich vor dem Berührungsschirm/Monitor befindet, und dem Kunden durch die Stablänge bzw. die Tischtiefe den Minimalabstand (G) anzeigt, gesteuert. Der Stab bzw. Tisch (F) kann am Monitor befestigt sein, aber auch freistehend sein.

Der Bedienknopf (I) befindet sich in einer Position, die vom Kunden mit entspannter Armlänge (J) erreicht werden kann; durch Drücken des Knopfes (I) wird die Videokamera (A), die sich hinter dem Spiegel (S) befindet, in Betrieb genommen. Die in Figur 2 dargestellte beispielhafte Anordnung eignet sich insbesondere für eine genaue Betrachtung, z.B. zur Anprobe von Schmuck oder Brillen, bei der sich der Kunde vorzugsweise in sitzender Position befindet; dazu ist auch der Schirm des Monitors (H) neig- und schwenkbar ausgestaltet.

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In der Ausführungsform der Figur 2 sind eine zusätzliche Kamera A1 und ein zusätzlicher Spiegel L vorgesehen. Der Spiegel L befindet sich hinter dem teilweise semitransparenten Spiegel S, z.B. im hinteren Teil einer transportablen Einheit, wie z.B. einer Kabine. Der Spiegel L ist länger als der Spiegel S, z.B. ein Spiegel voller Länge, wie er zur Anprobe von Kleidungsstücken, z.B. Mänteln, Hosen, Schuhen usw., üblich ist. Der Spiegel L muß nicht unbedingt einen semitransparenten Bereich aufweisen, ist aber vorzugsweise auch in drei Zonen, die den Zonen C, D und E des Spiegels S entsprechen, unterteilt, um dem Kunden das gleiche Betrachtungsgefühl wie vor dem Spiegel S zu vermitteln. Der Spiegel L ist an der Achse M befestigt und um diese schwenkbar. Zur Entfernung des Spiegels L und/oder für einen leichten Transport, z.B. in eine andere Verkaufsabteilung eines Warenhauses, sind die Elemente des Systems, z.B. die Spiegelanordnungen S und/oder M, vorzugsweise auf Rollen gelagert. Neben den Kameras A und A1 kann es in einigen Fällen auch zweckmäßig sein, zusätzliche Kameras, die sich z.B. auf einem Stativ befinden und/oder vom Verkaufspersonal gehalten und auch bedient werden, vorzusehen.

Bei einer anderen Ausführungsform wird eine Aufnahmeeinrichtung (Videokamera) mit extrem kleinem Durchmesser des Objektivs verwendet, wobei dieses Objektiv direkt in den Spiegel eingesetzt ist, so daß kein semitransparenter Bereich notwendig ist. Wenn der Durchmesser des Objektis gering genug ist, kann sich der Kunde dann z.B. störungsfrei zur Begutachtung eines Kleidungsstückes im Ganzen betrachten. Bei dieser Ausführungsform der Erfindung kann die Objektivachse bzw. der Blickwinkel des Kameraobjektivs auch so ausgerichtet werden, daß sie nicht direkt senkrecht zum Spiegel liegt. Die Kamera kann dann beispielsweise „etwas von oben" auf den Kunden blicken, wobei der Neigungswinkel dann zweckmäßigerweise derart eingestellt

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ist, daß das (vom Kunden wahrnehmbare) Objektiv gerade außerhalb seines Spiegelbildes liegt. Vorzugsweise wird die Kamera aber auch bei dieser Ausführungsform so eingestellt, daß eine optimale Augenkontaktzone gewährleistet ist.

P A T E N T A N S P R Ü C H E

1. Verkaufssystem mit einem Spiegel, in welchem ein Kunde sich mit einem Verkaufsobjekt, z.B. einer Brille, einem Kleidungsstück, Schmuck oder dergleichen, betrachten kann,
g e k e n n z e i c h n e t d u r c h
eine Videokamera (A), welche relativ zum Spiegel (S) so angeordnet ist, daß der Kunde, wenn er sich im Spiegel (S) betrachtet, von der Videokamera (A) aufnehmbar ist,
eine Speichereinrichtung, die vom Kunden oder einer dritten Person zum Speichern und Wiedergeben von Bildern, die von der Videokamera (A) aufgenommen wurden, betätigbar ist, und
eine Bildwiedergabeeinrichtung zum Wiedergeben der aufgenommenen Bilder zur Betrachtung durch den Kunden.

2. Verkaufssystem nach Anspruch 1,
d a d u r c h g e k e n n z e i c h n e t,
daß der Spiegel (S) derart zusammen mit der Videokamera (A) einstellbar ist, daß der Kunde unabhängig von seiner Körpergröße und/oder von einem zu betrachtenden Körperabschnitt den Spiegel (S) nach seinem Blickfeld einstellen kann.

3. Verkaufssystem nach Anspruch 6,
d a d u r c h g e k e n n z e i c h n e t,
daß die Videokamera (A) hinter dem semitransparenten Bereich (C) des Spiegels (S) und mit dem Spiegel (S) zusammen beweglich derart montiert ist, daß die Videokamera (A) durch den semitransparenten Bereich (C) hindurch Bilder vom Kunden aufnehmen und der Kunde sich

auch im semitransparenten Bereich (C) des Spiegels (S) betrachten kann.

4. Verkaufssystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Spiegel (S) einen für den Betrachter erkennbaren Bereich (C) aufweist, auf den der Betrachter seine Aufmerksamkeit lenkt, und der auf diese Weise zur Zone des Augenkontaktes des Betrachters wird.

5. Verkaufssystem nach Anspruch 3, dadurch gekennzeichnet, daß der Bereich (C) ein zentraler Bereich des Spiegels (S) ist.

6. Verkaufssystem nach Anspruch 3, dadurch gekennzeichnet, daß der Bereich (C) durch Einfärben, Tönen und/oder dergleichen Markierungseinrichtungen erkennbar ist.

7. Verkaufssystem nach Anspruch 4, dadurch gekennzeichnet, daß der Bereich (C) semitransparent ist.

8. Verkaufssystem nach Anspruch 3, dadurch gekennzeichnet, daß der semitransparente Bereich (C) von seiner Größe und/oder Geometrie her derart ausgebildet ist, daß seine Ränder im wesentlichen dem von der Videokamera (A) aufnehmbaren Bildausschnitt entsprechen und diesen gerade nicht oder nur unwesentlich begrenzen.

9. Verkaufssystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Spiegel (S) so groß ausgebildet ist, daß ein

Kunde im Spiegel (S) einen größeren Bereich als Spiegelbild betrachten kann, als er von der Videokamera (A) aufgenommen wird.

10. Verkaufssystem nach Anspruch 9, d a d u r c h g e k e n n z e i c h n e t, daß ein Spiegelbereich (D), welcher dem von der Kamera aufnehmbaren Bildausschnitt entspricht, auf dem Spiegel durch Einfärbungen, Tönungen oder dergleichen Markierungseinrichtungen erkennbar gemacht ist.

11. Verkaufssystem nach einem der vorhergehenden Ansprüche, d a d u r c h g e k e n n z e i c h n e t, daß die Speichereinrichtung zur Wiedergabe einzelner Standbilder und/oder von Bildsequenzen vorgegebener Länge ausgebildet ist.

12. Verkaufssystem nach einem der vorhergehenden Ansprüche, d a d u r c h g e k e n n z e i c h n e t, daß es eine Druckeinrichtung enthält, die mit der Speichereinrichtung zum Ausdrucken einzelner Standbilder operativ verbunden ist.

13. Verkaufssystem nach einem der Ansprüche 7 bis 12, d a d u r c h g e k e n n z e i c h n e t, daß die Kamera (A) in einem die Kamera umschließenden Raum hinter dem Spiegel montiert ist, der lichtdicht abgeschlossen ist.

14. Verkaufssystem nach einem der vorhergehenden Ansprüche, d a d u r c h g e k e n n z e i c h n e t, daß es eine Beleuchtungseinrichtung zum Beleuchten der von der Videokamera (A) aufzunehmenden Situation enthält, die steuerbar und/oder einstellbar ausgebildet und angebracht ist.

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15. Verkaufssystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie eine Distanzvorgabeeinrichtung (F) zum Einstellen der Distanz (G) des Kunden zur Videokamera (A) enthält.

16. Verkaufssystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es eine Bedienungseinrichtung (I) zum Steuern und Bedienen von Systemelementen, insbesondere der Videokamera (A) und/oder der Speichereinrichtung, durch den Kunden oder eine dritte Person enthält, die derart ausgebildet und angebracht ist, daß der Kunde die Bedienungseinrichtung in einer natürlichen Körperhaltung betätigen kann.

17. Verkaufssystem nach Anspruch 16, dadurch gekennzeichnet, daß die Bedienungseinrichtung (I) als bewegbare drahtlose oder drahtgebundene Fernsteuerung ausgebildet ist.

18. Verwendung eines Verkaufssystems nach einem der vorhergehenden Ansprüche zur Überwachung von Räumen, Raumabschnitten oder dergleichen Gebäudeteilen.

19. Spiegel, verwendbar in einem Verkaufssystem nach einem der Ansprüche 1 bis 13, dadurch gekennzeichnet, daß der Spiegel (S) einen für den Betrachter erkennbaren Bereich (C) aufweist, auf den der Betrachter seine Aufmerksamkeit lenkt, und der auf diese Weise zur Zone des Augenkontaktes vom Betrachter wird.

20. Spiegel nach Anspruch 19,
d a d u r c h g e k e n n z e i c h n e t,
daß der Bereich (C) ein zentraler Bereich des Spiegels (S) ist.

21. Spiegel nach Anspruch 19 oder 20,
d a d u r c h g e k e n n z e i c h n e t,
daß der Bereich (C) durch Einfärben, Tönen oder dergleichen Markierungen erkennbar ist.

22. Spiegel nach einem der Ansprüche 19 bis 21, verwendbar in einem Verkaufssystem nach einem der Ansprüche 6 bis 17,
d a d u r c h g e k e n n z e i c h n e t,
daß der Bereich (C) semitransparent ist.

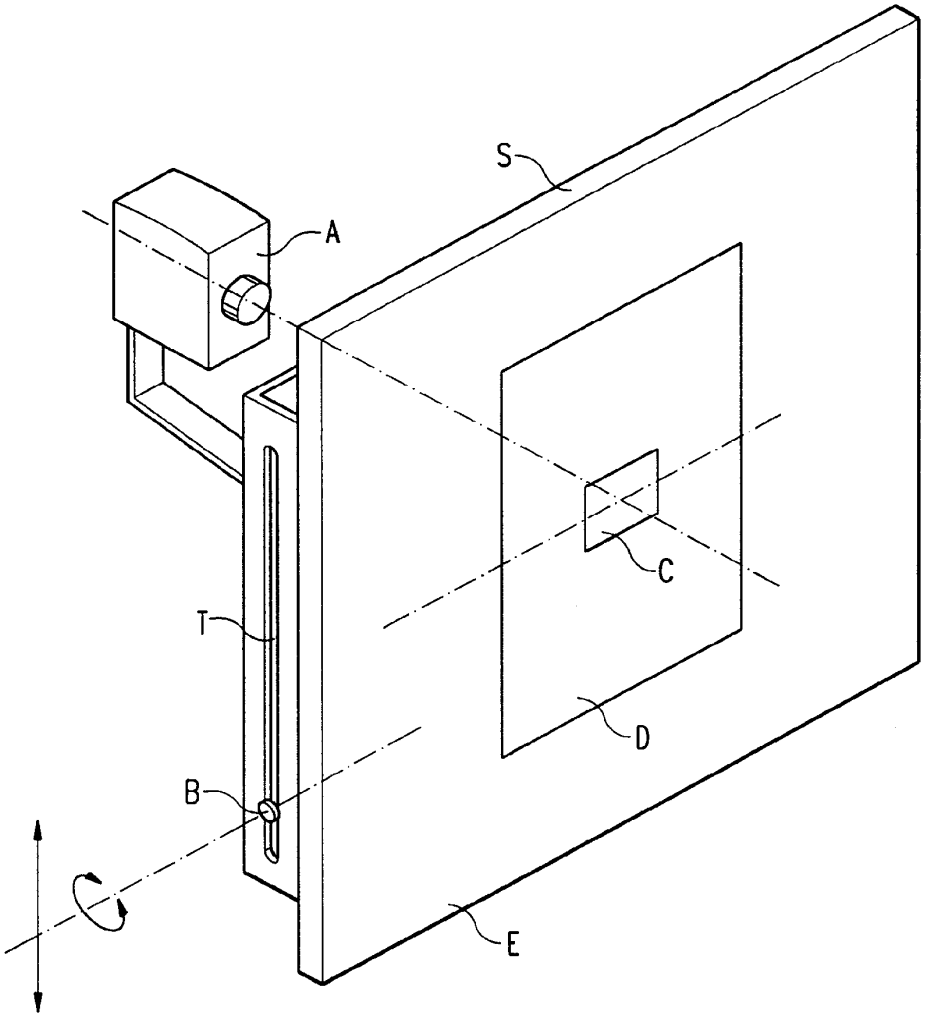


Fig. 1

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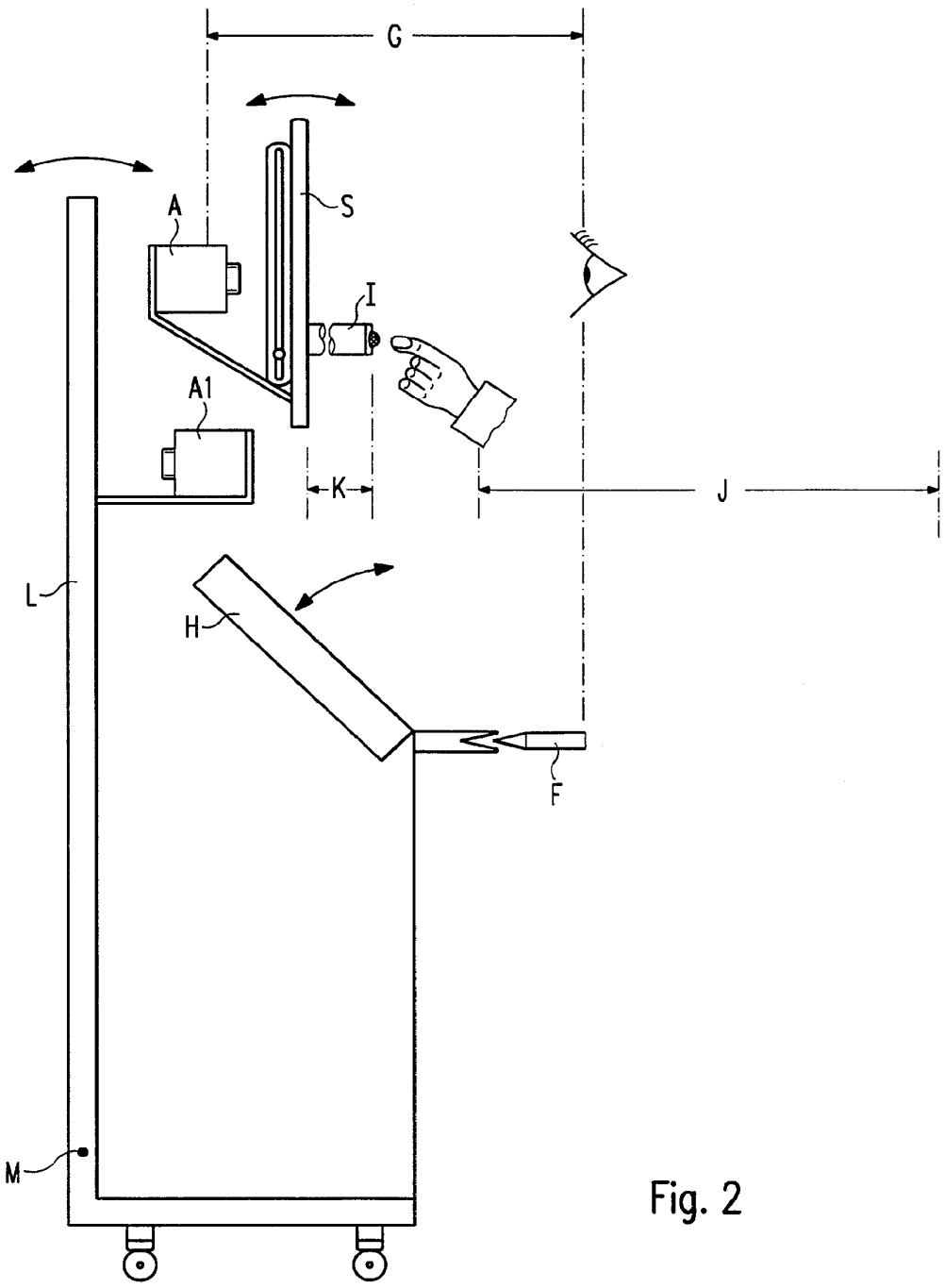


Fig. 2

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INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/EP 99/07638

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A45D44/00 G09B19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G07F A45D G09B G03B A47G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 664 258 A (MARINIER STEPHANE) 10 January 1992 (1992-01-10) abstract; figures 1-7	19-22
A	US 4 864 410 A (VASSILADIS ARTHUR ET AL) 5 September 1989 (1989-09-05) column 2, line 49 - line 61 column 4, line 28 - line 41; figures 2,3 abstract	1-15, 18-22
A	US 4 434 467 A (SCOTT DALE) 28 February 1984 (1984-02-28) column 1, line 16 - line 21 column 3, line 58 -column 4, line 19; figure 1 abstract	1-15, 18-22

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[X] Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
15 February 2000	22/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Wauters, J

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INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/EP 99/07638

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 261 012 A (MALOOMIAN LAURENCE G) 7 April 1981 (1981-04-07) column 5, line 12 - line 21; figure 1 abstract	1-15, 18-22
A	US 5 621 492 A (BEVERIDGE IAIN M ET AL) 15 April 1997 (1997-04-15) column 3, line 10 - line 18; figures 2,3,5,6 abstract	1-15, 18-22
A	US 5 768 142 A (JACOBS HERBERT H) 16 June 1998 (1998-06-16) column 3, line 18 - line 29; figure 1 abstract	1-15, 18-22
A	US 5 184 160 A (MASSARSKY YEFIM) 2 February 1993 (1993-02-02) abstract; figures 2-4	1-3

1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inten nal Application No
PCT/EP 99/07638

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2664258 A	10-01-1992	NONE	
US 4864410 A	05-09-1989	NONE	
US 4434467 A	28-02-1984	US 4258478 A	31-03-1981
US 4261012 A	07-04-1981	NONE	
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US 5768142 A	16-06-1998	NONE	
US 5184160 A	02-02-1993	NONE	

Form PCT/ISA/210 (patent family annex) (July 1992)

INTERNATIONALER RECHERCHENBERICHT

Intern. Aktenzeichen
PCT/EP 99/07638

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 7 A45D44/00 G09B19/00

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 7 G07F A45D G09B G03B A47G

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der Internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie°	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X	FR 2 664 258 A (MARINIER STEPHANE) 10. Januar 1992 (1992-01-10) Zusammenfassung; Abbildungen 1-7	19-22
A	US 4 864 410 A (VASSILADIS ARTHUR ET AL) 5. September 1989 (1989-09-05) Spalte 2, Zeile 49 - Zeile 61 Spalte 4, Zeile 28 - Zeile 41; Abbildungen 2,3 Zusammenfassung	1-15, 18-22
A	US 4 434 467 A (SCOTT DALE) 28. Februar 1984 (1984-02-28) Spalte 1, Zeile 16 - Zeile 21 Spalte 3, Zeile 58 -Spalte 4, Zeile 19; Abbildung 1 Zusammenfassung	1-15, 18-22

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[X] Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

[X] Siehe Anhang Patentfamilie

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Datum des Abschlusses der Internationalen Recherche	Absendedatum des Internationalen Recherchenberichts
15. Februar 2000	22/02/2000

Name und Postanschrift der Internationalen Recherchenbehörde	Bevollmächtigter Bediensteter
Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Wauters, J

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Formblatt PCT/ISA/210 (Blatt 2) (Juli 1992)

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INTERNATIONALER RECHERCHENBERICHT

Intern. ...nales Aktenzeichen
PCT/EP 99/07638

C.(Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie°	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	US 4 261 012 A (MALOOMIAN LAURENCE G) 7. April 1981 (1981-04-07) Spalte 5, Zeile 12 - Zeile 21; Abbildung 1 Zusammenfassung	1-15, 18-22
A	US 5 621 492 A (BEVERIDGE IAIN M ET AL) 15. April 1997 (1997-04-15) Spalte 3, Zeile 10 - Zeile 18; Abbildungen 2,3,5,6 Zusammenfassung	1-15, 18-22
A	US 5 768 142 A (JACOBS HERBERT H) 16. Juni 1998 (1998-06-16) Spalte 3, Zeile 18 - Zeile 29; Abbildung 1 Zusammenfassung	1-15, 18-22
A	US 5 184 160 A (MASSARSKY YEFIM) 2. Februar 1993 (1993-02-02) Zusammenfassung; Abbildungen 2-4	1-3

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INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Interne nales Aktenzeichen
PCT/EP 99/07638

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
FR 2664258 A	10-01-1992	KEINE	
US 4864410 A	05-09-1989	KEINE	
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US 4261012 A	07-04-1981	KEINE	
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		JP 10503343 T	24-03-1998
		WO 9623386 A	01-08-1996
US 5768142 A	16-06-1998	KEINE	
US 5184160 A	02-02-1993	KEINE	

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(74) Agents: **PEARL COHEN ZEDEK LATZER** et al.; Shenkar 5, Po Box 12704, 46733 Herzlia (IL).

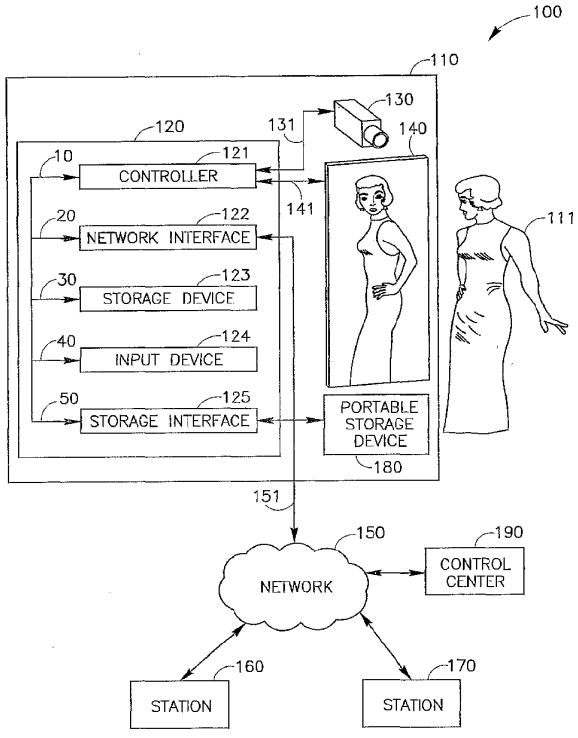
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(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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— *without international search report and to be republished upon receipt of that report*

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(54) **Title:** DEVICES, SYSTEMS AND METHODS OF CAPTURING AND DISPLAYING APPEARANCES



(57) **Abstract:** Some demonstrative embodiments of the invention include systems, devices and/or methods enabling appearance comparison. The system, according to some demonstrative embodiments, may include at least one interactive imaging and display station. The station may include, for example, a mirror-display device capable of selectably operating in either or both a mirror mode or a display mode; an imaging device to capture one or more appearances appearing in a filed of view in front of the mirror-display device; and/or an image control unit to select the mode of operation of the mirror-display device according to a user command. Other embodiments are described and claimed.

WO 2006/092793 A2

DEVICES, SYSTEMS AND METHODS OF CAPTURING AND DISPLAYING APPEARANCES

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims priority from United States Provisional Application No. 60/656,884, filed March 1, 2005; and United States Provisional Application No. 60/656,885, filed March 1, 2005, the entire disclosures of both of which are incorporated herein by reference.

FIELD OF THE INVENTION

[002] The invention relates generally to imaging and display systems and, more particularly, to interactive displays, e.g., in retail and/or service environments.

BACKGROUND OF THE INVENTION

[003] Customers may shop for consumer articles, for example, apparel such as clothes, e.g., shirts, pants, coats and other garments, as well as shoes, glasses, and/or any other items or products, such as cosmetics, furniture and the like. Shopping normally takes place at a shopping facility, for example, retail stores. Prior to making a decision which article to buy a customer may try on various articles (e.g., apparel, cosmetics) and/or pose with other articles (e.g., furniture), and may view for each trial a user-appearance in front of a mirror, which may be located, for example, at a trial area of the retail store. For example, the customer may try on a first article, e.g., a suit, and view for that first trial his/her user-appearance in front of the mirror. Then, the customer may try on a second article, e.g., another suit. The customer may then need to memorize his/her user-appearance from the first trial in order to perform a mental comparison between the first article and the second article, thereby to evaluate which of the two articles might be a better fit for the customer.

[004] Unfortunately, since the customer may try on numerous articles and/or since the second trial may take place a considerable amount of time after the first trial, the customer may not be able to recall his/her appearance for each trial and may therefore be

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required to repeatedly retry articles, e.g., items of apparels, previously tried on. This may result in a frustrating and inefficient shopping experience.

SUMMARY OF SOME EMBODIMENTS OF THE INVENTION

[005] Some demonstrative embodiments of the invention include devices, systems and/or methods enabling appearance comparison.

[006] According to some demonstrative embodiments of the invention, a system enabling appearance comparison may include at least one interactive imaging and display station. The station may include, for example, a mirror display device capable of operating in either or both a mirror or a display mode; an imaging device to capture one or more appearances from a field of view in front of the mirror-display device; and/or an image control unit to select the mode of operation the mirror display device according to a user command.

[007] According to some demonstrative embodiments of the invention the image control unit may include an input device to receive the user command.

[008] According to some demonstrative embodiments of the invention, the image control unit may include a storage device to store data of one or more images which may correspond to one or more appearances.

[009] According to some demonstrative embodiments of the invention, the mirror-display device may be capable of being partitioned into at least first and second simultaneously-displayable frames. The first frame may be selectably operable, for example, both in a mirror mode and a display mode. The second frame may be operable, for example, in a mirror mode.

[0010] According to some demonstrative embodiments of the invention, the imaging device may be capable of capturing three-dimensional images of appearances.

[0011] According to some demonstrative embodiments of the invention, the mirror-display device may be capable of displaying images of appearances at predefined sequences.

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[0012] According to some demonstrative embodiments of the invention, the image control unit may be able to selectively enable a user access to images of appearances authorized to the user, e.g., based on user-identifying data received from the user.

[0013] According to some demonstrative embodiments of the invention, the at least one interactive imaging and display system may include two or more interactive imaging and display stations able to communicate over a network. For example, the two or more stations may be able to communicate between each other data representing images of appearances.

[0014] According to some demonstrative embodiments of the invention, the image control unit may control the mirror-display device to display, e.g., during the display mode, one or more images corresponding to the appearances. The one or more images may include, for example, one or more mirrored appearances.

[0015] According to some demonstrative embodiments of the invention, a method enabling appearance comparison may comprise using a mirror mode of operation of a mirror-display device capable of being selectably operated in either a mirror or a display mode; capturing an image corresponding to an appearance of a first trial in front of the mirror-display device; storing the image of the first trial; selecting the display mode of operation of the mirror-display device; and/or retrieving the image of the first trial and displaying the image on the mirror-display device.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to organization and method of operation, together with features and advantages thereof, may best be understood by reference to the following detailed description when read with the accompanied drawings in which:

[0017] Fig. 1 is a schematic illustration of an interactive system enabling appearance comparison in accordance with some demonstrative embodiments of the invention;

[0018] Figs. 2A and 2B are schematic illustrations of two, sequential, stages of appearances comparison using an interactive system in accordance with some demonstrative embodiments of the invention; and

[0019] Figs. 3A, 3B and 3C are schematic illustrations of three, sequential, stages of appearances comparison using an interactive system in accordance with some demonstrative embodiments of the invention; and

[0020] Fig. 4 is a schematic flow chart of a method enabling comparison of one or more user-appearances in accordance with some demonstrative embodiments of the invention.

[0021] It will be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn accurately or to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity or several physical components included in one element. Further, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. It will be appreciated that these figures present examples of embodiments of the present invention and are not intended to limit the scope of the invention.

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DETAILED DESCRIPTION OF SOME DEMONSTRATIVE EMBODIMENTS OF THE INVENTION

[0022] In the following description, various aspects of the present invention will be described. For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention may be practiced without the specific details presented herein. Furthermore, some features of the invention relying on principles and implementations known in the art may be omitted or simplified to avoid obscuring the present invention.

[0023] Some demonstrative embodiments of the invention may include an interactive system enabling a user to compare one or more appearances, for example, to compare between different appearances, e.g., as described in detail below.

[0024] The term "user-appearance" as used herein may relate to the appearance of a customer while trying a consumer article. The article may include, for example, apparel, such as clothing, shoes, glasses, garments, ties, and the like; an article, e.g., furniture, located in the vicinity of the customer; as well as other items, articles, designs or products such as, for example, cosmetics, headdresses, hair cuts.

[0025] According to some demonstrative embodiments of the invention, the system may include an imaging device able to capture user-appearances and a mirror-display device, able to operate selectably as a mirror or as a display. When in the mirror mode, the mirror-display device may enable the user to evaluate and/or view a user-appearance of a current trial of a consumer article. When in the display mode, the mirror-display device may enable the user to evaluate and/or view one or more user-appearances, e.g., as captured by the imaging device, of a previous trial, e.g., as described in detail below.

[0026] Reference is made to Fig. 1, which schematically illustrates an interactive system 100 in accordance with some demonstrative embodiments of the invention.

[0027] According to some demonstrative embodiments of the invention, system 100 may include an interactive imaging and display station 110, which may include an image control unit 120, an imaging device 130, and a mirror-display device 140. Image control

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unit 120 may include a controller 121, a network interface 122, a storage device 123, an input device 124, all of which elements are described in detail below.

[0028] Aspects of the invention are described herein in the context of demonstrative embodiments of an imaging device, e.g., imaging device 130, a mirror-display device, e.g., mirror-display device 140, and/or an image control unit, e.g., image control unit 120, being separate units of an appearance comparison system, e.g., system 100. However, it will be appreciated by those skilled in the art that the invention is not limited in this respect, and that according to other embodiments of the invention, the system may include any suitable configuration, combination, and/or arrangement of the imaging device, the mirror-display device, and/or the image control unit. For example, the system may include an integrated module including the mirror-display device, the imaging device and/or the image control unit. For example, the imaging device and/or the image control unit may be implemented as part of the mirror-display device.

[0029] According to some demonstrative embodiments of the invention, mirror-display device 140 may be configured and/or may include components and mechanisms allowing mirror-display device 140 to operate selectably in two modes of operation. In a first mode of operation (the "mirror-mode"), mirror-display device 140 may operate as a mirror. In a second mode of operation (the "display mode"), mirror-display device 140 may operate as a display. When mirror-display device 140 operates in the mirror-mode, a user 111 of system 100 may evaluate and/or view a user-appearance of a first trial of a consumer article, as may be reflected by mirror-display device 140. Imaging device 130 may capture an image of the user-appearance of the first trial. The captured image may be stored, for example, by storage device 123, e.g., as described below. User 111 may then pose in front of mirror-display device 140 trying a second article, and imaging device 130 may capture a second image of the user-appearance of the second trial. When in the display mode, mirror-display 140 may be controlled to display one or more of previously captured images. By virtue of the capability of mirror-display device 140 to operate selectably in the mirror or display mode, user 111 may be able to compare simultaneously or sequentially between the user-appearances of the first and second trials, as described in detail below. In some demonstrative embodiments of the invention, e.g., as shown in Figs. 1, 2A, 2B, 3a, and/or 3B, controller 121 may control device 140 to

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display, during the display mode of operation, a mirror-image of the appearances. However, it will be appreciated by those of ordinary skill in the art that the invention is not limited in this respect, and that in other embodiments the controller may control device 140 to display, during the display mode of operation, any other image corresponding to the appearance, e.g., a rotated appearance, a revered appearance, a substantially non-altered, e.g., frontal, appearance, a rendered appearance, and the like, e.g., as described below.

[0030] Device 140 may include any suitable configuration and/or mechanism to enable selectably operating mirror-display device 140 in the first and second modes of operation. For example, in one embodiment device 140 may include an array of liquid crystal (LC) elements, which may change their optical attributes such as, e.g., reflectivity, refractive index and the like, depending on, for example, a voltage applied to the liquid crystals. For example, applying a first voltage may result in changing the optical attributes of the liquid crystals such that mirror-display device 140 may operate as a mirror; and a second voltage may result in changing the optical attributes of the liquid crystals such that mirror-display device 140 may operate as a liquid crystal display.

[0031] In another embodiment of the invention, for example, mirror-display device 140 may include a liquid crystal display (LCD) device embedded in a semi-reflective or one-directional mirror. Accordingly, if the LCD is switched to an inactive mode of operation, mirror-display 140 may passively reflect sufficient light incident thereon to enable the user to view user-appearances at reasonable quality and brightness. In contrast, when the LCD is turned to an active mode of operation, mirror-display device 140, images displayed by the LCD device may be viewed by user 111 because they may be significantly brighter than residual reflections from the surface of the mirror-display.

[0032] According to some demonstrative embodiments of the invention, mirror display device 140 may be implemented by a LCD HD ready mirror TV such as, for example, model No. 32PM8822/10 available from Royal Philips Electronics, e.g., as described at the Internet site <http://www.research.philips.com/newscenter/archive/2003/mirrortv.html>. Such a device may include, for example, a polymer-based organic light-emitting display (OLED). Mirror-display device 140 may include any other suitable device implementing any suitable display technology. For example, device 140 may include a nano-emissive

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display (NED); a plasma display panel (PDP); a cathode ray tube display (CRT); a Digital Light Processing (DLP) display; a surface conduction electron emitter display (SED); a Tablet screen; a flat-panel SED; an Organic electronic display; electronic paper; a 3-Dimentional display, e.g., a Hologram display; a thin film resistor (TFT) display; an optical TFT; a Dot Matrix LED screen; an LCD having CCD capabilities, e.g., such that mirror-display 140 may be capable of performing the functionality of imaging device 130; a paintable LCD; a surface-conduction electron-emitter (SED) display; a high definition television (HDTV) display; a rear projector display device, and the like.

[0033] According to some demonstrative embodiments of the invention, imaging device 130 may be adapted to capture one or more appearances from a Field-of-View (FOV) in front of mirror-display device 140. The FOV in front of mirror-display device 140 may include, for example, a field, area, scene, zone, and/or region in front of mirror-display device 140. For example, the FOV may include at least part of a field, area, scene, zone, and/or region captured by mirror-display device 140 when in the mirror mode.

[0034] Although the scope of the present invention is not limited in this respect, imaging device 130 may be or may include, for example, a CCD camera, a video camera, a camera and/or camera set-up enabling capturing of 3D-images, e.g., a stereoscopic camera and the like. A stereoscopic camera may be adapted, for example, to capture a 3-D image of the user-appearance. The stereoscopic camera may include, for example, two lenses having a distance between each other that may correspond to a distance between two human eyes. Accordingly, the stereo camera may be able to simulate human binocular vision, also known as Stereophotography, thereby being able to capture a 3D-image.

[0035] According to some demonstrative embodiments of the invention, station 110 may be a stand alone unit, which may be located at an appearance- comparison area of a desired location, for example, an office, a home, or a retail store, e.g., apparel store.

[0036] According to other demonstrative embodiments of the invention, station 110 may be connected, e.g., via network interface 122, to a network, for example, a network 150, thereby enabling communication between station 110 and one or more other stations affiliated with network 150 such as, for example, station 160 and/or station 170.

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[0037] According to some demonstrative embodiments of the invention, station 110 may include a network interface 122, which may be adapted to interact with network 150, to send and receive information from other stations in network 150, as described herein. Such information may include but is not limited to data corresponding to images of users captured at various stations of system 100, for example, station 160 and/or 170, as well as identifying information of the users to enable secure access to the system, as described in more detail below. Network 150 may include, for example, a local area network (LAN), a wide area network (WAN), a global communication network, e.g., the Internet, a wireless communication network such as, for example, a wireless LAN (WLAN) communication network, a Bluetooth network, a wireless virtual private network (VPN), a cellular communication network, for example, a 3rd Generation Partnership Project (3GPP), such as, for example, Frequency Domain Duplexing (FDD) network, a Global System for Mobile communications (GSM) network, a Wideband Code Division Multiple Access (WCDMA) cellular communication network, and the like.

[0038] According to some demonstrative embodiments of the invention, one or more of stations 160 and 170 may be portable devices. Non-limiting examples of such portable devices may include a mobile telephone, a laptop computer, a notebook computer, a mobile computer, a Personal Communication Systems (PCS) device Personal Digital Assistants (PDA), a wireless communication device, a PDA device which incorporates a wireless communication device, a cellular telephone, a wireless telephone, a smart card, a token, a memory card, a memory unit, and the like. In some embodiments of the invention, one or more of stations 160 and 170 may be non-portable devices such as, for example, a desktop computer, a tablet computer, a television set, a server computer, and the like.

[0039] According to some embodiments of the invention, system 100 may also include a control center 190, which may be connected to stations 110, 160 and/or 170, e.g., via network 150. Control center 190 may receive and store data, which may represent, for example, data and/or images of user-appearances, received from one or more of stations 110, 160 and/or 170.

[0040] According to some embodiments of the invention, stations 110, 160 and/or 170 may be located at different locations such as, for example, different stores of a retail

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chain. In addition, stations 110, 160 and/or 170 may be located at different locations within a building, e.g., different floors, different sections at the same floor and the like. Such locations may include, for example, clothing stores, shoe stores, points of sale, concept showrooms, exhibitions, shopping malls, eyewear stores, cosmetic stores, sport clubs, health institutes, fitness centers, airports, train stations, coffee shops, restaurants, hotels, homes, and the like. One or more of stations 110, 160 and 170 may also be used for interactive billboard signs. For example, imaging device 130 may, for example, capture images which may be displayed on a billboard sign (not shown). System 100 may enable user 111 to choose an image to be displayed on the billboard sign out of a plurality of images of, for example, various previous trials of apparel.

[0041] According to some demonstrative embodiments of the invention, images of user appearances may be viewed at different locations. For example, imaging device 130 may capture an image of the first trial. The image may then be sent from network interface 122 via network 150 using signals 151 and 152, for example, to station 160. Accordingly, user 111 may be able to view the image of the first user-appearance at station 160. Therefore, user 111 may be able to view, for example, the user-appearance of the first trial in a first store of a retail store chain, e.g., a store associated with station 110; and may compare the user-appearance of the first trial with a user-appearance of a second trial, which may take place at a second store of the same or an affiliated chain, e.g., a store associated with station 160; and/or at a different time, e.g., one or more hours, days or weeks after the first trial.

[0042] According to another demonstrative embodiment of the invention, imaging device 130 may capture an image of a user-appearance of a first trial, and send the image via network interface 122 over network 150 to control center 190, where the image may be stored for later retrieval. Accordingly, user 111 may gain access to the images of the first trial by accessing any station, e.g., station 160, connected over network 150 with control center 190.

[0043] According to some demonstrative embodiments of the invention, storage device 123 may include, for example, a hard disk drive, a floppy disk drive, a Compact Disk (CD) drive, a CD-ROM drive, a Digital Versatile Disc (DVD) drive, or other suitable removable or non-removable storage units.

