

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	043508-0439886
First Named Inventor	Allan VISITACION et al.
Title	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form**
(PTO/SB/17 or equivalent)
2. ☐ **Applicant asserts small entity status.**
See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29.
Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☒ **Specification** [Total Pages 45]
Both the claims and abstract must start on a new page.
(See MPEP § 608.01(a) for information on the preferred arrangement)
5. ☒ **Drawing(s)** (35 U.S.C. 113) [Total Sheets 6]
6. **Inventor's Oath or Declaration** [Total Pages 10]
(including substitute statements under 37 CFR 1.64 and assignments
serving as an oath or declaration under 37 CFR 1.63(e))
 - a. ☐ Newly executed (original or copy)
 - b. ☒ A copy from a prior application (37 CFR 1.63(d))
7. ☒ **Application Data Sheet** * See note below.
See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R**
in duplicate, large table, or Computer Program (Appendix)
 ☐ Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission**
(If applicable, Items a. – c. are required)
 - a. ☐ Computer Readable Form (CRF)
 - b. ☐ Specification Sequence Listing on:
 - i. ☐ CD-ROM or CD-R (2 copies); or
 - ii. ☐ Paper
 - c. ☐ Statements verifying identity of above copies

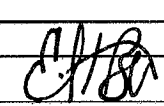
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ACCOMPANYING APPLICATION PAPERS

10. ☐ **Assignment Papers**
(cover sheet & document(s))
Name of Assignee _____
11. ☐ **37 CFR 3.73(c) Statement** ☐ **Power of Attorney**
(when there is an assignee)
12. ☐ **English Translation Document**
(if applicable)
13. ☒ **Information Disclosure Statement**
(PTO/SB/08 or PTO-1449)
☐ Copies of citations attached
14. ☐ **Preliminary Amendment**
15. ☐ **Return Receipt Postcard**
(MPEP § 503) (Should be specifically itemized)
16. ☐ **Certified Copy of Priority Document(s)**
(if foreign priority is claimed)
17. ☐ **Nonpublication Request**
Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35
or equivalent.
18. ☐ **Other:** _____

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS
☒ The address associated with Customer Number: 93383 OR ☐ Correspondence address below

Name				
Address				
City		State		Zip Code
Country		Telephone		Email
Signature				Date
Name (Print/Type)	Emily T. Bell			Registration No. (Attorney/Agent)
				47,418

This collection of information is required by 37 CFR 1.53(b). 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 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, 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.

Docket Number: 043508-0439886
Client Reference: IMM413C1

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Group Art Unit: Unassigned

Allan VISITACION et al.

Application No.: New

Examiner: Unassigned

Filed: July 24, 2015

Confirmation No.: Unassigned

For: SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Pursuant to 37 CFR 1.56, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO-1449. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom. Applicant respectfully requests the Examiner return an initialed copy of the enclosed Form PTO-1449 to Applicant with the next Office communication to indicate that the references have been considered, per MPEP § 609.

This Information Disclosure Statement is being filed (a) within three months of the U.S. filing date of this non-CPA application, OR (b) before the mailing date of the first Office Action on the merits in the present application. No certification or fee is required.

Respectfully Submitted,

PILLSBURY WINTHROP SHAW PITTMAN LLP



Emily T. Bell
Registration Number 47418
Customer Number: 93383

Date: July 24, 2015
Telephone: (703) 770-7900
Facsimile: (703) 770-7901
P.O. Box 10500
McLean, VA 22102

FORM PTO-1449 (modified)
To: U.S. Department of Commerce
(PW FORM PAT-1449)
Patent and Trademark Office

Atty.
Dkt. No.

M#

Client Ref.

043508

0439886

IMM413C1

**INFORMATION DISCLOSURE STATEMENT
BY APPLICANT**

Inventor(s): Allan VISITACION et al.

Appln. No.: New

Filing Date: July 24, 2015

Date: July 24, 2015

Page

1

of

1

Examiner: Unassigned

Group Art Unit: Unassigned

U.S. PATENT DOCUMENTS

Examiner's Initials*	Document Number	Date MM/YYYY	Name (Family Name of First Inventor)	Class	Sub Class	Filing Date (if appropriate)
	AR 2012/0242698	09/2012	HADDICK et al.			
	BR 2013/0314303	11/2013	OSTERHOUT et al.			
	CR 7,584,158	09/2009	IWAKI et al.			
	DR 2010/0007474	01/2010	BEHM et al.			
	ER 2013/0342570	12/2013	KINNEBREW et al.			
	FR 2010/0079356	04/2010	HOELLWARTH			
	GR					
	HR					
	IR					
	JR					
	KR					
	LR					
	MR					
	NR					
	OR					
	PR					

FOREIGN PATENT DOCUMENTS

	Document Number	Date MM/YYYY	Country	Inventor Name	English Abstract		Translation Readily Available	
					Enclosed	No	Enclose	No
	QR							
	RR							
	SR							
	TR							
	UR							

OTHER (Including in this order Author, Title, Periodical Name, Date, Pertinent Pages, etc.)

	VR							
	WR							
	XR							
	YR							

Examiner

Date Considered:

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

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

Title of Invention	WEARABLE HAPTIC DEVICE
-----------------------	------------------------

As the below named inventor, I hereby declare that:

This declaration ☐ The attached application, or
is directed to: ☒ United States application or PCT International application number 13/841,551
filed on March 15, 2013.

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:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

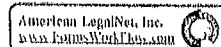
Inventor: Allan Viskacion Date (Optional): 5/18/13

Signature: [Signature]

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

This collection of information is required by 35 U.S.C. 116 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 1460, Alexandria, VA 22313-1460. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1460, Alexandria, VA 22313-1460.

If you need assistance in completing the form, call 1-800-PTO-0199 and select option 2.



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

Title of
Invention

WEARABLE HAPTIC DEVICE

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This declaration
is directed to:



The attached application, or



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LEGAL NAME OF INVENTOR

Inventor: Trevor Jones

Date (Optional): _____

Signature: *Trevor Jones*

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. 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:

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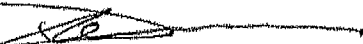
I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTORInventor: Daniel Gregory Parker

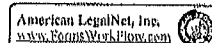
Date (Optional):

4/3/13Signature: 

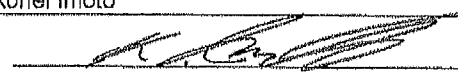
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form.
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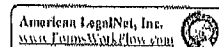


**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
 APPLICATION DATA SHEET (37 CFR 1.76)**

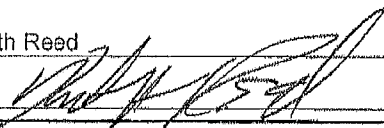
Title of Invention	WEARABLE HAPTIC DEVICE
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT International application number <u>13/841,551</u> filed on <u>March 15, 2013</u>. The above-identified application 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: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: Kohei Imoto	
Date (Optional): _____	
Signature: 	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.	

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If you need assistance in completing the form, call 1-800-PTO-0190 and select option 2.



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

Title of Invention	WEARABLE HAPTIC DEVICE
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 <u>13/841,551</u>	
filed on <u>March 15, 2013</u> .	
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: <u>Keith Reed</u> Date (Optional): _____	
Signature: 	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.	

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American LegalNet, Inc.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
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I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

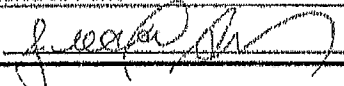
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LEGAL NAME OF INVENTOR

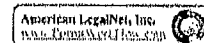
Inventor: Jessica E. Ferro Date (Optional): 3/20/13

Signature: 

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

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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
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WARNING:

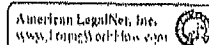
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LEGAL NAME OF INVENTORInventor: Aaron KapelusDate (Optional): April 10, 2013Signature: Aaron Kapelus

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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**

WEARABLE HAPTIC DEVICE

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 13/841,551filed on March 15, 2013.

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.

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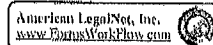
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LEGAL NAME OF INVENTORInventor: Nell OllenDate (Optional): 3/26/17Signature: Nell Ollen

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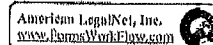
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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
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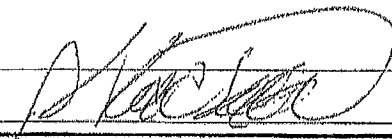
Title of Invention	WEARABLE HAPTIC DEVICE
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT International application number <u>13/841,551</u> filed on <u>March 15, 2013</u>. The above-identified application 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: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: <u>Danny A. Grant</u> Date (Optional): <u>April 2, 2013</u> Signature: <u>[Signature]</u> Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.	

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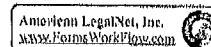


**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	WEARABLE HAPTIC DEVICE
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 <u>13/841,551</u> filed on <u>March 15, 2013</u>. 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: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: <u>Robert Lacroix</u> Date (Optional) : _____ Signature:  Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.	

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SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation application claiming the benefit of priority of United States Patent Application Serial No. 13/841,551, filed March 15, 2013, the entire content of which is incorporated herein by reference.

FIELD

[0002] The present invention relates to a system with a wearable device, a second device, and a haptic output device that is configured to generate feedback based on an event that occurs in an environment related to the wearable device and/or the second device.

BACKGROUND

[0003] Augmented reality devices provide an augmented reality environment in which physical objects in a physical space are concurrently displayed with virtual objects in a virtual space. Various augmented reality devices recognize specific codes (e.g., QR codes) disposed on physical objects and display one or more virtual objects in a view that includes the physical objects augmented with the virtual objects based on the specific codes. Other augmented reality devices can recognize specific, known physical objects using image recognition such as by transmitting images to a server that performs the image recognition.

[0004] Despite advances in augmented reality systems, the ability to interact with an augmented virtual environment is limited. Providing useful feedback to the user is also limited. In addition, recognizing objects in the virtual reality environment may be computationally intensive and reduce usability in many instances.

SUMMARY

[0005] The disclosure relates to a wearable device that is configured to generate feedback based on an event that occurs in an environment related to the wearable device. The wearable device may comprise, for example, a processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and at least a first haptic output device disposed at a first position at the wearable device, where the first

haptic output device may be configured to provide haptic feedback based on the generated control signal.

[0006] The wearable device may comprise, for example, a processor, an input component, a feedback component, a communication port, an imaging component, a storage, and/or other components. The input component may be configured to receive an input such as, for example, a button press, a gesture, voice command, and/or other input. The feedback component may be configured to provide feedback via the wearable device. The communication port may include an interface through which a communication channel may be maintained with, for example, a server, and/or other devices. The imaging component such as a camera may be configured to image the physical space related to the wearable device. In some implementations, the imaging component of the wearable device may comprise a camera, an infrared detector, and/or another image recording device. The storage of the wearable device may store data related to events

[0007] In some implementations, the processor of the wearable device may be configured to execute one or more modules, including, for example, an event handler module, a control signal generation module, a feedback control module, a communication module, an object recognition module, and/or other computer program modules. The event handler module may be configured to detect whether an event occurs in the environment related to the wearable device. The control signal generation module may be configured to receive information relating to an event and generate a control signal. The control signal may be representative of the event occurring in an environment related to the wearable device. The feedback control module may be configured to receive a control signal and cause the feedback component to provide feedback. The communication module may be configured to facilitate communication between the wearable device and another device. The object recognition module may be configured to recognize physical objects in the physical space related to the wearable device.

[0008] The event may include, for example, an indication of a physical object within a predetermined proximity of the wearable device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device, an interaction between the wearable device and an object in the environment, an indication that the wearable device recognizes an object in the environment, a

navigation event, and/or another event occurring in an environment related to the wearable device.

[0009] In some implementations, the feedback control module may be configured to provide the control signal to the feedback component. In some of these implementations, the control signal may be directly applied to the feedback component to cause the feedback. In some implementations, the feedback control module may be configured to determine a feedback signal based on the received control signal. In these implementations, the feedback control module may consult a lookup table to determine the feedback signal based on the received control signal.

[0010] The communication module may be configured to facilitate communication between the wearable device and another device such as, for example, a server, and/or other devices that may be in communication with the wearable device. The communication module may be configured to provide a wired or wireless communication channel for communication between the wearable device, the server, and/or another device. In some implementations, the processor may be configured to receive a signal representative of an event occurring at another computing device via a wireless or wired communication channel of the communication module.

[0011] In some implementations, the object recognition module may be configured to recognize objects in a physical space. The object recognition module may communicate with the imaging component and the storage of the wearable device to recognize an object in the physical space. For example, the object recognition module may receive visual data captured from the imaging component and may process the visual data to determine whether one or more objects exist in the captured visual data. The object recognition module may compare the captured objects that exist in the visual data with objects stored in the storage.

[0012] The input component may be configured to receive an input such as, for example, a button press, a gesture, voice command, and/or another type of communication. The input may be communicated, by the processor, to another device such as, for example, server and/or another device in communication with the wearable device, via the communication channel. For example, the input component may include a touch pad, a touch screen, a mechanical button, a switch, an audio receiver, such as a microphone, and/or another input component that can receive an input.

[0013] In some implementations, the feedback component may comprise one or more haptic output devices configured to provide haptic feedback, one or more visual devices configured to

provide a visual feedback, one or more audio devices configured to provide an audible feedback, and/or another device that produces feedback.

[0014] The haptic output device may include an actuator, for example, an electromagnetic actuator such as an Eccentric Rotating Mass (“ERM”) in which an eccentric mass is moved by a motor, a Linear Resonant Actuator (“LRA”) in which a mass attached to a spring is driven back and forth, or a “smart material” such as piezoelectric, electro-active polymers, or shape memory alloys, a macro-composite fiber actuator, an electro-static actuator, an electro-tactile actuator, and/or another type of actuator that provides a physical feedback such as a haptic (e.g., vibrotactile) feedback. The haptic output device may include non-mechanical or non-vibratory devices such as those that use electrostatic friction (ESF), ultrasonic surface friction (USF), or those that induce acoustic radiation pressure with an ultrasonic haptic transducer, or those that use a haptic substrate and a flexible or deformable surface, or those that provide projected haptic output such as a puff of air using an air jet, and so on.

[0015] The visual device may be configured to generate a visual feedback such as visible light at the wearable device. For example, the visual feedback may visually indicate the occurrence of an event in an environment related to the wearable device.

[0016] The audio device may be configured to generate audio feedback such as one or more sounds at the wearable device. For example, the audio feedback may audibly indicate the occurrence of an event in an environment related to the wearable device.

[0017] The feedback component may be configured to receive one or more signals (e.g., one or more control signals or one or more feedback signals) from the feedback control module. Based on the one or more signals, the one or more haptic output devices, one or more visual devices, one or more audio devices, and/or other feedback components may provide feedback via the wearable device.

[0018] The communication port may be configured to establish a communication channel with another device. The communication port may maintain an interface through which a communication channel may be maintained with another device such as, for example, a server, and/or other devices that may be in communication with the wearable device. In some implementations, a control signal may be received via the communication channel, which may include a wired or a wireless communication channel.

[0019] In some implementations, the wearable device may comprise a sensor. The sensor may be configured to sense one or more environmental conditions related to the wearable device.

[0020] In some implementations, the wearable device may be a wearable augmented reality (“AR”) device configured to generate an augmented reality (“AR”) environment comprising both an augmented reality space and a physical space. The wearable AR device may comprise, for example, an imaging device configured to image the physical space, one or more processors configured to generate the augmented reality space coincident with the physical space, recognize at least one physical object in the physical space and augment the physical object with one or more virtual objects in the AR space, determine an event associated with the AR environment, and generate a control signal based on the determined event, and at least a first haptic output device disposed at a first position at the wearable AR device, where the first haptic output device may be configured to provide haptic feedback based on the generated control signal.

[0021] In some implementations, the wearable AR device may comprise, for example, a processor, an input component, a feedback component, a communication port, an imaging component, a storage, and/or other components. The input component may be configured to receive an input such as, for example, a button press, a gesture, voice command, and/or other input. The feedback component may be configured to provide feedback via the wearable AR device. The communication port may comprise an interface through which a communication channel may be maintained with, for example, a server, and/or other devices. An imaging component such as a camera may be configured to image the physical space. In some implementations, the imaging component of the wearable AR device may comprise a camera, an infrared detector, and/or another image recording device. The processor may be configured to generate the augmented reality space coincident with the physical space. The processor may be configured to recognize at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the AR space. The processor may be configured to determine an event within the AR environment and generate a control signal representative of that event. The control signal may cause feedback to be generated at the wearable AR device.

[0022] In some implementations, the processor of the wearable AR device may be configured to execute one or more modules, including, for example, an event handler module, a control signal generation module, a feedback control module, a communication module, an

object recognition module, an object generation module, and/or other computer program modules. The event handler module may be configured to detect whether an event occurs in the augmented reality environment. The control signal generation module may be configured to receive information relating to an event and generate a control signal related to the event. The feedback control module may be configured to receive a control signal and cause the feedback component to provide the feedback. The communication module may be configured to facilitate communication between the augmented reality device and other devices such as a server. The object recognition module may be configured to recognize physical objects in the physical space. The object generation module may be configured to generate virtual objects to augment recognized physical objects.