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[0044] According to some demonstrative embodiments of the invention, controller 121 may be or may include, for example, a Central Processing Unit (CPU), a Digital Signal Processor (DSP), a microprocessor, a controller, a chip, a microchip, an Integrated Circuit (IC), or any other suitable multi-purpose or specific processor or controller, e.g., as are known in the art.

[0045] Input device 124 may include, for example, a keyboard; a remote control; a motion sensor; a pointer device such as, for example, a laser pointer; a mouse; a touch-pad; a touch screen, which may be embedded, for example, in mirror-display device 140, or may be implemented by any other suitable unit, e.g., separate from device 140; a biometric input device, e.g., a fingerprint scanner, and/or a camera for scanning a face; and/or any other suitable pointing device or input device. Input device 124 may be adapted to receive user-identifying data, for example, to enable, access, e.g., secure access, of user 111 to system 100, as described in detail below.

[0046] According to some demonstrative embodiments of the invention, user 111 may provide user commands to input device 124 for operating the imaging device 130. Input device 124 may include, for example, an interface to enable user 111 of system 100 to define operational parameters of imaging device 130. Controller 121 may receive the inputs from user 111 via signals 131 and control the operation of imaging device 130 accordingly. The user commands may include, for example, commands relating to the timing for capturing an image, the positioning of imaging device 130, e.g., according to an automatic tracking algorithm which may follow, for example, the position of user 111, and/or imaging attributes such as focus, camera position, capturing angle, dynamic range and the like. The user commands may also include commands to define image capturing operating modes of imaging device 130 such as, for example, a video capturing mode, a photographic mode and the like. According to some embodiments of the invention, imaging device 130 may include a sound input device, for example, a microphone and/or a sound output device, for example, a loudspeaker. Accordingly, imaging device may receive audio signals, e.g., voice signals generated by user 111, which may be recorded and stored, e.g., in storage device 123 and reproduce the audio signals through the sound output device. The sound output device may be able to reproduce any other kind of audio signals such as, radio programs, compact disc records and the like.

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[0047] According to some demonstrative embodiments of the invention, controller 121 may, for example, set the mode of operation of mirror-display device 140 according to the command received from user 111. For example, if mirror-display device 140 operates in the mirror mode, the user of system 100 may provide input device with a switching command, e.g., by pressing a designated button at input device 124, for switching mirror-display device 140 to the display mode. Controller 121 may receive the input from input device 124 and may control device 140 to switch to the display mode of operation, e.g., using signals 141.

[0048] According to some demonstrative embodiments of the invention, imaging device 130 may be mounted in various positions such as, for example, on top, below, or on the side of mirror-display device 140, thereby capturing an image of a user-appearance which may be an image of a given trial of apparel, an image of user 111 with various articles, e.g., furniture and/or posing with different garments and the like. In some embodiments of the invention, imaging device 130 may capture a user-appearance as it appears in mirror-display device 140, i.e., a mirror-image of the user-appearance. In other embodiments, imaging device 130 may capture the appearance, and controller 121 may generate a mirror-image corresponding to the appearance captured by imaging device 130. For example, storage 123 may store instructions that when executed by controller may result in any suitable method or algorithm of rotating, reversing, and/or mirroring the appearance captured by imaging device 130, thereby to generate image data representing rotated, reversed, and/or mirrored image of the image captured by device 130. According to these embodiments, controller 121 may control mirror-display device 140 to display, during the display mode of operation, the rotated, reversed, and/or mirrored image. In other embodiments, controller 121 may control mirror-display device 140 to display, during the display mode of operation, an image corresponding to the image captured by device 130, e.g., a non-mirrored, non-rotated, and/or non-reversed image. In some embodiments, imaging device 130 may not be visible to user 111, may be located behind display device 140, and/or may be embedded in mirror-display device 140, which may be or may include, for example, a LCD-CCD device capable of both displaying and capturing images. For example, in one demonstrative embodiment of the invention, device 140 may include an array, screen or surface, e.g., including liquid crystals, to

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perform the mirror-display functionality, e.g., as described above, as well as the imaging functionality of imaging device 130, e.g., device 140 may include a mirror-imaging-display device.

[0049] In some demonstrative embodiments of the invention, one or more of stations 110, 160 and/or 170 may not include image capturing device 130; and/or one or more of stations 110, 160 and/or 170 may not include mirror-display 140. For example, a first station of system 100 may include only imaging device 130, and may not include, e.g., mirror-display device 140. User 111 may use the first station to capture the image of the first trial of the user-appearance, e.g., without being able to view at the first station the resultant image of the first trial. User 111 may later view the captured image of the first trial at another station of system 100, which may include mirror-display device 140.

[0050] According to some demonstrative embodiments of the invention, imaging device 130 may be positioned in a manner enabling capturing of an image and/or a sequence of images, videos or the like, of a scene taking place in front of mirror-display device 140. Additionally or alternatively, imaging device 130 may positioned in a manner enabling capturing an image reflected from mirror-display device 140. For example, imaging device 130 may be able to capture an image of user 111 posing in front of mirror-display device 140. While posing in front of mirror-display device 140, user 111 may check his appearance of, e.g., a first fitting trial of clothes. According to an input provided by user 111 at input device 124, imaging device 130 may capture the image of the user-appearance which may be, for example, a given trial of apparel, e.g., a garment and the like. It may be noted that trials by user 111 may also include user 111 engaging with various subjects, which may be located in the vicinity of user 111 such as, furniture, studio set-up and the like. Accordingly, imaging device 130 may capture images of user-appearances of, for example, a first trial, a second trial, etc., and may send the respective captured images to storage device 123 via signals 131 and signals 30. User 111 may be able to retrieve the captured image of, e.g., the first trial, at a later time, e.g., following the second or other subsequent trials, and may compare between the first and second or other trial, e.g., as described below with reference to Figs. 2A, 2B and 2C.

[0051] According to some demonstrative embodiments of the invention, storage device 123 may be adapted to receive data representing images captured by imaging device 130,

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and to store images of appearances and, more specifically, user-appearances of, for example, given trials of apparel, captured by imaging device 130. Images of given trials of user-appearances may be retrieved from storage device 123, e.g., by controller 121, and displayed by display 140. User 111 may compare between the displayed images, e.g., as described in detail below.

[0052] According to some demonstrative embodiments of the invention, storage device 123 may include data representing, e.g., software algorithms, requiring and/or verifying user identifying data such as user-ID, password, login-time, bio-metric data and the like to enable secure access to station 110, as described in detail below. For example, controller 121 may control mirror-display device 140 to display images corresponding to an identity of user 111, e.g., based on the identity data provided by user 111. For example, user 111 may provide input 124 with user-identifying input, which may include, for example, a biometric input such as face recognition, a hand print, a finger print, an eye print, voice recognition and the like. The user-identifying input may include any other suitable input, for example, a credit card, a personal identification number (PIN), a password, a smart card, a customer card, a club card, or the like. Controller 121 check, e.g., based on any suitable method and/or algorithm, whether the user-identifying input provided at input device 124 matches with user-identifying data which may be stored, e.g., in storage device 123 or in control center 190. Software having the capability of verifying a biometric input may be, for example, "Active ID FaceVision technology" ® provided by Geometric Inc. If controller 121 matches the input of user 111 with the stored user-identifying data, controller 121 may enable user 111 to access data representing, for example, images of previous user-appearances of user 111.

[0053] According to some demonstrative embodiments of the invention, storage device 123 may include data representing, e.g., software algorithms enabling additional system features such as, for example, rendering virtual effects on mirror-display device 140. For example, controller 121 may be able to render an image at mirror-display device 140 of user-appearances engaged and/or combined with virtual articles such as, for example, clothes, collections, headdresses, hair cuts, furniture and the like. In addition, controller 121 may be able to render an image at mirror-display device 140 of user-appearances having different body shapes for simulating, e.g., weight loss, weight gain of user 111

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and the like. For example, user 111 may choose in a first trial a specific article, such as a suit out of a collection and controller 121 may virtually adjust the collection to an image of user 111 appearing in mirror-display device 140. Controller 121 may store the image of the first trial in storage device 123 and may perform the same step at a second trial. Accordingly, user 111 of system 100 may be able to compare between user-appearances of the first and a second trials of the collection.

[0054] According to some demonstrative embodiments of the invention, controller 121 may provide, for example, image and/or video browsing capabilities, image and/or video replay functions, which capabilities and functions may be predefined by system 100 or may be defined, e.g., on-the-fly, according to one or more user commands received from user 111 via input device 124. For example, controller 121 may be able to retrieve one or more images of previous user-appearances and display the images on mirror-display device 140 at various sequences. For example, images from previous trials may be displayed in a substantially continuous forward, backwards, or mixed, e.g., randomly-accessible, sequence, and/or may be a stepwise sequence or in any other sequence. Furthermore, images from previous trials may be displayed simultaneously at mirror-display device 140, e.g., as described below. Controller 121 may also be able to delete previously captured user-appearances, limit the amount of data which may be saved in storage device 123 and the like, and may further control a shape, size, color, etc., of the image displayed on mirror-display device 140.

[0055] According to some demonstrative embodiments of the invention, user 111 may use a portable storage device 180 able to store one or more of the captured images. The portable storage device may include any suitable portable storage device, e.g., a smartcard, a disk-on-key device, and the like. User 111 may download, for example, images represented by, .e.g., signals 50, of a first trial of user-appearances from storage device 123, e.g., via a storage interface 125 or via any other suitable data connection. User 111 may then upload at a later time the image of, e.g., the first trial, to another location, e.g., a home of user 111, or another station of system 100, e.g., station 170.

[0056] In some embodiments of the invention, station 110 may include more than one mirror-display device or may include a mirror-display device 140, which may be

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partitioned simultaneously into two frames as described hereinafter with reference to Figs. 2A and 2B.

[0057] According to some demonstrative embodiments of the invention, controller 121 may record or store, e.g., in storage 123, parameters characterizing user 111. For example, system 100 may include a weighing machine, connected to, e.g., storage device 123 via controller 121. Controller 121 may be able to record, for example, a weight of user 111 during, for example, a trial of an article. Accordingly, user 111 may later retrieve the parameter which may be, for example, the weight of user 111.

[0058] Reference is now made to Figs 2A and 2B, which schematically illustrate stages of comparing between appearances using an interactive system in accordance some demonstrative embodiments of the invention.

[0059] According to some demonstrative embodiments of the invention, mirror-display device 140 may be partitioned into two frames, wherein one frame may operate as a mirror frame 191 and another frame 192 may operate selectably as a mirror and as a display frame. As shown in Fig. 2A, user 111 may pose in front of mirror frame 191 a first trial, which may be captured by imaging device 130 and stored in storage device 123. Henceforward, as indicated in Fig. 2B, user 111 may view simultaneously in mirror frame 192 the image of the user-appearance of the first trial and/or any other user-appearances, e.g., user-appearances stored in storage device 123 and/or received over network 150 (Fig. 1), side-by-side with the normal mirror appearance of a second trial, and compare between the first and the second trial.

[0060] Reference is now made to Figs. 3A, 3B and 3C, which schematically illustrate three, sequential, stages of comparing between appearances using an interactive system in accordance some demonstrative embodiments of the invention.

[0061] As shown in Fig. 3A, the user of system 100 may view a first trial of a user-appearance in mirror-display device 140 operating in its mirror mode. Controller 121 may receive, e.g., from input device 124, a user input, which may include a request to use imaging device 130 for capturing a first trial of the user-appearance. As a result, imaging device 130 may capture an image of the first trial of the user-appearance and storage device 123 may store the captured image.

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[0062] As shown in Fig. 3B, user 111 may view a second trial of his user-appearance in mirror-display device 140, which may operate in the mirror mode of operation. Then, when user 111 desires to view a previous appearance, e.g., for comparison, controller 121 may receive a user input via input device 124 requesting to view the first trial. At this point, as shown in Fig. 3C, controller 121 may change the operational mode of mirror-display device 140 to the display mode using signals 141. Controller 121 may also control device 140 to display the first trial. Therefore, by switching between operating modes of mirror-display device 140, user 111 may compare the user-appearance of the second trial with the user-appearance of the first trial and/or any other user-appearances previously stored in storage device 123.

[0063] Reference is now made to Fig. 4, which schematically illustrates a flow-chart of a method enabling comparing between one or more various appearances in accordance with some demonstrative embodiments of the invention. Although the invention is not limited in this respect, one or more operations of the method of Fig. 4 may be performed by one or more elements of system 100 (Fig. 1).

[0064] As indicated at block 410, the method may include, for example, setting the operating mode of a mirror-display device. For example, user 111 (Fig. 1) may initially set the operating mode of mirror-display device 140 (Fig. 1) to the mirror mode. Alternatively, display 140 (Fig. 1) may be designed to operate in the mirror mode by default whenever a new user logs into system 100 (Fig. 1).

[0065] As indicated at block 420, the method may also include, for example, posing in front of the mirror-display device. For example, user 111 (Fig. 1) may pose in front of mirror-display device 140 (Fig. 1) and check the user-appearance of a first trial of, e.g., clothing, shoes and/or any other apparel.

[0066] As indicated at block 430, the method may also include, for example, capturing an image of the user-appearance of the first trial. For example, user 111 (Fig. 1) may provide user command to device 120 (Fig. 1) commanding imaging device 130 (Fig. 1) to capture an image of the user-appearance of the first trial.

[0067] As indicated at block 440, the method may also include, for example, posing in front of the mirror-display device in a different user-appearance. For example, user 111 (Fig. 1) may change one or more items of environment such as, for example, furniture

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and/or apparel, pose once again in front of mirror-display device 140 which may operate in mirror mode, and view a second user-appearance.

[0068] As indicated at block 450, the method may also include, for example, switching between operating modes of the mirror-display device. For example, user 111 (Fig. 1) may switch mirror-display device 140 (Fig. 1) between the mirror and the display mode. Accordingly, user 111 (Fig. 1) may be able to compare between the user-appearance of the first trial, and/or any other user-appearances, e.g., user-appearances stored in storage device 123 and/or received over network 150 (Fig. 1), and the user-appearance of the second trial.

[0069] According to some demonstrative embodiments of the invention, user 111 (Fig. 1) may indicate, and/or station 110 (Fig. 1) may be able to store, e.g., automatically, for each trial parameters, e.g., including shopping parameters, such as, for example, name of store, address of store, price, time and/or date of trial of apparel, name of salesperson, and the like. User 111 (Fig.1) may, for example, store the captured images of user-appearances in a removable or portable storage device, e.g., as described above with reference to Fig. 1, and may later review images of user-appearances while being able to ascribe every image to, e.g., a specific store and the like. In addition, user 111 may define, and/or controller 121 (Fig. 1) may be able to generate, and/or store in storage device 123 reminders, for example, alarms about, e.g., discounts, end of season sales and the like.

[0070] While certain features of the invention have been illustrated and described herein, many modifications, substitutions, changes, and equivalents may occur to those skilled in the art. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the invention.

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CLAIMS

[0071] What is claimed is:

1. A system to enable appearance comparison, the system comprising:

at least one interactive imaging and display station, the station comprising:

a mirror-display device capable of selectably operating in either or both a mirror mode or a display mode;

an imaging device to capture one or more appearances from a field-of-view in front of said mirror-display device; and

an image control unit to select the mode of operation of said mirror-display device according to a user command.

2. The system of claim 1, wherein said image control unit includes an input device to receive said user command from a user.

3. The system of claim 1, wherein said image control unit includes a storage device to store one or more images corresponding to said one or more appearances.

4. The system of claim 1, wherein said mirror-display device is capable of being partitioned into at least first and second simultaneously-displayable frames, the first frame selectably operable both in a mirror mode and a display mode, and the second frame operable in a mirror mode.

5. The system of claim 1, wherein said imaging device is capable of capturing three-dimensional images of said appearances.

6. The system of claim 1, wherein said mirror-display device is capable of displaying images of appearances at predefined sequences.

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7. The system of claim 1, wherein said image control unit is able to selectively enable a user to access images of appearances authorized to said user, based on user-identifying input received from said user.

8. The system of claim 1, wherein said at least one interactive imaging and display station comprises two or more interactive imaging and display stations able to communicate over a network.

9. The system of claim 8, wherein said two or more stations are able to communicate between each other data representing images of appearances.

10. The system of claim 1, wherein said image control unit is able to control said mirror display device to display, during said display mode, one or more images corresponding to said appearances.

11. The system of claim 10, wherein the one or more images comprise one or more mirrored appearances.

12. A method to enable appearance comparison, the method comprising:

using a mirror mode of operation of a mirror-display device capable of being selectably operated in either a mirror mode or a display mode;

capturing an image corresponding to an appearance of a first trial from a field-of-view in front of said mirror-display device;

storing said image;

selecting the display mode of operation of said mirror-display device;

retrieving said image and displaying the image on said mirror-display device.

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1/4

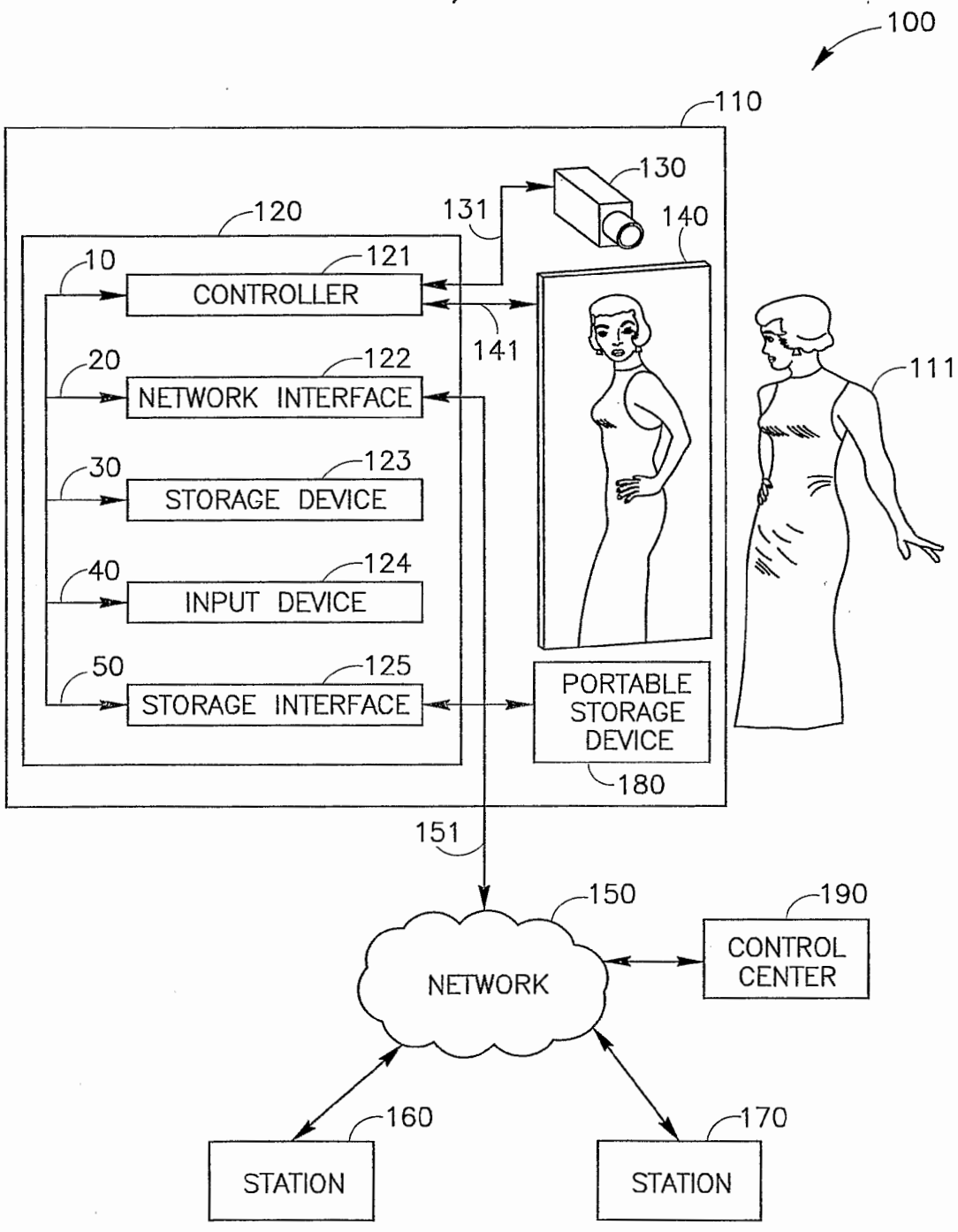


FIG.1

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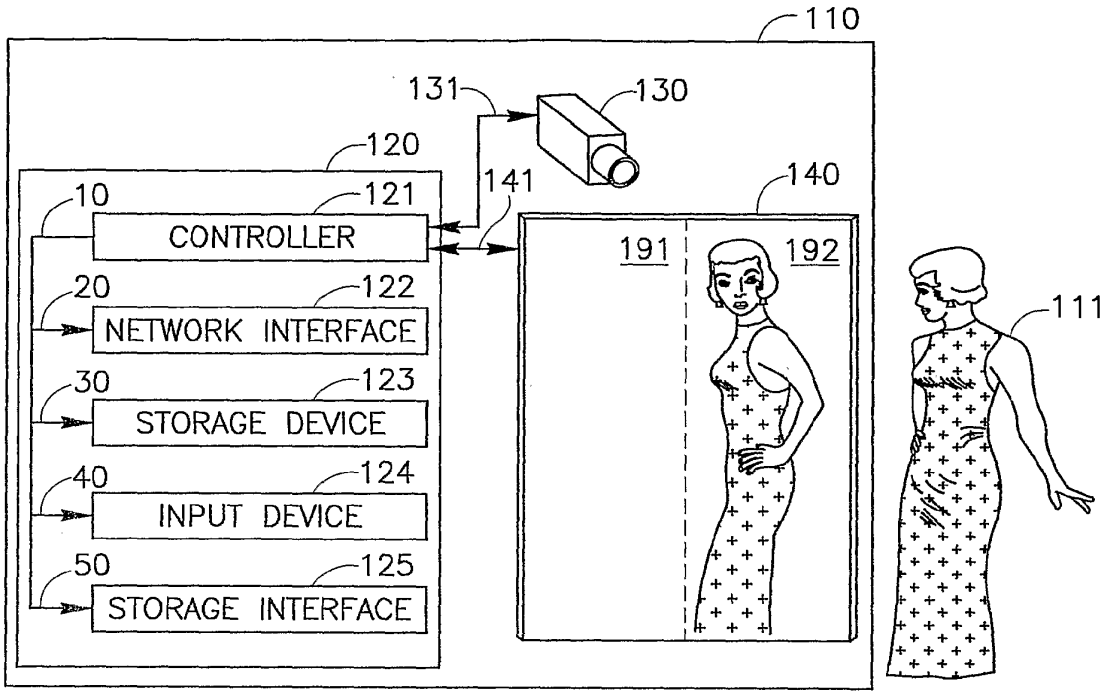

110
131
130
120
141
140
10
121
CONTROLLER
191
192
20
122
NETWORK INTERFACE
111
30
123
STORAGE DEVICE
40
124
INPUT DEVICE
50
125
STORAGE INTERFACE

FIG.2A

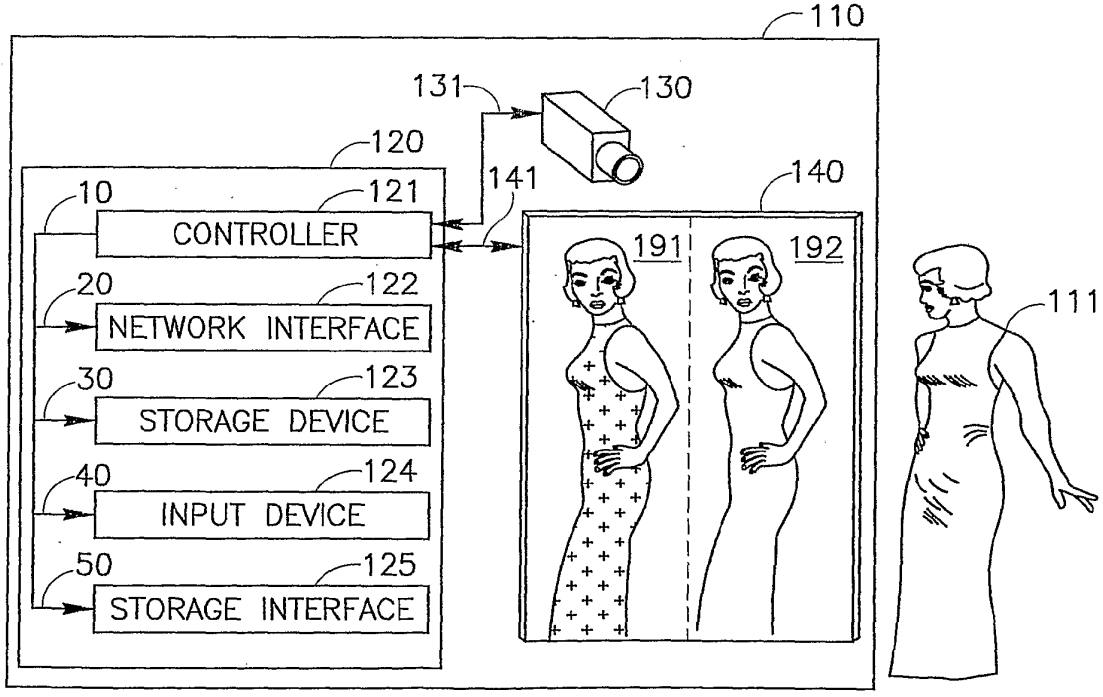

110
131
130
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CONTROLLER
191
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122
NETWORK INTERFACE
111
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123
STORAGE DEVICE
40
124
INPUT DEVICE
50
125
STORAGE INTERFACE

FIG.2B

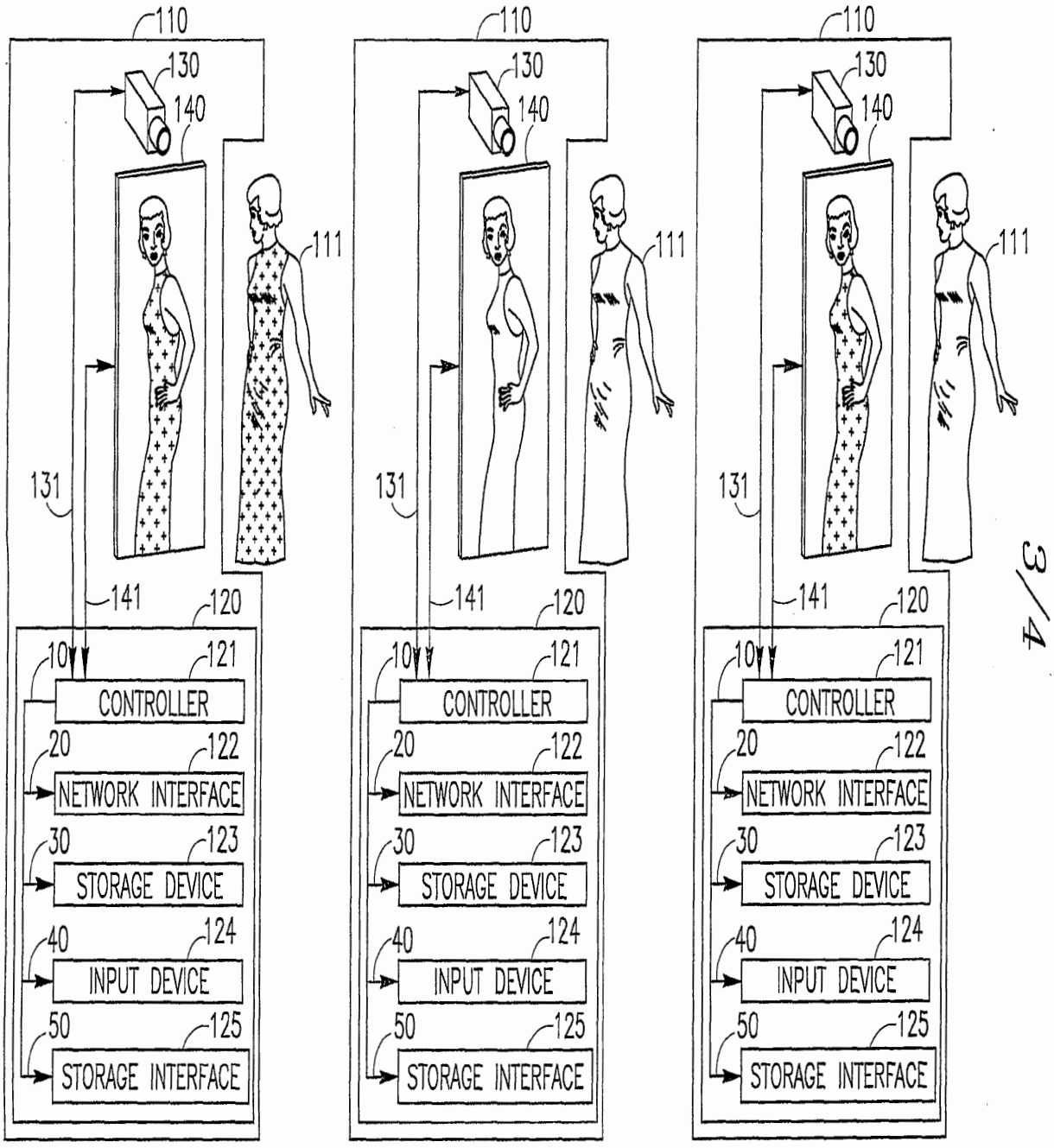


FIG.3A FIG.3B FIG.3C

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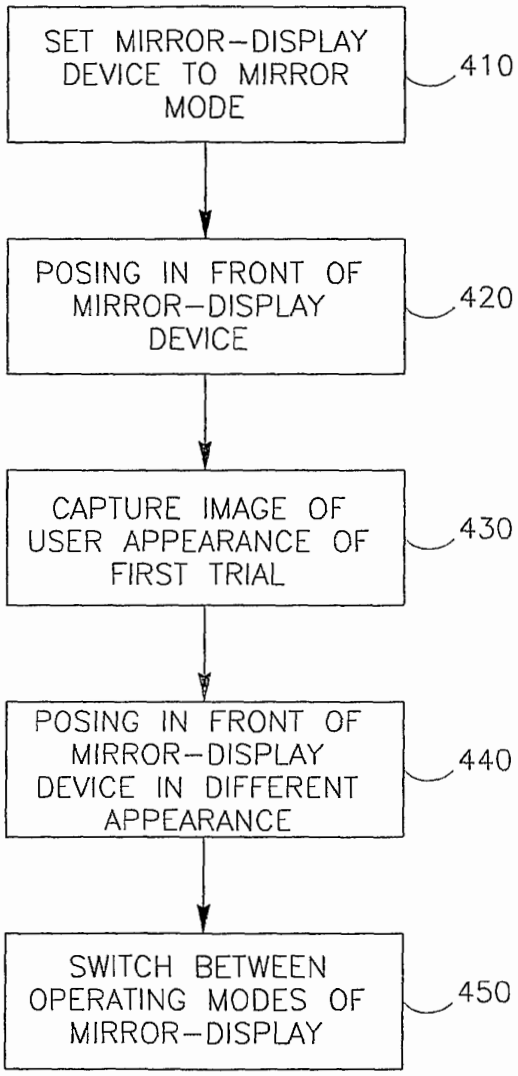

SET MIRROR-DISPLAY DEVICE TO MIRROR MODE
410
POSING IN FRONT OF MIRROR-DISPLAY DEVICE
420
CAPTURE IMAGE OF USER APPEARANCE OF FIRST TRIAL
430
POSING IN FRONT OF MIRROR-DISPLAY DEVICE IN DIFFERENT APPEARANCE
440
SWITCH BETWEEN OPERATING MODES OF MIRROR-DISPLAY
450

FIG. 4

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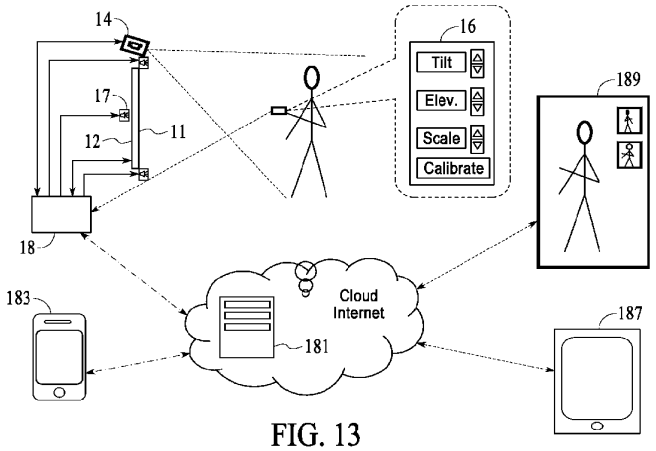


FIG. 13

(57) Abstract: Systems, devices and methods enabling appearance comparison. The system includes at least one interactive imaging and display station. The station includes a mirror-display device capable of selectably operating in either or both a mirror mode or a display mode; an imaging device to capture one or more appearances appearing in a field of view in front of the mirror- display device; and/or an image control unit to select the mode of operation of the mirror-display device according to a user command.

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DEVICES, SYSTEMS AND METHODS OF CAPTURING AND DISPLAYING APPEARANCES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority benefit of U.S. Application No. 13/843,001, filed on March 15, 2013, and U.S. Provisional Application No. 61/738,957, filed on December 18, 2012. The entire disclosures of the above listed applications are incorporated herein by reference.

BACKGROUND

1. Field

[0002] The invention relates generally to imaging and display systems and, more particularly, to monitors, and interactive displays, e.g., in retail and/or service environments, medical or home situations, video conferencing, gaming, etc. Specific implementations relate to making a flat panel display appear as a mirror. Another specific implementation relates to making a flat panel display provide a video of a person looking at his eyes to create an eye to eye video conference.

2. Related Art

[0003] Customers may shop for consumer articles, for example, apparel such as clothes, e.g., shirts, pants, coats and other garments, as well as shoes, glasses, and/or any other items or products, such as cosmetics, furniture and the like. Shopping normally takes place at a shopping facility, for example, retail stores. Prior to making a decision which article to buy, a customer may try on various articles (e.g., apparel, cosmetics) and/or pose with other background articles (e.g., furniture), and may view for each trial a user-appearance in front of a mirror, which may be located, for example, at a trial area of the retail store. For example, the customer may try on a first article, e.g., a suit, and view for that first trial his/her user-appearance in front of the mirror. Then, the customer may try on a second article, e.g., another suit. The customer may then need to memorize his/her user-appearance from the first trial in order to perform a mental comparison between the first article and the second article, thereby to evaluate which of the two articles might be a better fit for the customer.

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[0004] Unfortunately, since the customer may try on numerous articles and/or since the second trial may take place a considerable amount of time after the first trial or even at a different store, the customer may not be able to recall his/her appearance for each trial and may therefore be required to repeatedly retry articles, e.g., items of apparels, previously tried on. This may result in a frustrating and inefficient shopping experience.

[0005] The conventional mirror (i.e., reflective surface) is the common and most reliable tool for an individual to explore actual self-appearance, in real time. A few alternatives have been proposed by prior art around the combination of a camera and a screen to replace the conventional mirror. However, these techniques are not convincing and are not yet accepted as a reliable image of the individual as if he was looking at himself in a conventional mirror. This is mainly because the image generated by a camera is very different from an image generated by a mirror.

[0006] When a user looks at himself in the mirror, what he actually sees is the reflection of himself as if he was standing at a distance that is double the distance from him to the mirror. This is illustrated in Figure 5A, wherein the user standing at distance D1 sees himself at a distance equal to twice D1. Similarly, as shown in Figure 5B, a user standing at distance D2 will see himself at a distance 2xD2. In addition, the angle of the user's Field of View (FOV) changes when the user changes the distance, e.g., gets closer, to the mirror. The FOV is limited by the specular reflecting angle (β) from the mirror to the user's eye and to the edge of the visible image on all sides of the mirror (four sides for a rectangular or square mirror). In Figure 5B the bottom of the vertical FOV is illustrated as double the angle (β) formed by the lines connecting the user's eyes to the bottom of the mirror and reflecting to the user's shoes. Consequently, as illustrated in Figure 5B, when the user approaches the mirror, the FOV angle increases, which is why he continues to see the same size reflection (FOV1 < FOV2), so that the user actually sees himself roughly at the same size, but closer. This is a noticeable difference from a camera, wherein as the user gets closer to the camera, he appears larger in the image. This is mainly because the FOV of a camera is fixed and is determined mainly by the size of the camera lens, or focal length.

[0007] There are other phenomena to note regarding reflection of a mirror. For example, when the user approaches the mirror, the reflection of his eyes will always stay on the same virtual line into the mirror. Conversely, depending on a camera's height, as the user gets closer to

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the camera, the user's eyes may appear at different levels. Another difference from a camera is that when one looks at a mirror, one's image appears to be reversed (e.g., if one raises one's right hand, his left hand will appear to go up in the mirror). However, a mirror does not "swap" left and right any more than it swaps top and bottom. A mirror reverses the forward/backward axis (i.e., what's in front of the mirror appears to be behind the mirror), and we define left and right relative to front and back. Also, because the image in the mirror is virtual, the mirror can be smaller than the full body and the user will still see the reflection of his full body. The reason is that the specular reflection (in Figure 5A the angle of incidence β equals to the reflection angle β) can increase the effective field of view while the user approaches the mirror. Moreover, although the mirror is a two dimensional object, the user sees his appearance in three dimensions.

[0008] For at least some of the reasons noted above, so far no system has been provided for imitating a mirror convincingly. Imitating a mirror can have many applications in retail and other fields, and opens the possibility of incorporating real life experiences with virtual life experiences, such as sharing on social networks and other mobile technologies.

SUMMARY

[0009] Some demonstrative embodiments of the invention include devices, systems and/or methods enabling appearance comparison.

[0010] According to some demonstrative embodiments of the invention, a system enabling appearance comparison may include at least one interactive imaging and display station. The station may include, for example, a mirror display device capable of operating in either or both a mirror or a display mode; an imaging device to capture one or more appearances from a field of view in front of the mirror-display device; and/or an image control unit to select the mode of operation the mirror display device according to a user command. The mirror display device may be in the form of a flat panel TV, wherein during mirror mode the TV presents a transposed live video feed from the camera, while during display mode it presents a transposed video taken at an earlier time and fetched from a memory.

[0011] According to some demonstrative embodiments of the invention the image control unit may include an input device to receive the user command.

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[0012] According to some demonstrative embodiments of the invention, the image control unit may include a storage device to store data of one or more images which may correspond to one or more appearances.

[0013] According to some demonstrative embodiments of the invention, the mirror-display device may be capable of being partitioned into at least first and second simultaneously-displayable frames. The first frame may be selectably operable, for example, both in a mirror mode and a display mode. The second frame may be operable, for example, in a mirror mode.

[0014] According to some demonstrative embodiments of the invention, the imaging device may be capable of capturing three-dimensional images of appearances.

[0015] According to some demonstrative embodiments of the invention, the mirror-display device may be capable of displaying images of appearances at predefined sequences.

[0016] According to some demonstrative embodiments of the invention, the image control unit may be able to selectively enable a user access to images of appearances authorized to the user, e.g., based on user-identifying data received from the user.

[0017] According to some demonstrative embodiments of the invention, the at least one interactive imaging and display system may include two or more interactive imaging and display stations able to communicate over a network. For example, the two or more stations may be able to communicate between each other data representing images of appearances.

[0018] According to some demonstrative embodiments of the invention, the image control unit may control the mirror-display device to display, e.g., during the display mode, one or more images corresponding to the appearances. The one or more images may include, for example, one or more mirrored appearances. The mirrored appearances are obtained by transposing the images or video feed obtained from a camera to generate images and video that, when presented on a monitor, resembles an appearance in a mirror.

[0019] According to some demonstrative embodiments of the invention, a method enabling appearance comparison may comprise using a mirror mode of operation of a mirror-display device capable of being selectably operated in either a mirror or a display mode; capturing an image corresponding to an appearance of a first trial in front of the mirror-display device; storing the image of the first trial; selecting the display mode of operation of the mirror-display device; and/or retrieving the image of the first trial and displaying the image on the mirror-display device.

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[0020] According to further embodiments, methods and apparatus are provided utilizing a camera and a flat screen display to create a convincing mirror appearance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to organization and method of operation, together with features and advantages thereof, may best be understood by reference to the following detailed description when read with the accompanied drawings in which:

[0022] FIG. 1 is a schematic illustration of an interactive system enabling appearance comparison in accordance with some demonstrative embodiments of the invention;

[0023] FIGS. 2A and 2B are schematic illustrations of two, sequential, stages of appearances comparison using an interactive system in accordance with some demonstrative embodiments of the invention; and

[0024] FIGS. 3A, 3B and 3C are schematic illustrations of three, sequential, stages of appearances comparison using an interactive system in accordance with some demonstrative embodiments of the invention; and

[0025] FIG. 4 is a schematic flow chart of a method enabling comparison of one or more user-appearances in accordance with some demonstrative embodiments of the invention.

[0026] FIGS. 5A and 5B schematically illustrate mirror reflection.

[0027] FIG. 6 illustrates an embodiment having one camera or multiple cameras in a vertical array at the user's eye level, so as to obtain low image distortion.

[0028] FIG. 7 is a schematic illustrating what happens when the user approaches the mirror or moves away from it when using a camera mounted above the screen and pointed horizontally.

[0029] FIG. 8 is a schematic illustrating a system wherein the camera is positioned above a monitor screen and is tilted downwards.

[0030] FIG. 9 is a block diagram of an embodiment of the invention which performs image transformation to generate an image that mimics a mirror.

[0031] FIGS 10A and 10B are schematics illustrating calibration processes according to embodiments of the invention.

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[0032] FIG. 11 is a block diagram illustrating a process according to an embodiment of the invention.

[0033] FIG. 12 is a block diagram illustrating modules and processes to perform the calibration and image transformation according to an embodiment of the invention.

[0034] FIG. 13 illustrates another embodiment, wherein calibration and transformation mapping is performed in the field after installation of the system.

[0035] FIG. 14 illustrates an embodiment for extracting data from the image of camera.

[0036] FIG. 15 illustrates an embodiment wherein stitching of images from n cameras is performed.

[0037] FIG. 16 illustrates an embodiment for presenting the eyes to their fullest, mimicking the user looking directly at himself in the mirror.

[0038] It will be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn accurately or to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity or several physical components included in one element. Further, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. It will be appreciated that these figures present examples of embodiments of the present invention and are not intended to limit the scope of the invention.

DETAILED DESCRIPTION

[0039] In the following description, various aspects of the present invention will be described. For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention may be practiced without the specific details presented herein. Furthermore, some features of the invention relying on principles and implementations known in the art may be omitted or simplified to avoid obscuring the present invention.

[0040] Some demonstrative embodiments of the invention may include an interactive system enabling a user to compare one or more appearances, for example, to compare between different appearances, e.g., as described in detail below.

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[0041] The term "user-appearance" as used herein may relate to the appearance of a customer while trying a consumer article. The article may include, for example, apparel, such as clothing, shoes, glasses, garments, ties, and the like; an article, e.g., furniture, located in the vicinity of the customer; as well as other items, articles, designs or products such as, for example, cosmetics, headdresses, haircuts, etc. Similarly, embodiments may be employed to technical usage, for example, for Fashion designers that want to see versions of designs, it can be for use by people at home who are creating a lifelong album of family members in real size, etc.

[0042] According to some demonstrative embodiments of the invention, the system may include an imaging device able to capture user-appearances and a mirror-display device, able to operate selectably as a mirror or as a display. When in the mirror mode, the mirror-display device may enable the user to evaluate and/or view a user-appearance of a current trial of a consumer article. As will be described further below, this can be done using live video feed to a flat panel display, wherein the video feed is modified prior to presentation on the screen, such that it emulates a mirror. When in the display mode, the mirror-display device may enable the user to evaluate and/or view one or more user-appearances, e.g., as previously captured by the imaging device, of a previous trial, e.g., as described in detail below.

[0043] Reference is made to FIG. 1, which schematically illustrates an interactive system 100 in accordance with some demonstrative embodiments of the invention.

[0044] According to some demonstrative embodiments of the invention, system 100 may include an interactive imaging and display station 110, which may include an image control unit 120, an imaging device 130 (e.g., a still or video camera), and a mirror-display device 140 (e.g., a flat panel display). Image control unit 120 may include a controller 121, a network interface 122, a storage device 123, an input device 124, all of which elements are described in detail below.

[0045] Aspects of the invention are described herein in the context of demonstrative embodiments of an imaging device, e.g., imaging device 130, a mirror-display device, e.g., mirror-display device 140, and/or an image control unit, e.g., image control unit 120, being separate units of an appearance comparison system, e.g., system 100. However, it will be appreciated by those skilled in the art that the invention is not limited in this respect, and that according to other embodiments of the invention, the system may include any suitable configuration, combination, and/or arrangement of the imaging device, the mirror-display device,

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and/or the image control unit. For example, the system may include an integrated module including the mirror-display device, the imaging device and/or the image control unit. For example, the imaging device and/or the image control unit may be implemented as integral part of the mirror-display device.

[0046] According to some demonstrative embodiments of the invention, mirror-display device 140 may be configured and/or may include components and mechanisms allowing mirror-display device 140 to operate selectably in two modes of operation. In a first mode of operation (the "mirror-mode"), mirror-display device 140 may operate as a mirror. In a second mode of operation (the "display mode"), mirror-display device 140 may operate as a display. When mirror-display device 140 operates in the mirror-mode, a user 111 of system 100 may evaluate and/or view a user-appearance of a first trial of a consumer article, as may be reflected by mirror-display device 140 in real time. Imaging device 130 may capture an image of the user-appearance of the first trial. The captured image may be stored, for example, by storage device 123, e.g., as described below. User 111 may then pose in front of mirror-display device 140 trying a second article, and imaging device 130 may capture a second image of the user-appearance of the second trial. The user may be able to view the second article in real time using the mirror-display device 140 set to mirror mode. When the mirror-display device 140 is switched to the display mode, mirror-display 140 may be controlled to display one or more of previously captured images. By virtue of the capability of mirror-display device 140 to operate selectably in the mirror or display mode, user 111 may be able to compare simultaneously or sequentially between the user-appearances of the first and second trials, as described in detail below.

[0047] In some demonstrative embodiments of the invention, e.g., as shown in FIGS. 1, 2A, 2B, 3A, and/or 3B, controller 121 may control device 140 to display, during the display mode of operation, a mirror-image of the appearances. However, it will be appreciated by those of ordinary skill in the art that the invention is not limited in this respect, and that in other embodiments the controller may control device 140 to display, during the display mode of operation, any other image corresponding to the appearance, e.g., a rotated appearance, a revered appearance, a substantially non-altered, e.g., frontal, appearance, a rendered appearance, and the like, e.g., as described below.

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[0048] Device 140 may include any suitable configuration and/or mechanism to enable selectably operating mirror-display device 140 in the first and second modes of operation. For example, in one embodiment device 140 may include an array of liquid crystal (LC) elements, which may change their optical attributes such as, e.g., reflectivity, refractive index and the like, depending on, for example, a voltage applied to the liquid crystals. For example, applying a first voltage may result in changing the optical attributes of the liquid crystals such that mirror-display device 140 may operate as a mirror; and a second voltage may result in changing the optical attributes of the liquid crystals such that mirror-display device 140 may operate as a liquid crystal display.

[0049] In another embodiment of the invention, for example, mirror-display device 140 may include a liquid crystal display (LCD) device embedded in a semi-reflective or one-directional mirror. Accordingly, if the LCD is switched to an inactive mode of operation, mirror-display 140 may passively reflect sufficient light incident thereon to enable the user to view user-appearances at reasonable quality and brightness. In contrast, when the LCD is turned to an active mode of operation, images displayed by the LCD device may be viewed by user 111 because they may be significantly brighter than residual reflections from the surface of the mirror-display. In other embodiments, the system is implemented in a stand-alone computer, without the display itself, such that the purchaser of the system may supply its own display or have configurations where the system is used without screens, but remote controlled by customers mobile devices or tablets, so they can see their appearances in their mobile and remote controlled the recording.

[0050] Also in some cases the camera can be far from the display, for example, in luxury brands they might embed the screen in the wall and put the camera with appropriate lenses in a remote location.

[0051] According to some demonstrative embodiments of the invention, mirror display device 140 may be implemented by a LCD HD ready mirror TV such as, for example, model No. 32PM8822/10 available from Royal Philips Electronics, e.g., as described at the Internet site <http://www.research.philips.com/newscenter/archive/2003/mirrortv.html- >. Such a device may include, for example, a polymer-based organic light-emitting display (OLED). Mirror-display device 140 may include any other suitable device implementing any suitable display technology. For example, device 140 may include a nano-emissive display (NED); a plasma display panel

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(PDP); a cathode ray tube display (CRT); a Digital Light Processing (DLP) display; a surface conduction electron emitter display (SED); a Tablet screen; a flat-panel SED; an Organic electronic display; electronic paper; a 3-Dimensional display, e.g., a Hologram display; a thin film resistor (TFT) display; an optical TFT; a Dot Matrix LED screen; an LCD having CCD capabilities, e.g., such that mirror-display 140 may be capable of performing the functionality of imaging device 130; a paintable LCD; a surface-conduction electron-emitter (SED) display; a high definition television (HDTV) display; a rear projector display device, and the like.

[0052] According to some demonstrative embodiments of the invention, imaging device 130 may be adapted to capture one or more appearances from a Field-of-View (FOV) in front of mirror-display device 140. The FOV in front of mirror-display device 140 may include, for example, a field, area, scene, zone, and/or region in front of mirror-display device 140. For example, the FOV may include at least part of a field, area, scene, zone, and/or region captured by mirror-display device 140 when in the mirror mode.

[0053] Although the scope of the present invention is not limited in this respect, imaging device 130 may be or may include, for example, a CCD camera, a video camera, a camera and/or camera set-up enabling capturing of 3D-images, e.g., a stereoscopic camera and the like. A stereoscopic camera may be adapted, for example, to capture a 3-D image of the user-appearance. The stereoscopic camera may include, for example, two lenses having a distance between each other that may correspond to a distance between two human eyes. Accordingly, the stereo camera may be able to simulate human binocular vision, also known as Stereophotography, thereby being able to capture a 3D-image.

[0054] According to some demonstrative embodiments of the invention, station 110 may be a stand alone unit, which may be located at an appearance-comparison area of a desired location, for example, an office, a home, or a retail store, e.g., apparel store.

[0055] According to other demonstrative embodiments of the invention, station 110 may be connected, e.g., via network interface 122, to a network, for example, a network 150, thereby enabling communication between station 110 and one or more other stations affiliated with network 150 such as, for example, station 160 and/or station 170.

[0056] According to some demonstrative embodiments of the invention, station 110 may include a network interface 122, which may be adapted to interact with network 150, to send and receive information from other stations in network 150, as described herein. Such information

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may include but is not limited to data corresponding to images of users captured at various stations of system 100, for example, station 160 and/or 170, as well as identifying information of the users to enable secure access to the system, as described in more detail below. Network 150 may include, for example, a local area network (LAN), a wide area network (WAN), a global communication network, e.g., the Internet, a wireless communication network such as, for example, a wireless LAN (WLAN) communication network, a Bluetooth network, a wireless virtual private network (VPN), a cellular communication network, for example, a 3.sup.rd Generation Partnership Project (3GPP), such as, for example, Frequency Domain Duplexing (FDD) network, a Global System for Mobile communications (GSM) network, a Wideband Code Division Multiple Access (WCDMA) cellular communication network, and the like.

[0057] According to some demonstrative embodiments of the invention, one or more of stations 160 and 170 may be portable devices. Non-limiting examples of such portable devices may include a mobile telephone, a laptop computer, a notebook computer, a mobile computer, a tablet computer, a Personal Communication Systems (PCS) device, Personal Digital Assistants (PDA), a wireless communication device, a PDA device which incorporates a wireless communication device, a cellular telephone, a wireless telephone, a smart card, a token, a memory card, a memory unit, and the like. In some embodiments of the invention, one or more of stations 160 and 170 may be non-portable devices such as, for example, a desktop computer, a television set, a server computer, and the like.

[0058] According to some embodiments of the invention, system 100 may also include a control center 190, which may be connected to stations 110, 160 and/or 170, e.g., via network 150. Control center 190 may receive and store data, which may represent, for example, data and/or images of user-appearances, received from one or more of stations 110, 160 and/or 170.

[0059] According to some embodiments of the invention, stations 110, 160 and/or 170 may be located at different locations such as, for example, different stores of a retail chain. In addition, stations 110, 160 and/or 170 may be located at different locations within a building, e.g., different floors, different sections at the same floor and the like. Such locations may include, for example, clothing stores, shoe stores, points of sale, concept showrooms, exhibitions, shopping malls, eyewear stores, cosmetic stores, sport clubs, health institutes, fitness centers, airports, train stations, coffee shops, restaurants, hotels, homes, and the like. One or more of stations 110, 160 and 170 may also be used for interactive billboard signs. For example,

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imaging device 130 may, for example, capture images which may be displayed on a billboard sign (not shown). System 100 may enable user 111 to choose an image to be displayed on the billboard sign out of a plurality of images of, for example, various previous trials of apparel.

[0060] According to some demonstrative embodiments of the invention, images of user appearances may be viewed at different locations. For example, imaging device 130 may capture an image of the first trial. The image may then be sent from network interface 122 via network 150 using signals 151 and 152, for example, to station 160. Accordingly, user 111 may be able to view the image of the first user-appearance at station 160. Therefore, user 111 may be able to view, for example, the user-appearance of the first trial in a first store of a retail store chain, e.g., a store associated with station 110; and may compare the user-appearance of the first trial with a user-appearance of a second trial, which may take place at a second store of the same or an affiliated chain, e.g., a store associated with station 160; and/or at a different time, e.g., one or more hours, days or weeks after the first trial.

[0061] According to another demonstrative embodiment of the invention, imaging device 130 may capture an image of a user-appearance of a first trial, and send the image via network interface 122 over network 150 to control center 190, where the image may be stored for later retrieval. Accordingly, user 111 may gain access to the images of the first trial by accessing any station, e.g., station 160, connected over network 150 with control center 190.

[0062] According to some demonstrative embodiments of the invention, storage device 123 may include, for example, a hard disk drive, a floppy disk drive, a Compact Disk (CD) drive, a CD-ROM drive, a Digital Versatile Disc (DVD) drive, or other suitable removable or non-removable storage units.

[0063] According to some demonstrative embodiments of the invention, controller 121 may be or may include, for example, a Central Processing Unit (CPU), a Digital Signal Processor (DSP), a microprocessor, a controller, a chip, a microchip, an Integrated Circuit (IC), or any other suitable multi-purpose or specific processor or controller, e.g., as are known in the art.

[0064] Input device 124 may include, for example, a keyboard; a remote control; a motion sensor; a pointer device such as, for example, a laser pointer; a mouse; a touch-pad; a touch screen, which may be embedded, for example, in mirror-display device 140, or may be implemented by any other suitable unit, e.g., separate from device 140; a biometric input device, e.g., a fingerprint scanner, and/or a camera for scanning a face; and/or any other suitable pointing

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device or input device. Input device 124 may be adapted to receive user-identifying data, for example, to enable, access, e.g., secure access, of user 111 to system 100, as described in detail below.

[0065] According to some demonstrative embodiments of the invention, user 111 may provide user commands to input device 124 for operating the imaging device 130. Input device 124 may include, for example, an interface to enable user 111 of system 100 to define operational parameters of imaging device 130. Controller 121 may receive the inputs from user 111 via signals 131 and control the operation of imaging device 130 accordingly. The user commands may include, for example, commands relating to the timing for capturing an image, the positioning of imaging device 130, e.g., according to an automatic tracking algorithm which may follow, for example, the position of user 111, and/or imaging attributes such as focus, camera position, capturing angle, dynamic range and the like. The user commands may also include commands to define image capturing operating modes of imaging device 130 such as, for example, a video capturing mode, a photographic mode and the like. According to some embodiments of the invention, imaging device 130 may include a sound input device, for example, a microphone and/or a sound output device, for example, a loudspeaker. Accordingly, imaging device may receive audio signals, e.g., voice signals generated by user 111, which may be recorded and stored, e.g., in storage device 123 and reproduce the audio signals through the sound output device. The sound output device may be able to reproduce any other kind of audio signals such as, radio programs, compact disc records and the like.

[0066] According to some demonstrative embodiments of the invention, controller 121 may, for example, set the mode of operation of mirror-display device 140 according to the command received from user 111. For example, if mirror-display device 140 operates in the mirror mode, the user of system 100 may provide input device with a switching command, e.g., by pressing a designated button at input device 124, for switching mirror-display device 140 to the display mode. Controller 121 may receive the input from input device 124 and may control device 140 to switch to the display mode of operation, e.g., using signals 141.

According to some demonstrative embodiments of the invention, imaging device 130 may be mounted in various positions such as, for example, on top, below, or on the side of mirror-display device 140, thereby capturing an image of a user-appearance which may be an image of a

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given trial of apparel, an image of user 111 with various articles, e.g., furniture and/or posing with different garments and the like. In some embodiments of the invention, imaging device 130 may capture a user-appearance as it appears in mirror-display device 140, i.e., a mirror-image of the user-appearance. In other embodiments, imaging device 130 may capture the appearance, and controller 121 may generate a mirror-image corresponding to the appearance captured by imaging device 130. For example, storage 123 may store instructions that when executed by controller may result in any suitable method or algorithm of rotating, reversing, and/or mirroring the appearance captured by imaging device 130, thereby to generate image data representing rotated, reversed, and/or mirrored image of the image captured by device 130. According to these embodiments, controller 121 may control mirror-display device 140 to display, during the display mode of operation, the rotated, reversed, and/or mirrored image. In other embodiments, controller 121 may control mirror-display device 140 to display, during the display mode of operation, an image corresponding to the image captured by device 130, e.g., a non-mirrored, non-rotated, and/or non-reversed image. In some embodiments, imaging device 130 may not be visible to user 111, may be located behind display device 140, and/or may be embedded in mirror-display device 140, which may be or may include, for example, a LCD-CCD device capable of both displaying and capturing images. For example, in one demonstrative embodiment of the invention, device 140 may include an array, screen or surface, e.g., including liquid crystals, to perform the mirror-display functionality, e.g., as described above, as well as the imaging functionality of imaging device 130, e.g., device 140 may include a mirror-imaging-display device.

[0067] In some demonstrative embodiments of the invention, one or more of stations 110, 160 and/or 170 may not include image capturing device 130; and/or one or more of stations 110, 160 and/or 170 may not include mirror-display 140. For example, a first station of system 100 may include only imaging device 130, and may not include, e.g., mirror-display device 140. User 111 may use the first station to capture the image of the first trial of the user-appearance, e.g., without being able to view at the first station the resultant image of the first trial. User 111 may later view the captured image of the first trial at another station of system 100, which may include mirror-display device 140.

[0068] According to some demonstrative embodiments of the invention, imaging device 130 may be positioned in a manner enabling capturing of an image and/or a sequence of images,

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videos or the like, of a scene taking place in front of mirror-display device 140. Additionally or alternatively, imaging device 130 may positioned in a manner enabling capturing an image reflected from mirror-display device 140. For example, imaging device 130 may be able to capture an image of user 111 posing in front of mirror-display device 140. While posing in front of mirror-display device 140, user 111 may check his appearance of, e.g., a first fitting trial of clothes. According to an input provided by user 111 at input device 124, imaging device 130 may capture the image of the user-appearance which may be, for example, a given trial of apparel, e.g., a garment and the like. It may be noted that trials by user 111 may also include user 111 engaging with various subjects, which may be located in the vicinity of user 111 such as, furniture, studio set-up and the like. Accordingly, imaging device 130 may capture images of user-appearances of, for example, a first trial, a second trial, etc., and may send the respective captured images to storage device 123 via signals 131 and signals 30. User 111 may be able to retrieve the captured image of, e.g., the first trial, at a later time, e.g., following the second or other subsequent trials, and may compare between the first and second or other trial, e.g., as described below with reference to FIGS. 2A, 2B and 2C.

[0069] According to some demonstrative embodiments of the invention, storage device 123 may be adapted to receive data representing images captured by imaging device 130, and to store images of appearances and, more specifically, user-appearances of, for example, given trials of apparel, captured by imaging device 130. Images of given trials of user-appearances may be retrieved from storage device 123, e.g., by controller 121, and displayed by display 140. User 111 may compare between the displayed images, e.g., as described in detail below.

[0070] According to some demonstrative embodiments of the invention, storage device 123 may include data representing, e.g., software algorithms, requiring and/or verifying user identifying data such as user-ID, password, login-time, bio-metric data and the like to enable secure access to station 110, as described in detail below. For example, controller 121 may control mirror-display device 140 to display images corresponding to an identity of user 111, e.g., based on the identity data provided by user 111. For example, user 111 may provide input 124 with user-identifying input, which may include, for example, a biometric input such as face recognition, a hand print, a finger print, an eye print, voice recognition and the like. The user-identifying input may include any other suitable input, for example, a credit card, a personal identification number (PIN), a password, a smart card, a customer card, a club card, or the like.

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Controller 121 check, e.g., based on any suitable method and/or algorithm, whether the user-identifying input provided at input device 124 matches with user-identifying data which may be stored, e.g., in storage device 123 or in control center 190. Software having the capability of verifying a biometric input may be, for example, "Active ID FaceVision technology" provided by Geometric Inc. If controller 121 matches the input of user 111 with the stored user-identifying data, controller 121 may enable user 111 to access data representing, for example, images of previous user-appearances of user 111.

[0071] According to some demonstrative embodiments of the invention, storage device 123 may include data representing, e.g., software algorithms enabling additional system features such as, for example, rendering virtual effects on mirror-display device 140. For example, controller 121 may be able to render an image at mirror-display device 140 of user-appearances engaged and/or combined with virtual articles such as, for example, clothes, collections, headdresses, hair cuts, furniture and the like. In addition, controller 121 may be able to render an image at mirror-display device 140 of user-appearances having different body shapes for simulating, e.g., weight loss, weight gain of user 111 and the like. For example, user 111 may choose in a first trial a specific article, such as a suit out of a collection and controller 121 may virtually adjust the collection to an image of user 111 appearing in mirror-display device 140. Controller 121 may store the image of the first trial in storage device 123 and may perform the same step at a second trial. Accordingly, user 111 of system 100 may be able to compare between user-appearances of the first and a second trials of the collection.

[0072] According to some demonstrative embodiments of the invention, controller 121 may provide, for example, image and/or video browsing capabilities, image and/or video replay functions, which capabilities and functions may be predefined by system 100 or may be defined, e.g., on-the-fly, according to one or more user commands received from user 111 via input device 124. For example, controller 121 may be able to retrieve one or more images of previous user-appearances and display the images on mirror-display device 140 at various sequences. For example, images from previous trials may be displayed in a substantially continuous forward, backwards, or mixed, e.g., randomly-accessible, sequence, and/or may be a stepwise sequence or in any other sequence. Furthermore, images from previous trials may be displayed simultaneously at mirror-display device 140, e.g., as described below. Controller 121 may also be able to delete previously captured user-appearances, limit the amount of data which may be

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saved in storage device 123 and the like, and may further control a shape, size, color, etc., of the image displayed on mirror-display device 140.

[0073] According to some demonstrative embodiments of the invention, user 111 may use a portable storage device 180 able to store one or more of the captured images. The portable storage device may include any suitable portable storage device, e.g., a smartcard, a disk-on-key device, and the like. User 111 may download, for example, images represented by, e.g., signals 50, of a first trial of user-appearances from storage device 123, e.g., via a storage interface 125 or via any other suitable data connection. User 111 may then upload at a later time the image of, e.g., the first trial, to another location, e.g., a home of user 111, or another station of system 100, e.g., station 170.

[0074] In some embodiments of the invention, station 110 may include more than one mirror-display device or may include a mirror-display device 140, which may be partitioned simultaneously into two frames as described hereinafter with reference to FIGS. 2A and 2B.

[0075] According to some demonstrative embodiments of the invention, controller 121 may record or store, e.g., in storage 123, parameters characterizing user 111. For example, system 100 may include a weighing machine, connected to, e.g., storage device 123 via controller 121. Controller 121 may be able to record, for example, a weight of user 111 during, for example, a trial of an article. Accordingly, user 111 may later retrieve the parameter which may be, for example, the weight of user 111.

[0076] Reference is now made to FIGS. 2A and 2B, which schematically illustrate stages of comparing between appearances using an interactive system in accordance some demonstrative embodiments of the invention.

[0077] According to some demonstrative embodiments of the invention, mirror-display device 140 may be partitioned into two frames, wherein one frame may operate as a mirror frame 192 and another frame 191 may operate selectably as a mirror and as a display frame. As shown in FIG. 2A, user 111 may pose in front of mirror frame 192 a first trial, which may be captured by imaging device 130 and stored in storage device 123. Henceforward, as indicated in FIG. 2B, user 111 may view simultaneously in frame 191 the image of the user-appearance of the first trial and/or any other user-appearances, e.g., user-appearances stored in storage device 123 and/or received over network 150 (FIG. 1), side-by-side with the normal mirror appearance of a second trial in frame 192, and compare between the first and the second trial.

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[0078] Reference is now made to FIGS. 3A, 3B and 3C, which schematically illustrate three, sequential, stages of comparing between appearances using an interactive system in accordance some demonstrative embodiments of the invention.

[0079] As shown in FIG. 3A, the user of system 100 may view a first trial of a user-appearance in mirror-display device 140 operating in its mirror mode. Controller 121 may receive, e.g., from input device 124, a user input, which may include a request to use imaging device 130 for capturing a first trial of the user-appearance. As a result, imaging device 130 may capture an image of the first trial of the user-appearance and storage device 123 may store the captured image.

[0080] As shown in FIG. 3B, user 111 may view a second trial of his user-appearance in mirror-display device 140, which may operate in the mirror mode of operation. Then, when user 111 desires to view a previous appearance, e.g., for comparison, controller 121 may receive a user input via input device 124 requesting to view the first trial. At this point, as shown in FIG. 3C, controller 121 may change the operational mode of mirror-display device 140 to the display mode using signals 141. Controller 121 may also control device 140 to display the first trial. Therefore, by switching between operating modes of mirror-display device 140, user 111 may compare the user-appearance of the second trial with the user-appearance of the first trial and/or any other user-appearances previously stored in storage device 123.

[0081] Reference is now made to FIG. 4, which schematically illustrates a flow-chart of a method enabling comparing between one or more various appearances in accordance with some demonstrative embodiments of the invention. Although the invention is not limited in this respect, one or more operations of the method of FIG. 4 may be performed by one or more elements of system 100 (FIG. 1).

[0082] As indicated at block 410, the method may include, for example, setting the operating mode of a mirror-display device. For example, user 111 (FIG. 1) may initially set the operating mode of mirror-display device 140 (FIG. 1) to the mirror mode. Alternatively, display 140 (FIG. 1) may be designed to operate in the mirror mode by default whenever a new user logs into system 100 (FIG. 1).

[0083] As indicated at block 420, the method may also include, for example, posing in front of the mirror-display device. For example, user 111 (FIG. 1) may pose in front of mirror-

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display device 140 (FIG. 1) and check the user-appearance of a first trial of, e.g., clothing, shoes and/or any other apparel.

[0084] As indicated at block 430, the method may also include, for example, capturing an image of the user-appearance of the first trial. For example, user 111 (FIG. 1) may provide user command to device 120 (FIG. 1) commanding imaging device 130 (FIG. 1) to capture an image of the user-appearance of the first trial.

[0085] As indicated at block 440, the method may also include, for example, posing in front of the mirror-display device in a different user-appearance. For example, user 111 (FIG. 1) may change one or more items of environment such as, for example, furniture and/or apparel, pose once again in front of mirror-display device 140 which may operate in mirror mode, and view a second user-appearance.

[0086] As indicated at block 450, the method may also include, for example, switching between operating modes of the mirror-display device. For example, user 111 (FIG. 1) may switch mirror-display device 140 (FIG. 1) between the mirror and the display mode. Accordingly, user 111 (FIG. 1) may be able to compare between the user-appearance of the first trial, and/or any other user-appearances, e.g., user-appearances stored in storage device 123 and/or received over network 150 (FIG. 1), and the user-appearance of the second trial.

[0087] According to some demonstrative embodiments of the invention, user 111 (FIG. 1) may indicate, and/or station 110 (FIG. 1) may be able to store, e.g., automatically, for each trial parameters, e.g., including shopping parameters, such as, for example, name of store, address of store, price, time and/or date of trial of apparel, name of salesperson, and the like. User 111 (FIG. 1) may, for example, store the captured images of user-appearances in a removable or portable storage device, e.g., as described above with reference to FIG. 1, and may later review images of user-appearances while being able to ascribe every image to, e.g., a specific store and the like. In addition, user 111 may define, and/or controller 121 (FIG. 1) may be able to generate, and/or store in storage device 123 reminders, for example, alarms about, e.g., discounts, end of season sales and the like.

[0088] We now present discussions relating to embodiment of using an image captured by a camera, e.g., a digital still or video camera, and manipulating the image such that when it is projected on a screen it resembles a mirror image, i.e., an image the user would have seen if the screen was actually a standard mirror.

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[0089] Figure 6 is a schematic illustration for an understanding of the following embodiments, which includes a digital screen 640, a camera 630, and a computerized image processor 645, that could create a convincing mirror experience. In an ideal situation, the camera would be able to move on a parallel plane behind the screen, in correspondence with the user's eye location to create a convincing eye-to-eye look experience. However, it is not practical to locate a camera behind a regular screen, simply because it will block the camera's view. In theory, it is possible to overcome this problem by using a semitransparent screen or multiple pinholes with multiple cameras, though it may be too expensive and complex to implement. A simpler solution is to place the camera above the display screen and manipulate the captured image so as to mimic a mirror. Examples for the appropriate manipulations are provided below.

[0090] An adaptive FOV is required in order to compensate for the changes in the distances between the user and the screen, so that the user will see his image at the same size, just like in a mirror. According to one embodiment, this is solved by using the camera's zoom (digital and/or mechanical). Traditional cameras have fixed FOV or mechanically tunable FOV. In order to create an adaptive, i.e., continuously variable, FOV the system needs to manipulate the resolution, or to control the camera zoom and focus in real-time, based on user tracking.

[0091] Additionally, the image needs to be flipped vertically, to support the right-to-left behavior of the mirror. This image transformation may be performed relatively easily by manipulating the pixels addresses of a digital image.

[0092] As explained with respect to Figure 1, the mirror can be smaller than the user and still show a full body reflection. This can be achieved in combination of proper selection of FOV and proper selection of the size screen. The idea is to project an image on the screen, which has a FOV giving the perception that the user sees a reflection at double the distance to the mirror, such that the entire body is visible even if the digital screen is smaller than the height of the user. This is exemplified by images A, B, and C in Figure 6, showing an image of the user captured at different distances to the mirror, but showing the user's body at the same size by, among others, manipulating the FOV. In some embodiments, the image resolution also changes according to the user's distance to the mirror. For example, for close distances, one embodiment may use an array of cameras and the image manipulator would use stitching to reduce image distortion.

[0093] In order to support three dimensional imaging, the setup will require two cameras at a distance corresponding to the distance between the user's eyes, or one camera with two

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effective virtual points of view. A convincing 3D experience will also require the implementation of an adaptive closed-loop method that can change the creation of a 3D image as a function of the distance. When the user looks at his reflection in the mirror he sees himself in 3D, although when he approaches the mirror or walks away, the angle from his eyes to his reflection changes, which also changes the depth of the 3D image.

[0094] As explained with reference to Figure 6, it may be too complex or expensive to place the camera behind the display at eye level. Therefore, in the following embodiments a practical method is provided to implement the ideal system described above with a fixed-mounted camera/cameras located at the perimeter of the screen and facing the user. The main challenge is how to compensate for the image distortions adaptively and in real time, so as to create similar user experience as we would get in the ideal setup. Figures 7 and 8 show some examples of the challenges of using the practical setup with the camera placed above the digital screen, i.e., not corresponding to the user's eye level.

[0095] Figure 7 depicts what happens when the user approaches the mirror or moves away from it when using a camera mounted above the screen and pointed horizontally. Assuming the system is calibrated to central dynamic range, when the user is far the image is smaller and higher (scenario C in figure 7) and when the user is closer to the screen (scenario A) the image of the user is larger and the FOV of the camera cuts the image of the user. Additionally, when the user approaches the screen, a projection distortion becomes noticeable, meaning that the user will not feel as if he is looking at himself in a mirror.

[0096] To enable capturing the entire body of the user at any distance, in one embodiment the camera is located at the top of the screen and tilted downwards to allow maximum dynamic range of the user's movement in front of the screen. As depicted in Figure 8, because the camera is tilted downwards, the projection distortion is much larger and noticeable. The closer the user is to the camera, the more distorted his image becomes. The nature of the distortion is mainly projection distortion – the user look shorter and the upper body looks larger. In this configuration the image of the user also got smaller as he was further away from the screen. On the other hand, the effective/usable FOV of the camera will cover a larger area in front of the screen, and will allow the user to get much closer to the screen and still see an entire body image.

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[0097] To enable generating a convincing (augmented) mirror experience from a camera a located in front of the user and in spatial offset from the screen, a computerized method is used to manipulate the captured image prior to its presentation on the screen. The computerized method may operate in real time or not in real time, depending on the operational mode of the screen.

[0098] The computerized method receives as an input the image captured by the camera and performs a transformation of the image to correct the point of view and field of view of the camera to fit with the view point that would occur with a conventional mirror. That is, when the user moves closer or further from the mirror, the view point that would have been reflected in the mirror would have been different from that captured by the camera. Embodiments of the inventive computerized method incorporate an adaptive POV (point of view) and Adaptive FOV modules based on tracking the position of the user.

[0099] Specifically, attempting to solve the virtual mirror problem by only flipping the image vertically as was proposed in the prior art is insufficient to create a mirror experience. When using a camera, once the user gets closer to the camera/screen the user's image becomes larger, and vice versa, as opposed to a conventional mirror where the user will always see himself roughly at the same size with a bit of a different FOV, regardless of his distance from the mirror. In addition, getting closer to the camera introduces image distortion that needs to be corrected in a much more advanced computerized method. Performing an adaptive POV and adaptive FOV prior to displaying the image on the screen results in an image that mimics a reflection of a mirror positioned at the location of the screen. Moreover, to obtain an even more convincing mirror experience, the following features may also be incorporated.

[00100] According to one embodiment, the computerized method further performs dynamic adaptive image stitching of images obtained from a plurality of cameras. According to this embodiment, the system incorporate multiple cameras, e.g., positioned at different locations and/or based on multiple technologies/characteristics, so as to improve the image resolution, accuracy of the image, extend the FOV of a single camera, reduce distortion for different users and different orientation of user, and create a better model for the user body mesh to compensate the camera's distortion. For example, because the image loses resolution as the user moves away from the screen (fewer pixels capture the user's image), it make sense to optically zoom and refocus the camera. The problem is that it comes at the expense of shrinking the camera's FOV.

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In order to improve resolution while maintaining FOV, a stitching or dynamic zoom can be implemented concurrently.

[00101] As mentioned in the preceding paragraph, to properly convey a mirror experience, the system may further implement an adaptive optical zoom. The adaptive optical zoom enhances the image/video's quality/resolution, based on distance tracking, i.e., continuously tracking the distance to the user. In addition, it reduces the asymmetric distortion that can occur if the camera is mounted on the side of the screen.

[00102] In order to ensure the accuracy of the image transposition, the platform can be calibrated in discrete pointers and the computerized method can interpolate and extrapolate the correct transformation on different positions in front of the screen. According to one embodiment, the projection distortion can be calculated in an analytical way based on user tracking and camera location. According to another embodiment, the image distortion is measured in front of the screen, and this measurement information is used instead of direct projection calculation.

[00103] The computerized method is optimized to reduce delay as much as possible by using, e.g., parallel computing and/or calculating the transformation per distance beforehand offline, such that when a distance to a user is measure, the mapping transformation is ready upfront. According to another embodiment, a straightforward approach is used without calibration, by analytically creating a projection transformation per user's calculated/measured point of view.

[00104] The following is a high-level description of the modules that together provide the mirror image transformation. The video acquisition module performs: grabbing the video, making video enhancements, camera optimization setting and control to get the best video quality under the available hardware limitations. The geometric measurements module measures or estimates any combination of distance to the user, the user height, identifies eye position and head pose, performs 3D body mash estimation, etc. The camera control module sets the camera for image/video quality and max resolution. In case of multiple cameras, optimization on FOV to get the max resolution will be done based user distance from each camera.

[00105] The geometric transformation module takes the video frame by frame, and the relevant user geometrical position/orientation information, and maps the raw images to the correct location and fills the blind pixel if there are any. For example, the geometric

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transformation is performed to match the eyes as if the user is looking at the mirror. That is, the computerized method calculates the right geometric transformation to distort the input video such that the user will look at himself and will feel that he is looking at his own eyes. This transformation is useful in other situation as well. For example, when performing video conference using computers, since the camera is positioned above the computer monitor or screen, the resulting image always shows the user looking downwards, since the user is actually looking at the computer monitor and not at the camera. Using the disclosed geometric transformation is such a situation would result in an image of the user as if he was looking at the camera, when in fact he is still looking at the screen. This would result in a more personalized conference environment. In the video conferencing application the geometric correction is similar to the mirror application though flipping image left right is not required.

[00106] The mapping transformation module can be implemented using various embodiments. According to one embodiment, a scaling approach is used, wherein geometric assumptions are used to make scaling correction per distance to the user, so as to match the size of the image that the user would see in a mirror. According to another embodiment, an image projection and scaling approach is used, wherein based on user distance, spatial offset and eyes location per distance and offset, projection transformation error between user/user-eyes and camera location is calculated or measured. Additional transformation can be made to correct optic distortion.

[00107] According to yet another embodiment, a registration approach is used, which has been shown to provide rather accurate results. According to this approach, the transformation is pre-programmed based on offline true registration technique of raw image from offset/projected/back oriented camera to an image that was taken in front of the user when the user eyes are staring at the camera. Reference image can be generated from one multiple cameras with stitching. For example, a reference camera will be located in a similar height and distance that will reduce most optic distortion, e.g., at eye level and 2-3m from the user. The registration will yield the best transformation to match the eyes and the full body based on multiple pointers. In one example, multiple pointers, e.g., white dotes, on a 2D or 3D calibration target, e.g., human/doll target will form a two-dimensional grid around central body. For example, circular stickers can be placed on the legs, on the chest, on the shoulders, on the eyes, etc. To improve accuracy, this registration can be repeated for multiple user locations/positions in front of the

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screen to account for, e.g., multiple spatial offsets from broadside, multiple heights, multiple distances, etc. For each location, the best mapping possible is created, assuming multiple distortions (projection, barrel, fisheye, or any combination, etc.) that can be corrected with multiple registration techniques (e.g., projection, affine transformation, similarity, polynomial, or any combination, etc.).