[0023] In some implementations, an event determined by the processor of the wearable AR device may include an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, a confirmation that an object in the physical space has been augmented, an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the augmented reality device, and/or another occurrence in the augmented reality environment.

[0024] In some implementations, one or both of the wearable device and/or the wearable AR device may be configured as eyewear. For example, the eyewear may comprise one or more components, including, for example, a frame, a first lens connected to a first portion of the frame, a second lens connected to a second portion of the frame, a first nose pad connected to a first lens, a second nose pad connected to a second lens, and/or other components. The frame may comprise, for example, a first top portion of the frame at a first end of the frame, a second top portion of the frame at a second end opposite the first end of the frame, a first temple connected to the first top portion and extending in a direction perpendicular to the first top portion, a second temple connected to the second top portion and extending in a direction perpendicular to the second top portion and parallel to the first temple, and/or other components.

The first temple may comprise one or more portions including, for example, a first portion, a second portion and/or other portions. The second temple may comprise one or more portions including, for example, a first portion, a second portion, and/or other portions.

[0025] In some implementations, a first top portion of the frame may comprise one or more haptic output devices of the feedback component positioned at one or more respective positions of the frame. In some implementations, a second top portion of the frame may comprise one or more haptic output devices of the feedback component positioned at one or more respective positions of the frame. In some implementations, the first temple may comprise one or more haptic output devices positioned at one or more respective portions of the first temple. The second temple may comprise one or more haptic output devices positioned at one or more respective portions of the second temple.

[0026] In some implementations, the first temple may comprise a deformable material. In some of these implementations, the first temple may be configured to bend laterally inward. In some of these implementations, a first portion of the first temple may be configured to bend laterally inward and a second portion of the first temple adjacent the first portion may be configured to bend laterally inward or laterally outward. In some implementations, the second temple may comprise a deformable material. In some of these implementations, the second temple may be configured to bend laterally inward. In some of these implementations, a first portion of the second temple may be configured to bend laterally inward and a second portion of the second temple adjacent the first portion may be configured to bend laterally inward or laterally outward.

[0027] In some implementations, the first nose pad may comprise a deformable material. The first nose pad may be configured to bend laterally inward. In some implementations, the deformable material of the first temple, the second temple, the first nose pad, the second nose pad, and/or other components that comprise deformable material may provide feedback as one or more feedback components of the wearable device configured as eyewear.

[0028] In some implementations, the wearable AR device may be configured to display the AR environment via one or both lenses of the eyewear.

[0029] These and other objects, features, and characteristics of the system and/or method disclosed herein, as well as the methods of operation and functions of the related elements of structure and the combination of parts and economies of manufacture, will become more

apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention. As used in the specification and in the claims, the singular form of “a”, “an”, and “the” include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The components of the following figures are illustrated to emphasize the general principles of the present disclosure and are not necessarily drawn to scale. Reference characters designating corresponding components are repeated as necessary throughout the figures for the sake of consistency and clarity.

[0031] FIG. 1 illustrates a block diagram of an exemplary wearable device configured to provide feedback based on an event that occurs in an environment related to the wearable device, according to various implementations of the invention;

[0032] FIG. 2 illustrates a block diagram of an exemplary wearable augmented reality device configured to provide feedback based on an event that occurs in an environment related to the wearable augmented reality device, according to various implementations of the invention;

[0033] FIG. 3 illustrates a schematic view of an exemplary feedback component, according to various implementations of the invention;

[0034] FIG. 4 illustrates a depiction of an exemplary augmented reality environment, according to various implementations of the invention;

[0035] FIG. 5 illustrates a schematic view of an exemplary wearable augmented reality device configured as eyewear, according to various implementations of the invention; and

[0036] FIG. 6 illustrates a flowchart of an exemplary process of providing feedback based on an event that occurs in an environment related to the wearable device, according to various implementations of the invention.

DETAILED DESCRIPTION

[0037] FIG. 1 illustrates a block diagram of an exemplary system 10 of providing feedback based on an event that occurs in an environment related to a wearable device 100. The system 10 may comprise the wearable device 100, a server 400, a communication channel 300, and/or other devices that may be in communication with the wearable device 100.

[0038] The wearable device 100 may be configured to generate feedback based on an event that occurs in an environment related to the wearable device 100. An event may include, for example, an indication of a physical object within a predetermined proximity of the wearable device 100, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device 100, an interaction between the wearable device 100 and an object in the environment, an indication that the wearable device 100 recognizes an object in the environment, a navigation event, and/or another event occurring in an environment related to the wearable device 100.

[0039] The wearable device 100 may comprise, for example, a processor 110 configured to generate a control signal representative of an event occurring in an environment related to the wearable device 100 and at least a first haptic output device (e.g., feedback component 130) disposed at a first position at the wearable device 100, where the first haptic output device (e.g., feedback component 130) may be configured to provide haptic feedback based on the generated control signal.

[0040] The wearable device 100 may also comprise, for example, an input component 120, a feedback component 130 configured to provide feedback (e.g., haptic feedback, a haptic effect, etc.) based on the generated control signal, a communication port 140, an imaging component 150, a storage 170, and/or other components. The input component 120 may be configured to receive an input such as, for example, a button press, a gesture, voice command, and/or other input. The feedback component 130 may be configured to provide feedback via the wearable device 100. The communication port 140 may include an interface through which a communication channel may be maintained with, for example, a server, and/or other devices. The imaging component 150 may be configured to image the physical space related to the wearable device 100. In some implementations, the imaging component 150 of the wearable device 100 may comprise a camera, an infrared detector, and/or another image recording device.

The storage 170 of the wearable device 100 may store data related to one or more events which the wearable device 100 may recognize. For example, the storage 170 of the wearable device 100 may store data related to events including, for example, an indication of a physical object within a predetermined proximity of the wearable device 100, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device 100, an interaction between the wearable device 100 and an object in the environment, an indication that the wearable device 100 recognizes an object in the environment, a navigation event, and/or another event occurring in an environment related to the wearable device 100.

[0041] In some implementations, the wearable device 100 may comprise one or more sensors 160. The one or more sensors 160 may be configured to sense one or more environmental conditions in an environment related to the wearable device 100. For example, one or more sensors 160 may be configured to sense temperature, humidity, sound, light, magnetic fields, gravity, the presence of one or more chemicals, air quality, and/or other environmental conditions.

[0042] In some implementations, the processor 110 may be configured to execute one or more modules, including, for example, an event handler module 111, a control signal generation module 112, a feedback control module 113, a communication module 114, an object recognition module 115, and/or other computer program modules. The event handler module 111 may be configured to detect whether an event occurs in the environment related to the wearable device 100. The control signal generation module 112 may be configured to receive information relating to an event and generate a control signal. The control signal may be representative of an event occurring in an environment related to the wearable device 100. The feedback control module 111 may be configured to receive a control signal and cause the feedback component 130 to provide the feedback. The communication module 112 may be configured to facilitate communication between the wearable device 100 and another device.

[0043] In some implementations, the event handler module 111 may be configured to detect whether an event occurs in the AR environment. The event handler module 111 may receive data from the imaging component 150, the object recognition module 115, the input component

120, the communication port 140, the storage 170, and/or other modules or components of the wearable device 100.

[0044] In some implementations, the event handler module 111 may receive visual data from the imaging component 150, information relating to captured objects in the visual data from the object recognition module 115, information received via the input component 120, information from another computing device received via a communication channel 300, and/or other information of the environment related to the wearable device. The event handler module 111 may compare the received information to data related to events stored in the storage 170 to determine whether the information (or a portion of the information) is associated with an event. When some or all of the received information is associated with an event, the event handler module 111 may transmit event data including the received information and data relating to the associated event to the control signal generation module 112.

[0045] In some implementations, the event handler module 111 may receive data from the processor 110 indicating that an interaction occurred between the wearable device 100 and one or more objects in the environment related to the wearable device 100, a condition in the environment related to the wearable device 100 changed, input was received at the wearable device 100, input received from another device was processed by the wearable device 100, an interaction occurred between a user and the environment related to the wearable device 100, and/or other processing was performed by the wearable device 100. In some implementations, the event handler module 111 may compare the data received from the processor 110 with data stored in the storage 170 to determine whether the data is associated with an event. When some or all of received information is associated with an event stored in the storage 170, the event handler module 111 may transmit event data including the received information and data relating to the associated event to the control signal generation module 112.

[0046] In some implementations, when the received information is not associated with an event stored in the storage 170, the event handler module 111 may transmit event data including the received information to the server 400 such that the server 400 can perform event handling. When some or all of received information is associated with an event stored in a storage of the server 400, the server 400 may communicate information relating to the associated event to the event handler module 111. The event handler module 111 may transmit event data including the received information and data relating to the associated event to the control signal generation

module 112. When the received information is not associated with an event stored in the storage of the server 400, the server 400 may communicate an indication that no match was found.

[0047] In some implementations, the control signal generation module 112 may be configured to receive the event data from the event handler module 111 and generate a control signal based on the event data. The storage 170 of the wearable device 100 may include a lookup table that associates a plurality of events and a respective plurality of control signals. Based on the event data received from the event handler module 111, the control signal generation module 112 may generate a control signal. For example, the control signal generation module 112 may compare the received event data to the data stored at the storage 170. When some or all of the event data matches an event 170 stored in the storage, the control signal generation module 112 may generate a control signal related to the control signal associated with the matched event. When the event data does not match an event stored in the storage 170, the control signal generation module 112 may communicate the event data to the server 400 to determine whether a storage of the server 400 has stored a control signal associated with some or all of the event data. The control signal may comprise, for example, information indicating that an event occurred, information indicating that a specific type of event occurred, information relating to one or more objects of the event, information related to one or more environmental conditions of the event, information relating to one or more interactions of the event, information relating to a timing of the event, information related to a date of the event, information relating to a duration of the event, information relating to a frequency of a type of event, information relating to a frequency of the event detected, and/or other information relating to an event.

[0048] The feedback control module 113 may be configured to receive a control signal (e.g., from the control signal generation module 112) and cause the feedback component 130 to provide feedback via the wearable device 100. The control signal may be representative of an event that occurs in an environment related to a wearable device 100. The event may include, for example, an indication of a physical object within a predetermined proximity of the wearable device 100, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device 100, an interaction between the wearable device 100 and an object in the environment, an indication that

the wearable device 100 recognizes an object in the environment, a navigation event, and/or another event occurring in an environment related to the wearable device 100. In some implementations, the feedback control module 113 may be configured to provide the control signal to the feedback component 130. In this implementation, the control signal may be directly applied to the feedback component 130 to cause the feedback. In some implementations, the feedback control module 113 may be configured to determine a feedback response based on the received control signal. In these implementations, the feedback control module 113 may consult a lookup table to determine the feedback response based on the received control signal. The feedback response may comprise one or more types of feedback and one or more feedback signals of the indicated feedback types to be generated based on the received control signal. The feedback control module 113 may be configured to generate the indicated feedback signals of the feedback response and transmit the feedback signals to the respective feedback components 130 to which the signals correspond.

[0049] In some implementations, the feedback control module 113 may consult a lookup table of the wearable device 100 to determine which types of feedback and which feedback signals to include in the feedback response based on the received control signal.

[0050] The feedback response may include a single feedback signal, a plurality of feedback signals for a single feedback component 130, a plurality of feedback signals for a plurality of feedback components 130, a pattern of feedback signals for one or more feedback components 130, and/or other types of feedback response. In some implementations, a plurality of feedback components 130 may provide a feedback response at a same time. In some implementations, one or more feedback components 130 may provide a first feedback response at a first time and one or more feedback components 130 may provide a second feedback response at a second time subsequent to the first time.

[0051] In some implementations, the type of feedback response may indicate the type of event represented by the control signal. For example, a feedback response comprising a single signal may indicate that the event represents the recognition of an object in the environment related to the wearable device 100. A feedback response comprising a pattern of signals may indicate that the event represents an interaction between the wearable device 100 and an object in the environment related to the wearable device 100. The indications associated with the different types of feedback responses are not limited to the described examples.

[0052] In some implementations, the lookup table may store associations between a plurality of control signals and a plurality of feedback responses. For example, when a control signal comprises information indicating that an event occurred, the lookup table may store a feedback response associated with that control signal. When a control signal comprises information indicating that a type of event occurred, the lookup table may store one or more different feedback responses for one or more types of event that may be indicated by the information of the control signal. When a control signal comprises information indicating an interaction between the wearable device 100 and one or more objects in an environment related to the wearable device 100, the lookup table may store a different feedback response for different interactions that may occur between the wearable device 100 and one or more objects in the environment related to the wearable device 100. In some implementations, the feedback control module 113 may retrieve a feedback response from a server 400 that is configured to store a lookup table comprising a plurality of control signals and associated feedback responses.

[0053] The communication module 114 may be configured to facilitate communication between the wearable device 100 and another device such as, for example, a server 400, and/or other devices that may be in communication with the wearable device 100. The communication module 114 may be configured to provide a wired or wireless communication channel 300 for communication between the wearable device 100, the server 400, and/or another device. In some implementations, the processor 110 may be configured to receive a signal representative of an event occurring at the wearable device 100 via a wireless or wired communication channel 300 of the communication module 114.

[0054] In some implementations, the object recognition module 115 may be configured to recognize objects in a physical space. The object recognition module 115 may communicate with the imaging component 150 and the storage 170 of the wearable device 100 to recognize an object in the physical space. For example, the object recognition module 115 may receive visual data captured from the imaging component 150 and may process the visual data to determine whether one or more objects exist in the captured visual data. The object recognition module 115 may compare the captured objects that exist in the visual data with objects stored in the storage 170.

[0055] For example, the object recognition module 115 may compare the pixels of a captured object with the pixels of a stored object in the storage 170 according to known techniques. When

a threshold percentage of pixels (e.g., 80%, 90%, 100%, and/or other percentages) of the captured object match the pixels of a stored object, the object recognition module 115 may determine that the captured object has been recognized as the stored object. In some implementations, the threshold percentage may depend upon a resolution of the imaging component 150.

[0056] The object recognition module 115 may obtain information relating to the stored object and transmit the information relating to the stored object and the information relating to the captured object to the event handler module 111. The information transmitted to the event handler module 111 may include, for example, image data for the stored object, a type of the stored object, the location of the captured object in the physical space, a proximity of the captured object to other physical objects, context information relating to the stored object, context information relating to the captured object, and/or other data associated with the stored object or the captured object. In some implementations, the object recognition module 115 may transmit the information relating to the stored object and the information relating to the captured object to one or more of the event handler module 111, the control signal generation module 112, the feedback control module 113, and/or other modules of the processor 110.

[0057] In some implementations, when the captured object does not match a stored object, the object recognition module 115 may transmit data relating to the captured object to the server 400 such that the server 400 can perform object recognition. When the server 400 recognizes the captured object, the server 400 may communicate information relating to a stored object that matches the captured object to the object recognition module 115. The object recognition module 115 may transmit the information relating to the stored object from the server 400 and the information relating to the captured object to the event handler module 111. When the server 400 does not recognize the captured object, the server 400 may communicate an indication that no match was found.

[0058] The input component 120 may be configured to receive an input such as, for example, a button press, a gesture, voice command, and/or other input. The input may be communicated, by the processor 110, to another device such as, for example, server 400 and/or another device in communication with the wearable device 100, via the communication channel 300. For example, the input component 120 may include a touch pad, a touch screen, a mechanical button, a switch,

an audio receiver, such as a microphone, and/or another input component that can receive an input.

[0059] The feedback component 130 may comprise one or more haptic output devices configured to provide haptic feedback, one or more visual devices configured to provide a visual feedback, one or more audio devices configured to provide an audible feedback, and/or another device that produces feedback. A haptic output device may include an actuator, for example, an electromagnetic actuator such as an Eccentric Rotating Mass (“ERM”) in which an eccentric mass is moved by a motor, a Linear Resonant Actuator (“LRA”) in which a mass attached to a spring is driven back and forth, or a “smart material” such as piezoelectric, electro-active polymers, or shape memory alloys, a macro-composite fiber actuator, an electro-static actuator, an electro-tactile actuator, and/or another type of actuator that provides a physical feedback such as a haptic (e.g., vibrotactile) feedback. The haptic output device may include non-mechanical or non-vibratory devices such as those that use electrostatic friction (ESF), ultrasonic surface friction (USF), or those that induce acoustic radiation pressure with an ultrasonic haptic transducer, or those that use a haptic substrate and a flexible or deformable surface, or those that provide projected haptic output such as a puff of air using an air jet, and so on. A visual device may be configured to generate a visual feedback such as visible light at the wearable device 100. For example, the visual feedback may visually indicate the occurrence of an event in an environment related to the wearable device. An audio device may be configured to generate audio feedback such as one or more sounds at the wearable device 100. For example, the audio feedback may audibly indicate the occurrence of an event in an environment related to the wearable device.