[00108] The above-described embodiments can be implemented in conjunction with the following further enhancement. Image stitching can be used with multiple cameras that are located so as to improve resolution quality, to minimize distortion from single camera, or to increasing field of view. Image stitching element will be integrated stitching based on user geometric location. Each camera will have its own transformation correction since the offset relative to the virtual eye location will be different. The multiple cameras can also be used to generate three dimensional view to improve the user experience.

[00109] A three-dimensional infrared (3D IR) image can also be generated. Such an image can be used to generate an accurate virtual model of the user, which can then be used to allow API for virtual dressing and augmented reality. Using augment reality, one can change the background, insert objects, perform virtual dressing of different clothes, etc. This may also be used to analyze the user body language and link it with the augmented reality applications, virtual dressing applications, gaming, video conferences, etc.

[00110] Since the system records the image, either still or video, various analytics can be performed on the images. For example, video analytics and/or store analytics can be used to collect information on the user or the store performance, e.g., how many times he smiled, did he enjoy the experience, estimated age, sex, ethnic origin, etc. Various inputs can be used for behavioral analysis platform that can help to integrate the eComerce into the real try-on experience, or as add on to any other application. For example, the system can analyze the user try-on item/items and linked it with the shop inventory, 3D printing, and the eComerce web, eComerce stylist, social network, etc.

[00111] Reference is now made to Figure 9, which is a block diagram of an embodiment of the invention which performs image transformation to generate an image that mimics a mirror. The various modules of the system illustrated in Figure 9 can be implemented on programmed general purpose computer, DSP, CPU, GPU, Camera DSP/ASIC, Screen DSP/ASIC, standalone computing device, FPGA card, DSP device, ASIC, cloud parallel computing, etc.

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[00112] Block 930 represents one or more cameras 1:n, which stream the images to the image grabber module 932. Block 930 may include still and/or video cameras, IR camera, two and/or three-dimensional camera arrangements. A range finder, e.g., electroacoustic or electronic range finder, may also be included.

[00113] The image grabber module 932 captures the streamed images from block 930, and may apply filters to improve the image quality. Additionally, it may perform cropping or image resizing as needed for optimization of the image. If multiple cameras are used, the grabber module 932 applies image stitching as needed for better quality or wider effective field of view.

[00114] The trigger event module 960 is a parallel process that can get its input directly from the image grabber module 932, although it can also get the images after the eyes-match module 934. The input can be optimized in size, bandwidth and rate to perform the required functionality. Examples of elements that can reside in the trigger event module 960 include the following. Identify that a user is standing in-front of the camera 930, e.g., based on background subtracting and changes in a predefine zone, pattern recognition, etc. Measure the distance to the user by, e.g., correlation between stereo cameras, 3D IR camera, etc. According to another embodiment the distance to the user is estimated using a single camera measurement, by making some geometrical assumption, e.g., the user is roughly standing in front of the mirror and on a flat floor, so that the distance, the user height or the user theoretical point of view in a mirror, for example, can be deduce from measuring the location of the user's shoes and the user's special offset from the screen broadside.

[00115] A face recognition module may be included in order to ease the user interface identification. In operation, after registration the platform should save the information for each user, and once the user is recognized by the system, the system can upload the user's data, make updates, suggest items, etc. With face recognition the user doesn't have to identify himself, which saves time and enhances ease the use. The face recognition can be the trigger event for automatic recording of the apparences. In some embodiments, the length of the recording of each session is pre-defined and may start once the face recognition is successful. In other embodiments remote control technics can be used as trigger, such as a function in a mobile application or dedicated tablet/mobile/other remote control devices.

[00116] Other elements that can reside in the trigger event module 960 include video analytics (to create meaningful feedback, e.g., estimate age, sex, mood, other popular items,

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etc.), item recognition (so that the system can easily link the try-on items into the store, enhance inventory and eComerce platform for better recommendation and faster checkout and inventory planning), and gesture identification (for seamless user control without an input device).

[00117] The eyes-match transformation module 934 performs the image transformation prior to display on screen(s) 940. It gets as an input the image from the grabber module 932, and in addition, may receive the calculated distance or distance and height or actual user point of view. The eyes-match transformation module 934 calculates the required mapping. The required mapping can be calculated directly based calculation of the projection angle difference between camera and user theoretical point of view, e.g., matching the required image scale and positioning. Alternatively, a true-match approach that utilizes factory calibration process can be used to create a very accurate transformation between the camera and calculated point of view at discreet locations in-front of the mirror. Additionally, the base images and transformation that created per other one or more parameters, for example, distance, height, pose, measurements done in the factory, or real time when the user is standing in front of the screen, may also be used.

[00118] Based on user distance or the combination of user distance and eyes point of view, the eyes-match transformation module 934 creates interpolation of the transformation at any location in front of the camera. Since the distance of various parts of the user's body to the camera is not uniform, the projection distortion creates effect where closer body parts, like the head, are imaged by more pixels than far body parts, like the legs. Consequently, the user appears with shorted legs and large head, i.e., closer body parts appear larger and further body parts appear smaller. This mapping is not a linear, i.e., each pixel represent different area length and width (dx,dy), so pixel filling/under sampling decimation will have to be performed to maintain the axis proportion. Filling approach can be any interpolation (near, linear, cubic, polynomial etc.) or more complex filling from different camera projection. For example, cameras from above and below the screen can complement and better estimate the missing pixels or the correct eye orientation. Additional option is to perform some of the analysis in direct optic (special lens/prism) that will correct most of the projection distortion and will improve the resolution. Some of the resizing issue that affects the quality can also be compensate optically by mechanical zoom.

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[00119] An optional virtual dressing/augmented reality module 936 can be included to enhance the user's experience. Module 936 gets its input from the EyesMatch module 934 or from the recording module 938. The EyesMatch module 934 performs a transformation of the image and will be explained in further details below. The EyesMatch module 934 can be used in various applications other than the mirror, such as for video cams, video conferences, etc. In addition, module 936 can get input elements to render from the CPU that maintains an active link with the inventory, a database, a 3D printing, eCommerce data base etc. Using the input data, module 936 can render digital images to be merged with the transposed image. For example, module 936 can be used to change an item's color based on actual try on and available inventory or user customization. It should be appreciated that module 936's rendering is different from regular virtual dressing, in that module 936 performs the rendering on an item that is imaged while on the user's body. Thus, for example, rendering the item in different color does not change the physical appearance of the item that the user is wearing, but only its color. Consequently, the user can feel the actual item on his body, see how it actually effects and changes his body shape and appearance, view actual folds and stretches, etc. Module 936 can also be used to add accessory to actual user's image or add true virtual dressing capability to the platform. Similarly, module 936 can be used to augment the background to change or create different environments to match the item the user wear, e.g., beach background for bathing suit, night club background for night dress, etc.

[00120] The video/stills recording module 938 receives its video/stills from the camera grabber 932 directly, from the EyesMatch module 934, or from the virtual dressing augmented reality module 936. In addition, it gets control signals from the control module 962, that indicates when to start/stop recording, what information to store per user, and on what video/stills to process off line additional transformation/augment, reality/virtual dressing/quality enhancement, etc. The method that can be used for the recording without loading the system resources (CPU/BUS/GPU) can include encoding/decoding capabilities in the GPU cards.

[00121] In addition to having a local copy of the video/images in the Mirror Memory (station), the images can be automatically replicated to a Cloud Service and can be encoded automatically for any necessary size.

[00122] The recording process can also modify the frame rate, the compression, the cropping, /change the formats, and modify video and color effects.

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[00123] Other than recording, optionally the system can provide live streaming of the Mirror video. For example, the system will be able to show on the web in real-time streaming from any mirror, meaning that any device will be able to watch the streaming, including mirror to mirror.

[00124] Control module 962 controls the operation of all of the other modules. The control module 962 configures all of the hardware and software elements in the system, including the cameras 930, screen 940, DSP, etc. Control module 962 includes an interface, serving as a link between the local station and the cloud base eComerce 950, other web applications 952, smartphone applications 954, etc. The information that will be recorded on the recording module 938 can be delivered to the user immediately by wireless signals/IR/wire, or can be delivered by the user authorization to a cloud base application like Facebook, Google, or other, or to the company server that can be linked to the eComerce application.

[00125] The factory calibration module 964 is utilized when the transformation relies on actual image transforms. The camera to screen geometry orientation can be determined/measured in the factory, or can be measured in the field, and offsets can match the calibration with the factory condition. In addition, correction can be matched to height or angle of the mirror setup relative to the floor. The calibration process may be implemented as follows. The first step is to create a mirror reference of how the image should look like in the mirror at different discrete distances, special orientation, different eyes reflection location (i.e., theoretical point of view). The reference can be taken in multiple ways:

1. As illustrated in Figure 10A, the camera 14 is located at the location of the "supposed" mirror and at the user's eye height or close to it. A user or a doll with pointers (e.g., white sticker dots 10) is positioned at a distance from the camera, such that it will eliminate most of the camera distortion when looking at the camera. The scaling of the image can be matched and cropped to represent true size of a supposed reflection at a mirror, or slightly smaller. That is, the generated reference image should match the true size of the user on a mirror placed at the camera location, or smaller to fit the screen if preferred (depend on the size of the screen).

2. In Figure 10B, a user or a doll with the pointers is positioned in-front of a conventional mirror 12. The camera is positioned at the location of the user and located at eye level of the user, and images the reflection in the mirror. The reference image can also be taken with an array of cameras, e.g., in front of the user in a vertical line, to eliminate distortion.

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Thereafter, the multiple images are stitched to get a uniform image with high resolution and low distortion. Google glasses can also be an option for calibration in this scenario. The user/target with the camera will take a picture of himself in-front of a regular mirror. Since the FOV is fixed, the only thing that needs to be done is resize the image for true size.

[00126] Once the reference image is obtained, another image is taken by placing the camera at its actual service location, e.g., above the screen, which will be referred to herein as the actual image. Then a registration of the reference and actual image is performed, by matching the pointers on the actual image to those of the references image. From the registration information, the transformation that can best bring the distort image to the right eyes and body orientation is extracted. Also, based on actual installation geometry in the field, offsets or correction to the transformation can be added. Based on user distance and eyes point of view, an interpolation of the transformation at any location in front of the camera can be create.

[00127] Figure 11 is a block diagram illustrating a process according to an embodiment of the invention, which can be used in the systems described herein. The process begins at 1100, with a factory calibration procedure, which can be implemented using the followings steps as one example. A calibration target is selected, e.g., a doll, a user, a board etc. Target pointers are then placed on the target, for example stickers 10 illustrated in Figure 10A. The camera is then mounted at its service location, e.g., above the screen and tilted down as illustrated in Figure 8, and is set to capture the maximum range. Snap shots of the target are taken at multiple locations (i.e., distances, heights, literation offsets, etc.). On the other hand, for simplicity, taking images at multiple distances along the central virtual line in front of the screen would suffice. One or more reference images are then obtained by, for example, either of the methods shown in Figures 10A or 10B. As one example, the camera is positioned at eye level at the same location of the screen. Then one or more snapshots of the same target are taken, using the same allocated pointers. If only one image is taken, it should be taken at a reasonable distance to avoid camera distortion. If multiple reference images are taken, they should be taken at multiple distances so as to capture the small changes occurring when user approaches the mirror. Note, however, that if multiple target and multiple reference images are obtained, it would be advisable to take them at the same distances and same positions, to generate better transformations. The reference images can be resized to represent a true size on the screen, i.e., to mimic the size that would be reflected in a mirror positioned at the location of the screen.

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[00128] Once the target and reference images are obtained, the distorted target images that were taken from the tilted camera are registered to the reference image(s) using the pointers, so as to represent how the user would appear at a mirror positioned at the location of the screen. The output of the registration is a transformation operator, e.g., a set of pointers, each having two coordinates: one in the input image and one in the reference image. Various transformations can be tested over multiple target and reference images. For example, multiple distortion functions can be applied to get the best matching performance. The principle functions would be projection, resize, XY translation (offset) and left-to-right flip. The best transformation combination is selected and mapping transformation is created for each calibration point. This mapping transformation is the factory calibration according to which live images in the field would be transformed to mimic a mirror image. It should be appreciated that the mapping may include different transformations for each pixel or each section of the live image, so as to provide the best representation of a mirror reflection.

[00129] As can be understood, step 1100 can be implemented in the factory, prior to shipping the system. On the other hand, this procedure may also be done in the field, especially when the camera and the screen are provided as separate elements, such that in different situations the camera may be positioned at different locations with respect to the screen. In such circumstances, it may be beneficial to supply the system with a calibration target, e.g., a doll (3d target) or board with calibration markings (2d target) , such that the user may be able to perform the calibration in the field using a standard target. The system would then be pre-programmed to perform the calibration process and generate the transformation mapping in the field.

[00130] Once the system is installed in its service location, the process is at step 1105, wherein live image or video of a user is obtained and grabbed by, e.g., a frame grabber. At the same time, the user's location is measured, such that the user's point of view is determined. This can be done using IR measurement technology, or using available sensors, such as, e.g., Kinect®, available from Microsoft®. At step 1115, if needed, optionally a scaling factor is applied to match the screen size and user height.

[00131] At step 1120 the appropriate transformation mapping is selected, or a standard factory calibrated mapping is interpolated to create the correct mapping for the user's particular location in front of the screen. The transformation mapping is then applied by the EyesMatch module to the live video. In this context, the term "live" also refers to a video feed that was

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grabbed by a frame grabber and may reside in a buffer prior to being sent to the monitor screen for presentation. Also, if needed due to the transformation, at step 1125 missing pixels are filled in by interpolation technique. At step 1130 the image is sent from the buffer to the screen to be displayed. It should be appreciated, that due to fast processors available commercially, steps 1105-1130 can be performed in real time, such that the user cannot perceive any delay in presenting the image on the screen, which is referred to herein as "real time" or "live" presentation.

[00132] The EyesMatch module can be used to provide a more natural environment that more conform to daily interaction. For example, when making a video call using a PC, such as by using Skype®, since the camera is normally positioned above the monitor, the caller often seems to look away from the camera, since the caller is actually looking at the screen. This provides an unnatural conversation, since the callers are not looking at each other when talking. The EyesMatch module can be used in such application to apply a transformation such that the image displayed on the monitor appears as if the caller was looking directly at the video cam, even if the caller was actually looking at the screen, and thus away from the video cam. The transformation can be done either at the sender or receiver's computer. For example, a user using Skype® may have EyesMatch module installed on his computer, such that whenever the video cam is activated for a video conference, the EyesMatch module intercepts the signal from the video cam and applies the transformation prior to allowing the video to stream to the other user via the Skype application. When the other user receives the video signal, it has already been transposed such that the other user sees the image as if the caller is looking directly at the video cam. The same can be implemented is standard video conference systems, such as WebEx, Polycom, etc.

[00133] Figure 12 is a block diagram illustrating modules and processes to perform the calibration and image transformation according to an embodiment of the invention. Block 1230 represent the image acquisition module, which may include one or more still or video cameras, an IR camera or distance measurement sensor, a 3D camera arrangement, etc. Module 1232 controls the camera optimization settings, e.g., to obtain the proper FOV, image the proper zone in front of the screen, set focus and/or resolution, etc. Module 1260 is the trigger event module, which can be used to identify the presence of a user in front of the screen and start the image

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acquisition and transformation process. At other times, the system can be set at idle, showing only a background image on the screen until a user is detected.

[00134] Brace 1360 encompasses the calibration procedure, which will be described herein for a system configured for a field installation wherein the camera 1230 is positioned above the display screen 1240, as also exemplified in Figure 1. The calibration 1260 can be performed in the factory prior to shipment or in the field after installation. At 1261 a target with pointers is positioned and at 1262 one set of reference images are obtained (using, e.g., camera at eye level and looking forward) and a corresponding set of input images are obtained (e.g., using the camera at its field installation position above the screen and pointing downwards. At 1263 pointers from each input image are matched to corresponding pointers in corresponding reference image. So as to generate transformation vectors. Depending on the quality of mirror representation sought, optionally the vectors corresponding to areas around the eyes of a user are fine-tuned at 1264.

[00135] Using the matching of the pointers of the input images to the reference images, at 1265 the transformation parameters that lead to the best image matching can be determined and selected. The parameters that can be used for the transformation include the following. A highly effective transformation parameter is a tilt transformation. Tilt transformation corrects the distortion in the image caused by the camera being tilted downwards. The tilt transformation modifies an input image taken with the camera looking downwards and transforms the image to appear as if the camera was pointed straight horizontally (Video engine can also correct azimuth error). Another transformation parameter is elevation translation. The elevation spatial translation transformation linearly modifies offset in an image taken with a camera positioned externally to the screen, e.g., above the screen, and transforms the image to appear as if the image was taken from the screen location at the user's eyes level (match the eye height to the image in the screen height) Horizontal translation can also be apply to correct missalignments between the camera and the center of the screen). Another important transformation for mimicking mirror is scale. As explained above, in an actual mirror reflection the user sees very little change in body image size as the user gets closer to the mirror. Conversely, in a camera image the size changes considerably with distance to the camera. A scale transformation reduces the effect of size change with distance to the screen, so that the user sees almost constant size of

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himself in the screen, regardless of distance to the screen. Depending on the position and FOV of the camera, an x-y translation of the image may also be required.

[00136] In practice, it has been shown that performing tilt, elevation, and scale translations provides a rather convincing image that only needs to be right-to-left reversed to very effectively mimic a mirror reflection. For further improvements, one may also use barrel-effect transformation and fish-eye transformation. Additionally, one may add depth perception to the projected image by adding lighting and shadowing, either artificially by operating on the intensity and/or hue of the image pixels, or physically by controlling illumination elements such as LED's strategically position about the screen or the user. Moreover, a 3D effect can be created either with the use of 3D glasses or using glasses-free 3D technology. In glasses-free 3D technology different sets of images are projected to each eye. Since in the embodiments described the distance to the user and the location of the user's eye are measured or estimated, it makes it easier to project a 3D image to the user by projecting different sets of the images to each of the user's eyes.

[00137] At step 1266 a transformation mapping is generated and stored. This transformation mapping will be used at 1234 for transforming live video feeds from imaging 1230, utilizing the estimated distance to the user. Depending on the transformation mapping operation, pixel filling may be needed. For example, using a camera on top of the screen and tilted downwards would require tilt and elevation transformations which would provide an image that can be enhanced using pixel filling. This can be done at 1237, and the resulting image would be presented on the screen at 1240. Applying the transformation and pixel filling onto live video feed can be easily done in real time using the appropriate processing capacity.

[00138] Figure 13 illustrates another embodiment, wherein calibration and transformation mapping is performed in the field after installation of the system. In the example of Figure 13, camera 14 is positioned above video screen 12 and is tilted downwards. The camera 14 and screen 12 are in communication with and are controlled by controller 18. The user is provided with an input device 16, which may be in communication with controller 18 using wired or wireless technology. The user stands at an appropriate location, e.g., 2-3 meters from the screen 12, and enables the calibration process by, e.g., entering a "calibrate" command from the remote input device 16. During the calibration process, a live video stream is fed from camera 14 to the controller 18, and the controller "flips" the image about a central vertical axis (left to right) prior

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to displaying it on screen 12. Using the input device, the user acts on the various transformation functions. For example, the input device may include input buttons for correcting tilt, elevation and scale, as schematically illustrated in Figure 13. The user's input commands are transmitted to the controller 18, which then applies the transformations in real time to the video feed, such that the image is changing in real time in front of the user. The user may change the amount of each transformation function until the user sees a convincing image in the screen, at which point the user may press an input button indicating that calibration is completed. The controller 18 then saves the appropriate calibration parameters and uses these transformation parameters for all future live video feeds.

[00139] Another feature illustrated in Figure 13 is distance calculation. Since the position and tilt of the camera 14 with respect to the screen 12 are known (e.g., due to fixed bracket attaching the camera to the top of the screen), the image captured by the camera 14 can be used for triangulation and distance calculation. For example, when a user appears in a frame of a live video stream captured by camera 14, triangulation to the tips of the user's shoes can be performed in order to calculate the user's distance to the screen 12. This operation can be done every fixed number, n, of frames, such that the user's distance from the screen can be continuously updated to capture user's movement. The background can be updated once there is no user in front of the mirror – adaptive background method.

[00140] A further feature illustrated in Figure 13 is the use of lighting to create depth and/or atmosphere. Specifically, several light sources 17, e.g., LED arrays, can be placed at different locations about the screen 12, and be controlled by controller 18. The light sources 17 can be operated so as to create more depth in the image, e.g., adding shadows and brightly illuminated areas. The light sources 17 can be of different colors, so as to improve the existing lighting and create the appropriate overall "temperature" of the displayed image. The light sources can also be tuned according to the distance to the user, so as to create consistent image and remove artifacts created by the store's illumination. Alternatively, or additionally, color and lighting changes can be done by the controller directly on the digital image received from the camera 14. For example, color transformation can be used to enhance the mirror appearance of the image, e.g., operate on parameters providing an image that is: glossy, crisp, sharp, mat, metallic, etc. The controller 18 can also add virtual spot of lights and/or shadows on the image to create more depth to the image. Also, an anti-reflecting coating is provided on the front of the

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screen so as to remove and reduce reflections that are normally associated with flat panel displays. The LED Array can be connected to light sensor, and/or to light temperature sensor, and can be predefined to stay in particular levels of light and light temperatures, and will adjust automatically.

[00141] According to further embodiments, 3D imaging is implemented with two cameras at a distance D between each other. Distance D is calculated as an average distance between human eyes, generally referred to as interpupillary distance (IPD), which for adults is around 54–68 mm. The transformation will be calculate from registration of image obtained from the input camera at a distance D with an image obtained from two reference (base) cameras at a spatial distance that is also similar to the distance between to user eyes. The base for registration can be taken using a Kinect® or any IR 3D camera. Google glasses can also be an option for calibration, wherein the user/target wearing the Google glasses will take a picture of himself in front of a regular mirror. Since the FOV is fixed, the only thing that needs to be done is resize the image for true size. An image transformation module, such as controller 18, can also apply image resize for zoom in/out to allow the user to fit the image to the screen or to focus on some part.

[00142] As can be understood, while some of the above embodiments relate to building the transformation mapping by registering images or other empirical methods, alternatively direct calculations of the distortion between camera and theoretical user point of view can be performed based on analytics. Using analytics voids the need for any registration procedure. Instead, analytical mapping transformation is created to correct for the distortions.

[00143] Yet another feature illustrate in Figure 13 is the use of the Internet or the cloud for providing services relating to the transformation and mirror presentations. For example, according to one embodiment, the transformation can actually be performed in the cloud, if a sufficiently fast connection exists. In such a case, the feed from the camera 14 can be fed to server 181, which applies the transformation and sends it back to controller 18 for display on monitor screen 11. According to another embodiment, the images from camera 14 or transformed images from camera 14 can be stored in the cloud and streamed to devices, such as smartphone 183, tablet 187, and another monitor screen 189, such as a flat panel TV. This can be done in real time while the user is trying an outfit, such that the user can share the experience and get input from others at remote locations. Also, once the user leaves the store, the user can have access to all the images taken by using a smartphone, tables, PC, etc. Note that for ease of

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user interface, as shown in monitor 189 of Figure 13, thumbnail images of various tries can be displayed together with the current image, to enable the user to choose among views.

[00144] Figure 14 illustrates an embodiment for extracting data from the image of camera 1430. The trigger event module 1450 detects the presence of a user and activates the process for extracting the data. A camera optimization module 1432 can be used to control the camera to obtain the best image for the data extraction. In this embodiment, when the camera 1430 is located above the screen and pointed down, it can see the user's shoes from, e.g., 1m to 4m from the screen. However, since the camera is pointed down and the shoes are at a high distance from the camera compared with the user's head, the distortion is at the maximum. With the transformation mapping discussed above a compelling distortion improvement is achieved at all distances.

[00145] Additionally, according to this embodiment, the image of the user is separated from the background at 1462. At 1464 the central mass is calculated by multiplying the binary image of the user only by index matrix, and then taking the mean of the pixels index. Also, the min. body pixel below central mass (J,k) is determined by opening a window around k (central mass) and finding the lower active index – which can be assumed to represent the edge of the shoes. At 1468 the user's height is calculated by finding the top of the head and, based on the distance camera resolution, FOV, and the camera geometric tilt, the user's height is estimated.

[00146] Figure 15 illustrates an embodiment wherein stitching of images from n cameras is performed. Stitching is particularly beneficial for improving the image resolution and FoV when the user is approaching closer to the screen. In the embodiment of Figure 15, the live feeds 1530, 1532, of n cameras, 1:n, are stitched together. Trigger event module 1560 may be used to trigger stitching when a user is detected in front of the screen. Also, distance measurement may be supplied, either a single value representing an average distance to the user, or multiple values, e.g., one distance value for each camera. Conversely, or in addition, multiple distance values may be provided to indicate different distances of different body part.

[00147] Each camera may undergo separate camera optimization, 1533, 1536, and the feeds from each camera would go through a different geometrical transformation, 1560, 1562, since the location and orientation of the cameras are different relative to the user point of view, 1564, 1562. Overlay decision 1570 is the decision element to determine where will be best to perform the stitching. If we are dealing with scenario with two cameras one located above and

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one below the screen, the overlay decision will indicate the index of the best cut. Since we have distance measurement constantly, it is possible to maintain the stitching line almost fixed once user approach the mirror. For maximum performance the stitching 1572 needs to be optimized based on the user's distance from the cameras. Smoothing 1574 is needed to filter out the lines that may be generated at the intersections of different images from different cameras. The images from different cameras would be slightly different due to differences in absolute quality and in lightning, and due to different distortion correction for each camera. Interleaving between the images on multiple rows can be used to ease the lighting affect. The stitched image is output at 1576.

[00148] In the above described embodiments, the transformation mapping corrected the image obtained by the cameras and provided an image that mimics an image that would have reflected from a mirror. The following embodiment, illustrated in Figure 16, improves the quality of the eyes' presentation. The idea behind this embodiment is to override the eyes zone, or just the eyes, with modified pixels that will create the feeling of broadside view – i.e., presenting the eyes to their fullest mimicking the user looking directly at himself in the mirror. As can be understood, the user would be looking directly at himself projected in the screen, but since the camera is not positioned at eye level pointing horizontally, the user's eye as captured by the camera would not be seen looking straight ahead. The embodiment of Figure 16 corrects this problem.

[00149] The majority of the elements in Figure 16 are similar to that of Figure 12 and have the same reference, except that it is in the 16xx series. These elements will not be described here again. Instead, attention is directed to element 1680, which is responsible for the eyes correction. Since the scaling has already been correct by the prior elements, what needs to be done at this stage is to fix and/or reconstruct the internal eyes elements, e.g., pupil, iris, etc., so as to present the proper image.

[00150] Module 1680 first locates the eyes in the image and makes sure that the user does indeed look at the screen. The information for this step and for the corrections can be deduced from historical images, estimations for regular statistical eyes proportions, or actual measurement when the user looks directly at the camera or once the user is standing far enough from the screen where the distortion is relatively low after the transformation mapping. If the user is found to be looking at the screen, the pixels corresponding to the eyes area are either

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transformed or actually replaced by pixels that position the iris and pupil at the center of the eye, looking forward. Also, the sclera may be enlarged, to mimic straight-on view, especially if the camera is positioned above and pointed downwards.

[00151] Another feature that may be implemented in any of the above described embodiments is the frequency of transformation parameter update. That is, at times the user may prefer a stable image when he is standing stationary in front of the screen that mimics the mirror. Having the transformation mapping engine change while user is stationary may create an uncomfortable feeling. On the other hand, when the user is moving faster toward or backward from the screen, it may be fine to update the transformation parameters faster. Accordingly, according to this feature, multiple behavior zones are established. According to one embodiment, the behavior zones are set according to distance only. For example, when the user is moving more than a set distance amount, the video engine is updated. According to one embodiment, if the user moved an amount of less than, say 25cm, the transformation mapping is performed at a lower speed, say every x seconds, while if the user moved more than 25cm, the transformation mapping is updating the parameters at a second, faster speed. According to another embodiment, the zones are set according to the user's movement speed. For example, if it is determined that the user is moving less than x cm/s, then a first transform updating frequency is implements, while if the user moves faster, a second, faster updating frequency is used.

[00152] Thus, as can be understood from the above, while a real time video engine update may be used to image the user, the presentation transformation on the monitor screen may not be necessarily changing in real time, depending on the user's behavior. For example, is the user is relatively stationary or moves very slow, transformed parameters can vary in a semi-real time. Then, when the user starts to move faster or a large distance, the video engine may be updated more frequently.

[00153] It should be appreciated that the embodiments described above may be implemented using a digital (e.g., video) camera and a monitor, wherein the images from the camera are fed to a processor. The processor applies the transformation mapping to the images and display images in either a display mode or a mirror mode on the monitor. From the above description it should be appreciated that the mirror mode may be implemented by displaying on the monitor the live video feed, as modified by the transformation mapping. That is, in mirror mode the image that is being displayed on the monitor is an image/video of the user taken in real

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time. Conversely, in display mode the image that is being displayed is an image/video obtained in the past and taken from storage. The stored images may be either the raw images as fed from the camera or already transformed images. In either case, the prior images that are being displayed in a display mode are transformed images. Therefore, if the stored images are the raw images, the processor applies the transformation mapping prior to displaying the images on the monitor.

[00154] Whether the system operates in a display or mirror mode can be considered as a temporal issue: during mirror mode, the image that is being shown on the monitor is a transformed image of what the camera sees at that particular moment (or at a *de minimis* or unnoticeable earlier time), while during display mode the image that is being shown is a transformed image of what the camera or other camera saw earlier and is different than what the camera sees now. This issue also relates to perception: during mirror mode, since the monitor shows a transformed image of what the camera sees now, the user observing the monitor has the perception that he is looking at a mirror, while during the display mode the user observing the monitor has the perception of observing a video of events that took place in the past.

[00155] It should be appreciated that the system can be implemented separate and irrespective of the monitor screen. For example, in some locations (e.g., dressing room), only the monitor screen may be installed, without any camera. The monitor is configured to communicate with the system so as to download and display stored images. The user may interact with the monitor to view prior images taken, e.g., to compare with current outfit. As another example, all of the images taken can be uploaded to the cloud, such that a user may view the images on a PC or mobile device, such as using an app on a tablet.

[00156] As can be understood from the above description, various embodiments of the invention provide an image transformation apparatus that comprises an image input port for receiving digital images from a camera; a transposed image output port for outputting transposed images to be displayed on a monitor or stored in memory; and a transposition module that is programmed to receive images from the input port and apply a transformation to the images, wherein the transformation includes at least flipping the image about a vertical axis so as to reverse right and left sides of the image; applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror; resizing the image to reduce variations caused by changes in object's distance to the camera. In other embodiments, a

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program is provided that when operated on a computer causes the computer to transpose a digital image obtained from a camera, such that the transposed image resembles a reflection from a mirror, the transposition including at least flipping the image about a vertical axis so as to reverse right and left sides of the image; applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror; resizing the image to reduce variations caused by changes in object's distance to the camera. The program can be operated in any general purpose computer, such as a server, a PC, a tablet, a smartphone, etc.

[00157] According to further embodiments, a system is provided which enables a user to view self image on a digital screen by having the digital screen project an image mimicking a mirror image. The system includes a digital camera generating a stream of images of the user; a controller having an image input port to receive the stream of images from the camera and applying a transformation to the images to generate transformed images mimicking a reflection of the user in a mirror; the controller having an output port for outputting a stream of transposed images to be displayed on a monitor; and a storage facility to store the transformed images. The controller further having an Internet connection for uploading the stream of transposed images to the cloud. The system further having clients enabling download and viewing of the transformed images from the cloud.

[00158] In various embodiments, a controller applies a transformation to a stream of images, which includes: flipping the image about a vertical axis so as to reverse right and left sides of the image; applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror; and resizing the image to reduce variations caused by changes in object's distance to the camera. The mapping essentially reassigns new addresses to each pixel of the original image. The transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally. The transformation mapping comprises at least a tilt transformation and an elevation transformation, wherein a tilt transformation transforms the image to resemble tilting of the camera and the elevation transformation transforms the image to resemble changing the elevation of the camera.

[00159] The transformation mapping can be one that includes angle, tilt, azimuth, scale, spatial translation (i.e., elevation linear offset or horizontal offset) etc. The final transformation is a matrix multiplication of the individual transformation to generate the individual distortions.

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[00160] In other embodiments a system is provided for enhancing video conferencing or video calling. The system includes a transformation engine to transform a stream of images taken from a video camera positioned about a periphery of a monitor screen, such that images of a user looking directly at the screen portray a user not looking directly at the camera. The transformation engine receives the stream of images and transforms the images so as to provide images showing the user looking directly at the camera. The transformation includes any combination of correction for angle, tilt, azimuth, scale, spatial translation (i.e., elevation linear offset or horizontal offset), etc. The transformation may also include override the eyes zone, or just the eyes, with modified pixels that will create the feeling of broadside view – i.e., presenting the eyes to their fullest mimicking the user looking directly at the camera.

[00161] In various implementations, the method further comprises calculating distance to a user appearing in the image by tracking the distance between the user's eyes or the head size, and scaling the image accordingly. For example, according to one embodiment, the system is programmed with an expected distance between the user's eyes, i.e., interpupillary distance (IPD), at an average distance from the camera. The 95 percentile adult male in the USA has an IPD of 70 mm, while for females it is 65mm. When a user is sensed in front of the camera, the system may first determine whether it is a male or female, or simply go directly the the distance measurement program and use an average IPD number, e.g., 68mm. For the range measurement, the system identifies the pupils in the image, and scale the image so as to match the expected IPD. As video images continue to stream, the system scales the image to maintain the IPD constant and matching the expected IPD. In this manner, when the user moves away or closer to the camera, the size of the user in the image projected on the monitor screen would remain about the same, thus mimicking a reflection on a mirror. As can be understood, the system can use other standard measurements, such as distance between ears, etc., but using the eyes would make it simpler since the system can recognize the eyes pretty easily. However, if the user wears shades, the system may have to resort to other measurements based on o0ther body parts. This switch can be done dynamically, i.e., if the system finds the eyes, it uses IPD, but if not, it falls back to other body parts.

[00162] Also, effect filters can be applied, such as lighting filter effect, reflective texture effect, color spectrum filter to create metallic feeling, etc. Similarly, the camera's shutter timing, sensor gain, whitebalance, and any of their combinations can be controlled to modify the

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resulting image. In various embodiments, these parameters are controlled based on a dynamic region of interest (Dynamic RIO), such that the changes applied to the parameters relate only to a selected region in the image, and not the entire image. For example, the parameters can be modified and updated based on the distance to the user and limited to an ROI which is a window around the user. For example, the user's image can be separated from the background, and thhe parameters applied only to the pixels belonging to the user's image.

[00163] In further implementations, enhanced real time video effect is implemented by, e.g., recording a video with a high resolution camera at a first frame rate, and manipulating the display in a higher frame rate so as to smooth the video. Additionally, the background of the received video stream can be replaced with an artificial background stoered in the system. Additional video processing can be used to add or change color or texture of accessory or other element in the image. Also, for video conferencing and other applications the transformation can be performed without vertical flipping of the image.

[00164] While certain features of the invention have been illustrated and described herein, many modifications, substitutions, changes, and equivalents may occur to those skilled in the art. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the invention.

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CLAIMS

1. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing the non-ordered steps comprising:

obtaining a digital image from a camera;

flipping the image about a vertical axis so as to reverse right and left sides of the image;

applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;

resizing the image to reduce variations caused by changes in object's distance to the camera;

displaying the image on the monitor after performing the flipping, transformation mapping, and resizing.

2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.

3. The method of claim 1, wherein the transformation mapping comprises at least a tilt transformation and an elevation transformation.

4. The method of claim 3, wherein the tilt transformation modifies an input image taken with a non-horizontally pointing camera and transforming the image to appear as if the camera was pointed straight horizontally.

5. The method of claim 3, wherein the elevation transformation modifies an input image taken with a camera positioned at arbitrary height and transforming the image to appear as if the camera was positioned at a user's eye level.

6. The method of claim 1, wherein the step of resizing the image is performed integral to the step of applying the transformation mapping.

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7. The method of claim 1, further comprising the steps:
obtaining a reference image;
performing registration of the digital image with the reference image;
using data obtained from the registration to generate the transformation mapping.

8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.

9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image.

10. The method of claim 1, further comprising applying at least one of a barrel-effect transformation and a fish-eye transformation.

11. The method of claim 1, further comprising:
determining distance to a user appearing in the image; and,
varying resolution of the image according to the distance.

12. The method of claim 1, further comprising a step of pixel filling, wherein pixel image is extrapolated into empty pixels left after applying the transformation mapping.

13. The method of claim 1, further comprising the steps:
obtaining a second digital image from a second camera;
flipping the second image about a vertical axis so as to reverse right and left sides of the second image;
applying a transformation mapping to the second image to modify the second image such that it appears to mimic a reflection of a mirror;

resizing the second image to reduce variations caused by changes in object's distance to the second camera;

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stitching the image and the second image after performing the flipping, transformation mapping, and resizing, to thereby obtain a stitched image;

displaying the stitched image on the monitor.

14. The method of claim 13, wherein field of views of the camera and of the second camera overlap, and further comprising the step of overlay decision to determine best location in overlapping parts of the field of views to perform the stitching.

15. The method of claim 14, further comprising a smoothing operation to correct artifacts caused by the step of stitching.

16. The method of claim 1, further comprising the steps:

obtaining a second digital image from a second camera;

flipping the second image about a vertical axis so as to reverse right and left sides of the second image;

applying a transformation mapping to the second image to modify the second image such that it appears to mimic a reflection of a mirror;

resizing the second image to reduce variations caused by changes in object's distance to the second camera;

displaying the image and the second image after performing the flipping, transformation mapping, and resizing, to thereby obtain a three-dimensional image on the monitor.

17. The method of claim 1, wherein the non-ordered steps are performed on a series of images of a live video feed from the camera.

18. The method of claim 17, further comprising:

determining distance to a user appearing in the live video feed; and,

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varying rate at which the non-ordered steps are performed on the series of images according to the distance.

19. The method of claim 17, storing the live video feed in a digital storage device and selectively operating the system in one of a mirror mode or display mode, wherein during mirror mode displaying on the monitor transformed images of what the camera sees at that particular moment while during display mode displaying on the monitor a transformed images of what the camera saw in the past and obtained from the digital storage device.

20. The method of claim 1, further comprising calculating distance to a user appearing in the image by identifying user's shoes and triangulating to the shoes.

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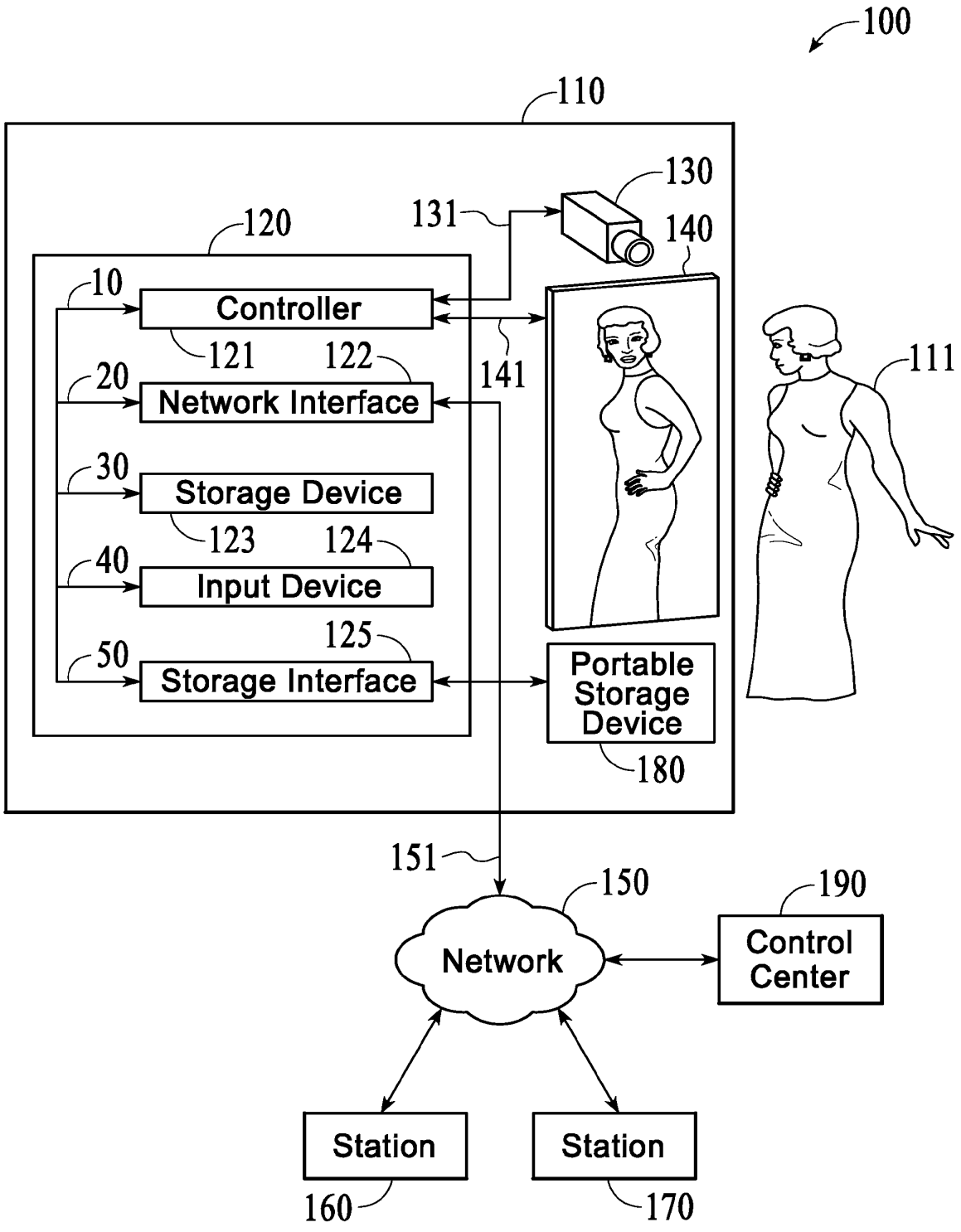


FIG. 1

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FIG. 2A

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FIG. 2B

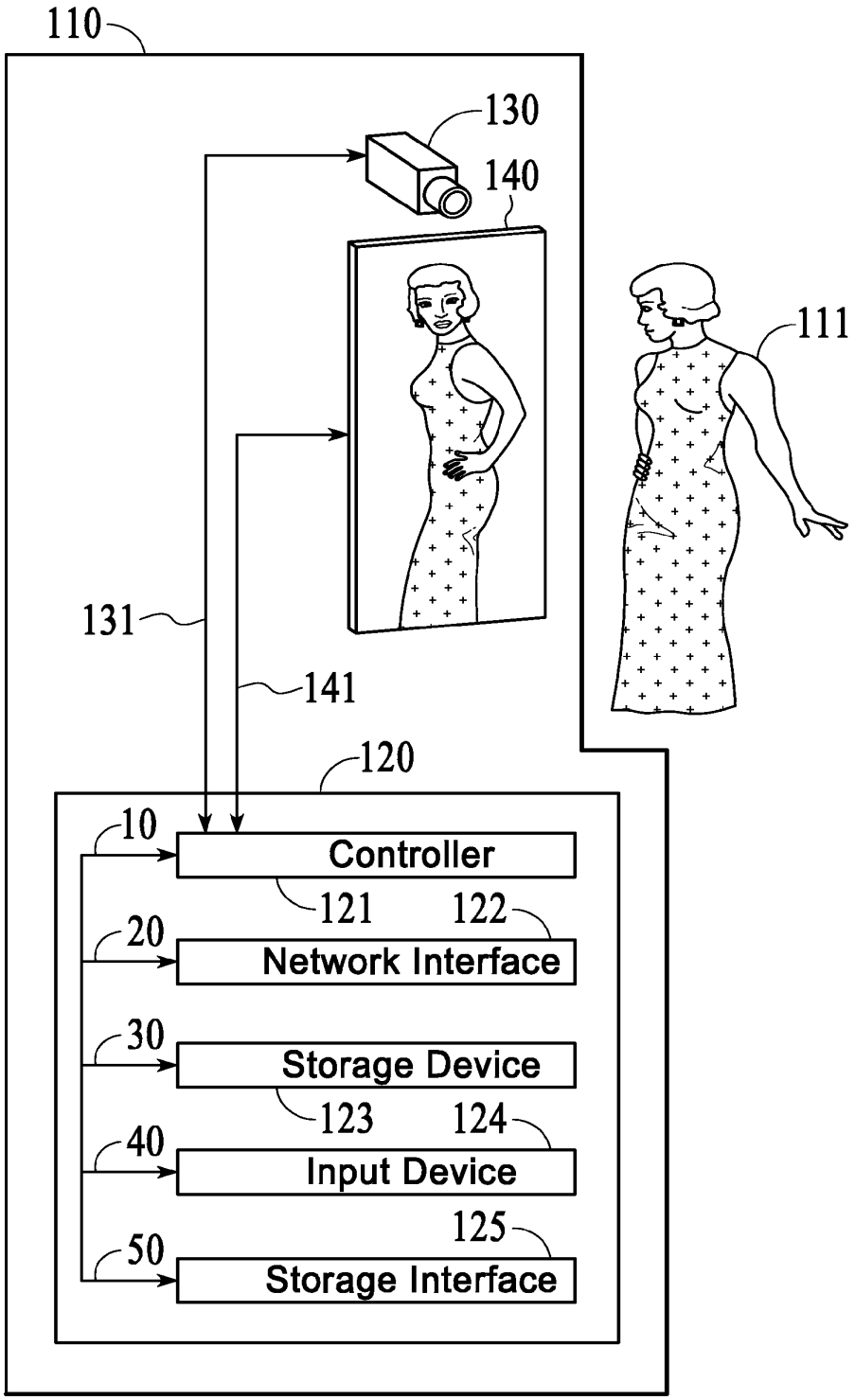


FIG. 3A

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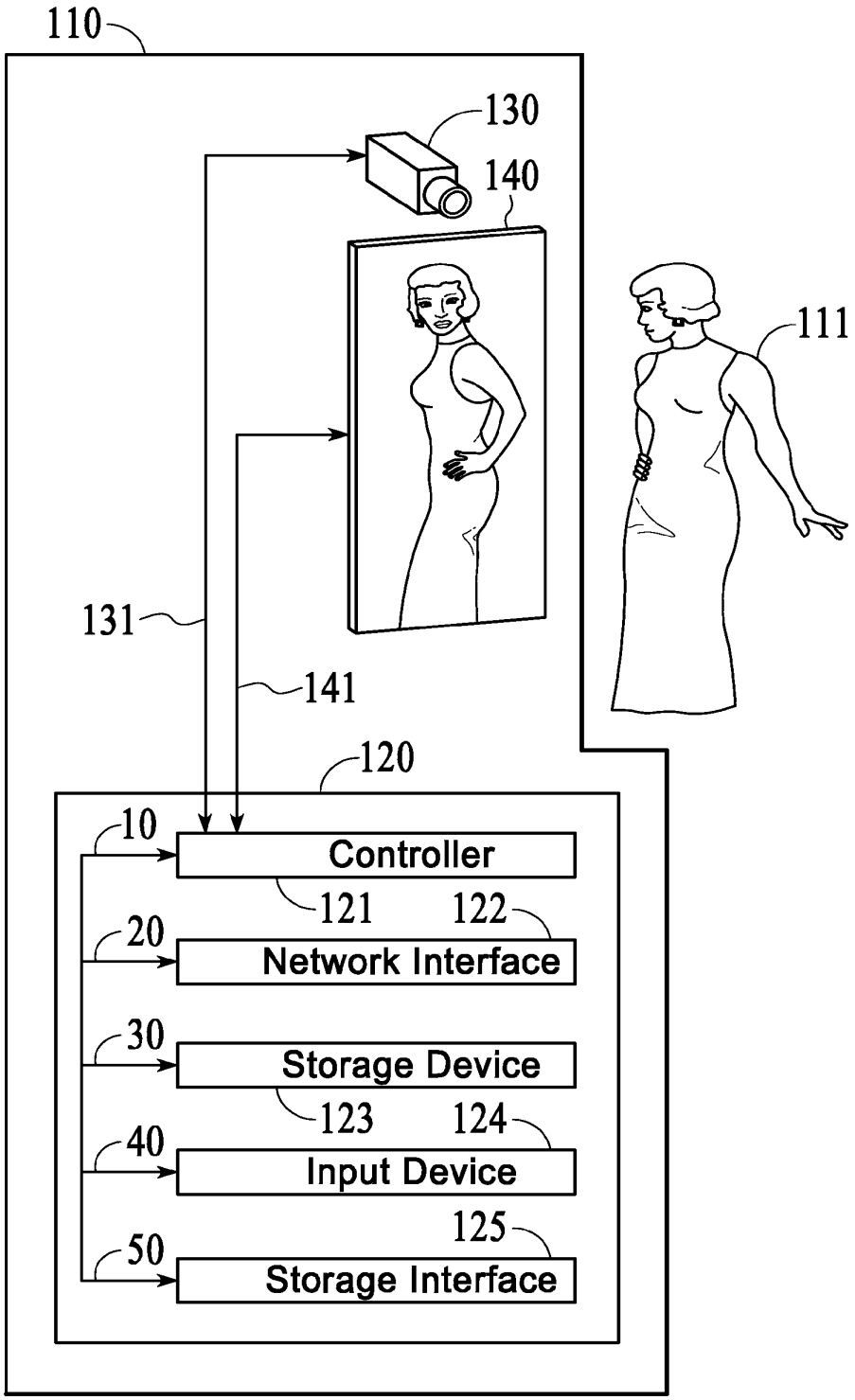


FIG. 3B

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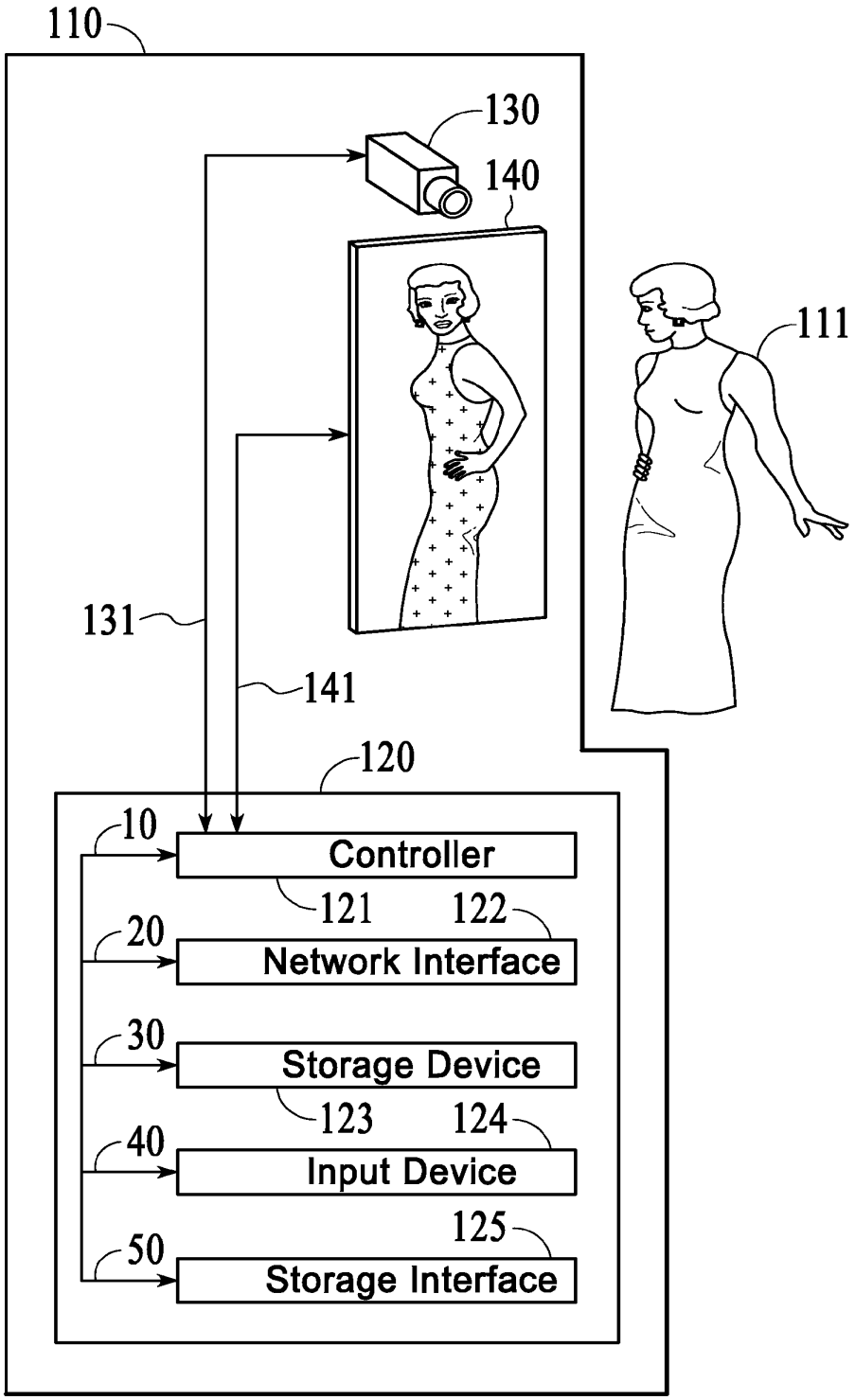


FIG. 3C

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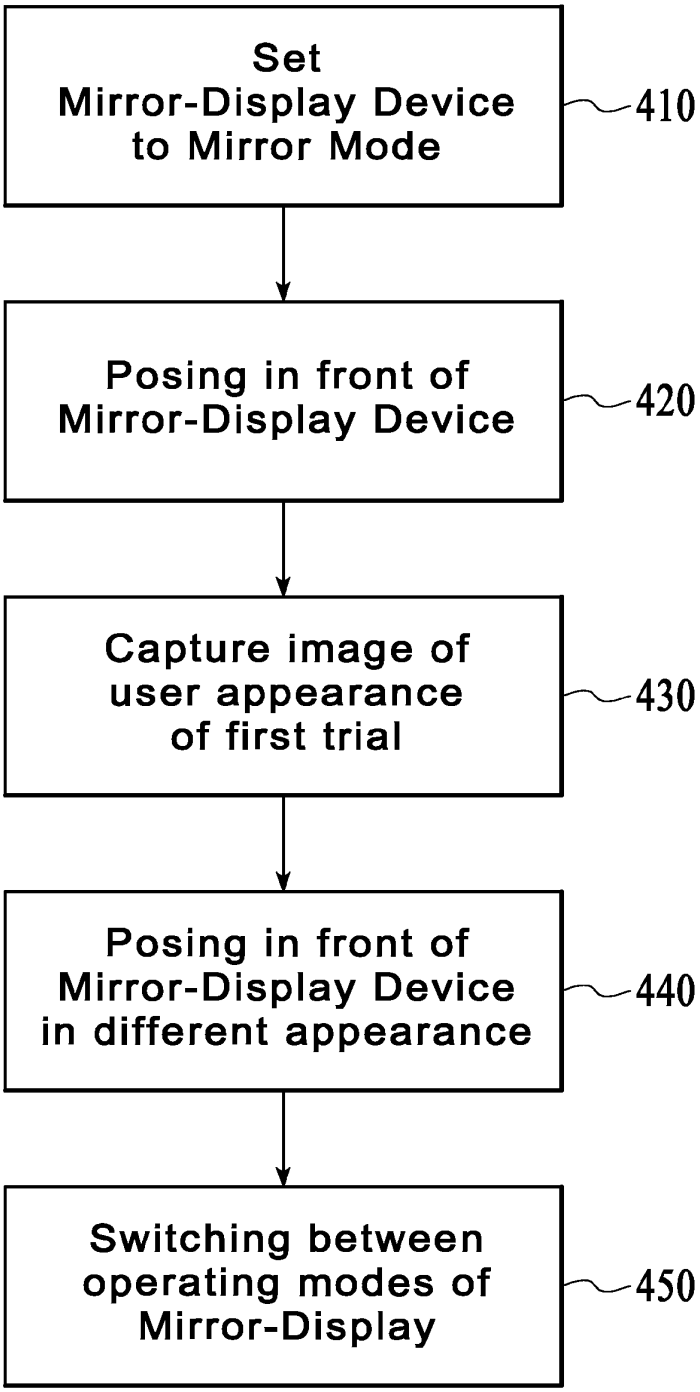


FIG. 4

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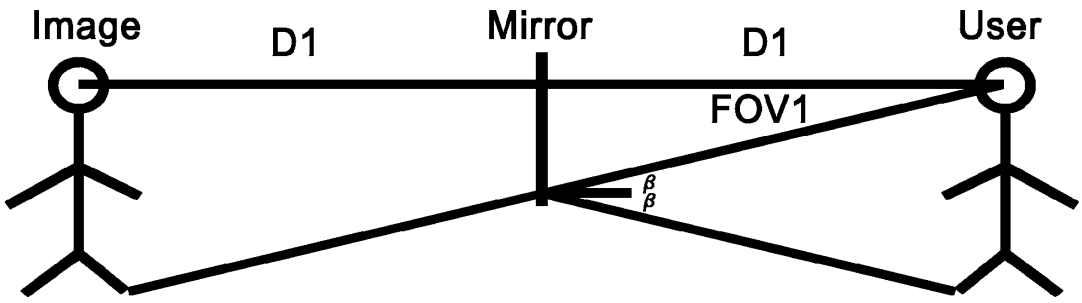


FIG. 5A

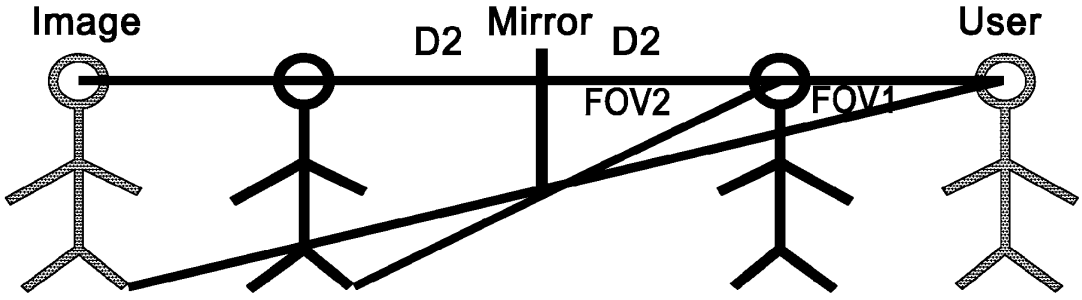


FIG. 5B

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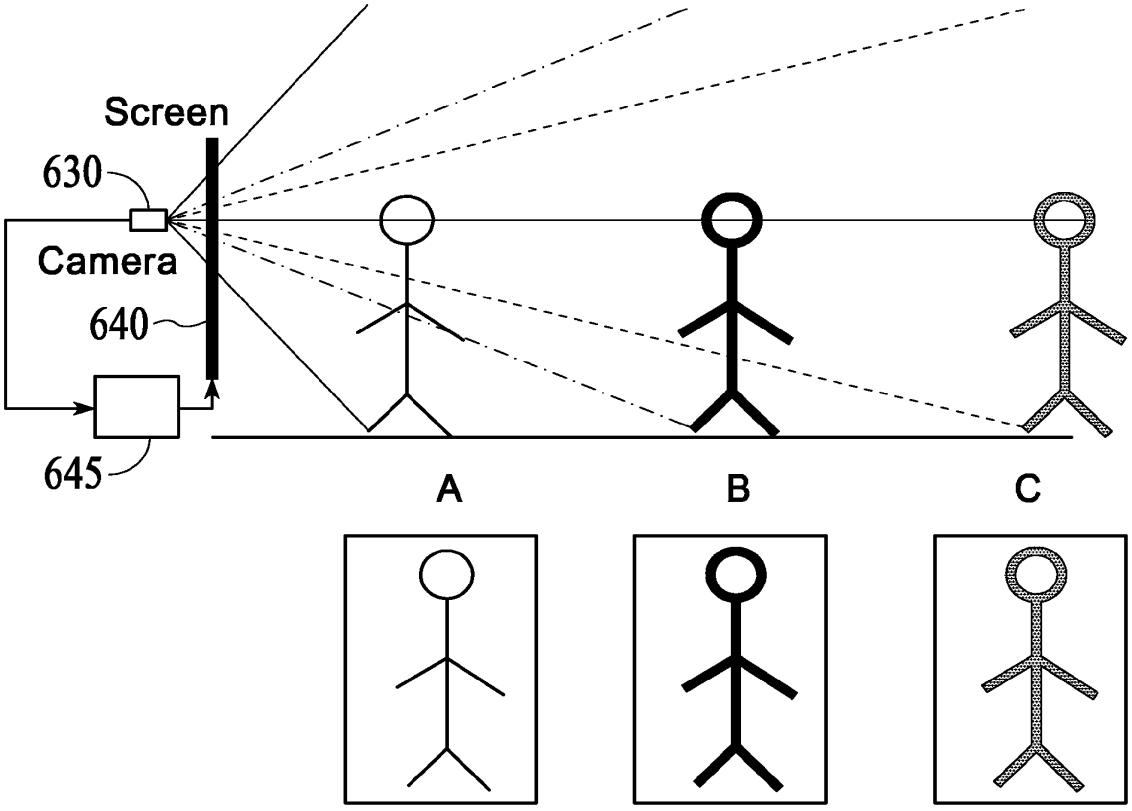


FIG. 6

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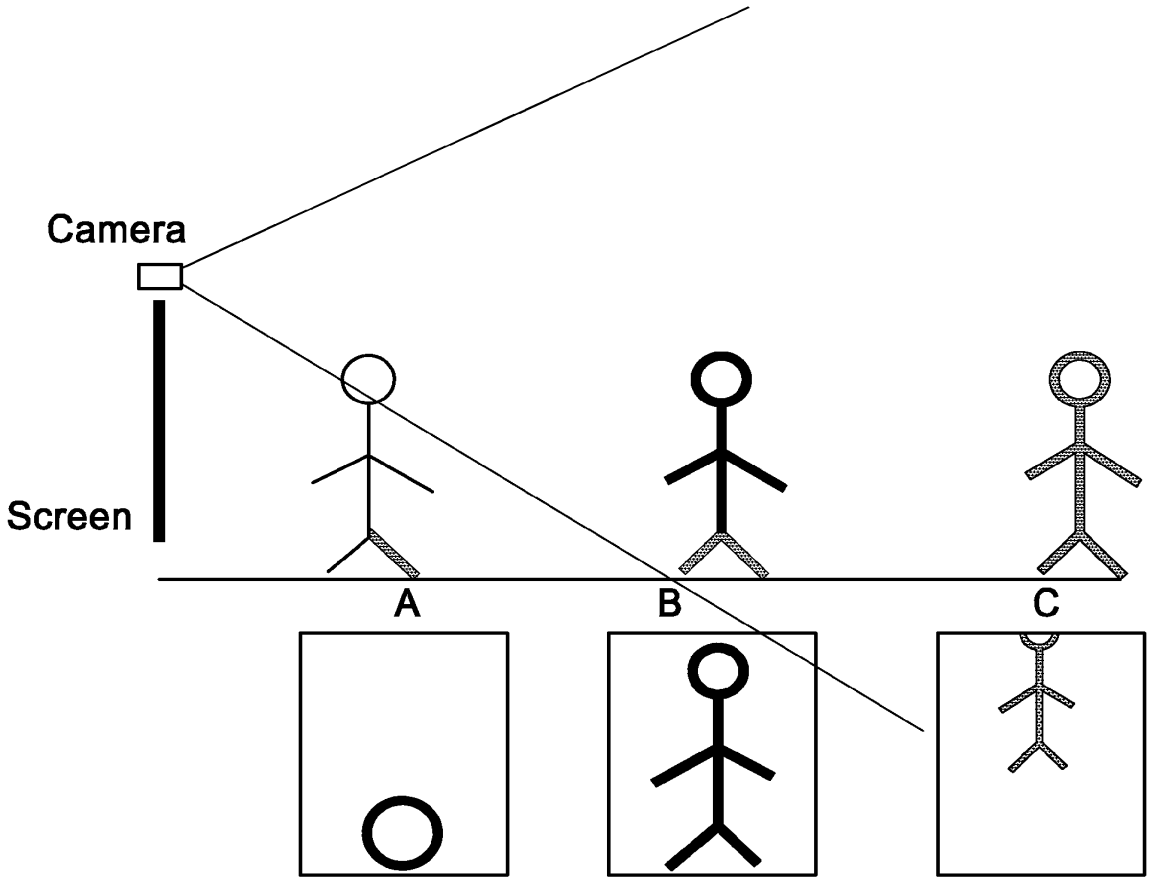


FIG. 7

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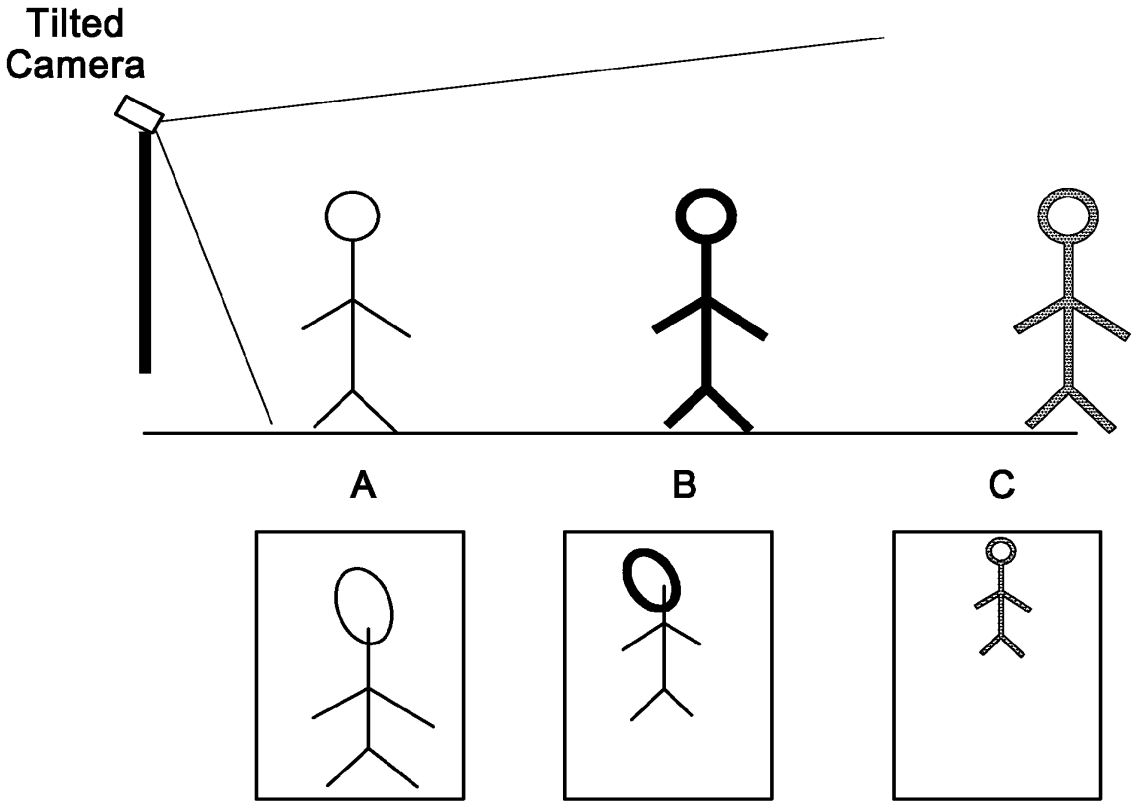


FIG. 8

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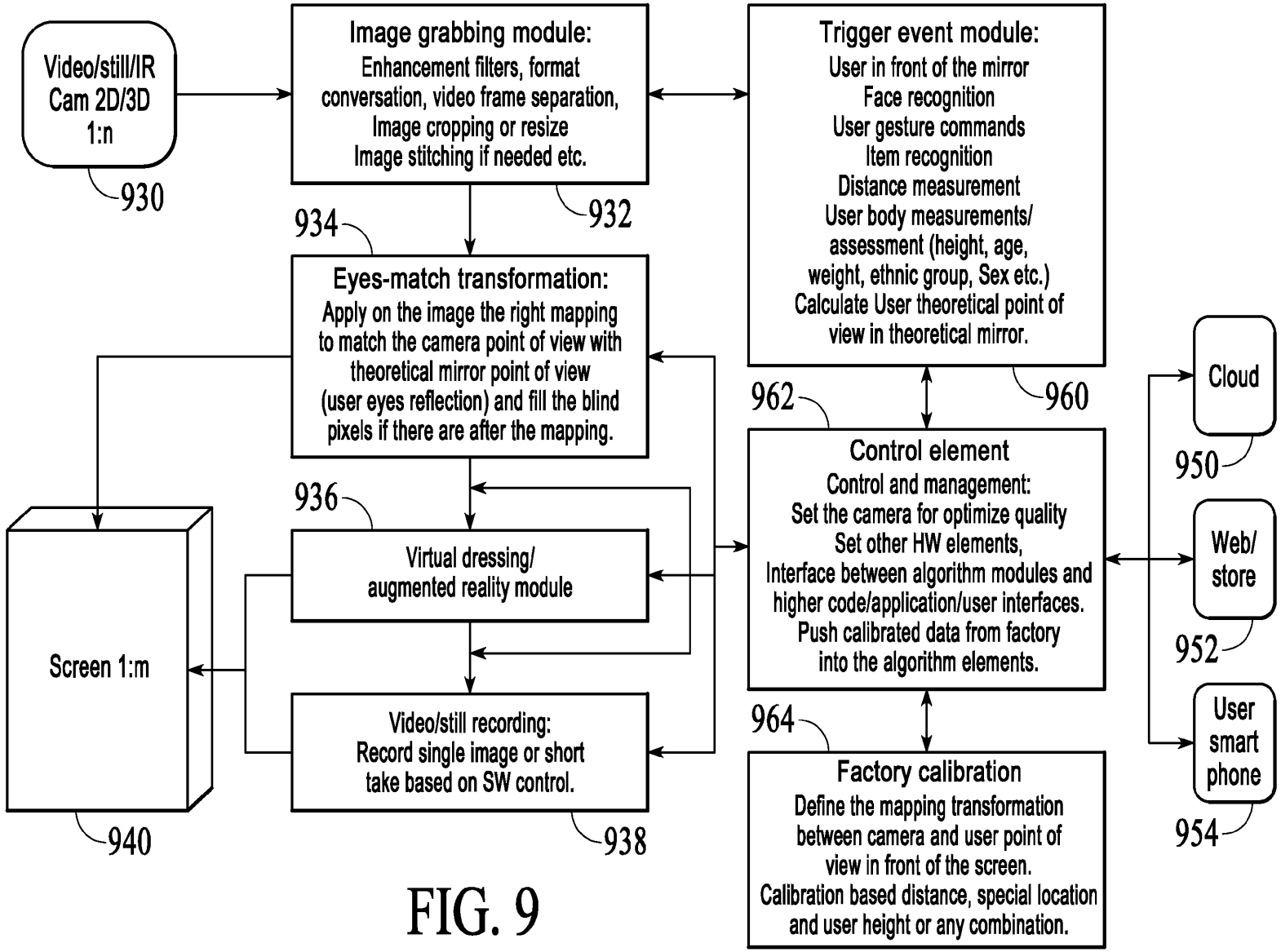

Video/still/IR Cam 2D/3D 1:n
930
Image grabbing module:
Enhancement filters, format conversation, video frame separation, Image cropping or resize
Image stitching if needed etc.
932
Trigger event module:
User in front of the mirror
Face recognition
User gesture commands
Item recognition
Distance measurement
User body measurements/ assessment (height, age, weight, ethnic group, Sex etc.)
Calculate User theoretical point of view in theoretical mirror.
960
934
Eyes-match transformation:
Apply on the image the right mapping to match the camera point of view with theoretical mirror point of view (user eyes reflection) and fill the blind pixels if there are after the mapping.
962
Control element
Control and management:
Set the camera for optimize quality
Set other HW elements,
Interface between algorithm modules and higher code/application/user interfaces.
Push calibrated data from factory into the algorithm elements.
936
Virtual dressing/ augmented reality module
Screen 1:m
940
Video/still recording:
Record single image or short take based on SW control.
938
964
Factory calibration
Define the mapping transformation between camera and user point of view in front of the screen.
Calibration based distance, special location and user height or any combination.
Cloud
950
Web/ store
952
User smart phone
954