[0060] The feedback component 130 may be configured to receive one or more signals (e.g., one or more control signals or one or more feedback signals) from the feedback control module 113. Based on the one or more signals, one or more haptic output devices, one or more visual devices, one or more audio devices, and/or other feedback components 130 may provide feedback via the wearable device 100.

[0061] The communication port 140 may include an interface through which a communication channel 300 may be maintained with another device such as, for example, a server 400, and/or other devices that may be in communication with the wearable device 100. In

some implementations, a control signal may be received via the communication channel 300, which may include a wired or a wireless communication channel.

[0062] In some implementations, the processor 110 may be configured to receive a signal from another computing device. For example, the processor 110 may be configured to receive a signal from another computing device via a communication channel 300 established by the communication port 140. The signal may be representative of an event occurring at the computing device. For example, the signal may comprise information relating to a communication received at the computing device. In another example, the signal may comprise sensory information. In some implementations, the event handler 111 of the processor may receive the signal from the computing device and may detect an event based on the signal. The event may be, for example, an indication of a communication at the computing device (e.g., a communication received at the computing device, a communication sent by the computing device, a communication generated by the computing device, and/or other communication), an indication of processing that occurred at the computing device, an interaction between the computing device and another device, and/or another event occurring at the computing device. In another example, based on the sensory information received in the signal, the event may comprise an indication of one or more environmental conditions in an environment related to the computing device, an indication of one or more environmental conditions in an environment separate from the computing device, an indication of one or more environmental conditions that may occur in the future in the environment related to the wearable device 100, and/or another event based on the sensory information. The event handler module 111 may send information relating to the event to the control signal generation module 112. The control signal generation module 112 may generate a control signal representative of the event. The feedback control module 113 may receive the control signal and may cause the feedback components to produce feedback based on the control signal.

[0063] The processor 110 may be configured to receive input via the input component 120. The input received via the input component 120 may comprise, for example, a button press, a gesture, voice command, and/or other input. The processor 110 of the wearable device 100 may process the received data and perform functionality based on the processing. In some implementations, based on the input received via the input component 120, an event may be

detected by the wearable device 100. In these implementations, feedback may be provided via the wearable device 100 based on the event detected from the received input.

[0064] In some implementations, the processor 110 may perform functionality that is detected as an event by the wearable device 100. For example, the processor 110 may perform functionality related to a navigation event. For example, the processor may perform functionality to obtain map information for a user of the wearable device 100. The map information may comprise, for example, a set of directions for a user of the wearable device 100 to follow. In some implementations, one or more of the directions may be detected as one or more navigation events by the event handler module 111 of the processor 110. Based on the one or more directions of the map information, the wearable device 100 may be configured to provide feedback via the wearable device 100 indicating the one or more directions. For example, a first haptic feedback via a first haptic output device of the feedback component 130 may be provided to indicate a first direction associated with the navigation event, and a second haptic feedback via a second haptic output device of the feedback component 130 may be provided to indicate a second direction different from the first direction. In another example, the first haptic feedback via the first haptic output device may be provided to indicate a first direction and the second haptic feedback via the second haptic output device may be provided to indicate the first direction.

[0065] In some implementations, the storage 170 of the wearable device 100 may store one or more sensor readings taken at different times from the one or more sensors 160 of the wearable device 100. For example, the storage 170 of the wearable device 100 may store a first sensor reading taken at a first time and a second sensor reading taken at a second time subsequent to the first time. The storage 170 and/or the event handler module 111 may store threshold values relating to one or more types of sensor readings. The event handler module 111 may determine whether an event indicating a change in an environmental condition based on one or more sensor readings has occurred based on a threshold value associated with that environmental condition. For example, the event handler module 111 may indicate that a change in temperature in the environment relating to the wearable device 100 has occurred if a temperature change of over 5 degrees has been sensed within a certain period of time.

[0066] In some implementations, the wearable device 100 may be configured as a wearable augmented reality ("AR") device 200 as shown in FIG. 2. The wearable device 100 may be

configured to generate an augmented reality (“AR”) environment comprising both an augmented reality space and a physical space. Wearable AR device 200 may comprise one or more same or similar components and functionality as the wearable device 100. For example, wearable AR device 200 may comprise, for example, a processor 210, an input component 120, a feedback component 130, a communication port 140, an imaging component 150, a storage 270, and/or other components. The processor 210 may be configured to generate the augmented reality space coincident with the physical space. The processor 210 may be configured to recognize at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the AR space. The processor 210 may be configured to determine an event within the AR environment and generate a control signal representative of that event. Based on the generated control signal, the processor 210 may cause feedback to be generated at the wearable AR device 200. The input component 120 may be configured to receive an input such as, for example, a button press, a gesture, voice command, and/or other input. The feedback component 130 may be configured to provide feedback via the AR wearable device. The communication port 140 may comprise an interface through which a communication channel may be maintained with, for example, a server 400, and/or other devices. An imaging component 150 may be configured to image the physical space. In some implementations, the imaging component 150 of the wearable AR device 200 may comprise a camera, an infrared detector, and/or another image recording device. The storage 270 of the wearable AR device 200 may store data related to one or more events which the wearable AR device 200 may recognize. For example, the storage 270 of the wearable AR device 200 may store data related to events including, for example, an interaction between at least one physical object and the AR environment, a confirmation of an action occurring with respect to the AR environment, an interaction between a physical object and one or more virtual objects displayed in the AR space, a generation of a specific type of virtual object to augment a physical object, a recognition of a physical object, a confirmation that a physical object has been recognized by the wearable AR device 200, an indication of at least one physical object within a predetermined proximity of the wearable AR device 200, an indication of an environmental condition occurring in an environment related to the wearable AR device 200, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable AR device 200, an interaction between a user

and one or more virtual objects displayed in the augmented reality space, and/or another occurrence related to the AR environment.

[0067] In some implementations, the wearable AR device 200 may comprise one or more sensors 160. The sensors 160 of the wearable AR device 200 may have the same or similar components and/or functionality as the sensors 160 of the wearable device 100.

[0068] In some implementations, the processor 210 of the wearable AR device 200 may comprise same or similar functionality as the processor 110 of the wearable device 100. Additionally, the processor 210 the wearable AR device 200 may have additional functionality. In some implementations, the processor 210 of the wearable AR device 200 may be configured to execute one or more modules, including, for example, an event handler module 211, a control signal generation module 212, a feedback control module 213, a communication module 214, an object recognition module 215, an object generation module 216, and/or other computer program modules. The event handler module 211 may be configured to detect whether an event occurs in the augmented reality environment. The control signal generation module 212 may be configured to receive information relating to an event and generate a control signal related to the event. The feedback control module 213 may be configured to receive a control signal and cause one or more feedback components 130 to provide feedback. The communication module 214 may be configured to facilitate communication between the wearable AR device 200 and other devices such as, for example, a server 400, and/or another device in communication with the wearable AR device 200. The object recognition module 215 may be configured to recognize physical objects in the physical space. The object generation module 216 may be configured to generate virtual objects to augment recognized physical objects.

[0069] In some implementations, an event determined by the processor 210 of the wearable AR device 200 may include an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, a confirmation that an object in the physical space has been augmented, an indication of at least one physical object within a predetermined proximity of the wearable AR device 200, an indication of an environmental condition occurring in an environment related to the wearable AR device 200, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object

within a predetermined proximity of the wearable AR device 200, an interaction between a user and one or more virtual objects displayed in the augmented reality space, and/or another event that occurs in an environment related to the wearable AR device 200.

[0070] In some implementations, the event handler module 211 of the wearable AR device 200 may comprise same or similar functionality as the event handler module 111 of the wearable device 100. Additionally, the event handler module 211 of the wearable AR device 200 may have additional functionality. In some implementations, the event handler module 211 may be configured to detect whether an event occurs in the AR environment. The event handler module 211 may receive data from the imaging component 150, the object recognition module 215, the object generation module 216, the storage 270, and/or other modules or components of the wearable AR device 200.

[0071] In some implementations, the event handler module 211 may receive visual data from the imaging component 150, information relating to captured objects in the visual data from the object recognition module 215, information relating to virtual objects generated by the object generation module 216, information received via the input component 120, information from another computing device received via a communication channel 300, and/or other information related to the AR environment. The event handler module 211 may compare the received information to data related to events stored in the storage 270 to determine whether the information (or a portion of the information) is associated with an event. When the received information is associated with an event, the event handler module 211 may transmit event data including the received information and data relating to the associated event to the control signal generation module 212. In some implementations, the event handler module 211 may also transmit event data to the object generation module 216.

[0072] In some implementations, the event handler module 211 may receive data from the processor 210 indicating that an interaction occurred between the wearable AR device 200 and the AR environment, one or more virtual objects in the AR environment changed, input was received from the wearable AR device 200, input received from the wearable AR device 200 was processed by the wearable AR device 200, an interaction occurred between a user and the AR environment, a condition in an environment relating to the wearable AR device 200 has changed, and/or other processing was performed by the wearable AR device 200. In some implementations, the event handler module 211 may compare the data received from the

processor 210 with data stored in the storage 270 to determine whether the data is associated with an event. When some or all of received information is associated with an event stored in the storage 270, the event handler module 211 may transmit event data including the received information and data relating to the associated event to the control signal generation module 212.

[0073] In some implementations, when the received information is not associated with an event stored in the storage 270, the event handler module 211 may transmit event data including the received information to the server 400 such that the server 400 can perform event handling. When some or all of received information is associated with an event stored in a storage of the server 400, the server 400 may communicate information relating to the associated event to the event handler module 211. The event handler module 211 may transmit event data including the received information and data relating to the associated event to the control signal generation module 212. When the received information is not associated with an event stored in the storage of the server 400, the server 400 may communicate an indication that no match was found.

[0074] In some implementations, the control signal generation module 212 may be configured to receive the event data from the event handler module 211 and generate a control signal based on the event data. The storage 270 of the wearable AR device 200 may include a lookup table that associates a plurality of events and a respective plurality of control signals. Based on the event data received from the event handler module 211, the control signal generation module 212 may generate a control signal. For example, the control signal generation module 212 may compare the received event data to the data stored at the storage 270. When some or all of the event data matches an event stored in the storage 270, the control signal generation module 212 may generate a control signal related to the control signal associated with the matched event. When the event data does not match an event stored in the storage 270, the control signal generation module 212 may communicate the event data to the server 400 to determine whether the storage of the server has stored a control signal associated with some or all of the event data. The control signal may comprise, for example, information indicating that an event occurred, information indicating that a specific type of event occurred, information relating to one or more objects of the event, information related to one or more environmental conditions of the event, information relating to one or more interactions of the event, information relating to a timing of the event, information related to a date of the event, information relating to a duration of the event, information relating to a frequency of a type of

event, information relating to a frequency of the event detected, and/or other information relating to an event.

[0075] The communication module 214 of the wearable AR device 200 may comprise same or similar functionality as the communication module 114 of the wearable device 100.

[0076] In some implementations, the object recognition module 215 of the wearable AR device 200 may comprise same or similar functionality as the object recognition module 115 of the wearable device 100. Additionally, the object recognition module 215 of the wearable AR device 200 may have additional functionality. The object recognition module 215 may be configured to recognize objects in a physical space. The object recognition module 215 may communicate with the imaging component 150 and the storage 270 of the wearable AR device 200 to recognize an object in the physical space. For example, the object recognition module 215 may receive visual data captured from the imaging component 150 and may process the visual data to determine whether one or more objects exist in the captured visual data. The object recognition module 215 may compare the captured objects that exist in the visual data with objects stored in the storage 270.

[0077] For example, the object recognition module 215 may compare the pixels of a captured object with the pixels of a stored object in the storage 270 according to known techniques. When a threshold percentage of pixels (e.g., 80%, 90%, 100%, and/or other percentages) of the captured object match the pixels of a stored object, the object recognition module 215 may determine that the captured object has been recognized as the stored object. In some implementations, the threshold percentage may depend upon a resolution of the imaging component 150.

[0078] The object recognition module 215 may obtain information relating to the stored object and transmit the information relating to the stored object and the information relating to the captured object to the event handler module 211. The information transmitted to the event handler module 211 may include, for example, image data for the stored object, a type of the stored object, the location of the captured object in the physical space, a proximity of the captured object to other physical objects, context information relating to the stored object, context information relating to the captured object, and/or other data associated with the stored object or the captured object. In some implementations, the object recognition module 215 may transmit the information relating to the stored object and the information relating to the captured

object to one or more of the object generation module 216, the control signal generation module 212, and/or other modules of the processor 210.

[0079] In some implementations, when the captured object does not match a stored object, the object recognition module 215 may transmit data relating to the captured object to the server 400 such that the server 400 can perform object recognition. When the server 400 recognizes the captured object, the server 400 may communicate information relating to a stored object that matches the captured object to the object recognition module 211. The object may transmit the information relating to the stored object from the server 400 and the information relating to the captured object to the event handler module 211. When the server 400 does not recognize the captured object, the server 400 may communicate an indication that no match was found.

[0080] In some implementations, the object generation module 216 may receive information relating to a physical object from the object recognition module 215 and may generate one or more virtual objects to augment the physical object in the AR environment. The object generation module 216 may access the storage 270 to determine whether one or more virtual objects are associated with the physical object. When no virtual objects are associated with the physical object, the object generation module 216 may communicate with the server 400 to determine whether the storage of the server 400 has stored one or more associations between the one or more physical objects and one or more virtual objects. When an association is found in the storage of the server 400, the server 400 may communicate, to the object generation module 216, data related to the associated virtual objects.

[0081] When a virtual object is associated with a physical object identified in the information received from the object recognition module 215, the object generation module 216 may generate an AR space coincident with the physical space. FIG. 3 illustrates a block diagram of an exemplary AR environment 500. The AR environment 500 comprises a physical space 520 comprising one or more physical objects 520a, 520b, ..., 520n and an AR space 510 comprising one or more virtual objects 510a, 510b, ..., 510n that augment one or more physical objects 520a, 520b, ..., 520n in the physical space 520.

[0082] In some implementations, the object generation module 216 may augment a physical object 520n with one or more virtual objects 510a, 510b, ..., 510n in the AR space 510. For example, the object generation module 216 may display the AR space 510 (and one or more virtual objects 510a, 510b, ..., 510n) via a display surface of the wearable AR device 200. In

some implementations, the AR space 510 and one or more virtual objects 510a, 510b, ..., 510n displayed may be displayed in a three-dimensional manner via the display surface of the wearable AR device 200.

[0083] The AR environment 500 displayed via the display of the wearable AR device 200 may include the physical space 520 and the AR space 510. In some implementations, the physical space 520 may be imaged by the imaging component 150 and displayed via the display. In some implementations, the physical space 520 may simply be viewed through the display, such as in implementations where the display is configured as an at least partially transparent display (e.g., a lens) through which the physical space 520 may be viewed. Whichever implementation to display the physical space 520 is used, one or more virtual objects 510a, 510b, ... 510n may be displayed coincident with or in association with one or more physical objects 520a, 520b, ... 520n that exist in the physical space 520, thereby augmenting the one or more physical objects 520a, 520b, ... 520n in the AR environment 500. A single virtual object 510a may augment a single physical object 520a or a plurality of physical objects 520a, 520b, ... 520n. A plurality of virtual objects 510a, 510b, ... 510n may augment a single physical object 520a or a plurality of physical objects 520a, 520b, ... 520n. The number and types of virtual objects 510a, 510b, ... 510n that augment physical objects 520a, 520b, ... 520n that exist in the physical space 520 is not limited to the examples described.

[0084] Returning to FIG. 2, the processor 210 may be configured to receive input from the wearable AR device 200. For example, the processor 210 may receive data from the wearable AR device 200 related to input that was received via the input component 150. The input received via the input component 150 may comprise, for example, a button press, a gesture, voice command, and/or other input. The processor 210 of the wearable AR device 200 may process the received data and perform functionality based on the processing. For example, the processor 210 may add, delete, change, and/or otherwise modify one or more virtual objects 510a, 510b, ..., 510n in the AR environment 500. The processor 210 may send data to the wearable device 100 based on the processing. The processor 210 may perform other functionality based on the processing. In some implementations, the processor 210 may receive input from another computing device that includes identifying indicia for the computing device and an indication that the input comprises the identifying indicia. The wearable AR device 200 may store the identifying indicia and associate the identifying indicia with the computing device.

[0085] As shown in FIG. 4, the feedback component 130 of the wearable device 100 (or the wearable AR device 200) may comprise one or more devices. In some implementations, the one or more devices may be spaced apart at the wearable device 100 (or the wearable AR device 200). The feedback component 130 may comprise, for example, one or more haptic output devices 132 configured to provide haptic feedback, one or more visual devices 134 configured to provide a visual feedback, one or more audio devices 136 configured to provide an audible feedback, a light-emitting band 138, and/or another device that produces feedback.