FIG. 9

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FIG. 10A

FIG. 10B

FIG. 11

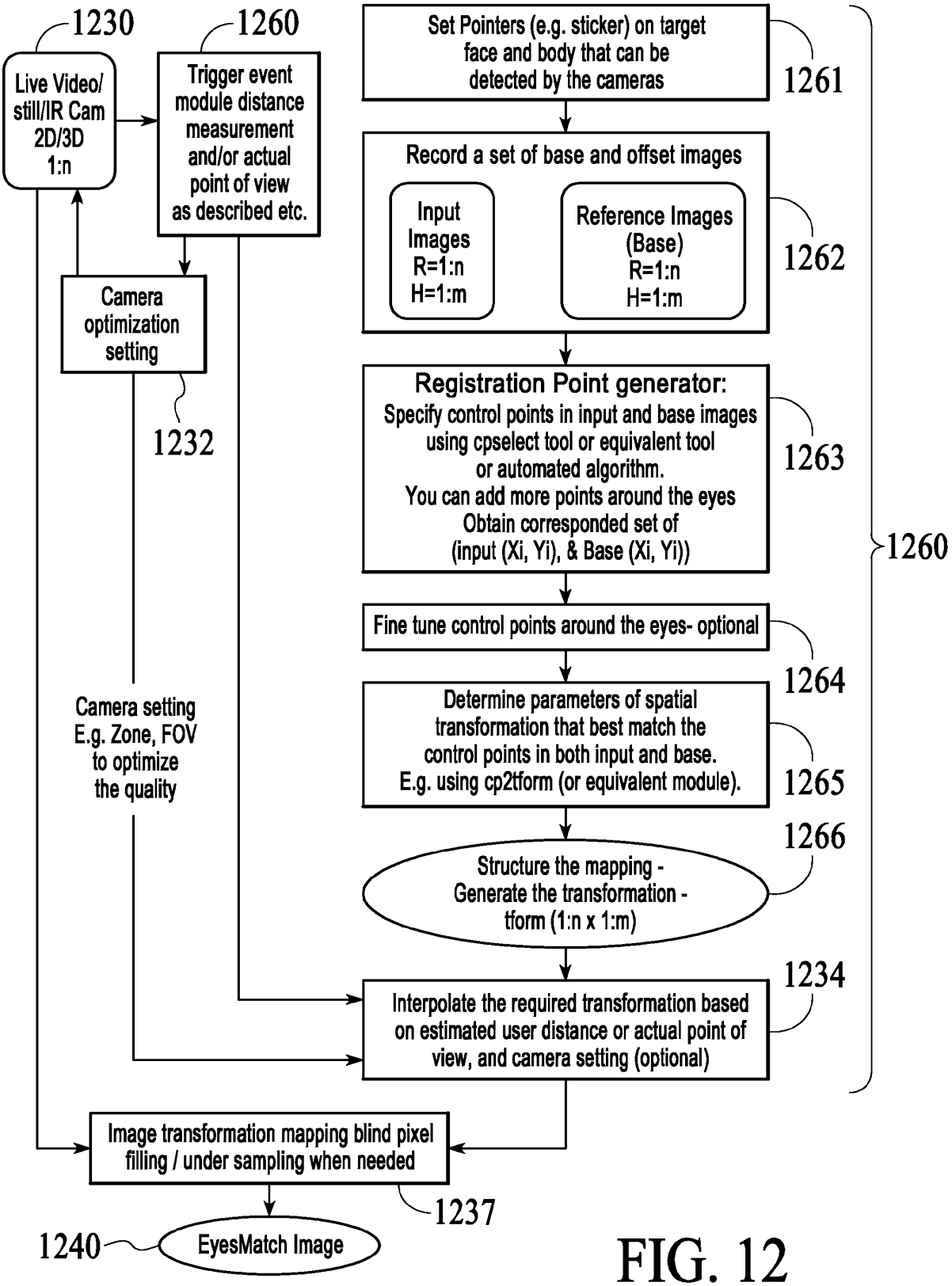


FIG. 12

Samsung/Google, EX1002, p. 288

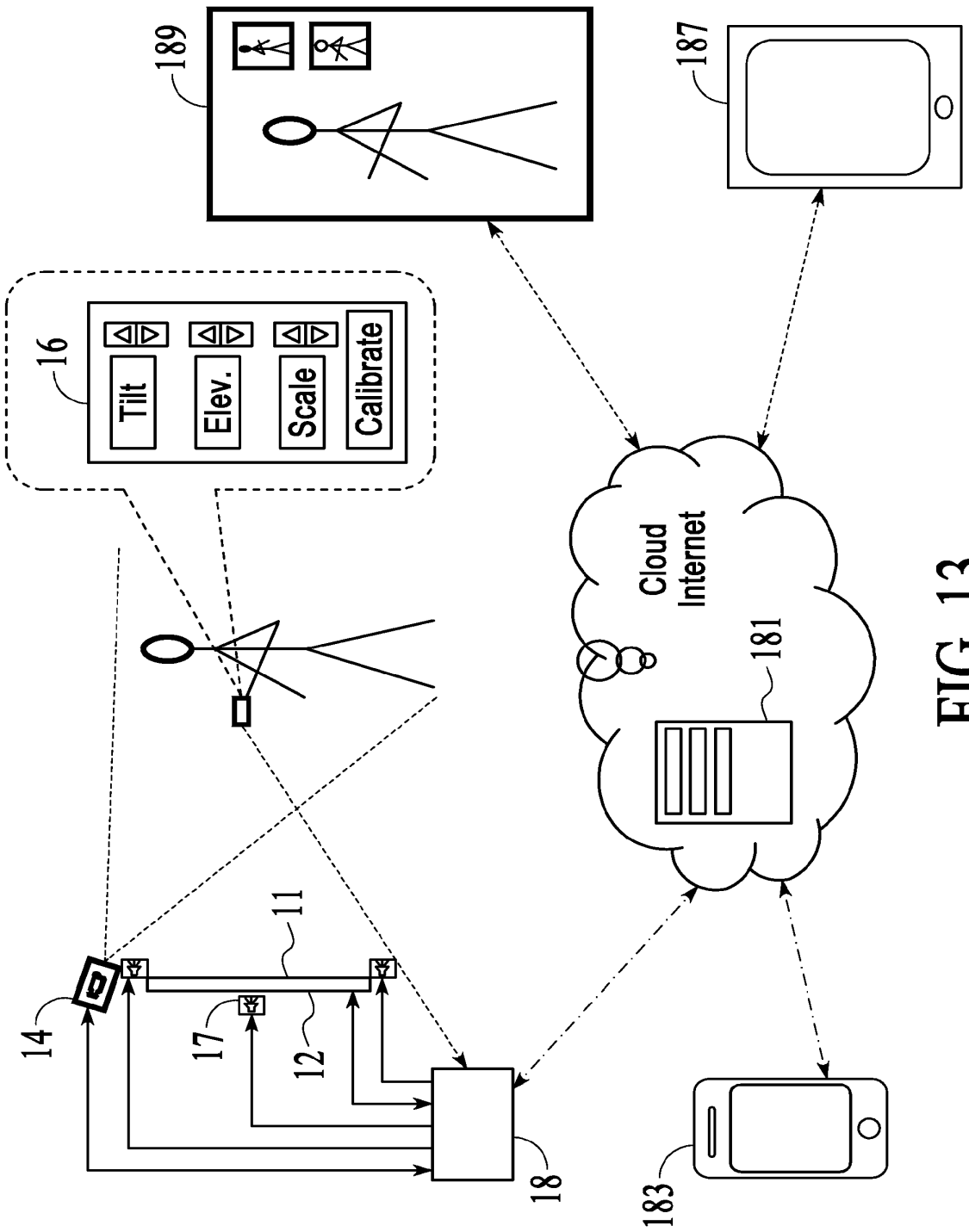


FIG. 13

Samsung/Google, EX1002, p. 289

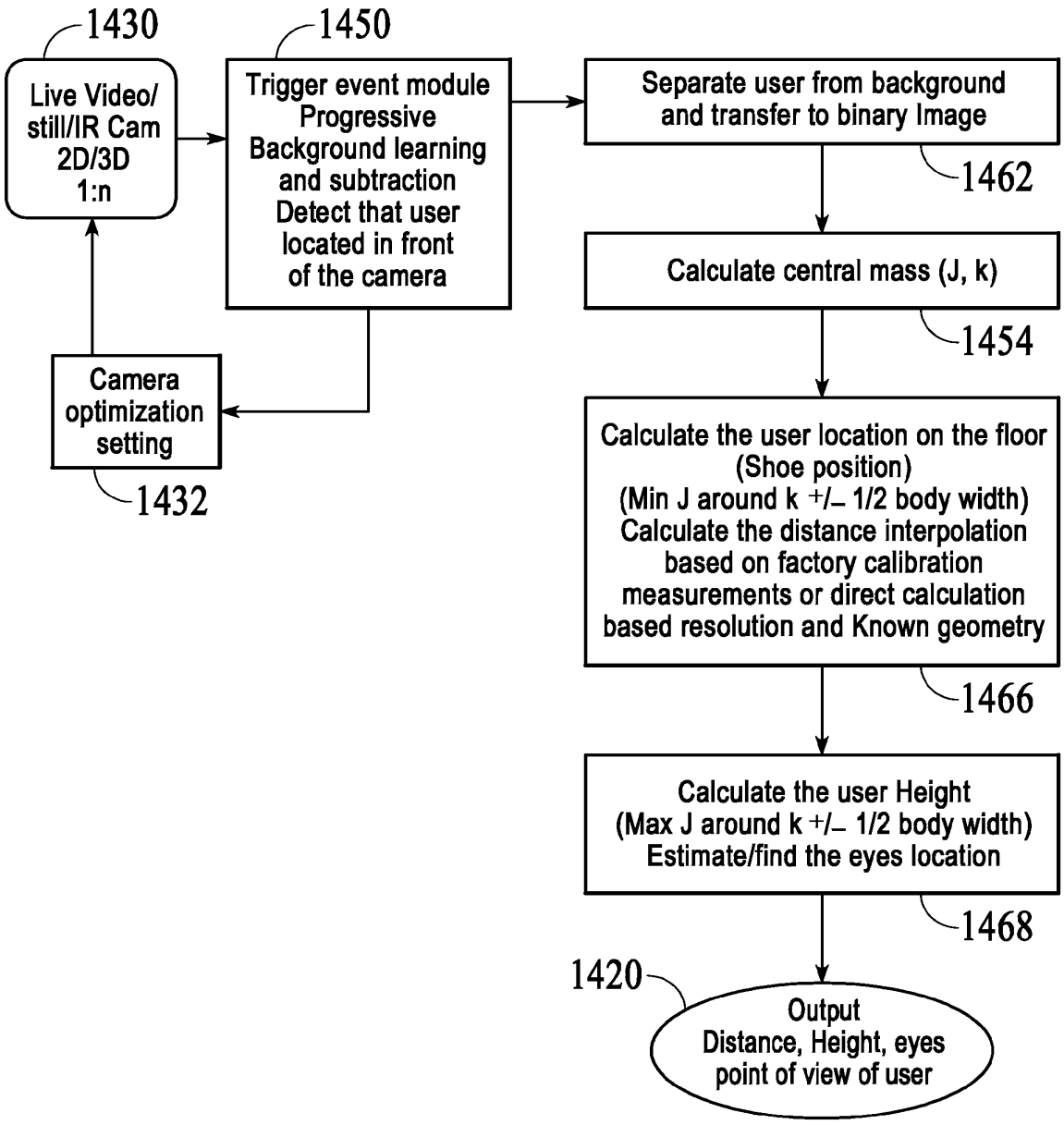


FIG. 14

Samsung/Google, EX1002, p. 290

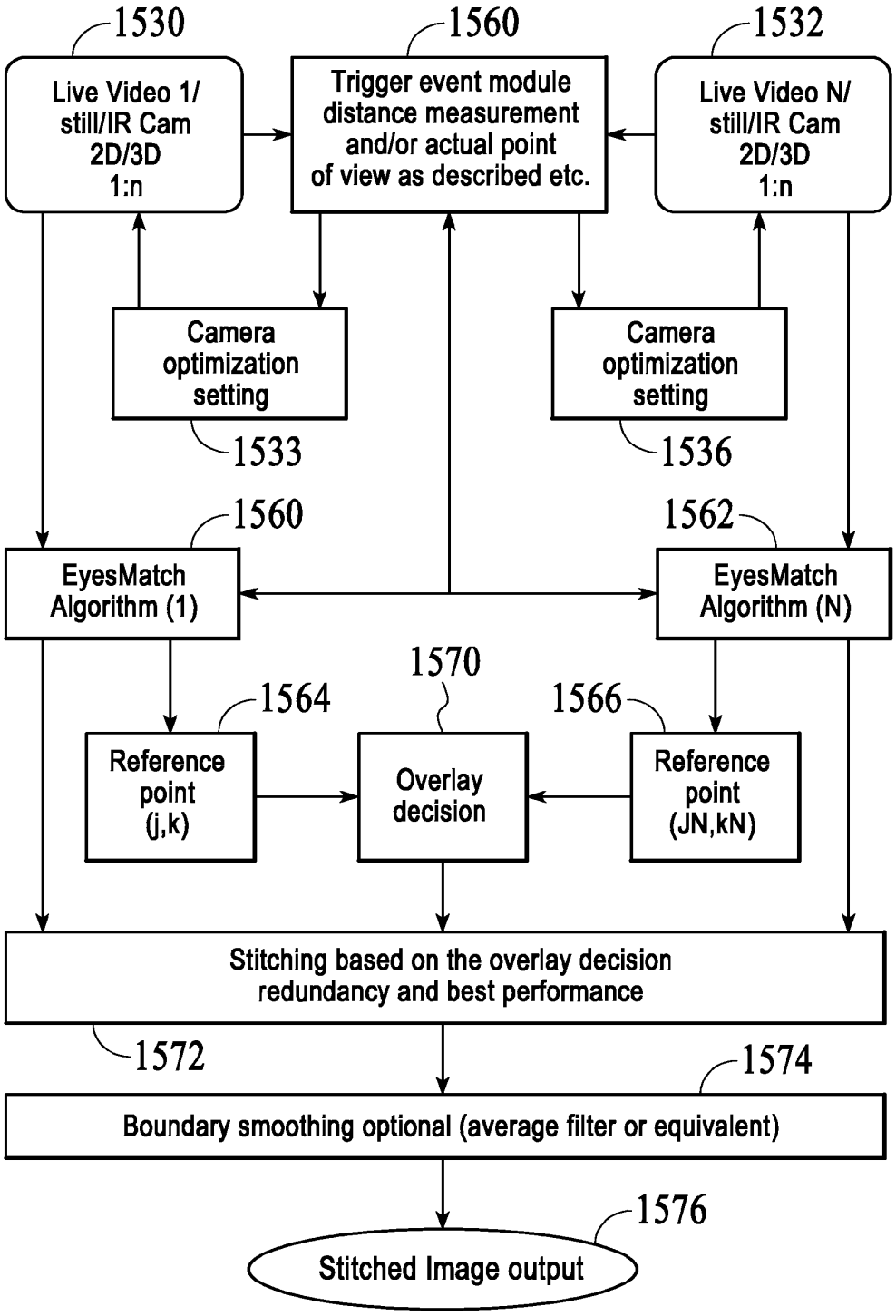


FIG. 15

Samsung/Google, EX1002, p. 291

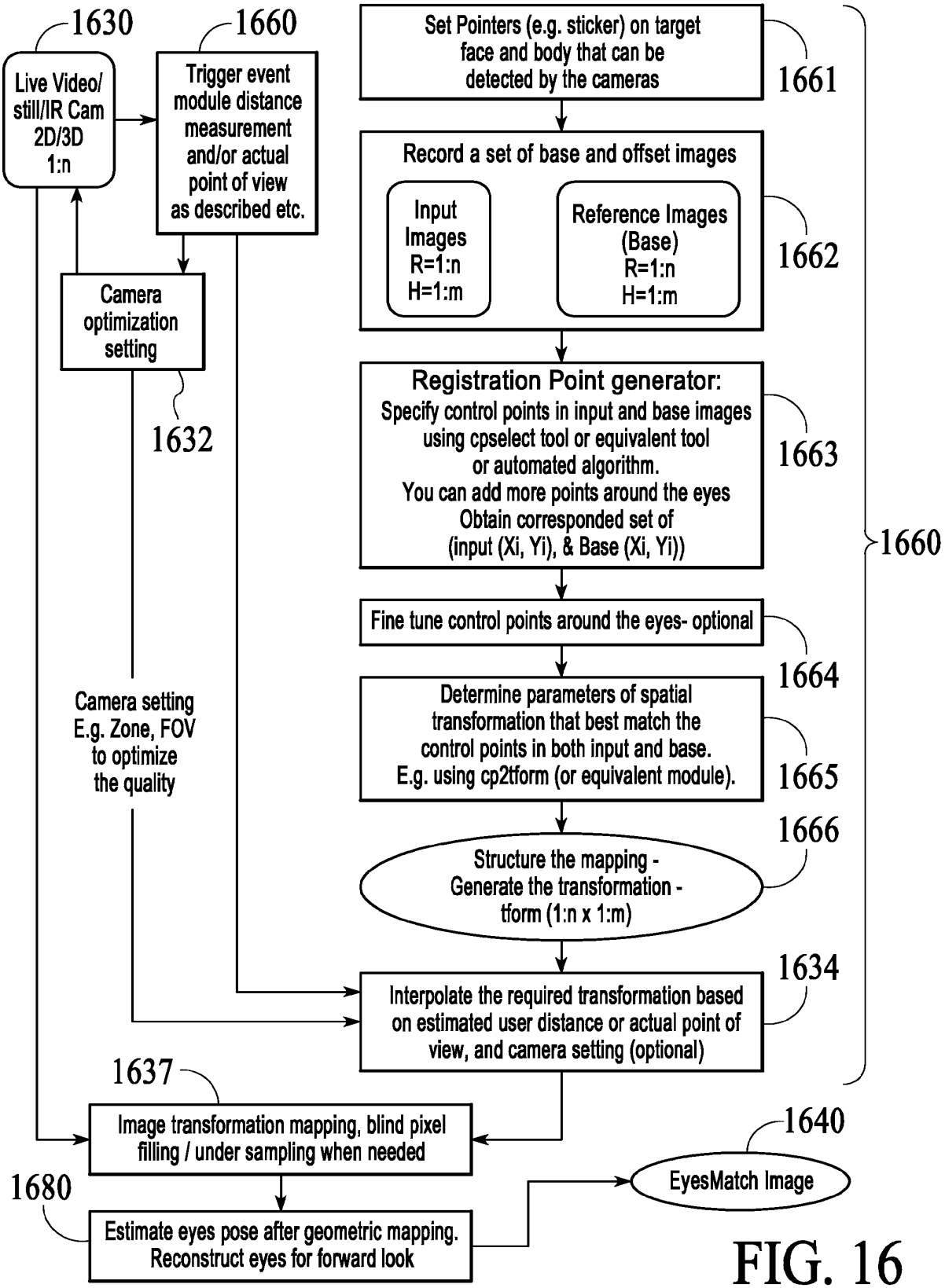


FIG. 16

Samsung/Google, EX1002, p. 292

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

RECEIVED
20 -06- 2007
EITAN LAW GROUP

To:
EITAN LAW GROUP
11 HAMENOFIM ST
P.O. BOX 2081
HERZLIA, ISRAEL 46120

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference P-7751-PC	Date of mailing (*day/month/year*) **FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No PCT/IL06/00281	International filing date (*day/month/year*) 01 March 2006 (01.03.2006)
Applicant NISSI VILCOVSKY	

1 ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338 82 70

For more detailed instructions, see the notes on the accompanying sheet

2 ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith

3 ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made

4 **Reminders**

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis* 1 and 90*bis* 3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer VIJAY SHANKAR Telephone No. 571-272-7682

Form PCT/ISA/220 (January 2004) (*See notes on accompanying sheet*)

PATENT COOPERATION TREATY

RECEIVED
28 -06- 2007
EITAN LAW GROUP

From the INTERNATIONAL SEARCHING AUTHORITY

To:
EITAN LAW GROUP
11 HAMENOFIM ST
P.O. BOX 2081
HERZLIA, ISRAEL 46120

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing (*day/month/year*) 12 JUN 2007
Applicant's or agent's file reference P-7751-PC	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No PCT/IL06/00281	International filing date (*day/month/year*) 01 March 2006 (01.03.2006)
Applicant NISSI VILCOVSKY	

1 ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No : (41-22) 338 82 70

For more detailed instructions, see the notes on the accompanying sheet

2 ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith

3 ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made

4 **Reminders**

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis* 1 and 90*bis* 3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO internet site.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer VIJAY SHANKAR Telephone No 571-272-7682

Form PCT/ISA/220 (January 2004) *(See notes on accompanying sheet)*

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P-7751-PC	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below
International application No PCT/IL06/00281	International filing date (*day/month/year*) 01 March 2006 (01 03 2006)	(Earliest) Priority Date (*day/month/year*) 01 March 2005 (01 03 2005)
Applicant NISSI VILCOVSKY		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18 A copy is being transmitted to the International Bureau

This international search report consists of a total of 4 sheets

☒ It is also accompanied by a copy of each prior art document cited in this report

1 **Basis of the Report**

a With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____ _____, which is the language of a translation furnished for the purposes of international search (Rules 12 3(a) and 23 1(b))

b ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No I

2 ☐ **Certain claims were found unsearchable** (See Box No II)

3 ☐ **Unity of invention is lacking** (See Box No III)

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant

☐ the text has been established by this Authority to read as follows:

5 With regard to the **abstract**,

☒ the text is approved as submitted by the applicant

☐ the text has been established, according to Rule 38 2(b), by this Authority as it appears in Box No IV The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a the figure of the **drawings** to be published with the abstract is Figure No 1

☒ as suggested by the applicant

☐ as selected by this Authority, because the applicant failed to suggest a figure

☐ as selected by this Authority, because this figure better characterizes the invention

b ☐ none of the figures is to be published with the abstract

Form PCT/ISA/210 (first sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/IL06/00281

A CLASSIFICATION OF SUBJECT MATTER
IPC: **G09G 5/00**(2006 01),**5/08**(2006 01)

USPC: 345/156-162,204-215
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U S. : 345/156-162, 204-215

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20030085866 A1 (BIMBER et al) 08 May 2003, Figures 1-23; Paragraph 0063-0137	1-12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 May 2007 (15.05.2007)	12 JUN 2007
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P O Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer VIJAY SHANKAR Telephone No 571-272-7682

Form PCT/ISA/210 (second sheet) (April 2005)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
EITAN LAW GROUP
11 HAMENOFIM ST
P.O. BOX 2081
HERZLIA, ISRAEL 46120

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*) 12 JUN 2007

Applicant's or agent's file reference
P-7751-PC

FOR FURTHER ACTION
See paragraph 2 below

International application No	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/IL06/00281	01 March 2006 (01.03.2006)	01 March 2005 (01.03.2005)

International Patent Classification (IPC) or both national classification and IPC

IPC: **G09G 5/00**(2006 01),**5/08**(2006 01)
USPC: 345/156-162,204-215

Applicant

NISSI VILCOVSKY

1 This opinion contains indications relating to the following items:

- ☒ Box No I — Basis of the opinion
- ☐ Box No II — Priority
- ☐ Box No III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No IV — Lack of unity of invention
- ☒ Box No V — Reasoned statement under Rule 43*bis* 1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No VI — Certain documents cited
- ☐ Box No VII — Certain defects in the international application
- ☐ Box No VIII — Certain observations on the international application

2 **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66 1*bis(b)* that written opinions of this International Searching Authority will not be so considered

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220

3 For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P O Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	15 May 2007 (15 05 2007)	VIJAY SHANKAR Telephone No 571-272-7682

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No
PCT/IL06/00281

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b format of material

☐ on paper

☐ in electronic form

c time of filing/furnishing

☐ contained in the international application as filed

☐ filed together with the international application in electronic form

☐ furnished subsequently to this Authority for the purposes of search

3 ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished

4 Additional comments:

Samsung/Google, EX1002, p. 298

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No
PCT/IL06/00281

Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims NONE	YES
	Claims 1-12	NO
Inventive step (IS)	Claims NONE	YES
	Claims 1-12	NO
Industrial applicability (IA)	Claims 1-12	YES
	Claims NONE	NO

2. Citations and explanations:

Claims 1-12 lacks novelty under PCT Article 33(2) as being anticipated by Bimber et al (US 2003/0085866 A1)

Bimber et al teaches a system to enable appearance comparison, the system comprising at least one interactive imaging and display station, the station comprising: a mirror-display device capable of selectably operating in either or both a mirror mode or a display mode; an imaging device to capture one or more appearances from a field-of-view in front of said mirror-display device; and an image control unit to select the mode of operation of said mirror-display device according to a user command (Figures 1-23; Paragraph 0063-0137)

Bimber et al teaches a method to enable appearance comparison, the method comprising: using a mirror mode of operation of a mirror,display device capable of being selectably operated in either a mirror mode or a display mode; capturing an image corresponding to an appearance of a first trial from a field-of-view in front of said mirror-display device; storing said image; selecting the display mode of operation of said mirror-display device; retrieving said image and displaying the image on said mirror-display device (Figures 1-23; Paragraph 0063-0137)

Samsung/Google, EX1002, p. 299

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING TRANSMITTAL OF COPY OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (CHAPTER I OF THE PATENT COOPERATION TREATY)
(PCT Rule 44bis 1(c))

To:

EITAN LAW GROUP
11 Hamenofim Street
PO Box 2081
46120 Herzlia
ISRAËL

Date of mailing *(day/month/year)* 20 September 2007 (20.09.2007)	
Applicant's or agent's file reference P-7751-PC	**IMPORTANT NOTICE**

International application No	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IL2006/000281	01 March 2006 (01.03.2006)	01 March 2005 (01.03.2005)

Applicant
VILCOVSKY, Nissi

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer
Simin Baharlou

e-mail: pt09.pct@wipo.int

Form PCT/IB/326 (January 2004)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference P-7751-PC	**FOR FURTHER ACTION**	See item 4 below
International application No PCT/IL2006/000281	International filing date *(day/month/year)* 01 March 2006 (01.03.2006)	Priority date *(day/month/year)* 01 March 2005 (01.03.2005)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant VILCOVSKY, Nissi		

1 This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2 This REPORT consists of a total of 4 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3 This report contains indications relating to the following items:

- ☒ Box No. I — Basis of the report
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI — Certain documents cited
- ☐ Box No. VII — Certain defects in the international application
- ☐ Box No. VIII — Certain observations on the international application

4 The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis*.2).

	Date of issuance of this report 11 September 2007 (11.09.2007)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Simin Baharlou e-mail: pt09.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
EITAN LAW GROUP
11 HAMENOFIM ST.
P.O. BOX 2081
HERZLIA, ISRAEL 46120

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

	Date of mailing (*day/month/year*) 12 JUN 2007
Applicant's or agent's file reference P-7751-PC	FOR FURTHER ACTION See paragraph 2 below

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/IL06/00281	01 March 2006 (01.03.2006)	01 March 2005 (01.03.2005)

International Patent Classification (IPC) or both national classification and IPC

IPC: **G09G 5/00**(2006.01),**5/08**(2006.01)
USPC: 345/156-162,204-215

Applicant

NISSI VILCOVSKY

1 This opinion contains indications relating to the following items:

- ☒ Box No. I — Basis of the opinion
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement under Rule 43*bis* 1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI — Certain documents cited
- ☐ Box No. VII — Certain defects in the international application
- ☐ Box No. VIII — Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(*b*) that written opinions of this International Searching Authority will not be so considered

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later

For further options, see Form PCT/ISA/220.

3 For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	15 May 2007 (15.05.2007)	VIJAY SHANKAR Telephone No. 571-272-7682

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/IL06/00281

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b format of material

☐ on paper

☐ in electronic form

c time of filing/furnishing

☐ contained in the international application as filed

☐ filed together with the international application in electronic form

☐ furnished subsequently to this Authority for the purposes of search

3 ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished

4. Additional comments:

Samsung/Google, EX1002, p. 303

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No
PCT/IL06/00281

Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims NONE	YES
	Claims 1-12	NO
Inventive step (IS)	Claims NONE	YES
	Claims 1-12	NO
Industrial applicability (IA)	Claims 1-12	YES
	Claims NONE	NO

2. Citations and explanations:

Claims 1-12 lacks novelty under PCT Article 33(2) as being anticipated by Bimber et al (US 2003/0085866 A1).

Bimber et al teaches a system to enable appearance comparison, the system comprising at least one interactive imaging and display station, the station comprising: a mirror-display device capable of selectably operating in either or both a mirror mode or a display mode; an imaging device to capture one or more appearances from a field-of-view in front of said mirror-display device; and an image control unit to select the mode of operation of said mirror-display device according to a user command (Figures 1-23; Paragraph 0063-0137)

Bimber et al teaches a method to enable appearance comparison, the method comprising: using a mirror mode of operation of a mirror,display device capable of being selectably operated in either a mirror mode or a display mode; capturing an image corresponding to an appearance of a first trial from a field-of-view in front of said mirror-display device; storing said image; selecting the display mode of operation of said mirror-display device; retrieving said image and displaying the image on said mirror-display device (Figures 1-23; Paragraph 0063-0137)

Samsung/Google, EX1002, p. 304

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
NIXON PEABODY LLP
P.O. BOX 60610
PALO ALTO, CA 94306

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing *(day/month/year)*	06 MAY 2014
Applicant's or agent's file reference 067055-002001	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US 13/76253	International filing date *(day/month/year)* 18 December 2013 (18.12.2013)
Applicant VILCOVSKY, NISSI	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer Lee W. Young PCT Helpdesk: 571-272-4300 Telephone No. PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 067055-002001	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US 13/76253	International filing date *(day/month/year)* 18 December 2013 (18.12.2013)	(Earliest) Priority Date *(day/month/year)* 18 December 2012 (18.12.2012)
Applicant VILCOVSKY, NISSI		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 13

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 13/76253

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06T 15/00 (2014.01)
USPC - 348/33.02
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC: 348/33.02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 348/333.01,333.02,333.03,333.05,333.06,333.12; 345/427,581,619; 382/295-297 (text search - see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase; PubWEST; Google
Search Terms Used: mimic, mirror, image, transform, camera, map, size, resize, image, flip, reverse, eye level, elevation, height, tilt, barrel effect, fish eye, distance, resolution, varying, triangulate, shoe

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 2007/0132863 A1 (DEGUCHI) 14 June 2007 (14.06.2007), entire document especially paras [0033], [0036], [0044], [0048], [0082]	1-17, 19 --- 18, 20
Y --- A	US 2011/0210970 A1 (SEGAWA) 01 September 2011 (01.09.2011), para [0052]-[0063]	1-17, 19 --- 18, 20
Y	US 2007/0120954 A1 (ALLEN et al.) 31 May 2007 (31.05.2007), entire document especially paras [0008], [0012]	2, 4, 5
Y	US 2012/0177284 A1 (WANG) 12 July 2012 (12.07.2012), entire document especially para [0077]	7
Y	US 2009/0051779 A1 (ROLSTON) 26 February 2009 (26.02.2009), entire document especially paras [0067]-[0068]	9
Y	US 2005/0047629 A1 (FARRELL et al.) 03 March 2005 (03.03.2005), entire document especially para [0023]	10
Y -- A	US 2005/259158 A1 (JACOB et al.) 24 November 2005 (24.11.2005), entire document especially paras [0015], [0085]	11 --- 18
Y	US 6,417,850 B1 (KANG) 09 July 2002 (09.07.2002), entire document especially col 9, lns 36-55	12

☒ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 April 2014 (01.04.2014)	06 MAY 2014
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 13/76253

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/0097442 A1 (LABLANS) 22 April 2010 (22.04.2010), entire document especially para [0065]	15
Y -- A	US 2008/0151092 A1 (VILCOVSKY) 26 June 2008 (26.06.2008), entire document especially paras[0029], [0050]	17, 19 --- 18
X, P	US 2013/0229482 A1 (VILCOVSKY) 05 September 2013 (05.09.2013), entire document	1-20
A	US 2002/0196333 A1 (GORISCHEK) 26 December 2002 (26.12.2002), entire document	1-20
A	US 2005/0018140 A1 (ISHIZAKI et al.) 27 January 2005 (27.01.2005), entire document	1-20
A	US 2003/0085866 A1 (BIMBER et al.) 08 May 2003 (08.05.2003), entire document	1-20
A	US 2006/0007303 A1 (MILTON) 12 January 2006 (12.01.2006), entire document	1-20
A	US 2012/0169850 A1 (KIM et al.) 05 July 2012 (05.07.2012), entire document	1-20

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: NIXON PEABODY LLP
P.O. BOX 60610
PALO ALTO, CA 94306

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	06 MAY 2014
Applicant's or agent's file reference: 067055-002001	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 13/76253	18 December 2013 (18.12.2013)	18 December 2012 (18.12.2012)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G06T 15/00 (2014.01)
USPC - 348/33.02

Applicant VILCOVSKY, NISSI

1. This opinion contains indications relating to the following items:

- [X] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [X] Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 *bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	01 April 2014 (01.04.2014)	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 13/76253

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 13/76253

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-20	YES
	Claims	None	NO
Inventive step (IS)	Claims	18, 20	YES
	Claims	1-17, 19	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1, 3, 6, 8, 13, 14, and 16 lack an inventive step under PCT Article 33(3) as being obvious over US 2007/0132863 A1 (DEGUCHI) in view of US 2011/0210970 A1 (Segawa).

Claim 1; Deguchi discloses a method for operating a system having a monitor (para [0036]), a camera (para [0022]), and a processor (12) (para [0033]), so as to display a mirror-mimicking image on the monitor (para [0082]), by performing the non-ordered steps comprising: obtaining a digital image from a camera (para [0027]); flipping the image about a vertical axis so as to reverse right and left sides of the image (para [0082]); applying a transformation mapping to the image (paras [0044], [0082]); resizing the image to reduce variations caused by changes in object's distance to the camera (para [0048], resized based on focal distance and zoom ratio); displaying the image on the monitor after performing the flipping, transformation mapping, and resizing (para [0036]). Deguchi does not specifically disclose the transformation mapping to modify the image such that it appears to mimic a reflection of a mirror; however, Segawa discloses a system to display a mirror-mimicking image, including transformations (para [0053]) to modify the image such that it appears to mimic a reflection of a mirror.(para [0063]). It would have been obvious to one of skill in the art to use the transformations, as taught by Segawa, in the method of Deguchi, to provide natural image orientation for the image displayed in the monitor (see Segawa para [0063]).

Claim 3; Deguchi in view of Segawa discloses the method of Claim 1, but does not specifically discloses that the transformation mapping comprises at least a tilt transformation and an elevation transformation, but Deguchi discloses combining images from cameras whose locations are unrestricted and Segawa discloses a variety of transformations among others (para [0053]). It would have been obvious to one of skill in the art to optimize the transformations wherein the .others. include both tilt and elevation transformations, to optimize the rendering of the displayed image.

Claim 6; Deguchi in view of Segawa discloses the method of Claim 1. Deguchi further discloses that the step of resizing the image (paras [0048], [0051]). while neither Deguchi nor Segawa specifically discloses resizing is performed integral to the step of applying the transformation mapping, it would have been obvious to one of skill in the art to optimize the transformations wherein resizing is performed integral to the step of applying the transformation mapping, to optimize the rendering of the displayed image.

Claim 8; Deguchi in view of Segawa discloses the method of Claim 1. Segawa further discloses applying a translation transformation to move the image within display area of the monitor (para [0053], [0055], viewpoint transformation to alter position).

Claim 13; Deguchi in view of Segawa discloses the method of Claim 1. Deguchi further discloses obtaining a second digital image from a second camera (para [0023]); flipping the second image about a vertical axis so as to reverse right and left sides of the second image (para [0082]); applying a transformation mapping (paras [0044], [0082]); resizing the second image to reduce variations caused by changes in object's distance to the second camera (para [0048] (resized based on focal distance and zoom ratio) stitching the image and the second image after performing the flipping, transformation mapping, and resizing, to thereby obtain a stitched image (para [0028], [0035]); displaying the stitched image on the monitor (para [0036]). Deguchi does not specifically disclose the transformation mapping to modify the second image such that it appears to mimic a reflection of a mirror; however, Segawa discloses a system to display a mirror-mimicking image, including transformations (para [0053]) with multiple images (para [0055]) to modify the image such that it appears to mimic a reflection of a mirror (para [0063]). It would have been obvious to one of skill in the art to use the transformations, as taught by Segawa, in the method of Deguchi, to provide natural image orientation for the image displayed in the monitor (see Segawa para [0063]).

Claim 14; Deguchi in view of Segawa discloses the method of Claim 13. Deguchi further discloses that field of views of the camera and of the second camera overlap, and further comprising the step of overlay decision to determine best location in overlapping parts of the field of views to perform the stitching (paras [0028], [0055] and [0059]).

-- Please see continuation in supplemental box .

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 13/76253

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V. 2. Citations and explanations:

Claim 16; Deguchi in view of Segawa discloses the method of Claim 1. Deguchi further discloses obtaining a second digital image from a second camera (para [0023]); flipping the second image about a vertical axis so as to reverse right and left sides of the second image (para [0082]); applying a transformation mapping to the second image to modify the second image (paras [0044], [0082]); resizing the second image to reduce variations caused by changes in object's distance to the second camera (para [0048]); displaying the image and the second image after performing the flipping, transformation mapping, and resizing to thereby obtain a non-planar image in a three dimensional coordiante system (paras [0029], [0036]), but does not specifically disclose the transformation mapping to modify the image such that it appears to mimic a reflection of a mirror and obtaining a three-dimensional image on the monitor; however, Segawa discloses a system to display a mirror-mimicking image, including transformations (para [0053]) with multiple images (para [0055]) to modify the image such that it appears to mimic a reflection of a mirror (para [0063]) and obtaining a three-dimensional image on the monitor (para [0055]). It would have been obvious to one of skill in the art to use the transformations and three-dimensional display, as taught by Segawa, in the method of Deguchi, to provide natural image orientation for the image displayed in the monitor (see Segawa para [0063]).

Claims 2, 4 and 5 lack an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 2007/0120954 A1 to ALLEN et al. (hereinafter Allen).

Claim 2; Deguchi in view of Segawa discloses the method of Claim 1, but does not specifically disclose that the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally. However, Allen discloses that the rendering an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally (paras [0008], [0012]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Allen such that the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally, since it would provide eye contact between the image and the user (see Allen para [0008]) and provide the desired angle of view (see Deguchi para [0082]).

Claim 4; Deguchi in view of Segawa discloses the method of Claim 3, but does not specifically disclose that the tilt transformation modifies an input image taken with a non-horizontally pointing camera and transforming the image to appear as if the camera was pointed straight horizontally.
Allen discloses an input image taken with a non-horizontally pointing camera and rendering the image to appear as if the camera was pointed straight horizontally(paras [0008], [0012]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Allen and through routine experimentation such that the tilt transformation modifies an input image taken with a non-horizontally pointing camera and transforming the image to appear as if the camera was pointed straight horizontally, since it would provide eye contact between the image and the user (see Allen para [0008]) and provide the desired angle of view (see Deguchi para [0082]).

Claim 5; Deguchi in view of Segawa discloses the method of Claim 3, but does not specifically disclose that the elevation transformation modifies an input image taken with a camera positioned at arbitrary height and transforming the image to appear as if the camera was positioned at a user's eye level. Allen discloses an input image taken with a camera positioned at arbitrary height and rendering the image to appear as if the camera was positioned at a user's eye level(paras [0008], [0012]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Allen and through routine experimentation such that the elevation transformation modifies an input image taken with a camera positioned at arbitrary height and transforming the image to appear as if the camera was positioned at a user's eye level, since it would provide eye contact between the image and the user (see Allen para [0008]) and provide the desired angle of view (see Deguchi para [0082]).

Claim 7 lacks an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 2012/0177284 A1 (WANG).

Claim 7; Deguchi in view of Segawa discloses the method of Claim 1. Deguchi further discloses obtaining a reference image (para [0059]), but does not specifically disclose performing registration of the digital image with the reference image; or using data obtained from the registration to generate the transformation mapping. However, Wang discloses performing registration of the digital image with the reference image (para [0077]); and using data obtained from the registration to generate the transformation mapping (para [0076]-[0078]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Wang so as to include performing registration of the digital image with the reference image and using data obtained from the registration to generate the transformation mapping, since it would allow a 3D rendering from 2D data (see Wang para [0077]).

Claim 9 lacks an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 2009/0051779 A1 (ROLSTON)

Claim 9; Deguchi in view of Segawa discloses the method of Claim 1, but does not specifically disclose changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image. However, Rolston discloses changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image (paras [0067]-[0068]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Rolston so as to include changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image, since it would highlight specific features of the image (see Rolston para [0067]).

-- Please see continuation in supplemental box .

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 13/76253

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:
Box V. 2. Citations and explanations:

Claim 10 lacks an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 2005/0047629 A1 to FARRELL et al. (hereinafter Farrell).

Claim 10; Deguchi in view of Segawa discloses the method of Claim 1, but does not specifically disclose applying at least one of a barrel-effect transformation and a fish-eye transformation. However,Farrell discloses applying at least one of a barrel-effect transformation and a fish-eye transformation (para [0023]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Farrell so as to include applying at least one of a barrel-effect transformation and a fish-eye transformation, since it would allow for expanding a target area such as the user's face while leaving objects on the edge unaffected and resolve interactive component conflicts (see Farrell para [0023]-[0024]).

Claim 11 lacks an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 2005/0259158 A1 to JACOB et al. (hereinafter Jacob).

Claim 11; Deguchi in view of Segawa discloses the method of Claim 1, but does not specifically disclose determining distance to a user appearing in the image; or varying resolution of the image according to the distance. However, Jacob discloses determining distance to a user appearing in the image (para [0015]); and varying resolution of the image according to the distance (para [0085]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Jacob so as to include determining distance to a user appearing in the image and so as to include varying resolution of the image according to the distance, since it would provide a uniform scale (see Jacob para [0085]).

Claim 12 lacks an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 6,417,850 B1 (KANG).

Claim 12; Deguchi in view of Segawa discloses the method of Claim 1, but does not specifically disclose a step of pixel filling, wherein pixel image is extrapolated into empty pixels left after applying the transformation mapping. However, Kang discloses a step of pixel filling, wherein pixel image is extrapolated into empty pixels left after applying the transformation mapping (col 9, lns 36-55). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Kang so as to include a step of pixel filling, wherein pixel image is extrapolated into empty pixels left after applying the transformation mapping, since it would fill in voids created by the transform.

Claim 15 lacks an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 2010/0097442 A1 (LABLANS).

Claim 15; Deguchi in view of Segawa discloses the method of Claim 13, but does not specifically disclose a smoothing operation to correct artifacts caused by the step of stitching. However, Lablans discloses a smoothing operation to correct artifacts caused by the step of stitching (para [0065]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Lablans so as to include a smoothing operation to correct artifacts caused by the step of stitching, since it would remove a transition edge (see Lablans para [0065]).

Claims 17 and 19 lack an inventive step under PCT Article 33(3) as being obvious over Deguchi in view of Segawa and further in view of US 2008/0151092 A1 (VILCOVSKY).

Claim 17; Deguchi in view of Segawa discloses the method of Claim 1, but does not specifically disclose that the non-ordered steps are performed on a series of images of a live video feed from the camera. However, Vilcovsky discloses that the non-ordered steps are performed on a series of images of a live video feed from the camera (para [0050]). It would have been obvious to a person skilled in the art to modify the method of Deguchi in view of Segawa in accordance with the teachings of Vilcovsky such that the non-ordered steps are performed on a series of images of a live video feed from the camera, since it would provide a real time mirror simulation.

Claim 19; Deguchi in view of Vilcovsky discloses the method of Claim 17. Vilcovsky further discloses storing the live video feed in a digital storage device and selectively operating the system in one of a mirror mode or display mode, wherein during mirror mode displaying on the monitor transformed images of what the camera sees at that particular moment while during display mode displaying on the monitor a transformed images of what the camera saw in the past and obtained from the digital storage device (para [0029]).

Claims 18 and 20 meet the criteria set forth under PCT Article 33(2)-(3) because the prior art fails to teach or fairly suggest the particular combination of elements recited in dependent claims 18 and 20.

The prior art is exemplified by Deguchi, Segawa, Vilcovsky, and Jacob.

Claim 18; Deguchi in view of Segawa and Vilcovsky discloses the method of Claim 17, but does not specifically disclose determining distance to a user appearing in the live video feed; or varying the rate at which the non-ordered steps are performed on the series of images according to the distance. Jacob discloses determining a distance to a user appearing in the live video feed (para [0015]). However, the prior art does not teach or fairly suggest varying a rate at which the non-ordered steps are performed on the series of images according to the distance.

Claim 20; Deguchi in view of Segawa discloses the method of Claim 1. However, the prior art does not teach or fairly suggest calculating distance to a user appearing in the image by identifying user's shoes and triangulating to the shoes.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 13/76253

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V. 2. Citations and explanations:

Claims 18 and 20 meet the criteria set forth under PCT Article 33(2)-(3) because the prior art fails to disclose or suggest the particular combination of elements recited in independent claims 18 and 20.

The prior art is exemplified by Deguchi, Vilcovsky, and Jacob.

Claim 18; Deguchi in view of Vilcovsky discloses the method of Claim 17, but does not specifically disclose determining distance to a user appearing in the live video feed; or varying the rate at which the non-ordered steps are performed on the series of images according to the distance. Jacob discloses determining a distance to a user appearing in the live video feed (para [0015]). However, the prior art does not teach or disclose varying a rate at which the non-ordered steps are performed on the series of images according to the distance.

Claim 20; Deguchi discloses the method of Claim 1. However, the prior art does not teach or suggest calculating distance to a user appearing in the image by identifying user's shoes and triangulating to the shoes.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

JB

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

RECEIVED
Nixon Peabody LLP
AUG 12 2014

To: JOSEPH BACH
NIXON PEABODY LLP
P.O. BOX 60610
PALO ALTO, CA 94306

PCT

INVITATION TO PAY ADDITIONAL FEES
AND, WHERE APPLICABLE, PROTEST FEE

(PCT Article 17(3)(a) and Rules 40.1 and 40.2(e))

	Date of mailing *(day/month/year)* 08 AUG 2014
Applicant's or agent's file reference 067055-002101	**PAYMENT DUE** within **ONE MONTH** from the above date of mailing
International application No. PCT/US2014/034333	International filing date *(day/month/year)* 16 April 2014
Applicant EYESMATCH LTD	

1. This International Searching Authority

   (i) considers that there are 6 *(number of)* inventions claimed in the international application covered by the claims indicated below/on an extra sheet:

   see Extra Sheet(s)

   (ii) therefore considers that **the international application does not comply with the requirement of unity of invention** (Rules 13.1, 13.2 and 13.3) for the reasons indicated below/on an extra sheet:

   see Extra Sheet(s)

   (iii) ☐ has carried out a partial international search (see Annex) ☒ will establish the international search report on those parts of the international application which relate to the invention first mentioned in claims Nos.:

   1-20

   (iv) will establish the international search report on the other parts of the international application only if, and to the extent to which, additional fees are paid.

2. Consequently, the applicant is hereby **invited to pay**, within the time limit indicated above, additional fees in the amount indicated below:

   $2,080 (Fee per additional invention) x 5 (number of additional inventions) = $10,400 (See Item 2 of annex) (total amount of additional fees/currency)

3. The applicant is informed that, according to Rule 40.2(c), **the payment of any additional fees may be made under protest**, that is, a reasoned statement to the effect that the international application complies with the requirement of unity of invention or that the amount of the required additional fees is excessive, where applicable, subject to the payment of a protest fee.

   Where the applicant pays additional fees under protest, the applicant is hereby invited, within the time limit indicated above, to pay a protest fee (Rule 40.2(e)) in the amount of _____ *(amount/currency)*

   Where the applicant has not, within the time limit indicated above, paid the required protest fee, the protest will be considered not to have been made and the International Searching Authority will so declare.

4. ☐ Claim(s) Nos. _____ have been found to be unsearchable under Article 17(2)(b) because of defects under Article 17(2)(a) and therefore have not been included with any invention.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine Copenheaver PCT Helpdesk: 571-272-4300

Form PCT/ISA/206 (April 2005)

INVITATION TO PAY ADDITIONAL FEES
AND, WHERE APPLICABLE, PROTEST FEE

International application No.
PCT/US2014/034333

Item 2 (continued). For International Applications filed on or after 01 January 2014, Applicant is reminded that the search fee per additional invention indicated in item 2 is the undiscounted fee per additional invention. An Applicant may pay the search fee per additional invention fee reduced by 50% (small entity assertion) or 75% (micro entity certification), as appropriate. See 37 CFR 1.27 and 1.29.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-20, drawn to a computer implemented method for operating a system comprising determining whether the user has an existing account.
Group II, claims 21-31, drawn to a computer readable storage medium storing a program for separating an object in a digital image.
Group III, claims 32-47, drawn to a computer system for perform color change on an object within a digital image.
Group IV, claims 48-56, drawn to a method for operating a mirror-display system where the processor flips the captured images about a vertical axis.
Group V, claims 57-74, drawn to a method for displaying a mirror-mimicking image on the monitor comprising initiating a mirror-mimicking mode and authentication process.
Group VI, claims 75-94, drawn to a method for operating a mirror-display system comprising operating in a mirror tracking mode by operating the processor to apply adaptive transformation mapping to images.

The inventions listed as Groups I-VI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: determining whether the user has an existing account and, if so, opening the user account and displaying thumbnails corresponding to the user account on the monitor; if the user has no existing account, setting a temporary account and so long as the user is still in front of the monitor, enabling the user to control the temporary account as claimed therein is not present in the invention of Groups II-VI. The special technical feature of the Group II invention: instructions for separating an object in a digital image by performing the steps comprising: obtaining a digital image; receiving a selection of an object within the digital image as claimed therein is not present in the invention of Groups I, III-VI. The special technical feature of the Group III invention: perform color change on an object within a digital image, comprising receiving a selection of object in the digital image to be recolored; performing element selection to obtain collection of pixels that belong to the selected object as claimed therein is not present in the invention of Groups I, II, IV-VI. The special technical feature of the Group IV invention: the processor flips the captured images about a vertical axis so as to reverse right and left sides of the captured images and applies transformation mapping to the captured images to generate modified images that appear to mimic reflection of a mirror as claimed therein is not present in the invention of Groups I, II, III or V-VI. The special technical feature of the Group V invention: initiating a mirror-mimicking mode for displaying the mirror-mimicking image on the monitor; initiating an authentication process as claimed therein is not present in the invention of Groups I-IV, VI. The special technical feature of the Group VI invention: operating the mirror-display system in a mirror tracking mode by operating the processor to apply adaptive transformation mapping to images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view as claimed therein is not present in the invention of Groups I-V.

Groups I, II, III, IV, V and VI lack unity of invention because even though the inventions of these groups require the technical feature of a method for operating a mirror-display system having a monitor camera and processor, operating the system in idle mode until a user presence is sensed in front of camera, once user presence identified, switching operation of mirror display into a different mode, this technical feature is not a special technical feature as it does not make a contribution over the prior art. Specifically, US 2008/0151092 A1 (VILCOVSKY) 26 June 2008 (26.06.2008) teaches a method for operating a mirror-display system having a monitor camera and processor (method for enabling a system to carry out an appearance comparison, wherein the system comprises a mirror display device, an imaging device to capture one or more appearances from a field of view in front of the mirror-display device, and central processor, Paras. 6 and 44), operating the system in idle mode until a user presence is sensed in front of camera, once user presence identified, switching operation of mirror display into a different mode (controller 121 receives input from imaging device 130 related to capturing a first trial of the user-appearance in front of imaging device 130, Para. 61 and Fig. 3A; at this point, controller 121 may view the first trial and then change the operational mode of mirror-display device 140 to the display mode using signals 141, wherein controller 121 further facilitates switching the mirror-display device from inactive to active mode, Paras. 31 and 62 and Fig. 3B).

Since none of the special technical features of the Group I, II, III, IV, V or VI inventions are found in more than one of the inventions, unity of invention is lacking.

Samsung/Google, EX1002, p. 316

Electronic Acknowledgement Receipt

EFS ID:	20632460
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Monica Moreno
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	06-NOV-2014
Filing Date:	15-APR-2014
Time Stamp:	22:32:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	067055_002400_IDS.pdf	613957 60350547baab226f8740101d1f84bf4d7201b1d8	no	8

Warnings:	
Information:	

2	Foreign Reference	DE10031965.pdf	327106 5720fd0393e7bc6b8993c9b6c0e9e4fa2bd27113	no	5
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3	Foreign Reference	DE19943355.pdf	946944 41b8b1f549e723b980f14c7e13294793bf4a1a53	no	11
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4	Foreign Reference	EP1372092.pdf	395308 7be95c442a3dfcf2d2d65283fe54568adc300264	no	9
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5	Foreign Reference	EP1376207.pdf	1561287 95f889b767baf6b0f47592d32bce85a2d43e7df8	no	30
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Information:					
6	Foreign Reference	EP1859432A2.pdf	218514 eb47dbe01d90c059daa30bbdab8c4f5ae0d266ea	no	3
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7	Foreign Reference	WO0022955.pdf	1096254 f7c29fa2c424ab0d1a244491d52ba54983c9111a	no	30
Warnings:					
Information:					
8	Foreign Reference	WO2006092793A2.pdf	1314180 2e3df5a0eed380dc686b76f12720f809c272fb47	no	25
Warnings:					
Information:					
9	Foreign Reference	WO2014100250A2.pdf	3123865 a5a5455faa9b3925088a122ef1c3042e52f6f530	no	66
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10	Non Patent Literature	Ext_SearchReport_EP06711263_dated_AUG_18_2011.pdf	299952 5f8eb70cb6e269daf65273b3dcdb4e2dc54910e8	no	8
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11	Non Patent Literature	OA_EP06711263_dated_JUN_21_2012.pdf	80581 e597f9eb3cd38f2bafbe04a6cc42f9178a61d47d	no	3
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12	Non Patent Literature	OA_EP06711263_dated_JUN_25_2013.pdf	163001 07561e20f941517e48826c4de5ddb3c929a41f6b	no	5
Warnings:					
Information:					
13	Non Patent Literature	Decision_to_Refuse_EP06711263_dated_NOV_4_2014.pdf	280990 03cf56f094b67c9c1b98caf81f9c30f2e7a1583f	no	8
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Information:					
14	Non Patent Literature	OA_13088369_dated_NOV_2_2012.pdf	235838 6fdc9c5e262915bf1a88ce7852a362d020b44ede	no	7
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15	Non Patent Literature	OA_13088369_dated_APR_9_2013.pdf	217542 62b34efb85ba9095ca23644b304aa4ff4b0273c2	no	6
Warnings:					
Information:					
16	Non Patent Literature	NOA_13088369_dated_SEPT_3_2013.pdf	406258 94fdf305b27336defc25bebe183265808ba1523f	no	8
Warnings:					
Information:					
17	Non Patent Literature	ISR_PCTIL2006000281_dated_JUN_12_2007.pdf	394126 2da2329101bf3624ca094bc675f76a9d7be54d8f	no	7
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Information:					
18	Non Patent Literature	IPRP_PCTIL2006000281_dated_SEPT_20_2007.pdf	223921 267ad646a53c6b461db9c453b7fac68aafb2a2a1	no	5
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19	Non Patent Literature	OA_11817411_dated_JUL_21_2010.pdf	215509 796c6abb8dd1ac162a23611ee16579d1bd0d58e0	no	7
Warnings:					
Information:					

20	Non Patent Literature	NOA_11817411_dated_FEB_3_2011.pdf	330448 0e3dfb78a701361ba78995ec39c67269f0ae6296	no	7
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21	Non Patent Literature	ISR_PCTUS2013076253_dated_MAY_6_2014.pdf	593211 d2b9286817eabc044061e2d42a2bda5ff30c8f62	no	10
Warnings:					
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22	Non Patent Literature	NOA_14253800_dated_OCT_24_2014.pdf	444884 8b31a2c43238e6485ff70d973597c98abceb6040	no	9
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Information:					
23	Non Patent Literature	Invit_to_Pay_PCTUS2014034333_dated_AUG_8_2014.pdf	83181 fd9e4ce56bf24e9bb1e2dc9c03a14ea0a6ceed6e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	13566857		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/253,831	04/15/2014	Ofer Saban	067055-002400

CONFIRMATION NO. 3426

46188
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

POA ACCEPTANCE LETTER

OC000000071805484

Date Mailed: 11/13/2014

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/05/2014.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/mbeyene/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14253831
Filing Date	2014-04-15
First Named Inventor	SABAN, Ofer
Art Unit	2697
Examiner Name	SHANKAR, VIJAY
Attorney Docket Number	067055-002400

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5551021	A	1996-08-27	Harada et al.	

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	SABAN, Ofer
	Art Unit	2697
	Examiner Name	SHANKAR, VIJAY
	Attorney Docket Number	067055-002400

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	SABAN, Ofer
	Art Unit	2697
	Examiner Name	SHANKAR, VIJAY
	Attorney Docket Number	067055-002400

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Joseph Bach/	Date (YYYY-MM-DD)	2014-11-20
Name/Print	Joseph Bach	Registration Number	37,771

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	20759099
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Tiffany Weeks
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	20-NOV-2014
Filing Date:	15-APR-2014
Time Stamp:	17:52:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	067055_002400_IDS_dated_11-20-2014.pdf	612277 b22f7665da7e355f738bd172b52be996b28d16d0	no	4

Warnings:	
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Total Files Size (in bytes):	612277

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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NOTICE OF ALLOWANCE AND FEE(S) DUE

46188 7590 12/03/2014

Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

EXAMINER
SHANKAR, VIJAY

ART UNIT	PAPER NUMBER
2697	

DATE MAILED: 12/03/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/253,831	04/15/2014	Ofer Saban	067055-002400	3426

TITLE OF INVENTION: METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/03/2015

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

Samsung/Google, EX1002, p. 328

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

46188 7590 12/03/2014
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/253,831	04/15/2014	Ofer Saban	067055-002400	3426

TITLE OF INVENTION: METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/03/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
SHANKAR, VIJAY	2697	345-204000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
❑ Issue Fee
❑ Publication Fee (No small entity discount permitted)
❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)
❑ A check is enclosed.
❑ Payment by credit card. Form PTO-2038 is attached.
❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
❑ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Samsung/Google, EX1002, p. 329

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/253,831	04/15/2014	Ofer Saban	067055-002400	3426

46188 7590 12/03/2014
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

EXAMINER	
SHANKAR, VIJAY	

ART UNIT	PAPER NUMBER
2697	

DATE MAILED: 12/03/2014

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Samsung/Google, EX1002, p. 330

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 14/253,831	Applicant(s) SABAN ET AL.	
	Examiner VIJAY SHANKAR	Art Unit 2697	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Examiner's Amendment on 11/25/14*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1,3-5 and 7-20*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/VIJAY SHANKAR/
Primary Examiner, Art Unit 2697

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Joseph Bach on 11/25/14.

The application has been amended as follows:

1) Amend Claim 1.

2) Cancel claims 2 and 6.

Claim 1 (Currently Amended). A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:

operating the camera to generate a stream of images of the user;

operating the processor to detect the presence of the user in the stream of images;

operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and,

displaying the modified images on the monitor;

<u>wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and</u>

<u>wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.</u>

DETAILED ACTION

2. The present application is being examined under the pre-AIA first to invent provisions.

Allowable Subject Matter

3. Claims 1, 3-5, 7-20 are allowed.

4. The following is an examiner's statement of reasons for allowance: The prior arts fail to teach a computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:

operating the camera to generate a stream of images of the user;

operating the processor to detect the presence of the user in the stream of images;

operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and,

displaying the modified images on the monitor;

wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and

wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to VIJAY SHANKAR whose telephone number is (571)272-7682. The examiner can normally be reached on M-F 7:30 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexander Eisen can be reached on (571) 272-7687. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/VIJAY SHANKAR/
Primary Examiner, Art Unit 2697

Notice of References Cited	Application/Control No. 14/253,831	Applicant(s)/Patent Under Reexamination SABAN ET AL.	
	Examiner VIJAY SHANKAR	Art Unit 2697	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,500,755	03-2009	Ishizaki et al.	353/28
*	B	US-7,874,481	01-2011	Silverbrook et al.	235/383
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14253831	SABAN ET AL.
	Examiner	**Art Unit**
	VIJAY SHANKAR	2697

CPC						
Symbol					**Type**	**Version**
G06T		19	/	006	F	2013-01-01
G02B		5	/	08	I	2013-01-01
G06F		3	/	011	I	2013-01-01
G09F		19	/	16	I	2013-01-01
G09F		27	/	00	I	2013-01-01
H04N		1	/	387	I	2013-01-01
H04N		1	/	622	I	2013-01-01
H04N		7	/	144	I	2013-01-01
G06T		11	/	00	I	2013-01-01
H04N		21	/	00	I	2013-01-01
G06T		3	/	00	I	2013-01-01
G06T		7	/	00	I	2013-01-01
G06T		15	/	205	I	2013-01-01
H04N		5	/	2624	A	2013-01-01
H04N		5	/	2628	A	2013-01-01
H04N		2005	/	2726	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 18	
/VIJAY SHANKAR/ Primary Examiner.Art Unit 2697 (Primary Examiner)	11/25/14 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14253831	SABAN ET AL.
	Examiner	**Art Unit**
	VIJAY SHANKAR	2697

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
345	204	G	0	6	F	3 / 038 (2013.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											
345	212	214										

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/VIJAY SHANKAR/ Primary Examiner.Art Unit 2697	11/25/14	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14253831	SABAN ET AL.
	Examiner	**Art Unit**
	VIJAY SHANKAR	2697

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	15	17												
-	2	16	18												
2	3	17	19												
3	4	18	20												
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9	11														
10	12														
11	13														
12	14														
13	15														
14	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 18	
/VIJAY SHANKAR/ Primary Examiner.Art Unit 2697 (Primary Examiner)	11/25/14 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	SABAN, Ofer
	Art Unit	2697
	Examiner Name	SHANKAR, VIJAY
	Attorney Docket Number	067055-002400

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5551021	A	1996-08-27	Harada et al.	
If you wish to add additional U.S. Patent citation information please click the Add button.						Add

U.S.PATENT APPLICATION PUBLICATIONS						Remove
Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					
If you wish to add additional U.S. Published Application citation information please click the Add button.						Add

FOREIGN PATENT DOCUMENTS							Remove	
Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐
If you wish to add additional Foreign Patent Document citation information please click the Add button							Add	

NON-PATENT LITERATURE DOCUMENTS			Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.S./

Receipt date: 11/20/2014	Application Number	14253831 14253831 - GAU: 2697
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Filing Date	2014-04-15
	First Named Inventor	SABAN, Ofer
(Not for submission under 37 CFR 1.99)	Art Unit	2697
	Examiner Name	SHANKAR, VIJAY
	Attorney Docket Number	067055-002400

	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button **Add**

EXAMINER SIGNATURE

Examiner Signature	/Vijay Shankar/	Date Considered	11/25/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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Receipt date: 11/20/2014	Application Number	14253831	14253831 - GAU: 2697
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2014-04-15	
	First Named Inventor	SABAN, Ofer	
	Art Unit	2697	
	Examiner Name	SHANKAR, VIJAY	
	Attorney Docket Number	067055-002400	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Joseph Bach/	Date (YYYY-MM-DD)	2014-11-20
Name/Print	Joseph Bach	Registration Number	37,771

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.S./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	14253831
Filing Date	2014-04-15
First Named Inventor	Ofer Saban
Art Unit	2656
Examiner Name	KUNTZ, CURTIS A.
Attorney Docket Number	067055-002400

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6417850	B1	2002-07-09	Kang	
	2	7948481	B2	2011-05-24	Vilcosky	
	3	8624883	B2	2014-01-07	Vilcosky	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020196333	A1	2002-12-26	Gorischek	
	2	20030085866	A1	2003-05-08	Bimber et al.	
	3	20050018140	A1	2005-01-27	Ishizaki et al.	

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Receipt date: 11/06/2014	Application Number	14253831	14253831 - GAU: 2697
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2014-04-15	
	First Named Inventor	Ofer Saban	
	Art Unit	2656	
	Examiner Name	KUNTZ, CURTIS A.	
	Attorney Docket Number	067055-002400	

	4	20050047629	A1	2005-03-03	Farrell et al.	
	5	20050259158	A1	2005-11-24	Jacob et al.	
	6	20060007303	A1	2006-01-12	Milton	
	7	20060178902	A1	2006-08-10	Vicars et al.	
	8	20070120954	A1	2007-05-31	Allen et al.	
	9	20070132863	A1	2007-06-14	Deguchi	
	10	20080151092	A1	2008-06-26	Vilcovsky	
	11	20090051779	A1	2009-02-26	Rolston	
	12	20090091710	A1	2009-04-09	Huebner	
	13	20100097442	A1	2010-04-22	Lablans	
	14	20100190510	A1	2010-07-29	Maranhas et al.	

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	Art Unit	2656	
	Examiner Name	KUNTZ, CURTIS A.	
	Attorney Docket Number	067055-002400	

	15	20100191578	A1	2010-07-29	Tran et al.	
	16	20110199294	A1	2011-08-18	Vilcovksy	
	17	20110210970	A1	2011-09-01	Segawa	
	18	20120169850	A1	2012-07-05	Kim et al.	
	19	20120177284	A1	2012-07-12	Wang	
	20	20130229482	A1	2013-09-05	Vilcovsky et al.	
	21	20140225977	A1	2014-08-14	Vilcovsky et al.	
	22	20140226000	A1	2014-08-14	Vilcovsky et al.	
	23	20140226900	A1	2014-08-14	Saban et al.	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

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	Examiner Name	KUNTZ, CURTIS A.	
	Attorney Docket Number	067055-002400	

	1	10031965	DE	A1	2002-01-10	Eberhard Floegel		☐
	2	19943355	DE	A1	2001-03-15	Markus Benesch		☐
	3	1372092	EP	A1	2003-12-17	Accenture Global Services GmbH		☐
	4	1376207	EP	A1	2004-01-02	Seiko Epson Corporation		☐
	5	1859432	EP	A2	2007-11-28	Nissi Vilcovsky		☐
	6	00/22955	WO	A1	2000-04-27	Eric Fischer		☐
	7	2006/092793	WO	A2	2006-09-08	Nissi Vilcovsky		☐
	8	2014/100250	WO	A2	2014-06-26	Nissi Vilcovsky, et al.		☐

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NON-PATENT LITERATURE DOCUMENTS **Remove**

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Extended Search Report for European Patent Application No. 06711263.1 dated August 18, 2011.	☐

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	Art Unit	2656
	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

	2	Office Action for European Patent Application No. 06711263.1 dated June 21, 2012.	☐
	3	Office Action for European Patent Application No. 06711263.1 dated June 25, 2013.	☐
	4	Decision to Refuse for European Patent Application No. 06711263.1 dated November 4, 2014.	☐
	5	Office Action for U.S. Patent Application No. 13/088,369 dated November 2, 2012.	☐
	6	Office Action for U.S. Patent Application No. 13/088,369 dated April 9, 2013.	☐
	7	Notice of Allowance for U.S. Patent Application No. 13/088,369 dated September 3, 2013.	☐
	8	International Search Report and Written Opinion for PCT/IL2006/000281 dated June 12, 2007.	☐
	9	International Preliminary Report on Patentability for PCT/IL2006/000281 dated September 20, 2007.	☐
	10	Office Action for U.S. Patent Application No. 11/817,411 mailed on July 21, 2010.	☐
	11	Notice of Allowance for U.S. Patent Application No. 11/817,411 mailed on February 3, 2011.	☐
	12	International Search Report and Written Opinion for PCT/US2013/076253 dated May 6, 2014.	☐

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2656
(Not for submission under 37 CFR 1.99)	Examiner Name	KUNTZ, CURTIS A.
	Attorney Docket Number	067055-002400

	13	Notice of Allowance for U.S. Patent Application No. 14/253,800 dated October 24, 2014.	☐
	14	Invitation to Pay Additional Fees And, Where Applicable, Protest Fee for PCT/US2014/034333 dated August 8, 2014.	☐

If you wish to add additional non-patent literature document citation information please click the Add button **Add**

EXAMINER SIGNATURE

Examiner Signature	/Vijay Shankar/	Date Considered	11/25/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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	Attorney Docket Number	067055-002400	

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Signature	/Joseph Bach/	Date (YYYY-MM-DD)	2014-11-06
Name/Print	Joseph Bach	Registration Number	37,771

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BIB DATA SHEET

CONFIRMATION NO. 3426

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/253,831	04/15/2014 RULE	345	2697	067055-002400

APPLICANTS

EyesMatch Ltd., Road Town, VIRGIN ISLANDS, BRITISH, Assignee (with 37 CFR 1.172 Interest);

INVENTORS

Ofer Saban, Vienna, VA;
Nissi Vilcovsky, Tokyo, JAPAN;

**** CONTINUING DATA ***************************

This application is a CIP of 13/843,001 03/15/2013
which is a CIP of 13/088,369 04/17/2011 PAT 8624883
which is a CON of 11/817,411 08/30/2007 PAT 7948481
which is a 371 of PCT/IL2006/000281 03/01/2006
which claims benefit of 60/656,885 03/01/2005
and claims benefit of 60/656,884 03/01/2005
and said 13/843,001 03/15/2013
claims benefit of 61/738,957 12/18/2012
This application 14/253,831 04/15/2014
claims benefit of 61/892,368 10/17/2013
and claims benefit of 61/862,025 08/04/2013

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
05/02/2014

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /VIJAY SHANKAR/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		VA	16	20	1

ADDRESS

Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306
UNITED STATES

TITLE

METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

FILING FEE RECEIVED		
730	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14253831	SABAN ET AL.
	Examiner	Art Unit
	VIJAY SHANKAR	2697

CPC- SEARCHED		
Symbol	Date	Examiner
G06F 3/01, 3/011, 3/005	11/25/2014	VS

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
345	204-215	11/25/2014	VS
348	333.01	11/25/2014	VS
434	395	11/25/2014	VS

SEARCH NOTES		
Search Notes	Date	Examiner
INVENTORS NAME SEARCH	11/25/2014	VS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
SAME	AS SEARCH	11/25/2014	VS

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	14253831
Filing Date	2014-04-15
First Named Inventor	Ofer Saban
Art Unit	2697
Examiner Name	SHANKAR, VIJAY
Attorney Docket Number	067055-002400

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5230039	A	1993-07-20	Grossman et al.	
	2	5923776	A	1999-07-13	Kamgar-Parsi	
	3	5937081	A	1999-08-10	O'Brill et al.	
	4	6195467	B1	2001-02-27	Asimopoulos et al.	
	5	6366694	B1	2002-04-02	Acharya	
	6	7874681	B2	2011-01-25	Huebner	
	7	8000727	B1	2011-08-16	Bushman et al.	

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	1	20020049546	A1	2002-04-25	Shimomura	
	2	20030110099	A1	2003-06-12	Trajkovic et al.	
	3	20030146901	A1	2003-08-07	Ryan	
	4	20060158534	A1	2006-07-20	Gotohda	
	5	20070040033	A1	2007-02-22	Rosenberg	
	6	20080056564	A1	2008-03-06	Lindbloom	
	7	20100169411	A1	2010-07-01	Colton et al.	
	8	20120120184	A1	2012-05-17	Fornell et al.	
	9	20120154872	A1	2012-06-21	Reddy	
	10	20120229637	A1	2012-09-13	Mooradian et al.	

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	Attorney Docket Number	067055-002400

	11	20120233089	A1	2012-09-13	Calman et al.	
	12	20130083015	A1	2013-04-04	Hernandez Esteban	
	13	20130088562	A1	2013-04-11	Hong et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Notice of Allowance for U.S. Patent Application No. 13/843,001 mailed on December 5, 2014.	☐
	2	International Search Report and Written Opinion for PCT/US2014/034333 dated December 17, 2014.	☐
	3	Notice of Allowance for U.S. Patent Application No. 14/253,827 dated December 15, 2014.	☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2697
	Examiner Name	SHANKAR, VIJAY
	Attorney Docket Number	067055-002400

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14253831
	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2697
	Examiner Name	SHANKAR, VIJAY
	Attorney Docket Number	067055-002400

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Joseph Bach/	Date (YYYY-MM-DD)	2015-01-06
Name/Print	Joseph Bach	Registration Number	37,771

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: JOSEPH BACH
NIXON PEABODY LLP
P.O. BOX 60610
PALO ALTO, CA 94306

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing *(day/month/year)*	17 DEC 2014
Applicant's or agent's file reference: 067055-002101	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No.: PCT/US2014/034333	International filing date *(day/month/year)*: 16 April 2014
Applicant: EYESMATCH LTD	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
   - ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
   - ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

   Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

   Within **19 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 Telephone No. PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2014)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 067055-002101	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2014/034333	International filing date *(day/month/year)* 16 April 2014	(Earliest) Priority Date *(day/month/year)* 04 August 2013
Applicant EYESMATCH LTD		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☒ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 15

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/034333

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See last page.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-20

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/034333

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06F 17/00 (2014.01)
USPC - G06F 17/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - G06F 17/00; G09B 25/00; H04N 5/222; 7/15 (2014.01)
USPC - 348/14.12, 333.01, 705/27.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - G06F 17/00; G09B 25/00; H04N 5/222; 7/15 (2014.09) (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Google, Orbit, Google Patents
Search terms used: camera, detect, user presence, switching, idle mode, mirror mode

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2008/0151092 A1 (VILCOVSKY) 26 June 2008 (26.06.2008) entire document	1-20
Y	US 2007/0040033 A1 (ROSENBERG) 22 February 2007 (22.02.2007) entire document	1-20
Y	US 2010/0169411 A1 (COLTON et al) 01 July 2010 (01.07.2010) entire document	1-20
Y	US 2006/0158534 A1 (GOTOHDA) 20 July 2006 (20.07.2006) entire document	2,3
Y	US 2003/0146901 A1 (RYAN) 07 August 2003 (07.08.2003) entire document	3,17-20
Y	US 8,000,727 B1 (BUSHMAN et al) 16 August 2011 (16.08.2011) entire document	4,5
Y	US 2012/0233089 A1 (CALMAN et al) 13 September 2012 (13.09.2012) entire document	5
Y	US 2003/0110099 A1 (TRAJKOVIC et al) 12 June 2003 (12.06.2003) entire document	6-15
Y	US 2012/0154872 A1 (REDDY) 21 June 2012 (21.06.2012) entire document	8-11
Y	US 20130/083015 A1 (HERNANDEZ ESTEBAN) 04 April 2013 (04.04.2013) entire document	15
Y	US 2012/0229637 A1 (MOORADIAN et al) 13 September 2012 (13.09.2012) entire document	16
Y	US 2013/0088562 A1 (HONG et al) 11 April 2013 (11.04.2013) entire document	18-20
Y	US 6,366,694 B1 (ACHARYA) 02 April 2002 (02.04.2002) entire document	8-11

☒ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 December 2014	17 DEC 2014
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/034333

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2008/0056564 A1 (LINDBLOOM) 06 March 2008 (06.03.2008) entire document	8-11
Y	US 5,9237,76 A (KAMGAR-PARSI) 13 July 1999 (13.07.1999) entire document	10
Y	US 6,195,467 B1 (ASIMOPOULOS et al) 27 February 2001 (27.02.2001) entire document	11
Y	US 5,937,081 A (O'Brill et al) 10 August 1999 (10.08.1999) entire document	19
Y	US 2002/0049546 A1 (SHIMOMURA) 25 April 2002 (25.04.2002) entire document	20
Y	US 5,230,039 A (GROSSMAN et al) 20 July 1993 (20.07.1993) entire document	11
A	US 2012/0120184 A1 (FORNELL et al) 17 May 2012 (17.05.2012) entire document	1-20

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/034333

Continuation of Box No. III:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-20, drawn to a computer implemented method for operating a system comprising determining whether the user has an existing account.
Group II, claims 21-31, drawn to a computer readable storage medium storing a program for separating an object in a digital image.
Group III, claims 32-47, drawn to a computer system for perform color change on an object within a digital image.
Group IV, claims 48-56, drawn to a method for operating a mirror-display system where the processor flips the captured images about a vertical axis.
Group V, claims 57-74, drawn to a method for displaying a mirror-mimicking image on the monitor comprising initiating a mirror-mimicking mode and authentication process.
Group VI, claims 75-94, drawn to a method for operating a mirror-display system comprising operating in a mirror tracking mode by operating the processor to apply adaptive transformation mapping to images.

The inventions listed as Groups I-VI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: determining whether the user has an existing account and, if so, opening the user account and displaying thumbnails corresponding to the user account on the monitor; if the user has no existing account, setting a temporary account and so long as the user is still in front of the monitor, enabling the user to control the temporary account as claimed therein is not present in the invention of Groups II-VI. The special technical feature of the Group II invention: instructions for separating an object in a digital image by performing the steps comprising: obtaining a digital image; receiving a selection of an object within the digital image as claimed therein is not present in the invention of Groups I, III-VI. The special technical feature of the Group III invention: perform color change on an object within a digital image, comprising receiving a selection of object in the digital image to be recolored; performing element selection to obtain collection of pixels that belong to the selected object as claimed therein is not present in the invention of Groups I, II, IV-VI. The special technical feature of the Group IV invention: the processor flips the captured images about a vertical axis so as to reverse right and left sides of the captured images and applies transformation mapping to the captured images to generate modified images that appear to mimic reflection of a mirror as claimed therein is not present in the invention of Groups I, II, III or V-VI. The special technical feature of the Group V invention: initiating a mirror-mimicking mode for displaying the mirror-mimicking image on the monitor; initiating an authentication process as claimed therein is not present in the invention of Groups I-IV, VI. The special technical feature of the Group VI invention: operating the mirror-display system in a mirror tracking mode by operating the processor to apply adaptive transformation mapping to images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view as claimed therein is not present in the invention of Groups I-V.

Groups I, II, III, IV, V and VI lack unity of invention because even though the inventions of these groups require the technical feature of a method for operating a mirror-display system having a monitor camera and processor, operating the system in idle mode until a user presence is sensed in front of camera, once user presence identified, switching operation of mirror display into a different mode, this technical feature is not a special technical feature as it does not make a contribution over the prior art. Specifically, US 2008/0151092 A1 (VILCOVSKY) 26 June 2008 (26.06.2008) teaches a method for operating a mirror-display system having a monitor camera and processor (method for enabling a system to carry out an appearance comparison, wherein the system comprises a mirror display device, an imaging device to capture one or more appearances from a field of view in front of the mirror-display device, and central processor, Paras. 6 and 44), operating the system in idle mode until a user presence is sensed in front of camera, once user presence identified, switching operation of mirror display into a different mode (controller 121 receives input from imaging device 130 related to capturing a first trial of the user-appearance in front of imaging device 130, Para. 61 and Fig. 3A; at this point, controller 121 may view the first trial and then change the operational mode of mirror-display device 140 to the display mode using signals 141, wherein controller 121 further facilitates switching the mirror-display device from inactive to active mode, Paras. 31 and 62 and Fig. 3B).

Since none of the special technical features of the Group I, II, III, IV, V or VI inventions are found in more than one of the inventions, unity of invention is lacking.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: JOSEPH BACH
NIXON PEABODY LLP
P.O. BOX 60610
PALO ALTO, CA 94306

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	17 DEC 2014
Applicant's or agent's file reference 067055-002101	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/034333	16 April 2014	04 August 2013

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G06F 17/00 (2014.01)
USPC - G06F 17/00

Applicant EYESMATCH LTD

1. This opinion contains indications relating to the following items:

- [x] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [x] Box No. IV Lack of unity of invention
- [x] Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	08 December 2014	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/034333

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

   ☐ on paper

   ☐ in electronic form

   b. (time)

   ☐ in the international application as filed

   ☐ together with the international application in electronic form

   ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Samsung/Google, EX1002, p. 367

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/034333

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the appicable time limit:
   - ☐ paid additional fees
   - ☐ paid additional fees under protest and, where applicable, the protest fee
   - ☐ paid additional fees under protest but the applicable protest fee was not paid
   - ☐ not paid additional fees
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
   - ☐ complied with
   - ☒ not complied with for the following reasons:

See Supplemental Box

4. Consequently, this opinion has been established in respect of the following parts of the international application:
   - ☐ all parts
   - ☒ the parts relating to claims Nos. 1-20

Form PCT/ISA/237 (Box No. IV) (July 2011)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

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Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-20	YES
	Claims	None	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-20	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	None	NO

2. Citations and explanations:

Claim 1 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton et al., hereinafter referred to as Colton.

Regarding claim 1, Vilcovsky discloses a computer implemented method for operating a system having a monitor, a camera, and a processor, so as to display a user's image on the monitor (a device, a method, a system for capturing and displaying appearances, abstract, title; fig.1 shows an interactive system 100 which comprises of an imaging device 130 which is a camera, a mirror-display device 140, para 0027, 0034; the mirror display device 140 operates selectably as a mirror or a display and operates in a display mode wherein the device enables the user to view user appearances as captured by the imaging device of a previous trial, para 0025), comprising: on a device having the processor and a memory storing a program for execution by the processor (the controller 121 includes a central processing unit, a digital signal processor, a microprocessor, para 0044; the controller 121 generates a mirror-image corresponding to the appearance captured by imaging device 130, a storage 123 stores instructions that when executed by a controller using an algorithm, para 0048), the program including instructions for: operating the system in a mode (the mirror-display device 140 is a LCD embedded in a semi-reflective mirror, wherein in an inactive mode of operation, a mirror-display 140 reflects sufficient light incident to enable the user to view user-appearances, para 0031); switching the system to virtual mirror mode wherein the system performs the steps comprising (the user sets the operating mode of a mirror device to a mirror mode and poses in front of the mirror-display device and captures an image of the user appearance of the first trial, and the device 130 captures the user-appearance, para 0064-0066; the user switches between operating modes mirror-mode and display mode, para 0068; the mirror-display device 140 when switched to an active mode of operation, images displayed by the LCD device is viewed by user 11, para 0031): transforming the images captured by the camera to generate mirror images (an imaging device captures the user appearances and displays it on the mirror-display device to view a user-appearance of a current trial, para 0025; the mirror-display device 140 operates in the mirror-mode wherein the user can view a user-appearance, wherein the imaging device 130 captures an image of the user-appearance of the first trial of a consumer article [displaying images of the user on the device 140 via the camera 130 is interpreted as transforming images], para 0029); storing the mirror images (wherein the imaging device 130 captures an image of the user-appearance of the first trial of a consumer article, and stores the captured image in a storage device 123, para 0029); displaying the mirror images on the monitor (imaging device captures the user appearances and displays it on the mirror-display device to view a user-appearance of a current trial, para 0025), but lacks the teaching of operating the system in an idle mode wherein images captured by the camera are buffered for display on the monitor, but are not stored; when a presence of a user is detected in a field of view of the camera, switching the system to virtual mirror mode; and, determining whether the user has an existing account and, if so, opening the user account and displaying thumbnails corresponding to the user account on the monitor; if the user has no existing account, setting a temporary account and so long as the user is still in front of the monitor, enabling the user to control the temporary account; and, once the user exits the field of view, returning the system to idle mode.

(Cont. in Supplemental Box)

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Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
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Continuation Box No. IV:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-20, drawn to a computer implemented method for operating a system comprising determining whether the user has an existing account.
Group II, claims 21-31, drawn to a computer readable storage medium storing a program for separating an object in a digital image.
Group III, claims 32-47, drawn to a computer system for perform color change on an object within a digital image.
Group IV, claims 48-56, drawn to a method for operating a mirror-display system where the processor flips the captured images about a vertical axis.
Group V, claims 57-74, drawn to a method for displaying a mirror-mimicking image on the monitor comprising initiating a mirror-mimicking mode and authentication process.
Group VI, claims 75-94, drawn to a method for operating a mirror-display system comprising operating in a mirror tracking mode by operating the processor to apply adaptive transformation mapping to images.

The inventions listed as Groups I-VI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: determining whether the user has an existing account and, if so, opening the user account and displaying thumbnails corresponding to the user account on the monitor; if the user has no existing account, setting a temporary account and so long as the user is still in front of the monitor, enabling the user to control the temporary account as claimed therein is not present in the invention of Groups II-VI. The special technical feature of the Group II invention: instructions for separating an object in a digital image by performing the steps comprising: obtaining a digital image; receiving a selection of an object within the digital image as claimed therein is not present in the invention of Groups I, III-VI. The special technical feature of the Group III invention: perform color change on an object within a digital image, comprising receiving a selection of object in the digital image to be recolored; performing element selection to obtain collection of pixels that belong to the selected object as claimed therein is not present in the invention of Groups I, II, IV-VI. The special technical feature of the Group IV invention: the processor flips the captured images about a vertical axis so as to reverse right and left sides of the captured images and applies transformation mapping to the captured images to generate modified images that appear to mimic reflection of a mirror as claimed therein is not present in the invention of Groups I, II, III or V-VI. The special technical feature of the Group V invention: initiating a mirror-mimicking mode for displaying the mirror-mimicking image on the monitor; initiating an authentication process as claimed therein is not present in the invention of Groups I-IV, VI. The special technical feature of the Group VI invention: operating the mirror-display system in a mirror tracking mode by operating the processor to apply adaptive transformation mapping to images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view as claimed therein is not present in the invention of Groups I-V.