[0086] The haptic output device 132 may include an actuator, for example, an electromagnetic actuator such as an Eccentric Rotating Mass (“ERM”) in which an eccentric mass is moved by a motor, a Linear Resonant Actuator (“LRA”) in which a mass attached to a spring is driven back and forth, or a “smart material” such as piezoelectric, electro-active polymers, or shape memory alloys, a macro-composite fiber actuator, an electro-static actuator, an electro-tactile actuator, and/or another type of actuator that provides a physical feedback such as a haptic (e.g., vibrotactile) feedback. The haptic output device 132 may include non-mechanical or non-vibratory devices such as those that use electrostatic friction (ESF), ultrasonic surface friction (USF), or those that induce acoustic radiation pressure with an ultrasonic haptic transducer, or those that use a haptic substrate and a flexible or deformable surface, or those that provide projected haptic output such as a puff of air using an air jet, and so on. In some implementations, one or more haptic output devices 132 may be spaced apart throughout the wearable device 100 (or the wearable AR device 200).

[0087] The visual device 134 may be configured to generate a visual feedback such as visible light at the wearable device 100. For example, the visual feedback may visually indicate the occurrence of an event detected by the wearable device 100 (or the wearable AR device 200).

[0088] The audio device 136 may be configured to generate audio feedback such as one or more sounds at the wearable device 100. For example, the audio feedback may audibly indicate the occurrence of an event detected by the wearable device 100 (or the wearable AR device 200).

[0089] The light-emitting band 138 may be configured to generate a light-emitting band emanating from and/or around the wearable device 100 (or the wearable AR device 200). The light emitted via the band 138 may include a color, a pattern, and/or other visual characteristics. The visual characteristics may coordinate with one or more events detected by the wearable device 100 (or the wearable AR device 200).

[0090] As shown in FIG. 5, in some implementations, the wearable AR device 200 may be configured in the shape of eyewear. For example, the wearable AR device 200 may be configured to display the AR environment 500 (or AR environments 500A, 500B) via one or both lenses 180A and 180B of the eyewear. In some implementations, a part of lens 180A may be configured to display an AR environment 500A and a part of lens 180B may be configured to display AR environment 500B. AR environment 500A and AR environment 500B may be separate AR environments, may be overlapping AR environments, may be displayed via two separate lenses as a single AR environment 500, and/or may comprise one or more AR environments to be displayed in other ways.

[0091] The eyewear may comprise one or more components, including, for example, a frame, a first lens 180A connected to a first portion of the frame, a second lens 180B connected to a second portion of the frame, a first nose pad 190A connected to the frame adjacent the first lens 180A, a second nose pad 190B connected to the frame adjacent the second lens 180B, and/or other eyewear components. The frame may comprise, for example, a first top portion 171A of the frame at a first end of the frame, a second top portion 171B of the frame at a second end opposite the first end of the frame, a first temple 172A connected to the first top portion 171A and extending in a direction perpendicular to the first top portion 171A, a second temple 172B connected to the second top portion 171B and extending in a direction perpendicular to the second top portion 171B and parallel to the first temple 172A, and/or other components. The first temple 172A may comprise one or more portions including, for example, a first portion 173A, a second portion 174A, a third portion 175A, and/or other portions. The second temple 172B may comprise one or more portions including, for example, a first portion 173B, a second portion 174B, a third portion 175B, and/or other portions.

[0092] Components of the wearable AR device 200 (e.g., the imaging component 150, wireless transceiver 140, processor, etc.) may be disposed at various locations of the eyewear. The following are merely for illustrative purposes and are non-limiting examples. A portion of the frame near one of the lenses 180A (or a portion of the lens 180A) may comprise the imaging component 150. A portion of the frame near the other lens 180B (or a portion of the other lens 180B) may comprise a wireless transceiver 140 that may comprise a communication port. One or both of the first top portion 171A and/or the second top portion 171B may comprise the processor, the communication port, and/or other components of the wearable AR device 200. In

some implementations, one or both of the first temple 172A and/or the second temple 172B may comprise one or more of the processor, the communication port, and/or other components of the wearable AR device 200.

[0093] In some implementations, the first top portion 171A of the frame may comprise one or more haptic output devices of the feedback component 130 positioned at one or more respective positions of the first top portion 171A of the frame. The second top portion 171B of the frame may comprise one or more haptic output devices of the feedback component 130 positioned at one or more respective positions of the second top portion 171B of the frame. In some implementations, the first temple 172A may comprise one or more haptic output devices positioned at one or more respective portions of the first temple 172A. The second temple 172B may comprise one or more haptic output devices positioned at one or more respective portions of the second temple 172B.

[0094] In some implementations, the first temple 172A may comprise a deformable material. In some of these implementations, the first temple 172A may be configured to bend laterally inward. In some of these implementations, a first portion 173A of the first temple 172A may be configured to bend laterally inward and a second portion 174A of the first temple 172A adjacent the first portion may be configured to bend laterally inward or laterally outward. A third portion 175A may be configured to bend laterally inward and laterally outward, vibrate, provide feedback that provides a tickling sensation to a wearer of the eyewear, and/or provide other types of feedback. In some implementations, one or more of the first portion 173A, second portion 174A, third portion 175A, and/or other portions of the first temple 172A may comprise one or more haptic output devices that may be configured to provide a vibration effect, provide a tickling sensation, comprise a deformable material configured to bend laterally inward, comprise a deformable material configured to bend laterally inward and laterally outward, and/or provide other types of haptic feedback.

[0095] In some implementations, the second temple 172B may comprise a deformable material. In some of these implementations, the second temple 172B may be configured to bend laterally inward. In some of these implementations, a first portion 173B of the second temple 172B may be configured to bend laterally inward and a second portion 174B of the second temple 172B adjacent the first portion may be configured to bend laterally inward or laterally outward. A third portion 175B may be configured to bend laterally inward and laterally

outward, vibrate, provide feedback that provides a tickling sensation to a wearer of the eyewear, and/or provide other types of feedback. In some implementations, one or more of the first portion 173B, second portion 174B, third portion 175B, and/or other portions of the second temple 172B may comprise one or more haptic output devices that may be configured to provide a vibration effect, provide a tickling sensation, comprise a deformable material configured to bend laterally inward, comprise a deformable material configured to bend laterally inward and laterally outward, and/or provide other types of haptic feedback. The various portions of first temple 172A and second temple 172B may provide one or more types of feedback disposed at one or more positions at first temple 172A and/or second temple 172B.

[0096] In some implementations, the first nose pad 190A may comprise a deformable material. The first nose pad 190A may be configured to bend laterally inward. In some implementations, one or both of first nose pad 190A or second nose pad 190B may comprise one or more haptic output devices. In some implementations, the deformable material of the first temple 172A, the second temple 172B, the first nose pad 190A, the second nose pad 190B, and/or other components that comprise deformable material may provide feedback as one or more feedback components 130 of the wearable AR device 200 configured as eyewear.

[0097] Other configurations of the eyewear may be used as well. For example, in some implementations, one or more portions of the eyewear may be configured to provide one or more of the following haptic sensations: the eyewear squeezing the head of a user, the eyewear squeezing the ear of the user, the eyewear squeezing the nose of the user, the eyewear having a vibrating array of elements 192 felt by the user, the eyewear moving against the ear of the user, protrusions 194 extending from the eyewear and contacting the user, sensations indicating flow or saltation along the eyewear by using, for example, the array of elements 192, changing the surface feel of the frame to the user, and deforming any part of the frame. By providing a more advanced functionality to the eyewear, more complex haptic information may be communicated to the user in order to provide, for example, gaming information, status information, direction information and/or object interaction information.

[0098] The haptic functionality described above may be provided by known actuation technologies, including but not limited to actuators that include piezoelectric materials, smart gels, shape memory alloys, electroactive polymers, electromagnetics, fluid reservoirs, etc. For example the “squeeze ear” modality may be created with a shape memory fiber embedded in the eyewear

frame. When actuated, the fiber may shrink and pull the frame so as to slightly reduce the radius of the ear piece applying pressure to the user's ear and convey a haptic effect to the user's ear.

[0099] In some implementations, the eyewear may include at least one touch sensitive surface implemented directly into the eyewear frame. In some implementations, electrostatic friction type displays may be used to change the surface feel of the eyewear frame in order to indicate an active function or confirmation, for example. In some implementations, the array of elements 192 may be an array of touch sensitive surfaces, such as touchpads.

[00100] Each of the haptic modalities described above may have many specific application examples. For example, haptic effects associated with the "squeeze ear" modality may be used to notify the user, to provide confirmation to the user of an action, to indicate status of an event or to provide directional information such as which direction to focus attention. The unique location of the haptic effect may provide additional information. For example, haptic effects on the nose may be used to indicate interaction with virtual objects the user is facing, while haptic effects to the right and left sides of the head along the temples of the eyewear, or behind the ears, may be used for interaction with objects to the right and left sides of the user, respectively.

[00101] In some implementations, the wearable device 100 may be configured in the shape of eyewear. The eyewear comprising the wearable device 100 may have one or more same or similar components and functionality as the wearable AR device 200 configured as eyewear. In some implementations, the wearable device 100 configured as eyewear may not display the AR environment 500 via one or both lenses 180A, 180B or via the frame of the eyewear.

[00102] In some implementations, the wearable device 100 may be configured as headwear, for example, a visor, goggles, a face mask, a ski mask, laboratory glasses, safety glasses, a hat, a baseball cap, a bandana, a headband, earmuffs, hair comb, hair chain, and/or other accessories worn around a user's head. In some implementations, the wearable AR device 200 may be configured as headwear, for example, a visor, goggles, a face mask, a ski mask, laboratory glasses, safety glasses, a hat, a baseball cap, a bandana, a headband, earmuffs, a necklace, earrings, hair comb, hair chain, and/or other accessories worn around a user's head.

[00103] Referring back to FIGS. 1 and 2, in some implementations, the server 400 may be configured to communicate with one or more of the wearable device 100, the wearable AR device 200, and/or other devices in communication with the server 400. In some implementations, server 400 may comprise a processor, a storage, and a communication port.

[00104] The processor of the server 400 may be configured to receive data, recognize objects, handle events, send data, and/or provide other functionality. In some implementations, the server 400 may be configured to receive, from the processor 110 of the wearable device 100, a control signal. The storage of the server 400 may comprise a lookup table that may be configured in a manner similar or the same as the lookup table of the wearable device 100 that comprises a plurality of control signals and a plurality of feedback responses. When the lookup table includes an entry relating to the control signal, the server 400 may communicate to the control signal generation module 112 information relating to the control signal found in the lookup table. When the lookup table of the server 400 does not include an entry relating to the control signal, the server 400 may communicate an indication that no match was found for the control signal to the feedback control module 111. In some implementations, the server 400 may perform image processing and/or object recognition relating to data received from the wearable device 100.

[00105] In some implementations, the server 400 may be configured to receive event data from the event handler module 111 of the processor 110 of the wearable device 100. The storage of the server 400 may include a lookup table that associates a plurality of events and a respective plurality of control signals. When some or all of the event data matches an event stored in the storage of the server 400, the processor of the server 400 may communicate the event data related to the event to the event handler module 111. When the event data does not match an event stored in the storage, the processor of the server 400 may communicate that no match was found to the wearable device 100.

[00106] In some implementations, the server 400 may receive data related to an object captured by the imaging component 150 of the wearable device 100. The processor of the server 400 may perform object recognition related to the captured object. The storage of the server 400 may comprise a lookup table that comprises one or more physical objects. The server 400 may determine whether the lookup table comprises an entry related to the object recognized from the received data. When the lookup table comprises an entry related to the recognized object, the server 400 may communicate information relating to a stored object that matches the recognized object to the object recognition module 115. When the server 400 does not recognize the recognized object, the server 400 may communicate an indication that no match was found to the object recognition module 115.

[00107] In some implementations, the server 400 may receive data related to a physical object recognized by the object recognition module 215 of the processor 210 of the wearable AR device 200. The processor of the server 400 may determine whether the storage of the server 400 has stored an association between the physical object and one or more virtual objects. In some implementations, the storage of the server 400 may comprise a lookup table that comprises physical objects, virtual objects, and one or more correlations between one or more physical object and one or more virtual objects. When an association is found in the storage of the server 400, the server 400 may communicate, to the object generation module 216, data related to the associated virtual objects. When no association is found in the storage of the server 400, the server 400 may communicate that no association has been found.

[00108] The communication port of the server 400 may include an interface through which a communication channel 300 may be maintained with, for example, the wearable device 100, the wearable AR device 200, and/or another device in communication with the server 400. Data and/or signals may be received via the communication channel 300, and/or another communication channel through which the server 400 receives data and/or signals.

[00109] FIG. 6 illustrates a flowchart of an exemplary method 600 of providing feedback based on an event occurring in an environment related to the wearable device 100, according to an implementation of the invention. The described operations of FIG. 6 and other Figures may be accomplished using some or all of the system components described in detail above and, in some implementations, various operations may be performed in different sequences. In other implementations, additional operations may be performed along with some or all of the operations shown in FIG. 6 and the other Figures. In yet other implementations, one or more operations may be performed simultaneously. In yet other implementations, one or more combinations of various operations may be performed. Some implementations may not perform all of the operations described with relation to FIG. 6 and other Figures. Accordingly, the operations described are exemplary in nature and, as such, should not be viewed as limiting.

[00110] In some implementations, the operations of FIG. 6 and other Figures may be implemented in one or more processing devices (e.g., wearable device 100, wearable AR device 200, server 400, and/or other devices). The one or more processing devices may include one or more devices executing some or all of the operations of FIG. 6 and other Figures in response to instructions stored electronically on an electronic storage medium. The one or more processing

devices may include one or more devices configured through hardware, firmware, and/or software to be specifically designed for execution of one or more of the operations of FIG. 6 and other Figures.

[00111] In an operation 602, an occurrence of an event may be detected in an environment related to the wearable device 100. The event handler module 111 may be configured to determine whether an event occurred in an environment related to the wearable device 100 based on information received from one or more of the processor 110 or the imaging component 150. The event may include an indication of a physical object within a predetermined proximity of the wearable device 100, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device 100, an interaction between the wearable device 100 and an object in the environment, an indication that the wearable device 100 recognizes an object in the environment, a navigation event, and/or another event occurring in an environment related to the wearable device 100. In some implementations, when an occurrence of an event is detected in an environment related to the wearable AR device 200, the event may include an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, a confirmation that an object in the physical space has been augmented, an indication of at least one physical object within a predetermined proximity of the wearable AR device 200, an indication of an environmental condition occurring in an environment related to the wearable AR device 200, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable AR device 200, an interaction with one or more virtual objects displayed in the augmented reality space, and/or another event that occurs in an environment related to the wearable AR device 200. An interaction with one or more virtual objects may comprise a manipulation of one or more virtual objects, an interaction between a user and one or more virtual objects displayed in the augmented reality space, an interaction between one or more physical objects in the physical space and the one or more virtual objects, and/or another event relating to a virtual object in the environment related to the wearable AR device 200.

[00112] In an operation 604, wearable device 100 may generate a control signal based on the detected event. For example, when the event handler module 111 of the wearable device 100 detects an event, the control signal generation module 112 may be configured to determine a control signal associated with the detected event. In some implementations, when an occurrence of an event is detected in an environment related to the wearable AR device 200, the event handler module 211 of the wearable device 100 detects an event, the control signal generation module 212 may be configured to determine a control signal associated with the detected event.

[00113] In an operation 606, the feedback control module 113 of the processor 110 may receive the control signal. Feedback may be provided via the wearable device 100. The feedback control module 113 may cause the feedback component 130 to provide feedback via the wearable device 100. In some implementations, the feedback control module 113 may be configured to provide the control signal to the feedback component 130. In these implementations, the control signal may be directly applied to the one or more feedback components 130 to cause the feedback. In some implementations, the feedback control module 113 may be configured to determine a feedback response based on the received control signal. The feedback control module 113 may provide a feedback response comprising one or more types of feedback and one or more feedback signals of the indicated feedback types to be generated. The feedback control module 113 may be configured to generate the indicated feedback signals of the feedback response and transmit the feedback signals to the respective feedback components 130 to which the signals correspond.

[00114] One or more feedback components 130 of the wearable device 100 may provide feedback via the wearable device 100. In some implementations, the feedback provided may be based on one or more feedback signals received from the feedback control module 113. The feedback may correspond to the event detected within the environment related to the wearable device. For example, the feedback may be representative of the event.

[00115] In some implementations, when an occurrence of an event is detected in an environment related to the wearable AR device 200, the feedback control module 213 of the processor 210 may receive the control signal. Feedback may be provided via the wearable AR device 200. The feedback control module 213 may cause the feedback component 120 to provide feedback via the wearable AR device 200. In some implementations, the feedback control module 213 may be configured to provide the control signal to the feedback component

130. In these implementations, the control signal may be directly applied to the one or more feedback components 130 to cause the feedback. In some implementations, the feedback control module 213 may be configured to determine a feedback response based on the received control signal. The feedback control module 213 may provide a feedback response comprising one or more types of feedback and one or more feedback signals of the indicated feedback types to be generated. The feedback control module 213 may be configured to generate the indicated feedback signals of the feedback response and transmit the feedback signals to the respective feedback components 130 to which the signals correspond.

[00116] One or more feedback components 130 of the wearable AR device 200 may provide feedback via the wearable AR device 200. In some implementations, the feedback provided may be based on one or more feedback signals received from the feedback control module 213. The feedback may correspond to the event detected within the environment related to the wearable device. For example, the feedback may be representative of the event.

[00117] Wearable device 100 may include storage 170, one or more processors 110, and/or other components. Wearable device 100 may include communication lines, or ports to enable the exchange of information with a network and/or other computing platforms. Illustration of wearable device 100 in FIG. 1 is not intended to be limiting. Wearable device 100 may include a plurality of hardware, software, and/or firmware components operating together to provide the functionality attributed herein to wearable device 100.

[00118] Storage 170 may comprise non-transitory storage media that electronically stores information. The electronic storage media of storage 170 may include one or both of system storage that is provided integrally (i.e., substantially non-removable) with wearable device 100 and/or removable storage that is removably connectable to wearable device 100 via, for example, a port (e.g., a USB port, a firewire port, etc.) or a drive (e.g., a disk drive, etc.). Storage 170 may include one or more of optically readable storage media (e.g., optical disks, etc.), magnetically readable storage media (e.g., magnetic tape, magnetic hard drive, floppy drive, etc.), electrical charge-based storage media (e.g., EEPROM, RAM, etc.), solid-state storage media (e.g., flash drive, etc.), and/or other electronically readable storage media. Storage 170 may include one or more virtual storage resources (e.g., cloud storage, a virtual private network, and/or other virtual storage resources). Storage 170 may store software algorithms, information determined by

processor 110, information received from wearable device 100, and/or other information that enables wearable device 100 to function as described herein.

[00119] Processor(s) 110 is configured to provide information processing capabilities in wearable device 100. As such, processor 110 may include one or more of a digital processor, an analog processor, a digital circuit designed to process information, an analog circuit designed to process information, a state machine, and/or other mechanisms for electronically processing information. Although processor 110 is shown in FIG. 1 as a single entity, this is for illustrative purposes only. In some implementations, processor 110 may include a plurality of processing units. These processing units may be physically located within the same device, or processor 110 may represent processing functionality of a plurality of devices operating in coordination. The processor 110 may be configured to execute modules 111, 112, 113, 114, and 115. Processor 110 may be configured to execute modules 111, 112, 113, 114, and 115 by software; hardware; firmware; some combination of software, hardware, and/or firmware; and/or other mechanisms for configuring processing capabilities on processor 110. As used herein, the term “module” may refer to any component or set of components that perform the functionality attributed to the module. This may include one or more physical processors during execution of processor readable instructions, the processor readable instructions, circuitry, hardware, storage media, or any other components.

[00120] It should be appreciated that although modules 111, 112, 113, 114, and 115 are illustrated in FIG. 1 as being implemented within a single processing unit, in implementations in which processor 110 includes multiple processing units, one or more of modules 111, 112, 113, 114, and 115 may be implemented remotely from the other modules. The description of the functionality provided by the different modules 111, 112, 113, 114, and 115 described below is for illustrative purposes, and is not intended to be limiting, as any of modules 111, 112, 113, 114, and 115 may provide more or less functionality than is described. For example, one or more of modules 111, 112, 113, 114, and 115 may be eliminated, and some or all of its functionality may be provided by other ones of modules 111, 112, 113, 114, and 115. As another example, processor 110 may be configured to execute one or more additional modules that may perform some or all of the functionality attributed below to one of modules 111, 112, 113, 114, and 115.

[00121] Wearable AR device 200 may include storage 270, one or more processors 210, and/or other components. Wearable AR device 200 may include communication lines, or ports

to enable the exchange of information with a network and/or other computing platforms.

Illustration of wearable AR device 200 in FIG. 2 is not intended to be limiting. Wearable AR device 200 may include a plurality of hardware, software, and/or firmware components operating together to provide the functionality attributed herein to wearable AR device 200.

[00122] Storage 270 may comprise non-transitory storage media that electronically stores information. The electronic storage media of storage 270 may include one or both of system storage that is provided integrally (i.e., substantially non-removable) with wearable AR device 200 and/or removable storage that is removably connectable to wearable AR device 200 via, for example, a port (e.g., a USB port, a firewire port, etc.) or a drive (e.g., a disk drive, etc.). Storage 270 may include one or more of optically readable storage media (e.g., optical disks, etc.), magnetically readable storage media (e.g., magnetic tape, magnetic hard drive, floppy drive, etc.), electrical charge-based storage media (e.g., EEPROM, RAM, etc.), solid-state storage media (e.g., flash drive, etc.), and/or other electronically readable storage media. Storage 270 may include one or more virtual storage resources (e.g., cloud storage, a virtual private network, and/or other virtual storage resources). Storage 270 may store software algorithms, information determined by processor 210, information received from wearable device 200, and/or other information that enables wearable AR device 200 to function as described herein.

[00123] Processor(s) 210 is configured to provide information processing capabilities in wearable AR device 200. As such, processor 210 may include one or more of a digital processor, an analog processor, a digital circuit designed to process information, an analog circuit designed to process information, a state machine, and/or other mechanisms for electronically processing information. Although processor 210 is shown in FIG. 2 as a single entity, this is for illustrative purposes only. In some implementations, processor 210 may include a plurality of processing units. These processing units may be physically located within the same device, or processor 210 may represent processing functionality of a plurality of devices operating in coordination. The processor 210 may be configured to execute modules 211, 212, 213, 214, 215, and 216. Processor 210 may be configured to execute modules 211, 212, 213, 214, 215, and 216 by software; hardware; firmware; some combination of software, hardware, and/or firmware; and/or other mechanisms for configuring processing capabilities on processor 210. As used herein, the term “module” may refer to any component or set of components that perform the functionality attributed to the module. This may include one or

more physical processors during execution of processor readable instructions, the processor readable instructions, circuitry, hardware, storage media, or any other components.

[00124] It should be appreciated that although modules 211, 212, 213, 214, 215, and 216 are illustrated in FIG. 2 as being implemented within a single processing unit, in implementations in which processor 210 includes multiple processing units, one or more of modules 211, 212, 213, 214, 215, and 216 may be implemented remotely from the other modules. The description of the functionality provided by the different modules 211, 212, 213, 214, 215, and 216 described below is for illustrative purposes, and is not intended to be limiting, as any of modules 211, 212, 213, 214, 215, and 216 may provide more or less functionality than is described. For example, one or more of modules 211, 212, 213, 214, 215, and 216 may be eliminated, and some or all of its functionality may be provided by other ones of modules 211, 212, 213, 214, 215, and 216. As another example, processor 210 may be configured to execute one or more additional modules that may perform some or all of the functionality attributed below to one of modules 211, 212, 213, 214, 215, and 216.

[00125] Server 400 may include storage, one or more processors, and/or other components. Server 400 may include communication lines, or ports to enable the exchange of information with a network and/or other computing platforms. Illustration of server 400 in FIGS. 1 and 2 are not intended to be limiting. Server 400 may include a plurality of hardware, software, and/or firmware components operating together to provide the functionality attributed herein to server 400. For example, server 400 may be implemented by a cloud of computing platforms operating together as server 400.

[00126] Although the system(s) and/or method(s) of this disclosure have been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred implementations, it is to be understood that such detail is solely for that purpose and that the disclosure is not limited to the disclosed implementations, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the spirit and scope of the appended claims. For example, it is to be understood that the present disclosure contemplates that, to the extent possible, one or more features of any implementation can be combined with one or more features of any other implementation.

WHAT IS CLAIMED IS:

1. A system comprising:
a wearable device;
a second device remote from and in communication with the wearable device;
a processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device; and
a haptic output device configured to provide haptic feedback based on the generated control signal.
2. The system according to claim 1, wherein the second device is a second wearable device.
3. The system according to claim 1, wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, or an indication that the wearable device or the second device recognizes an object in the environment.
4. The system according to claim 1, wherein the wearable device comprises the haptic output device.
5. The system according to claim 1, wherein the second device comprises the haptic output device.
6. The system according to claim 1, further comprising:
a sensor configured to sense one or more environmental conditions related to the wearable device or the second device,
wherein the event comprises the one or more environmental conditions sensed by the sensor.

7. The system according to claim 1, further comprising:
a communication port configured to establish a wireless or wired communication channel between the wearable device and the second device,
wherein the processor is configured to receive a signal representative of an event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal.
8. The system according to claim 7, wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information.
9. The system according to claim 8, wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device.
10. A system comprising:
an augmented reality device configured to generate an augmented reality environment comprising an augmented reality space and a physical space, the augmented reality device comprising
a processor configured to
generate the augmented reality space coincident with the physical space,
recognize at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space, and
determine an event associated with the augmented reality environment,
and
generate a control signal based on the determined event;
a wearable device remote from and in communication with the augmented reality device;
a third device remote from and in communication with the wearable device and the augmented reality device; and
a haptic output device configured to provide haptic feedback based on the generated control signal.

11. The system according to claim 10, wherein the third device is a second wearable device.

12. The system according to claim 10, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.

13. The system according to claim 10, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.

14. The system according to claim 10, wherein the augmented reality device comprises the haptic output device.

15. The system according to claim 10, wherein the wearable device comprises the haptic output device.

16. The system according to claim 10, wherein the third device comprises the haptic output device.

17. A method comprising:
generating a control signal representative of an event occurring in an environment related to a wearable device and/or a second device with a processor; and
providing haptic feedback based on the generated control signal with a haptic output device.

18. The method according to claim 17, wherein the second device is a second wearable device.

19. The method according to claim 17, wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, or an indication that the wearable device or the second device recognizes an object in the environment.

20. The method according to claim 17, wherein the wearable device comprises the haptic output device and the haptic feedback is provided at the wearable device.

21. The method according to claim 17, wherein the second device comprises the haptic output device and the haptic feedback is provided at the second device.

22. The method according to claim 17, further comprising:
sensing one or more environmental conditions related to the wearable device or the second device with a sensor,
wherein the event comprises the one or more environmental conditions sensed by the sensor.

23. The method according to claim 17, further comprising:
establishing a wireless or wired communication channel between the wearable device and the second device with a communication port; and
receiving a signal representative of an event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal with the processor.

24. The method according to claim 23, wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information.

25. The method according to claim 24, wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device.

26. A method comprising:
 generating an augmented reality environment comprising an augmented reality space and a physical space with an augmented reality device, said generating comprising
 generating the augmented reality space coincident with the physical space with a processor,
 recognizing at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space with the processor,
 determining an event associated with the augmented reality environment with the processor, and
 generating a control signal based on the determined event with the processor; and
 providing haptic feedback based on the generated control signal with a haptic output device of the augmented reality device, a wearable device remote from and in communication with the augmented reality device, or a third device remote from and in communication with the wearable device and the augmented reality device.

27. The method according to claim 26, wherein the third device is a second wearable device.

28. The method according to claim 26, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.

29. The method according to claim 26, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in

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the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.

ABSTRACT

A system includes a wearable device, a second device remote from and in communication with the wearable device, a processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device, and a haptic output device configured to provide haptic feedback based on the generated control signal.

FIG. 1

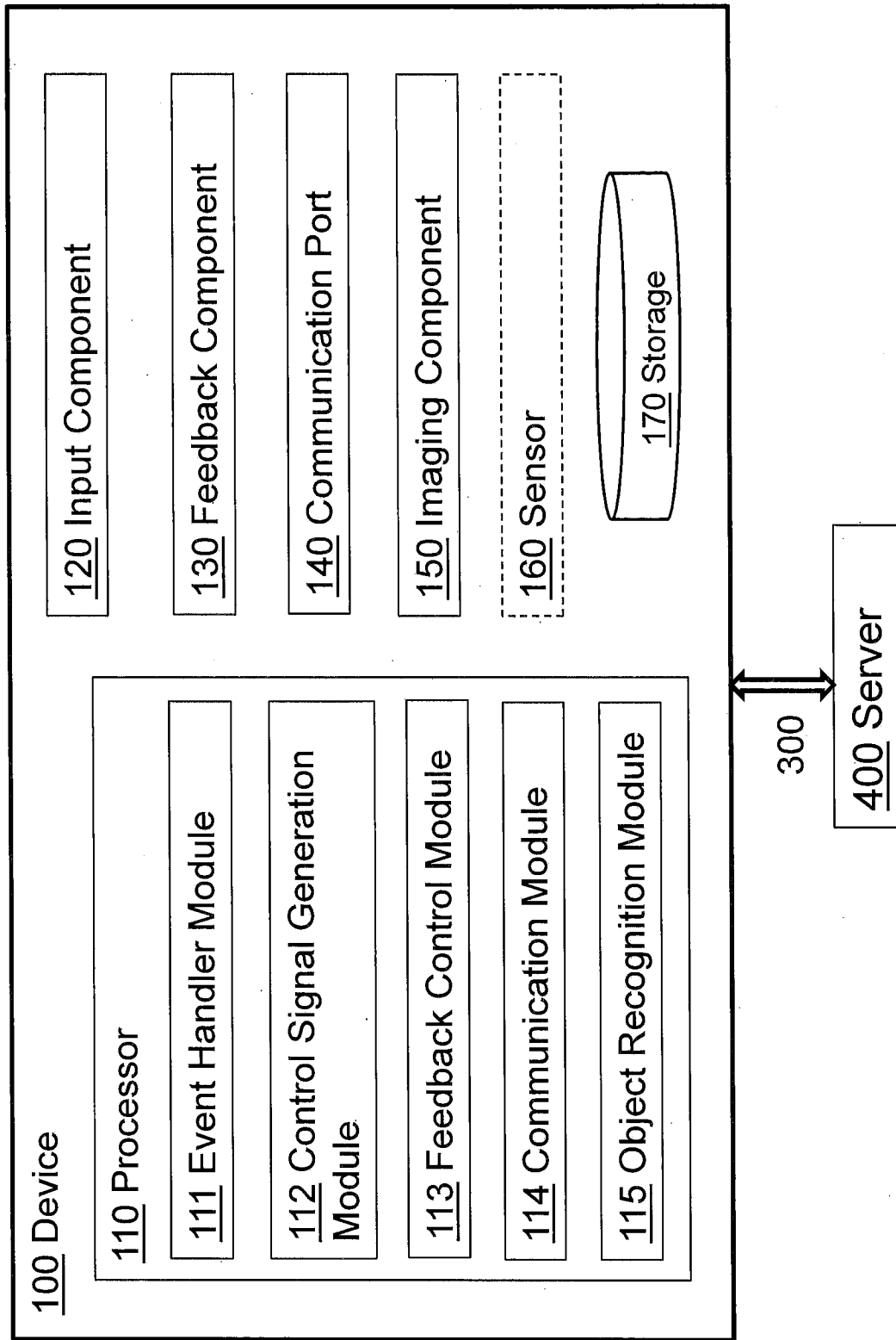


FIG. 2

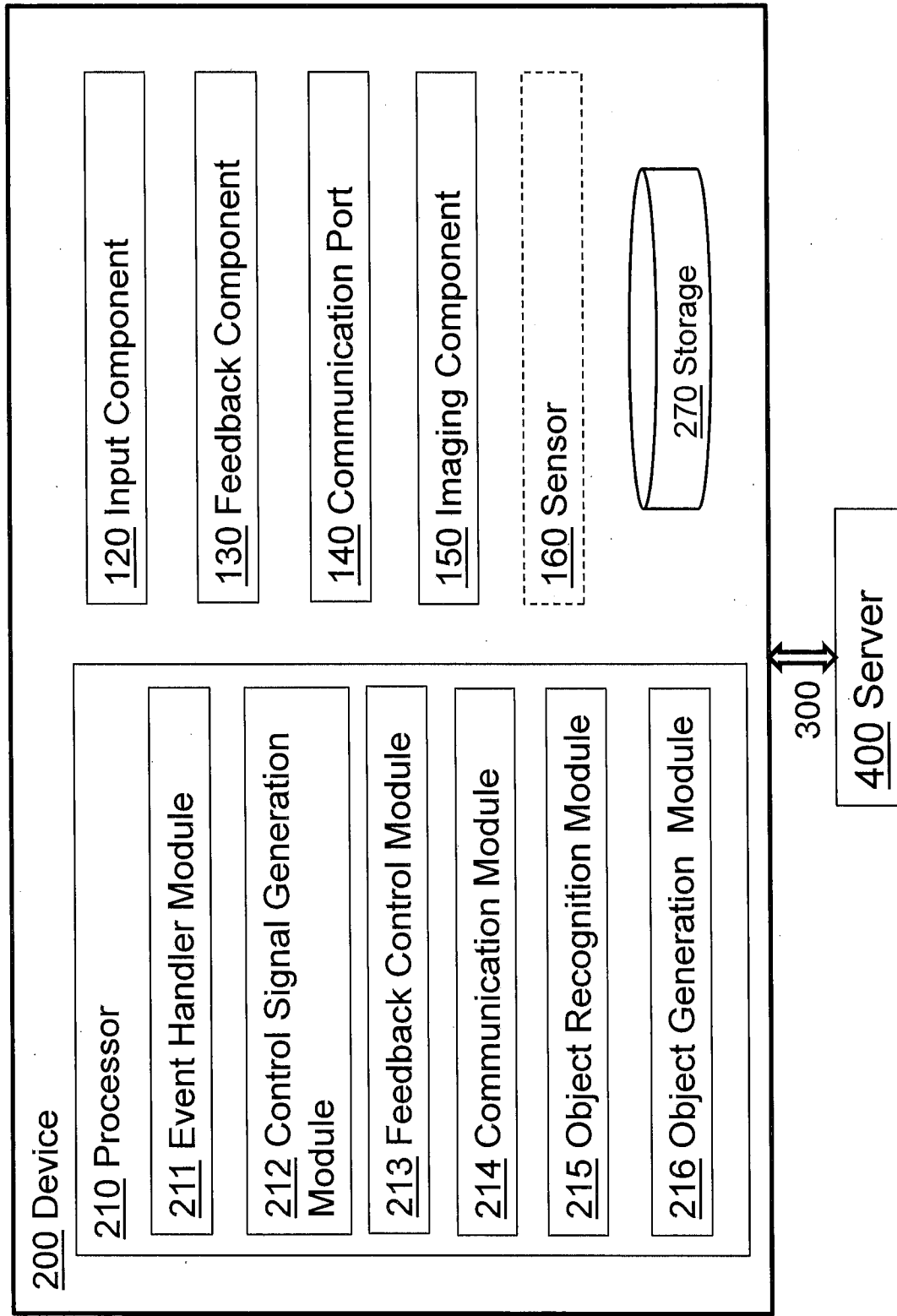


FIG. 3

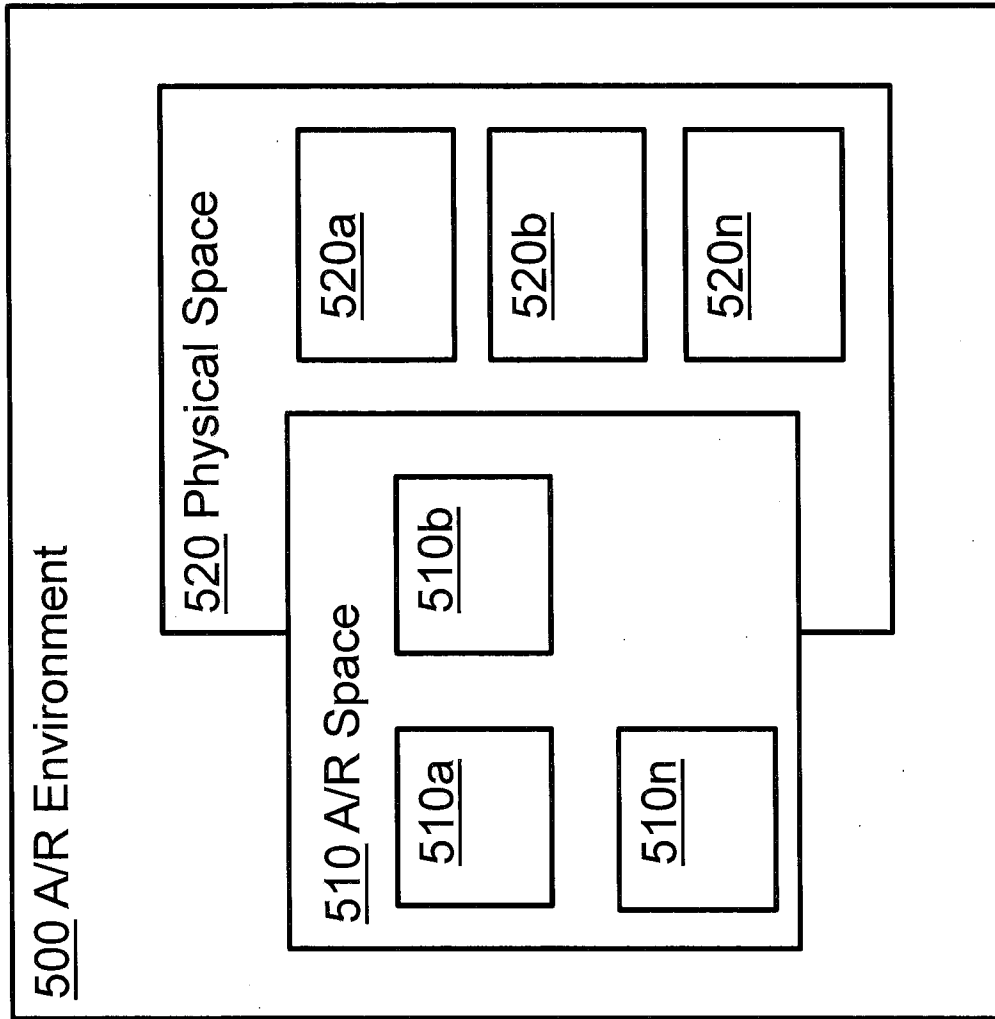


FIG. 4

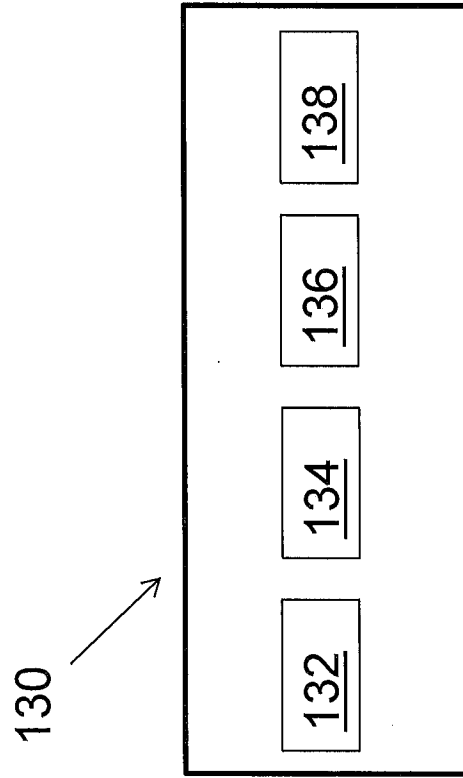


FIG. 5

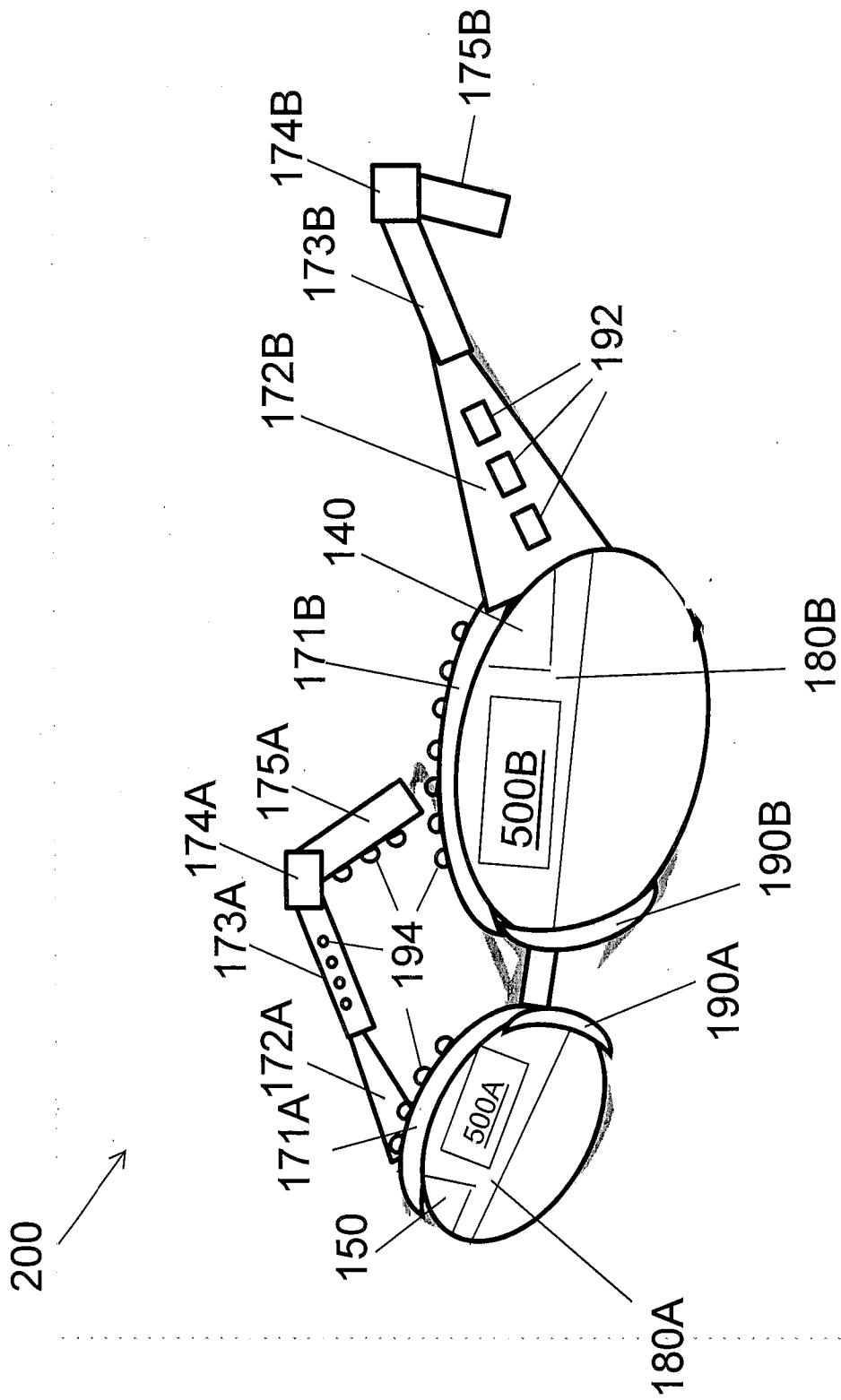
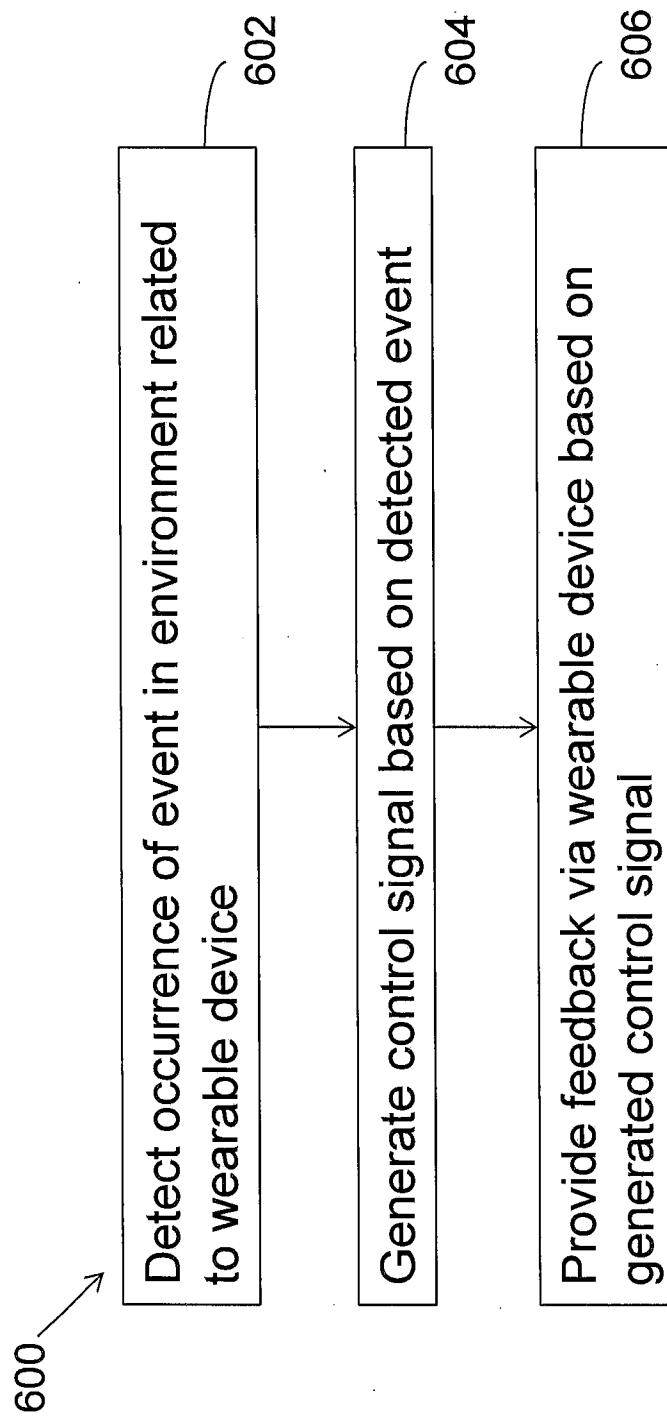


FIG. 6



Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		
First Named Inventor/Applicant Name:		Allan VISITACION		
Filer:		Emily T. Bell/Margaret Barham		
Attorney Docket Number:		043508-0439886		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility application filing	1011	1	280	280
Utility Search Fee	1111	1	600	600
Utility Examination Fee	1311	1	720	720
Pages:				
Claims:				
Claims in Excess of 20	1202	9	80	720
Independent claims in excess of 3	1201	1	420	420
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2740

Electronic Acknowledgement Receipt

EFS ID:	23020672
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	93383
Filer:	Emily T. Bell/Margaret Barham
Filer Authorized By:	Emily T. Bell
Attorney Docket Number:	043508-0439886
Receipt Date:	24-JUL-2015
Filing Date:	
Time Stamp:	17:00:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 2740
RAM confirmation Number	3726
Deposit Account	033975
Authorized User	BELL, EMILY T.

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	ADS.pdf	1820032	no	10
			c753fd9025b3a477048de3aa3a74d078fb5d97a2		

Warnings:

Information:

2		Filing.pdf	3858683	yes	64
			d692e069c669802a1a57b5102714acb2bb5d3e7c		

Multipart Description/PDF files in .zip description

	Document Description	Start	End
	Transmittal of New Application	1	1
	Transmittal Letter	2	2
	Information Disclosure Statement (IDS) Form (SB08)	3	3
	Oath or Declaration filed	4	13
	Specification	14	51
	Claims	52	57
	Abstract	58	58
	Drawings-only black and white line drawings	59	64

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3	Fee Worksheet (SB06)	fee-info.pdf	38387	no	2
			9515589930f95c950e675b06e71e83301fa72da9		

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Total Files Size (in bytes):			5717102
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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.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		
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						
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	Allan		VISITACION			
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Address 2						
City	Fremont	State/Province	CA			
Postal Code	94538	Country i	US			
Inventor 2					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Trevor		JONES			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
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Address 1		16151 Redwood Lodge Rd				
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City	Los Gatos	State/Province	CA			
Postal Code	95033	Country i	US			
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Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Daniel	Gregory	PARKER			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		043508-0439886	
		Application Number			
Title of Invention		SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE			

City	San Francisco	State/Province	CA	Country of Residence i	US
-------------	---------------	-----------------------	----	-------------------------------	----

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	Kohei			IMOTO	
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Postal Code	95051		Country i	US	
Remove					
Inventor 5					
Legal Name					
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	Keith			REED	
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Address 1	3239 Pumpherstons Way				
Address 2					
City	San Jose		State/Province	CA	
Postal Code	95148		Country i	US	
Remove					
Inventor 6					
Legal Name					
Prefix	Given Name	Middle Name		Family Name	Suffix
	Jesica	E.		FERRO	
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Redwood City	State/Province	CA	Country of Residence i	US

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

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Inventor 7[Remove](#)**Legal Name**

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	Aaron		KAPELUS	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				

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------	----------	------------------------	----

Mailing Address of Inventor:

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Postal Code	H2V 1Z7	Country i	CA

Inventor 8[Remove](#)**Legal Name**

Prefix	Given Name	Middle Name	Family Name	Suffix
	Neil		OLIEN	
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City	Montreal	Country of Residence i	CA
------	----------	------------------------	----

Mailing Address of Inventor:

Address 1	4455 Madison Ave		
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Postal Code	H4B 2V3	Country i	CA

Inventor 9[Remove](#)**Legal Name**

Prefix	Given Name	Middle Name	Family Name	Suffix
	Danny	A.	GRANT	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

City	Laval	Country of Residence ⁱ	CA
------	-------	-----------------------------------	----

Mailing Address of Inventor:

Address 1	1784 de Lunebourg		
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Postal Code	H7M 2A1	Country ⁱ	CA

Inventor 10

Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Robert		LACROIX	

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	San Jose	State/Province	CA	Country of Residence ⁱ	US
------	----------	----------------	----	-----------------------------------	----

Mailing Address of Inventor:

Address 1	1766 Comstock Lane		
Address 2			
City	San Jose	State/Province	CA
Postal Code	95124	Country ⁱ	US

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

Add

Correspondence Information: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	93383		
Email Address	docket_ip@pillsburylaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		
Attorney Docket Number	043508-0439886	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	

Filing By Reference :

Meta Platforms Exhibit 1007

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

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.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	93383		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(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.

When referring to the current application, please leave the application number blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	13/841551	2013-03-15
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

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. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(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).

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

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

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. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

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.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
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. ☒			
Organization Name	IMMERSION CORPORATION		
Mailing Address Information For Applicant:			
Address 1	50 Rio Robles		
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City	San Jose	State/Province	CA
Country ⁱ	US	Postal Code	95134
Phone Number		Fax Number	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			Add

Assignee Information including Non-Applicant Assignee Information:

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Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
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Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.				
Signature	/Emily T. Bell/		Date (YYYY-MM-DD)	2015-07-24
First Name	Emily T.	Last Name	Bell	Registration Number
				47418
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	043508-0439886
		Application Number	
Title of Invention	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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 records.
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.

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:

93383

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:

93383

OR

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

Assignee Name and Address: IMMERSION CORPORATION
50 Rio Robles
San Jose, CA 95134

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	June 10, 2015
Name	Catherine C. Maresh	Telephone	
Title	Senior IP Counsel, IMMERSION CORPORATION		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain 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:	23045276
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	93383
Filer:	Emily T. Bell/Margaret Barham
Filer Authorized By:	Emily T. Bell
Attorney Docket Number:	043508-0439886
Receipt Date:	28-JUL-2015
Filing Date:	
Time Stamp:	14:43:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Filing.pdf	191428 de544b160d162cae00e770429b526961ea790a0f	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Assignee showing of ownership per 37 CFR 3.73	1	2
	Power of Attorney	3	3
Warnings:			
Information:			
Total Files Size (in bytes):		191428	
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.			

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: IMMERSION CORPORATION

Application No./Patent No.: 14/808,740 Filed/Issue Date: July 24, 2015

Titled: SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE

IMMERSION CORPORATION, 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 036173, Frame 0654, 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 Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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 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, 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.

STATEMENT UNDER 37 CFR 3.73(c)

3. 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.

4. 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.

5. 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.

6. 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.

☐ 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.

Signature

Emily T. Bell

Printed or Typed Name

July 28, 2015

Date

47,418

Title or Registration Number

[Page 2 of 2]



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	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
14/808,740	07/24/2015	3735	2740	043508-0439886	29	4

CONFIRMATION NO. 4726

93383

Pillsbury Winthrop Shaw Pittman LLP (Immersion)
P.O. Box 10500
McLean, VA 22102

FILING RECEIPT



Date Mailed: 08/10/2015

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)

Allan VISITACION, Fremont, CA;
Trevor JONES, Los Gatos, CA;
Daniel Gregory PARKER, San Francisco, CA;
Kohei IMOTO, Santa Clara, CA;
Keith REED, San Jose, CA;
Jessica E. FERRO, Redwood City, CA;
Aaron KAPELUS, Montreal, CANADA;
Neil OLIEN, Montreal, CANADA;
Danny A. GRANT, Laval, CANADA;
Robert LACROIX, San Jose, CA;

Applicant(s)

IMMERSION CORPORATION, San Jose, CA;

Power of Attorney: The patent practitioners associated with Customer Number 93383

Domestic Priority data as claimed by applicant

This application is a CON of 13/841,551 03/15/2013 PAT 9092954

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: 08/07/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/808,740**

Projected Publication Date: 11/19/2015

Non-Publication Request: No

Early Publication Request: No

Title

SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE

Preliminary Class

600

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.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 14/808,740				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	600			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720			
TOTAL CLAIMS (37 CFR 1.16(j))	29 minus 20 =	*				x 80 =	720			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	*				x 420 =	420			
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		TOTAL	2740			
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =			x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =			x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE			TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =			x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =			x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE			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.										



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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
14/808,740	07/24/2015	Allan VISITACION	043508-0439886

CONFIRMATION NO. 4726

PUBLICATION NOTICE



OC00000078748818

93383
Pillsbury Winthrop Shaw Pittman LLP (Immersion)
P.O. Box 10500
McLean, VA 22102

Title:SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE

Publication No.US-2015-0332566-A1

Publication Date:11/19/2015

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.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

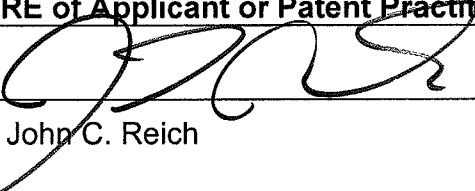
Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	14/808,740
Filing Date	07/24/2015
First Named Inventor	Allan Visitacion
Title	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
Art Unit	3735
Examiner Name	
Attorney Docket Number	04887.0007USC1/IMM413C1

SIGNATURE of Applicant or Patent Practitioner

Signature		Date (Optional)	1/28/16
Name	John C. Reich	Registration Number	37703
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.

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.

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

(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:

23552

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: 23552

OR

Firm or Individual Name				
Address				
City	State	Zip		
Country				
Telephone	Email			

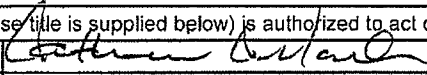
I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

IMMERSION CORPORATION

- ☐ 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	Catherine C. Maresh, Registration Number 35,268		
Title	Senior IP Counsel		

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.

POWER OF ATTORNEY BY APPLICANT

No more than ten (10) patent practitioners total may be appointed as set forth below by name and registration number. This page need not be submitted if appointing the Patent Practitioner(s) associated with a Customer Number (see form PTO/AIA/82B):

Name	Registration Number
Catherine C. Maresh	35268
Thomas A. Hassing	36159
Jeffrey C. Leng	68247

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 records.
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.

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.

STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Immersion CorporationApplication No./Patent No.: 14/808,740 Filed/Issue Date: 07/24/2015Titled: SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE_____, 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 036173, Frame 0654, 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
Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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 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, 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.

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.

STATEMENT UNDER 37 CFR 3.73(c)

3. 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.

4. 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.

5. 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.

6. 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.

☐ 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.

Signature

John C. Reich

Printed or Typed Name

Date

37703

Title or Registration Number

[Page 2 of 2]

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.

Electronic Acknowledgement Receipt

EFS ID:	24757592
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	93383
Filer:	John Christopher Reich/Leah Schwenke
Filer Authorized By:	John Christopher Reich
Attorney Docket Number:	043508-0439886
Receipt Date:	28-JAN-2016
Filing Date:	24-JUL-2015
Time Stamp:	17:44:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	2016-01-28_POA.PDF	283642 001bbe9ff58342ee87225459962d79537b30591d	no	4

Warnings:

Information:

2	Assignee showing of ownership per 37 CFR 3.73	2016-01-28_373cStatement. PDF	193284 058796fa8bdfbb68f3826bcc098ae6feb3df1f	no	3
Warnings:					
Information:					
Total Files Size (in bytes):				476926	
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C1

CONFIRMATION NO. 4726

POA ACCEPTANCE LETTER

23552
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903



Date Mailed: 02/09/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/28/2016.

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.

/fstephanos/



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
14/808,740	07/24/2015	Allan VISITACION	043508-0439886

CONFIRMATION NO. 4726

POWER OF ATTORNEY NOTICE

93383
Pillsbury Winthrop Shaw Pittman LLP (Immersion)
P.O. Box 10500
McLean, VA 22102



Date Mailed: 02/09/2016

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/28/2016.

- 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.

/fstephanos/



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.
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C1	4726
23552	7590	11/02/2016		
MERCHANT & GOULD P.C. P.O. BOX 2903 MINNEAPOLIS, MN 55402-0903			EXAMINER NGUYEN, PHUNG	
			ART UNIT	PAPER NUMBER
			2685	
			NOTIFICATION DATE	DELIVERY MODE
			11/02/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USPTO23552@merchantgould.com

Office Action Summary	Application No. 14/808,740	Applicant(s) VISITACION ET AL.	
	Examiner PHUNG NGUYEN	Art Unit 2685	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07/24/2015.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ 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.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-29 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-29 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, 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.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) ☒ Notice of References Cited (PTO-892) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____. | 4) ☐ Other: ____. |

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Specification

2. Applicant is requested to update the status of U.S. Patent Application No. 13/841,551, filed March 15, 2013 indicated in the instant application.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-29 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2, 7-10, 20, 26, and 27 of U.S. Patent No. 9092954 in view of Haddick et al. US. 2012/0242698.

Claims 1, 2, 7-10, 20, 26, and 27 of '954 patent claim all the limitations of the current application except the second device remote from and in communication with the wearable device. However, Haddick et al. disclose see-through near-eye display glasses with a multi-segment processor-controlled optical layer including the second device remote from and in

communication with the wearable device in the form of the eyepiece of the second user (paragraph 0365, lines 21-23). Since they both teach a system with wearable device and haptic output device, it would have been obvious to the skilled artisan to employ the teaching of Haddick et al. in the system of Visitacion et al. in order to extend the use of the device.

Claim Rejections - 35 USC § 102

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-29 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Haddick et al. (US 2012/0242698).

Regarding claim 1: Haddick et al. disclose see-through near-eye display glasses with a multi-segment processor-controlled optical layer comprising a wearable device; a second device remote from and in communication with the wearable device (paragraph 0365, lines 21-23); a

processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device; and a haptic output device configured to provide haptic feedback based on the generated control signal (paragraph 0231, 0370, and 0422).

Regarding claim 2: Haddick et al. disclose wherein the second device is a second wearable device (paragraph 0365, lines 22-23).

Regarding claim 3: Haddick et al. disclose wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, **or an indication that the wearable device or the second device recognizes an object in the environment** (paragraph 0422, lines 13-15).

Regarding claim 4: Haddick et al. disclose wherein the wearable device comprises the haptic output device (paragraph 0370).

Regarding claim 5: Haddick et al. disclose wherein the second device comprises the haptic output device (paragraph 0370).

Regarding claim 6: Haddick et al. disclose a sensor configured to sense one or more environmental conditions related to the wearable device or the second device, wherein the event comprises the one or more environmental conditions sensed by the sensor (paragraph 0007, lines 1-15).

Regarding claim 7: Haddick et al. disclose a communication port configured to establish a wireless or wired communication channel between the wearable device and the second device, wherein the processor is configured to receive a signal representative of an event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal (fig. 29, paragraph 0364).

Regarding claim 8: Haddick et al. disclose wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information (paragraph 0364, lines 1-6).

Regarding claim 9: Haddick et al. disclose wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device (paragraph 0365).

Regarding claim 10: Haddick et al. disclose a processor configured to generate the augmented reality space coincident with the physical space, recognize at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space (paragraph 0007, and 0481), and determine an event associated with the augmented reality environment, and generate a control signal based on the determined event; a wearable device remote from and in communication with the augmented reality device (paragraph 0007, and 0422); a third device (the eyepiece of the second user, para. 0365, lines 21-23) remote from and in communication with the wearable device and the augmented reality device (paragraph 0365); and a haptic output device configured to provide haptic feedback based on the generated control signal (paragraph 0370).

Regarding claim 11: Haddick et al. disclose wherein the third device is a second wearable device (paragraph 0365, lines 22-23).

Regarding claim 12: Haddick et al. disclose wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented (paragraph 0387 and 0487).

Regarding claim 13: Haddick et al. disclose wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device (paragraph 0422).

Regarding claim 14: Haddick et al. disclose wherein the augmented reality device comprises the haptic output device (paragraph 0370).

Regarding claim 15: Haddick et al. disclose wherein the wearable device comprises the haptic output device (paragraph 0370).

Regarding claim 16: Haddick et al. disclose wherein the third device comprises the haptic output device (paragraph 0365, lines 21-23).

Regarding claim 17: All the claimed subject matter is already discussed in respect to claim 1 above.

Regarding claim 18: Refer to claim 2 above.

Regarding claim 19: Refer to claim 3 above.

Regarding claim 20: Refer to claim 4 above.

Regarding claim 21: Refer to claim 5 above.

Regarding claim 22: Refer to claim 6 above.

Regarding claim 23: Refer to claim 7 above.

Regarding claim 24: Refer to claim 8 above.

Regarding claim 25: Refer to claim 9 above.

Regarding claim 26: All the claimed subject matter is already discussed in respect to claim 10 above.

Regarding claim 27: Refer to claim 11 above.

Regarding claim 28: Refer to claim 12 above.

Regarding claim 29: Refer to claim 13 above.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phung Nguyen whose telephone number is 571-272-2968. The examiner can normally be reached on Monday to Friday from 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hai Phan, can be reached on 571-272-6338. The fax phone number for this Group is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is 571-272-2600.

Application/Control Number: 14/808,740
Art Unit: 2685

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/PHUNG NGUYEN/

Primary Examiner, Art Unit 2685

Date: October 26, 2016

Notice of References Cited	Application/Control No. 14/808,740		Applicant(s)/Patent Under Reexamination VISITACION ET AL.	
	Examiner PHUNG NGUYEN		Art Unit 2685	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2012/0242698 A1	09-2012	Haddick; John D.	G02B27/0093	345/633
*	B	US-2013/0314303 A1	11-2013	Osterhout; Ralph F.	G06F3/005	345/8
*	C	US-7,584,158 B2	09-2009	Iwaki; Hidekazu	G06F3/011	706/45
*	D	US-2010/0007474 A1	01-2010	BEHM; GARY W.	A61H3/061	340/407.1
*	E	US-2013/0342570 A1	12-2013	Kinnebrew; Peter Tobias	G09G3/003	345/633
*	F	US-2015/0268721 A1	09-2015	JOO; Ga-hyun	G02B27/0093	345/156
*	G	US-9,215,293 B2	12-2015	Miller; Samuel A.	H04L67/38	1/1
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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	P					
	Q					
	R					
	S					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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BIB DATA SHEET

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SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/808,740	07/24/2015	340	2685 04887.0007USC1/IMM413C1	
RULE				

APPLICANTS IMMERSION CORPORATION, San Jose, CA;						
INVENTORS Allan VISITACION, Fremont, CA; Trevor JONES, Los Gatos, CA; Daniel Gregory PARKER, San Francisco, CA; Kohei IMOTO, Santa Clara, CA; Keith REED, San Jose, CA; Jessica E. FERRO, Redwood City, CA; Aaron KAPELUS, Montreal, CANADA; Neil OLIEN, Montreal, CANADA; Danny A. GRANT, Laval, CANADA; Robert LACROIX, San Jose, CA;						
** CONTINUING DATA ***** This application is a CON of 13/841,551 03/15/2013 PAT 9092954						PTN
** FOREIGN APPLICATIONS *****						PTN
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 08/07/2015						

Foreign Priority claimed	☐ Yes ☒ No	☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 6	TOTAL CLAIMS 29	INDEPENDENT CLAIMS 4
35 USC 119(a-d) conditions met	☐ Yes ☒ No					
Verified and Acknowledged	/PHUNG NGUYEN/ Examiner's Signature					

ADDRESS	
MERCHANT & GOULD P.C. P.O. BOX 2903 MINNEAPOLIS, MN 55402-0903 UNITED STATES	

TITLE	
SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE	

FILING FEE RECEIVED 2740	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

<i>Index of Claims</i> 	Application/Control No. 14808740	Applicant(s)/Patent Under Reexamination VISITACION ET AL.
	Examiner PHUNG NGUYEN	Art Unit 2685

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant		☐ CPA		☐ T.D.		☐ R.1.47			
CLAIM		DATE							
Final	Original	10/26/2016							
	1	✓							
	2	✓							
	3	✓							
	4	✓							
	5	✓							
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Inventor(s): Allan VISITACION et al.

Appln. No.: ~~Now~~ 14/808,740

Filing Date: July 24, 2015

2685

Date: July 24, 2015

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of

1

Examiner: ~~Unassigned~~Group Art Unit: ~~Unassigned~~

U.S. PATENT DOCUMENTS

Phung Nguyen

Examiner's Initials*	Document Number	Date MM/YYYY	Name (Family Name of First Inventor)	Class	Sub Class	Filing Date (if appropriate)
	AR 2012/0242698	09/2012	HADDICK et al.			
	BR 2013/0314303	11/2013	OSTERHOUT et al.			
	CR 7,584,158	09/2009	IWAKI et al.			
	DR 2010/0007474	01/2010	BEHM et al.			
	ER 2013/0342570	12/2013	KINNEBREW et al.			
	FR 2010/0079356	04/2010	HOELLWARTH			
	GR					
	HR					
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	JR					
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	NR					
	OR					
	PR					

FOREIGN PATENT DOCUMENTS

FOREIGN PATENT DOCUMENTS						Abstract		Readily Available	
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	RR								
	SR								
	TR								
	UR								

OTHER (Including in this order Author, Title, Periodical Name, Date, Pertinent Pages, etc.)

	VR				
	WR				
	XR				
	YR				

Examiner

/Phung Nguyen/

Date Considered:

10/26/2016

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

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	"20140266647"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/19 17:35
S2	10	"20100079356"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/20 19:33
S3	13777	((monitor\$4 or sens\$3 or detect\$3) near3 (environment)) and (haptic or vibration)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/20 19:41
S4	544	(wearable near2 device) and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/20 19:42
S5	282	S4 and (eyewear or \$3glass)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/20 19:43
S6	67	(physical near2 object) and S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/20 19:45
S7	871	(immersion near2 corporation).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/20 20:03
S8	1217	(haptic near2 device).ti.	US-PGPUB;	OR	OFF	2014/11/20

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S12	302	((monitor\$4 or sens\$3 or detect\$3) near3 environment) and (haptic or vibration) and (virtual near2 space)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/21 19:43
S13	24	(proximity near2 object) and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/21 19:43
S14	49	((monitor\$4 or sens\$3 or detect\$3) near3 environment)) and (haptic or vibration) and (blind near3 person)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/22 11:31
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S19	377	((monitor\$4 or sens\$3 or detect\$3) near3 (environment)) and (haptic or vibration) and (augmented near2 reality)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/24 16:34
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S23	51	S19 and S21	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/24 16:38
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S27	14443	(haptic or vibration) near2 feedback	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/24 18:56
S28	2417	((haptic or vibration) near2 feedback) and eye\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/11/24 18:57
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S51	1	S26 and S48	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2014/11/24 19:16

			DERWENT; IBM_TDB			
S52	67	((monitor\$4 or sens\$3 or detect\$3) near3 (environment)) and (haptic or vibration) and (second near2 haptic)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/03/13 16:30
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S54	4	((("20140267076") or ("20110163946")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/03/23 11:23
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S56	2	"20150332566"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/10/25 10:03
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S59	14	((("20120242698") or ("20130314303") or ("7584158") or ("20100007474") or ("20130342570") or ("20100079356")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/10/26 10:19

Search Notes 	Application/Control No. 14808740	Applicant(s)/Patent Under Reexamination VISITACION ET AL.
	Examiner PHUNG NGUYEN	Art Unit 2685

CPC- SEARCHED		
Symbol	Date	Examiner
G06F3/016, G06F3/011, G06T1/00, G06T19/006, G02B27/017, G02B25/001	10/26/2016	PTN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
340	407.1,539.13,539.2,566,665,691.1	10/26/2016	PTN
345	633,7	10/26/2016	PTN

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

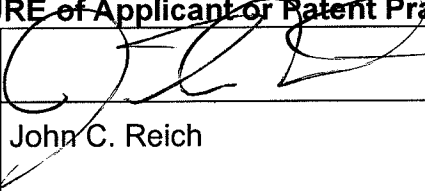
--	--

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	14/808,740
Filing Date	2015-07-24
First Named Inventor	Allan Visitacion
Title	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
Art Unit	2685
Examiner Name	Nguyen, Phung
Attorney Docket Number	04887.0007USC1/IMM413C

SIGNATURE of Applicant or Patent Practitioner

Signature		Date (Optional)	2016-11-02
Name	John C. Reich	Registration Number	37703
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.

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.

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

(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:

142056

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			

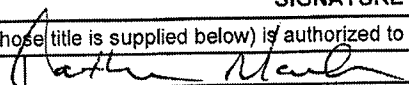
I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

IMMERSION CORPORATION

- ☐ 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	Catherine C. Maresh, Registration Number 35,268		
Title	Senior IP Director		

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.

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POWER OF ATTORNEY BY APPLICANT

No more than ten (10) patent practitioners total may be appointed as set forth below by name and registration number. This page need not be submitted if appointing the Patent Practitioner(s) associated with a Customer Number (see form PTO/AIA/82B):

Name	Registration Number
Catherine C. Maresh	35268
Thomas A. Hassing	36159
Eric Lin	67630

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 records.
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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CHANGE OF CORRESPONDENCE ADDRESS *Application*

Address to:
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	14808740
Filing Date	2015-07-24
First Named Inventor	Allan Visitacion
Art Unit	2685
Examiner Name	Nguyen, Phung
Attorney Docket Number	04887.0007USC1/IMM413C1

Please change the Correspondence Address for the above-identified patent application to:

☒ The address associated with
Customer Number:

142056

OR

☐ Firm or
Individual Name

Address

City

State

Zip

Country

Telephone

Email

This form cannot be used to change the data associated with a Customer Number. To change the data associated with an existing Customer Number use "Request for Customer Number Data Change" (PTO/SB/124).

I am the:

☐

Applicant

☒
Attorney or agent of record. Registration Number 37703
☐

Registered practitioner named in the application transmittal papers who acts in a representative capacity under 37 CFR 1.34. See 37 CFR 1.33(a)(1). Registration Number _____

Signature

Typed or Printed
Name

John C. Reich

Date 2016-11-02

Telephone 612-336-4608

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.
Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 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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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.
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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:	27400484
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	23552
Filer:	John Christopher Reich/Leah Schwenke
Filer Authorized By:	John Christopher Reich
Attorney Docket Number:	04887.0007USC1/IMM413C
Receipt Date:	02-NOV-2016
Filing Date:	24-JUL-2015
Time Stamp:	16:31:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	2016-11-02_POA_04887-0007USC1-IMM413C.PDF	311067 972fcdc1673b5bdee764ba8704bdc611eccd7b0ff	no	4

Warnings:

Information:					
2	Change of Address	2016-11-02_ChangeofCorr_048 87-0007USC1-IMM413C1.PDF	139282 273eb91ee3749cde90293f125a752db9395cf9d	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			450349		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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 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
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C

CONFIRMATION NO. 4726

POWER OF ATTORNEY NOTICE

23552
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903



Date Mailed: 11/10/2016

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/02/2016.

- 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.

/dtdinh/



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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
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C

CONFIRMATION NO. 4726

POA ACCEPTANCE LETTER

142056
M&G Immersion
PO Box 2903
Minneapolis, MN 55402



Date Mailed: 11/10/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/02/2016.

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.

/dtdinh/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		14808740
	Filing Date		2015-07-24
	First Named Inventor	Visitacion et al.	
	Art Unit	2685	
	Examiner Name	Nguyen, Phong	
	Attorney Docket Number	04887.0007USC1	

U.S.PATENTS						
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					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS						
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.

FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	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	2487672	GB	A	2012-01-08	The University of Sheffield		☐
	2	2011/119233	WO	A1	2011-09-29	Taghavi, Reza		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS								
---------------------------------	--	--	--	--	--	--	--	--

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14808740
	Filing Date	2015-07-24
	First Named Inventor	Visitacion et al.
	Art Unit	2685
	Examiner Name	Nguyen, Phung
	Attorney Docket Number	04887.0007USC1

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 European Search Report for Application No. 14159943.1 mailed December 20, 2016	☐

If you wish to add additional non-patent literature document citation information please click the Add button

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	14808740
Filing Date	2015-07-24
First Named Inventor	Visitacion et al.
Art Unit	2685
Examiner Name	Nguyen, Phung
Attorney Docket Number	04887.0007USC1

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).

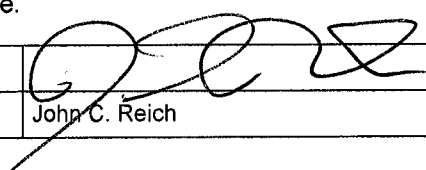
OR

☒ 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		Date (YYYY-MM-DD)	2017-03-02
Name/Print	John C. Reich	Registration Number	37,703

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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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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A61H 3/06 (2006.01)

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(54) Title of the Invention: **Active sensory augmentation device**
Abstract Title: **Active sensory augmentation device**

(57) A sensory array detects objects in an environment surrounding the user, such as a fireman or blind person, when the device is being worn, a tactile display to physically engage the user's body and to provide salient information about said environment. An algorithm controls one or both of the sensory array and tactile display so that the presentation of an object is adapted to circumstances other than the physical parameter of the object's proximity to the user. The output can therefore be tuned to provide salient feedback, based on the rate of change of position of the object with respect to the user, the physical attributes of the object, the time since first detection of the object by the electromagnetic or sonic sensory array; and/or the current situation or objectives of the user. This ensures that the user does not get too many distracting tactile responses for the user to understand their environment from vibrotactile stimulation of the skin.

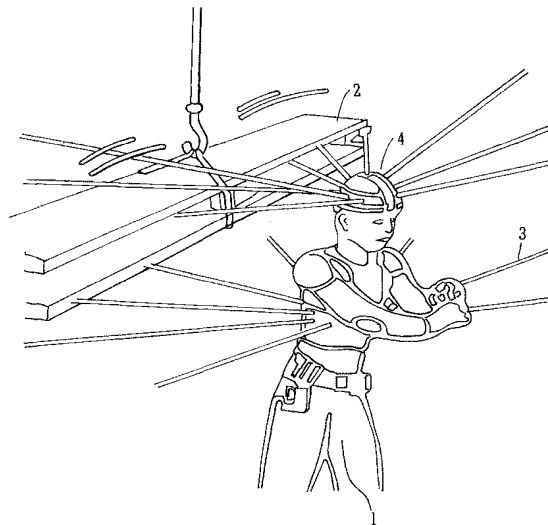


FIG. 1

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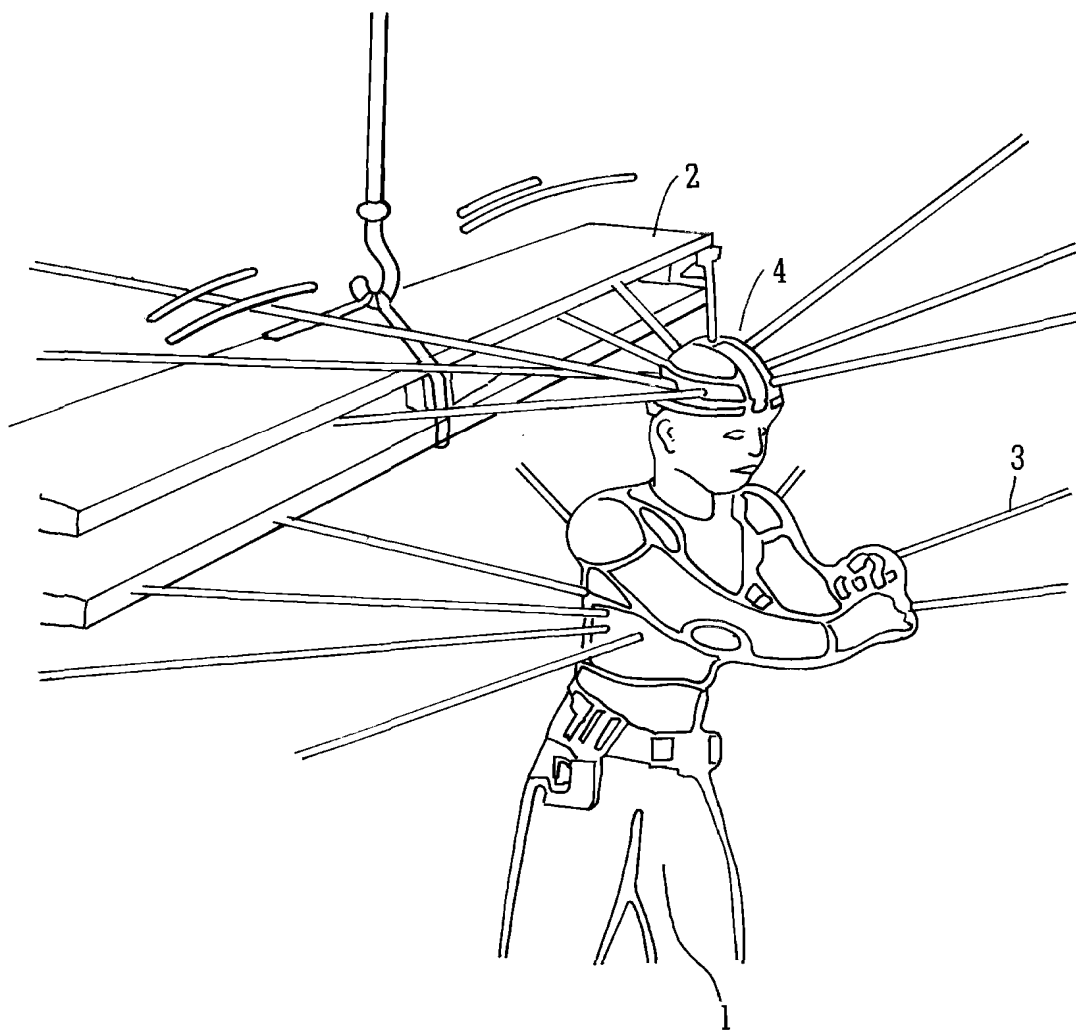


FIG. 1

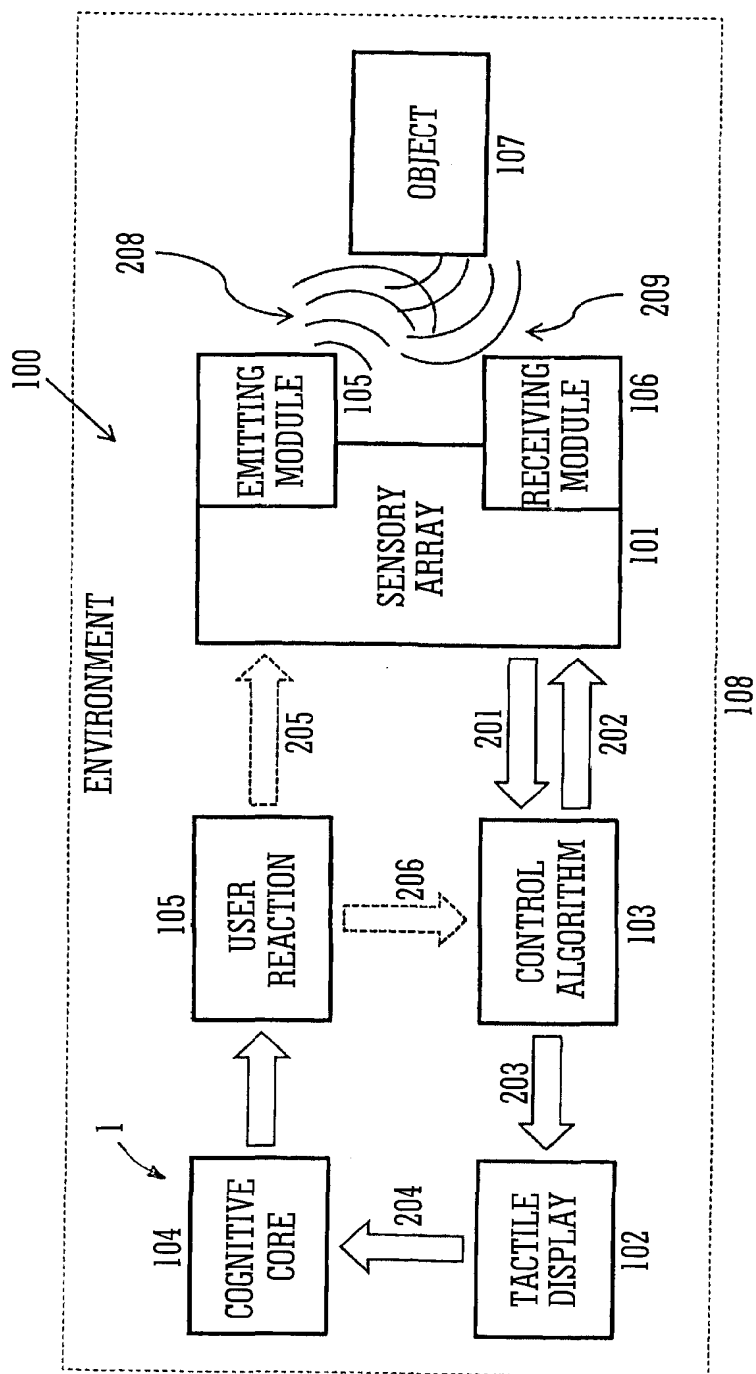


FIG. 2