Groups I, II, III, IV, V and VI lack unity of invention because even though the inventions of these groups require the technical feature of a method for operating a mirror-display system having a monitor camera and processor, operating the system in idle mode until a user presence is sensed in front of camera, once user presence identified, switching operation of mirror display into a different mode, this technical feature is not a special technical feature as it does not make a contribution over the prior art. Specifically, US 2008/0151092 A1 (VILCOVSKY) 26 June 2008 (26.06.2008) teaches a method for operating a mirror-display system having a monitor camera and processor (method for enabling a system to carry out an appearance comparison, wherein the system comprises a mirror display device, an imaging device to capture one or more appearances from a field of view in front of the mirror-display device; and central processor, Paras. 6 and 44), operating the system in idle mode until a user presence is sensed in front of camera, once user presence identified, switching operation of mirror display into a different mode (controller 121 receives input from imaging device 130 related to capturing a first trial of the user-appearance in front of imaging device 130, Para. 61 and Fig. 3A; at this point, controller 121 may view the first trial and then change the operational mode of mirror-display device 140 to the display mode using signals 141, wherein controller 121 further facilitates switching the mirror-display device from inactive to active mode, Paras. 31 and 62 and Fig. 3B).

Since none of the special technical features of the Group I, II, III, IV, V or VI inventions are found in more than one of the inventions, unity of invention is lacking.

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In case **the space in any of the preceding boxes is not sufficient.**
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Regarding claim 1 (Cont.):

Rosenberg is in the field of a digital mirror system that emulates a traditional mirror by displaying real-time video imagery of a user (abstract) and teaches operating the system in an idle mode (when the sensors detect that person has moved away from the screen is enabled to switch into a low-power idle state so that the display 301 is not wasting power by continually displaying mirroring imagery, para 0069); when a presence of a user is detected in a field of view of the camera, switching the system to virtual mirror mode (fig.3 shows proximity and motion sensors 305 for detecting whether a person is located before and when the person moves away from the display screen, the auto-activation feature is enabled by the proximity and motion sensors to send data to a processor indicating that an object is within a defined region and causes the mirror display 301 to automatically turn on upon the detection and to enter it a mirroring mode from a power off mode, para 0069); once the user exits the field of view, returning the system to idle mode (the digital mirror functions in selectively switching between plurality of states in response to a person stepping before and stepping away from the display screen, further when the sensors detect that person has moved away from the screen is enabled to switch into a low-power idle state so that the display 301 is not wasting power by continually displaying mirroring imagery, para 0069, 0070). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Rosenberg to incorporate operating the system in an idle mode; when a presence of a user is detected in a field of view of the camera, switching the system to virtual mirror mode; once the user exits the field of view, returning the system to idle mode into the invention of Vilcovsky. The motivation would have been to conserve power when no one is utilizing the mirror (see Rosenberg para 0069).
Furthrmore, Rosenberg teaches, wherein images captured by the camera are buffered for display on the monitor, but are not stored (the mirror-image buffering feature is configured to continually store in a buffer memory 1000 frames captured and displayed to the user, and as new frames come in, old frames are over-written, the image frame buffer maintains in memory the last 10 seconds of live imagery captured, para 0044) and setting a displaying so long as the user is still in front of the monitor (the auto-shut-down feature provides mirroring display screen to be turned off when it is determined that a user has stepped away from the mirror for more than some threshold amount of time and wherein sufficient motion was not detected before the screen for a period of time [turning of the display when the user is not detected is interpreted as displaying so long as the user is still in front of the monitor], para 0070).Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Rosenberg to incorporate wherein images captured by the camera are buffered for display on the monitor, but are not stored and setting a displaying so long as the user is still in front of the monitor into the invention of Vilcovsky. The motivation would have been to conserve power when no one is utilizing the mirror (see Rosenberg para 0069).
Colton is the field of sharing content among a plurality of users and enables the transfer of electronic content items captured (abstract) and teaches determining whether the user has an existing account and, if so, accessing the user account (fig.3 shows step 368 wherein the server 22 checks to determine if the identified recipient already has an account with the system, at step 372 it is determined that an account does exist then a content transfer takes place, para 0107); if the user has no existing account, setting a temporary account and, enabling the user to control the temporary account (fig.9 shows if the server determines that the recipient is not an account holder, a temporary account for that recipient is created in step 380, and the temporary account is utilized as a placeholder for the message generated by the sending user, para 0110). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Colton to incorporate determining whether the user has an existing account and, if so, accessing the user account; if the user has no existing account, setting a temporary account and, enabling the user to control the temporary account into the invention of Vilcovsky. The motivation would have been to provide almost very little effort to download, install and use an appropriate software for sending and receiving content (see Colton para 0028).
Furthermore, Colton teaches open an account and displaying thumbnails corresponding to the user account on the monitor (fig.10 shows a GUI [monitor] that displays a message that a recipient has received, and the display area 454 include attachments associated with the message in area 454C [displaying thumbnails], para 0127, 0129, 0130; a content sharing application is an email application [email message is viewed interpreted as open an account], para 0133). Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Colton to incorporate teaches open an account and displaying thumbnails corresponding to the user account on the monitor into the invention of Vilcovsky. The motivation would have been to provide the users with ease of access to contents independent of registering for an account.

Claim 2 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view Gothda.

Regarding claim 2, Vilcovsky lacks the teaching of wherein when the presence of the user is detected, the system further performs the step comprising calculating the height of the user.
Rosenberg is in the field of a digital mirror system that emulates a traditional mirror by displaying real-time video imagery of a user (abstract) and teaches wherein when the presence of the user is detected (when the sensors detect that person has moved away from the screen is enabled to switch into a low-power idle state so that the display 301 is not wasting power by continually displaying mirroring imagery, para 0069). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Rosenberg to incorporate wherein when the presence of the user is detected into the invention of Vilcovsky. The motivation would have been to conserve power when no one is utilizing the mirror (see Rosenberg para 0069).
Gotohda is in the field of capturing an image to provide a desirable composition to the user (abstract) and teaches the system further performs the step comprising calculating the height of the user (the facial position of the user is calculated in the captured image, the facial storage section stores the calculated facial position, and determines the user's height based on a user's facial position calculated, para 0085). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Gotohda to incorporate the system further performs the step comprising calculating the height of the user into the invention of Vilcovsky. The motivation would have been to provide an optimized and speedy process of determining a person's facial image (see Gotohda para 0085).

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In case **the space in any of the preceding boxes is not sufficient.**
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Claim 3 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view Gothda and further in view of Ryan.

Regarding claim 3, Vilcovsky lacks the teaching of wherein calculating the height comprises: identifying user's eyes in a frame of the images captured by the camera to identify the user's head; registering an oval around the user's head; matching at least one pixel at top section of the oval to a height calibration, to thereby deduce the user's height.
Gotohda is in the field of capturing an image to provide a desirable composition to the user (abstract) and teaches registering a location around the user's head (the facial position of the user is calculated in the captured image, the facial storage section stores the calculated facial position, and determines the user's height based on a user's facial position calculated, para 0085); matching at least one pixel at top section of the location to a height calibration, to thereby deduce the user's height (the facial position of the user is calculated in the captured image, the facial storage section stores the calculated facial position, and determines the user's height based on a user's facial position calculated, para 0085). Furthermore, to define the shape of the position located was a well-known practice in the art and the specifics (an oval shape) would have been a matter of design choice. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Gotohda to incorporate registering an oval around the user's head; matching at least one pixel at top section of the oval to a height calibration, to thereby deduce the user's height into the invention of Vilcovsky. The motivation would have been to provide an optimized and speedy process of determining a person's facial image (see Gotohda para 0085).
Ryan is in the field of computer processing apparatus wherein frames of image data received from a camera are processed to track the eyes of a user (abstract) and teaches identifying user's eyes in a frame of the images captured by the camera to identify the user's head (eye position calculator identifies two minima's in each group that are associated with y-positions of the user's eyebrow and eye, para 0106; the head model processor 34 performs processing to determine a rotation of the 3D computer head model, the three dimensional coordinate system orientates the head so that the eyes project the same positions in the 2D image space as the calculated eye position, para 0139). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Ryan to incorporate identifying user's eyes in a frame of the images captured by the camera to identify the user's head into the invention of Vilcovsky. The motivation would have been to provide an accurate and reliable way of determining locations (see Ryan para 0034).

Claim 4 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view Bushman et al., hereinafter referred to as Bushman.

Regarding claim 4, Vilcovsky lacks the teaching of wherein when a presence of a user is detected, the method further proceed to execute a user authentication procedure.
Bushman is in the field of a communication system wherein a device optically receives an image and process it (abstract) and teaches proceed to execute a user authentication procedure (to process the access code to authenticate the user and indicate the authentication in the authorization request, claim 15, col.6, lines 16-43). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Bushman to incorporate proceed to execute a user authentication procedure into the invention of Vilcovsky. The motivation would have been to provide an optimized process of authentication.

Claim 5 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Bushman and further in view of Calman et al., hereinafter referred to as Calman.

Regarding claim 5, Vilcovsky lacks the teaching of wherein the user authentication procedure comprises the steps: displaying a frame in a background area of the monitor; continuously analyzing the images captured by camera for presence of a code within the frame; and, when a code is detected, analyzing the code to authenticate the user.
Calman is in the field of presenting investment related information on a mobile device by using object recognition techniques (abstract) and teaches displaying a frame in a background area of the monitor (the AR application continuously captures video and analyzes the objects within the video stream, and an object recognition application alerts the user that a particular object has been identified, para 0055; the apparatus 100 includes a business entity identification application that identifies business entities based on the images captured in the video stream, by using images of products manufactured by the business entity, wherein the tags displayed in the products include a readable code such as a QR code, wherein the application decodes the QR code to identify he business entity associated, para 0066); continuously analyzing the images captured by camera for presence of a code within the frame (the AR application continuously captures video and analyzes the objects within the video stream, and an object recognition application alerts the user that a particular object has been identified, para 0055; the apparatus 100 includes a business entity identification application that identifies business entities based on the images captured in the video stream, by using images of products manufactured by the business entity, wherein the tags displayed in the products include a readable code such as a QR code, wherein the application decodes the QR code to identify he business entity associated, para 0066); and, when a code is detected, analyzing the code (the AR application continuously captures video and analyzes the objects within the video stream, and an object recognition application alerts the user that a particular object has been identified, para 0055; the apparatus 100 includes a business entity identification application that identifies business entities based on the images captured in the video stream, by using images of products manufactured by the business entity, wherein the tags displayed in the products include a readable code such as a QR code, wherein the application decodes the QR code to identify he business entity associated, para 0066). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Calman to incorporate displaying a frame in a background area of the monitor; continuously analyzing the images captured by camera for presence of a code within the frame; and, when a code is detected, analyzing the code into the invention of Vilcovsky. The motivation would have been to provide an optimized process of identifying products.
Bushman is in the field of a communication system wherein a device optically receives an image and process it (abstract) and teaches analyzing the code to authenticate the user (to process the access code to authenticate the user and indicate the authentication in the authorization request, claim 15, col.6, lines 16-43). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Bushman to incorporate analyzing the code to authenticate the user into the invention of Vilcovsky. The motivation would have been to provide an optimized process of authentication.

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In case **the space in any of the preceding boxes is not sufficient.**
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Claims 6, 7, 12-14 lack an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Trajkovic et al., hereinafter referred to as Trajkovic.

Regarding claim 6, Vilcovsky lacks the teaching of further comprising: when a presence of a user is detected, analyzing clothing articles worn by the user to determine whether corresponding articles are stored in a database accessible by the processor and, if so, enabling the user to specify a selected article from the clothing articles worn by the user and displaying on the monitor colors available for the selected article.
Trajkovic is in the field of virtual clothes modeling includes a unit for obtaining a virtual image (abstract) and teaches analyzing clothing articles worn by the user to determine whether corresponding articles are stored in a database accessible by the processor (fig.2 shows a step 205 wherein an image is obtained of a shopper, at step 210 an identifying token is read from the image, and at step 215 an image information regarding the article is retrieved from a database, and the images are scanned and stored in a database, and categorized information of the article is retrieved, para 035-0040) and, if so, enabling the user to specify a selected article from the clothing articles worn by the user and displaying on the monitor colors available for the selected article (a virtual image is displayed which is a composite image of the person shopping and the image of the article of clothing which is a three dimensional image, further the display prompts the shopper with variations of the article of clothing and the user can browse through and see oneself wearing the different variations of a particular article, para 0040-0042; fig.3 shows a prompt for the user to select additional articles of clothing retrieved with the first article of clothing, when a retrieved article is a red dress the same dress in white or blue cab be retrieved, para 0043). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Trajkovic to incorporate analyzing clothing articles worn by the user to determine whether corresponding articles are stored in a database accessible by the processor and, if so, enabling the user to specify a selected article from the clothing articles worn by the user and displaying on the monitor colors available for the selected article into the invention of Vilcovsky. The motivation would have been to provide the users with an optimized shopping experience.

Regarding claim 7, Vilcovsky lacks the teaching of further comprising: when the user selects specified color of the colors available for the selected article, modifying the mirror image to render the selected article with the specified color.
Trajkovic is in the field of virtual clothes modeling includes a unit for obtaining a virtual image (abstract) and teaches when the user selects specified color of the colors available for the selected article, modifying the mirror image to render the selected article with the specified color (a virtual image is displayed which is a composite image of the person shopping and the image of the article of clothing which is a three dimensional image, further the display prompts the shopper with variations of the article of clothing and the user can browse through and see oneself wearing the different variations of a particular article, para 0040-0042; when the shopper selects a different article, the retrieval means create a new combined image of the shopper with a second subsequently selected article of clothing, para 0032, 0034; fig.3 shows a prompt for the user to select additional articles of clothing retrieved with the first article of clothing, when a retrieved article is a red dress the same dress in white or blue cab be retrieved, para 0043). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Trajkovic to incorporate when the user selects specified color of the colors available for the selected article, modifying the mirror image to render the selected article with the specified color into the invention of Vilcovsky. The motivation would have been to provide the users with an optimized shopping experience.

Regarding claim 12, Vilcovsky lacks the teaching of wherein specify a selected article comprises at least one from the group consisting of: the user manually touching the actual article on the user's body, the user selecting a name of the article from a menu, the user saying the name of the article and the system recognizing the user's saying with a voice recognition system, and a preselection and automatic identification system configured to apply rules to the mirror image to select a predefined element matching the article within the mirror image.
Trajkovic is in the field of virtual clothes modeling includes a unit for obtaining a virtual image (abstract) and teaches the user selecting an article from a menu, (fig.3 shows providing a prompt on the display for a shopper to view a second article of clothing 230 and select additional articles of clothing, further fig.4 shows wherein the prompt has a browsing option for complimentary items 235, para 0042-0044). Furthermore, to establish a type of metadata associated with the displayed article was a well-known practice in the art and the specifics (a name) would have been a matter of design choice. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Trajkovic to incorporate the user selecting a name of the article from a menu into the invention of Vilcovsky. The motivation would have been to provide

Regarding claim 13, Vilcovsky lacks the teaching of wherein modifying the mirror image further comprises applying a mask to the mirror image to emulate a fabric, a texture, a reflection, an absorption, brightness, or tone over the selected article.
Trajkovic is in the field of virtual clothes modeling includes a unit for obtaining a virtual image (abstract) and teaches wherein modifying the mirror image further comprises applying a mask to the mirror image to emulate a fabric (when the shopper selects a different article, the retrieval means create a new combined image of the shopper with a second or subsequently selected article of clothing, wherein the composite image shows the shopper with a selected pants and different shirts, shoes, and the shopper views themselves with variations of the complimentary item, para 0032, 0034; a virtual masking of the image of the person with the article of clothing to produce a virtual image, para 0040). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Trajkovic to incorporate wherein modifying the mirror image further comprises applying a mask to the mirror image to emulate a fabric into the invention of Vilcovsky. The motivation would have been to provide the users with an optimized shopping experience.

Regarding claim 14, Vilcovsky lacks the teaching of wherein modifying the mirror image further comprises applying at least one mask selected from a macro texture mask 48 introducing shading into the mirror image and micro texture mask introducing fabric texture into the mirror image.
Trajkovic is in the field of virtual clothes modeling includes a unit for obtaining a virtual image (abstract) and teaches a micro texture mask introducing fabric texture into the mirror image (when the shopper selects a different article, the retrieval means create a new combined image of the shopper with a second or subsequently selected article of clothing, wherein the composite image shows the shopper with a selected pants and different shirts, shoes, and the shopper views themselves with variations of the complimentary item, para 0032, 0034; a virtual masking of the image of the person with the article of clothing to produce a virtual image, para 0040). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Trajkovic to incorporate micro texture mask introducing fabric texture into the mirror image into the invention of Vilcovsky. The motivation would have been to provide the users with an optimized shopping experience.

Samsung/Google, EX1002, p. 373

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Claims 8, 9, lack an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Trajkovic and further in view of Reddy and further in view of Acharya and further in view of Lindbloom.

Regarding claim 8, Vilcovsky lacks the teaching of wherein modifying the mirror image comprises: identifying estimated geometry of the article; selecting a plurality of representative pixels within the estimated geometry; analyzing the representative pixels to obtain representative color; using the representative color to find all pixels belonging to the article; and, applying the specified color to each pixel belonging to the article.
Reddy is in the field of a digitized document formatted as an image file and representing a scanned original page (abstract) and teaches identifying estimated geometry of the article (a digitized document is received, the digitized document is formatted as an image file and represents a scanned original page with a page boundary, the image files includes a vector data (geometric data) displayed as pixels, para 0014); selecting a plurality of representative pixels within the estimated geometry (the height and width are extracted from the digitized document by counting the pixels, vertically and horizontally to determine the height and width of the digitized document, the lookup file 310 provides information 312 that the digitized document is in JPEG format and measures 3336×5010 pixels in size and identifies that image border 306 has a height 316 of 5010 pixels and a width 318 of 3366 pixels, para 0020, 0021). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Reddy to incorporate identifying estimated geometry of the article; selecting a plurality of representative pixels within the estimated geometry into the invention of Vilcovsky. The motivation would have been to reproduce an accurate replica of an original scanned page (see Reddy para 0010).
Acharya is in the field of an integrated color interpolation and color space conversion technique (abstract) and teaches analyzing the representative pixels to obtain representative color (when the RGB values are converted to a full resolution XYZ space, again the needed storage size would be M*N*24 bits (each pixel having 8-bit X, Y and Z values, to derive a technique to convert directly a 8-bit pixel to a full resolution XYZ color space, col.4, lines 61-67, col.5, lines 1-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Acharya to incorporate analyzing the representative pixels to obtain representative color into the invention of Vilcovsky. The motivation would have been to provide conversion in an integrated manner to reduce overall computational complexity and time (see col.1, lines 30-36).
Lindbloom is in the field of a computer program product for color selection in a color image (abstract) and teaches using the representative color to find all pixels belonging to the article (the peaks of a 3D image are identified and separated one from another to segregate and group the pixels belonging to a particular color, the extent of each shape is automatically determined by segmentation process, thereby eliminating any tolerance, para 0029); and, applying the specified color to each pixel belonging to the article (the peaks of a 3D image are identified and separated one from another to segregate and group the pixels belonging to a particular color, the extent of each shape is automatically determined by segmentation process, thereby eliminating any tolerance, the user clicks on an object, the color of the object selects its segment, para 0029). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Lindbloom to incorporate using the representative color to find all pixels belonging to the article; and, applying the specified color to each pixel belonging to the article into the invention of Vilcovsky. The motivation would have been to provide an optimized process of editing for more seamless integration (see Lindbloom para 0019).

Regarding claim 9, Vilcovsky lacks the teaching of wherein analyzing the representative pixels comprises transforming RGB values of each representative pixel to an XYZ color field.
Acharya is in the field of an integrated color interpolation and color space conversion technique (abstract) and teaches wherein analyzing the representative pixels comprises transforming RGB values of each representative pixel to an XYZ color field (when the RGB values are converted to a full resolution XYZ space, again the needed storage size would be M*N*24 bits (each pixel having 8-bit X, Y and Z values, to derive a technique to convert directly a 8-bit pixel to a full resolution XYZ color space, col.4, lines 61-67, col.5, lines 1-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Acharya to incorporate wherein analyzing the representative pixels comprises transforming RGB values of each representative pixel to an XYZ color field into the invention of Vilcovsky. The motivation would have been to provide conversion in an integrated manner to reduce overall computational complexity and time (see col.1, lines 30-36).

Claim 10 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Trajkovic and further in view of Reddy and further in view of Acharya and further in view of Lindbloom and further in view of Kamgar-Parsi.

Regarding claim 10, Vilcovsky lacks the teaching of further comprising determining a distance of each representative pixel from an average color and, if the distance exceeds a threshold, excluding that pixel from determination of the representative color.
Lindbloom is in the field of a computer program product for color selection in a color image (abstract) and teaches using the representative color to find all pixels belonging to the article (the peaks of a 3D image are identified and separated one from another to segregate and group the pixels belonging to a particular color, the extent of each shape is automatically determined by segmentation process, thereby eliminating any tolerance, para 0029). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Lindbloom to incorporate using the representative color to find all pixels belonging to the article into the invention of Vilcovsky. The motivation would have been to provide an optimized process of editing for more seamless integration (see Lindbloom para 0019).
Kamgar-Parsi is in the field of extracting an object from an image which locates a pixel within the image (abstract) and teaches determining a distance of each representative pixel from a color and, if the distance exceeds a threshold, excluding that pixel (to performing a culling the distance of each bright pixel to the other one is calculated, and any such pixel distant from a selected number of bright pixels than a preset distance is excluded from the set of bright pixels, col.3, lines 55-65). Furthermore, to define an average color was a well-known practice in the art and the specifics would have been a matter of design choice. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Kamgar-Parsi to incorporate determining a distance of each representative pixel from an average color and, if the distance exceeds a threshold, excluding that pixel into the invention of Vilcovsky. The motivation would have been to provide an optimized process of pixel representation.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/034333

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Claim 11 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Trajkovic and further in view of Reddy and further in view of Acharya and further in view of Lindbloom and further in view of Asimopoulos et al., hereinafter referred to as Asimopoulos and further in view of Grossman.

Regarding claim 11, Vilcovsky lacks the teaching of further comprising: generating grey scale image of the mirror image; applying the grey scale image while applying the specified color to each pixel belonging to the article to thereby generate texture in the modified image.
Asimopoulos is in the field of generating grey scale image (equations for transforming color images into grayscale images, each pixel in a color image has intensities and an equivalent grayscale image is generated by applying transformation, col.4, lines 10-20); applying the grey scale image (equations for transforming color images into grayscale images, each pixel in a color image has intensities and an equivalent grayscale image is generated by applying transformation, the transformed grayscale image is applied with process 10 to sharpen the image, col.4, lines 10-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Asimopoulos to incorporate generating grey scale image of the mirror image; applying the grey scale image into the invention of Vilcovsky. The motivation would have been to provide an efficient process of image processing.
US 5230039 A
Grossman is in the field of a graphical display system and process for specifying and controlling a display range for texture mapping (abstract) and teaches while applying the specified color to each pixel belonging to the article to thereby generate texture in the modified image (texture mapping operates by applying color of a texture map to corresponding point elements (pixels) of an object on a display screen, col.1, lines 31-41; also see col.4, lines 53-59). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Grossman to incorporate while applying the specified color to each pixel belonging to the article to thereby generate texture in the modified image into the invention of Vilcovsky. The motivation would have been to provide an enhanced texture mapped image.

Claim 15 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Trajkovic and further in view of Hernandez and further in view of Esetban.

Regarding claim 15, Vilcovsky lacks the teaching of wherein applying at least one mask comprises generating a vector from all pixels of a mirror image frame and applying the mask to the vector.
Hernandez Esteban is in the field of rendering an image related to a target area (abstract) and teaches generating a vector from all pixels of a mirror image frame and applying the mask to the vector (a vector image data of the target area is received in block S302 and includes geometrically associated points and lines, para 0028; a mask for the vector image data is created and the mask is applied to the vector image data causes selections of the vector image data, para 0031). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Hernandez Esteban to incorporate generating a vector from all pixels of a mirror image frame and applying the mask to the vector into the invention of Vilcovsky. The motivation would have been to provide an improved process of image masking.

Claim 16 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Mooradian et al., hereinafter referred to as Mooradian.

Regarding claim 16, Vilcovsky further teaches wherein transforming the images comprises: for each frame: flipping the image about a vertical axis so as to reverse right and left sides of the image (the imaging device 130 captures the user-appearance and stores the data and generates an image data representing reversed mirrored image of the image captured, and displays the reversed image, para 0048); applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror (the imaging device 130 captures the user-appearance and stores the data and generates an image data representing reversed mirrored image of the image captured, and displays the reversed image, para 0048), but lacks the teaching of resizing the image to reduce variations caused by changes in the user's distance to the camera.
Mooradian is in the field of detecting a camera wherein a camera takes multiple pictures and based on algorithm process it (abstract) and teaches resizing the image to reduce variations caused by changes in the user's distance to the camera (the images are resized when taken at a distance which is less than the minimum optical zoom distance, resizing is based on the distance ratio equal to the actual distance divided by the minimum optical zoom distance, and resizing serves to normalize features in the images for all distances, para 0090). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Mooradian to incorporate resizing the image to reduce variations caused by changes in the user's distance to the camera into the invention of Vilcovsky. The motivation would have been to provide an optimized process of identifying a pirate camera (see Mooradian para 0027).

Claim 17 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Ryan.

Regarding claim 17, Vilcovsky lacks the teaching of further comprising analyzing each frame of the images from the camera to detect a symmetrical frame wherein the user's face appear symmetrical along a vertical line passing midway between the user's eyes.
Ryan is in the field of computer processing apparatus wherein frames of image data received from a camera are processed to track the eyes of a user (abstract) and teaches comprising analyzing each frame of the images from the camera to detect a symmetrical frame wherein the user's face appear symmetrical along a vertical line passing midway between the user's eyes (fig.1 shows images of user 2 are recorded by a camera 4 as he user changes their positions of their heads, the image data is recorded and processed to track the eyes of the user 2, by tracking the eyes of the user 2 through each frame of image data received from the camera 4, and generates a 3D head model to cover the eyes, para 0030, 0031, 0034; fig.5 shows a head symmetry line shown aby the y-axis, wherein on either side of the y-axis comprises a left group 60 of search bands 80 and a right group 70 of search bands 80 arranged , para 0062). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Ryan to incorporate comprising analyzing each frame of the images from the camera to detect a symmetrical frame wherein the user's face appear symmetrical along a vertical line passing midway between the user's eyes into the invention of Vilcovsky. The motivation would have been to provide an accurate and reliable way of determining locations (see Ryan para 0034).

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/034333

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Claim 18 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Ryan and further in view of Hong et al., hereinafter referred to as Hong.

Regarding claim 18, Vilcovsky lacks the teaching of further comprising removing the user's arms and hands from the image of the symmetrical frame to obtain a body-only image of the user.
Hong is in the field of a communication terminal that provides a silhouette function on a video screen (abstract) and teaches removing the user's eyes and nose from the image of the symmetrical frame to obtain a body-only image of the user (fig.3 shows silhouette processing a body image of a user in an input video source, wherein the processing unit 10 silhouette a body image 311 detected in an original video 310 by changing the clor within the body image 311 to a single color, and uses a silhouetted body image 321 as a final video to be transmitted, para 0035, 0036). Furthermore, to establish a particular body part to be removed was a well-known practice in the art and the specifics (user's arms and hands) would have been a matter of design choice. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Hong to incorporate removing the user's arms and hands from the image of the symmetrical frame to obtain a body-only image of the user into the invention of Vilcovsky. The motivation would have been to provide an image that can be used by third pay sources for various applications.

Claim 19 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Ryan and further in view of Hong and further in view of O'Brill et al., hereinafter referred to as O'Brill.

Regarding claim 19, Vilcovsky lacks the teaching of further comprising correlating the body-only image to body types stored in a database to thereby estimate measurements of the user's body.
O'Brill is in the field of image composition system includes a device coupled to a central processing device (abstract) and teaches correlating the image to body types stored in a database to thereby estimate measurements of the user's body (the system facilitates the selection of pants image 210 and shirt image 310 corresponding to the body type of the person 12, wherein the appropriately sized images are selected corresponding to the body type, col.4, lines 55-64; a customer's body type is determined at box 616 to enable appropriate size of item images to be matched,col.5, lines 49-57). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of O'Brill to incorporate correlating the image to body types stored in a database to thereby estimate measurements of the user's body into the invention of Vilcovsky. The motivation would have been to provide a fast and optimized shopping experience for the users.

Claim 20 lacks an inventive step under PCT Article 33(3) as being obvious over Vilcovsky in view of Rosenberg and further in view of Colton and further in view of Ryan and further in view of Hong and further in view of Shimomura.

Regarding claim 20, Vilcovsky lacks the teaching of wherein the estimate measurements comprise body mass estimation.
Shimomura is in the field of providing an easy process of body type determination (abstract) and teaches wherein the estimate measurements comprise body mass estimation (a body type determination is used to calculate an index of lean mass and body mass index, para 0036, 0039, 0042). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Shimomura to incorporate of wherein the estimate measurements comprise body mass estimation into the invention of Vilcovsky. The motivation would have been to provide an optimized process of calculating body mass.

Claims 1-20 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Electronic Patent Application Fee Transmittal

Application Number:	14253831
Filing Date:	15-Apr-2014
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Filer:	Joseph Bach/Monica Moreno
Attorney Docket Number:	067055-002400

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	2806	1	90	90
		Total in USD ($)		**90**

Electronic Acknowledgement Receipt	
EFS ID:	21137891
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Monica Moreno
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	07-JAN-2015
Filing Date:	15-APR-2014
Time Stamp:	02:17:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	067055_002400_IDS.pdf	613227 0d87811a4614c04cdcbbb0b026e1b96ce44cb4b2	no	6
Warnings:					
Information:					
2	Non Patent Literature	NOA_13843001_dated_DEC_5_2014.pdf	485455 38b47d13a1767b1a12da65cabf6f4878a3f9ce7e	no	10
Warnings:					
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3	Non Patent Literature	ISR_PCTUS2014034333_dated_DEC_17_2014.pdf	1210247 32ab29b1ac9194e93807aae29a2a105f9d8f6027	no	17
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4	Non Patent Literature	NOA_14253827_dated_DEC_15_2014.pdf	578878 d68c98153276d3a1e86ae33a379c1889c5d4412a	no	13
Warnings:					
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5	Fee Worksheet (SB06)	fee-info.pdf	30714 32abb54bf0cc447033736ad8e6659bc9ee733537	no	2
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

46188 7590 12/03/2014
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/253,831	04/15/2014	Ofer Saban	067055-002400	3426

TITLE OF INVENTION: METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/03/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
SHANKAR, VIJAY	2697	345-204000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 NIXON PEABODY LLP
2 Joseph Bach, Esq.
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: EYESMATCH LTD

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Road Town, Tortola, BRITISH VIRGIN ISLANDS

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ☒ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
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- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status.
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NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Joseph Bach/ Date January 30, 2015

Typed or printed name Joseph Bach Registration No. 37,771

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Samsung/Google, EX1002, p. 382

Electronic Patent Application Fee Transmittal

Application Number:	14253831
Filing Date:	15-Apr-2014
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Filer:	Joseph Bach/Monica Moreno
Attorney Docket Number:	067055-002400

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**480**

Electronic Acknowledgement Receipt	
EFS ID:	21365261
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Monica Moreno
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	30-JAN-2015
Filing Date:	15-APR-2014
Time Stamp:	20:35:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

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1	Issue Fee Payment (PTO-85B)	067055-002400_Fees_Transmittal.pdf	97708 eb1869a560db0d5c8ad4f6b3f134c1077e163e43	no	1
Warnings:					
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2	Fee Worksheet (SB06)	fee-info.pdf	30674 c50cebe7db89392f8735a4f47c78f3dff5b1115f	no	2
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/253,831	04/15/2014	Ofer Saban	067055-002400	3426

46188 7590 02/12/2015

Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

EXAMINER	
SHANKAR, VIJAY	

ART UNIT	PAPER NUMBER
2697	

NOTIFICATION DATE	DELIVERY MODE
02/12/2015	ELECTRONIC

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The time period for reply, if any, is set in the attached communication.

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U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
14/253,831	15 April, 2014	SABAN ET AL.	067055-002400

Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

EXAMINER	
VIJAY SHANKAR	
ART UNIT	PAPER
2697	20150205

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

The IDS filed on 1/7/15 is considered by the Examiner.

/VIJAY SHANKAR/
Primary Examiner, Art Unit 2697

PTO-90C (Rev.04-03)

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	14253831
Filing Date	2014-04-15
First Named Inventor	Ofer Saban
Art Unit	2697
Examiner Name	SHANKAR, VIJAY
Attorney Docket Number	067055-002400

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5230039	A	1993-07-20	Grossman et al.	
	2	5923776	A	1999-07-13	Kamgar-Parsi	
	3	5937081	A	1999-08-10	O'Brill et al.	
	4	6195467	B1	2001-02-27	Asimopoulos et al.	
	5	6366694	B1	2002-04-02	Acharya	
	6	7874681	B2	2011-01-25	Huebner	
	7	8000727	B1	2011-08-16	Bushman et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.S./

Receipt date: 01/07/2015	Application Number	14253831 14253831 - GAU: 2697
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Filing Date	2014-04-15
	First Named Inventor	Ofer Saban
	Art Unit	2697
(Not for submission under 37 CFR 1.99)	Examiner Name	SHANKAR, VIJAY
	Attorney Docket Number	067055-002400

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020049546	A1	2002-04-25	Shimomura	
	2	20030110099	A1	2003-06-12	Trajkovic et al.	
	3	20030146901	A1	2003-08-07	Ryan	
	4	20060158534	A1	2006-07-20	Gotohda	
	5	20070040033	A1	2007-02-22	Rosenberg	
	6	20080056564	A1	2008-03-06	Lindbloom	
	7	20100169411	A1	2010-07-01	Colton et al.	
	8	20120120184	A1	2012-05-17	Fornell et al.	
	9	20120154872	A1	2012-06-21	Reddy	
	10	20120229637	A1	2012-09-13	Mooradian et al.	

EFS Web 2.1.17 ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.S./

Receipt date: 01/07/2015	Application Number	14253831	14253831 - GAU: 2697
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Filing Date	2014-04-15	
(Not for submission under 37 CFR 1.99)	First Named Inventor	Ofer Saban	
	Art Unit	2697	
	Examiner Name	SHANKAR, VIJAY	
	Attorney Docket Number	067055-002400	

	11	20120233089	A1	2012-09-13	Calman et al.	
	12	20130083015	A1	2013-04-04	Hernandez Esteban	
	13	20130088562	A1	2013-04-11	Hong et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Notice of Allowance for U.S. Patent Application No. 13/843,001 mailed on December 5, 2014.	☐
	2	International Search Report and Written Opinion for PCT/US2014/034333 dated December 17, 2014.	☐
	3	Notice of Allowance for U.S. Patent Application No. 14/253,827 dated December 15, 2014.	☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.S./

Receipt date: 01/07/2015	Application Number	14253831	14253831 - GAU: 2697
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2014-04-15	
	First Named Inventor	Ofer Saban	
	Art Unit	2697	
	Examiner Name	SHANKAR, VIJAY	
	Attorney Docket Number	067055-002400	

EXAMINER SIGNATURE			
Examiner Signature	/Vijay Shankar/	Date Considered	02/05/2015

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.S./

Receipt date: 01/07/2015	Application Number	14253831	14253831 - GAU: 2697
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2014-04-15	
	First Named Inventor	Ofer Saban	
	Art Unit	2697	
	Examiner Name	SHANKAR, VIJAY	
	Attorney Docket Number	067055-002400	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Joseph Bach/	Date (YYYY-MM-DD)	2015-01-06
Name/Print	Joseph Bach	Registration Number	37,771

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.S./

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/253,831	03/17/2015	8982110	067055-002400	3426

46188 7590 02/25/2015

Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Ofer Saban, Vienna, VA;
EyesMatch Ltd., Road Town, VIRGIN ISLANDS, BRITISH, Assignee (with 37 CFR 1.172 Interest);
Nissi Vilcovsky, Tokyo, JAPAN;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
14/253,831	April 15 2014

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 146807

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

EYESMATCH LTD

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	
Name	SALVADOR NIETO VELOSO		
Title	CEO		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	28826524
Application Number:	14253831
International Application Number:	
Confirmation Number:	3426
Title of Invention:	METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPERENCE
First Named Inventor/Applicant Name:	Ofer Saban
Customer Number:	46188
Filer:	Joseph Bach/Devon Pack
Filer Authorized By:	Joseph Bach
Attorney Docket Number:	067055-002400
Receipt Date:	04-APR-2017
Filing Date:	15-APR-2014
Time Stamp:	13:33:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	14253831EyesMatch_POA.pdf	981459 6a4ebe7ba7935317d18ca8ed4c170abc73f6f449	no	1

Warnings:

Information:	
Total Files Size (in bytes):	981459

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/253,831	04/15/2014	Ofer Saban	067055-002400

CONFIRMATION NO. 3426

46188
Nixon Peabody LLP
P.O. Box 26769
San Francisco, CA 94126

POWER OF ATTORNEY NOTICE

OC000000090541847

Date Mailed: 04/12/2017

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/04/2017.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/mteklemichael/

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United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/253,831	04/15/2014	Ofer Saban	067055-002400

CONFIRMATION NO. 3426

146807
Womble Carlyle Sandridge & Rice, LLP
Attn: IP Docketing
P.O. Box 7037
Atlanta, GA 30537-7037

POA ACCEPTANCE LETTER

OC000000090541946

Date Mailed: 04/12/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/04/2017.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/mteklemichael/

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court For The District of Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	1/28/2021	For The District of Delaware

PLAINTIFF	DEFENDANT
EyesMatch Ltd. and Memomi Labs Inc.	Facebook, Inc., Instagram, LLC, and WhatsApp Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US 8,624,883 B2	1/7/2014	EyesMatch Ltd.
2	US 7,948,481 B2	5/24/2011	EyesMatch Ltd.
3	US 8,982,109 B2	3/17/2015	EyesMatch Ltd.
4	US 8,982,110 B2	3/17/2015	EyesMatch Ltd.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
14/253,831	8982110	2697	145603

PAIR Correspondence Address/Fee Address Change

The following fields have been changed to Customer Number 26158 on 08/16/2021 via Private PAIR in view of the certification copied below that authorized the change.

- Correspondence Address

The address for Customer Number 26158 is:
26158
WOMBLE BOND DICKINSON (US) LLP
ATTN: IP DOCKETING
P.O. BOX 7037
ATLANTA, GA 30357-0037

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature:	/CHRIS HUMPHREY/
Name:	Chris Humphrey
Registration Number:	43683

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
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- Maintenance Fee Address

The address for Customer Number 26158 is:
26158
WOMBLE BOND DICKINSON (US) LLP
ATTN: IP DOCKETING
P.O. BOX 7037
ATLANTA, GA 30357-0037

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature:	/CHRIS HUMPHREY/
Name:	Chris Humphrey
Registration Number:	43683

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
21-111-RGA-JLH	1/28/2021	For The District of Delaware

PLAINTIFF	DEFENDANT
EyesMatch Ltd. and Memomi Labs Inc.	Facebook, Inc., Instagram, LLC, and WhatsApp Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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2	US 7,948,481 B2	5/24/2011	EyesMatch Ltd.
3	US 8,982,109 B2	3/17/2015	EyesMatch Ltd.
4	US 8,982,110 B2	3/17/2015	EyesMatch Ltd.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1			
2			
3			
4			
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
All attached Order

CLERK	(BY) DEPUTY CLERK	DATE
John A. Cerino	M. Selmyer	6/28/2022

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy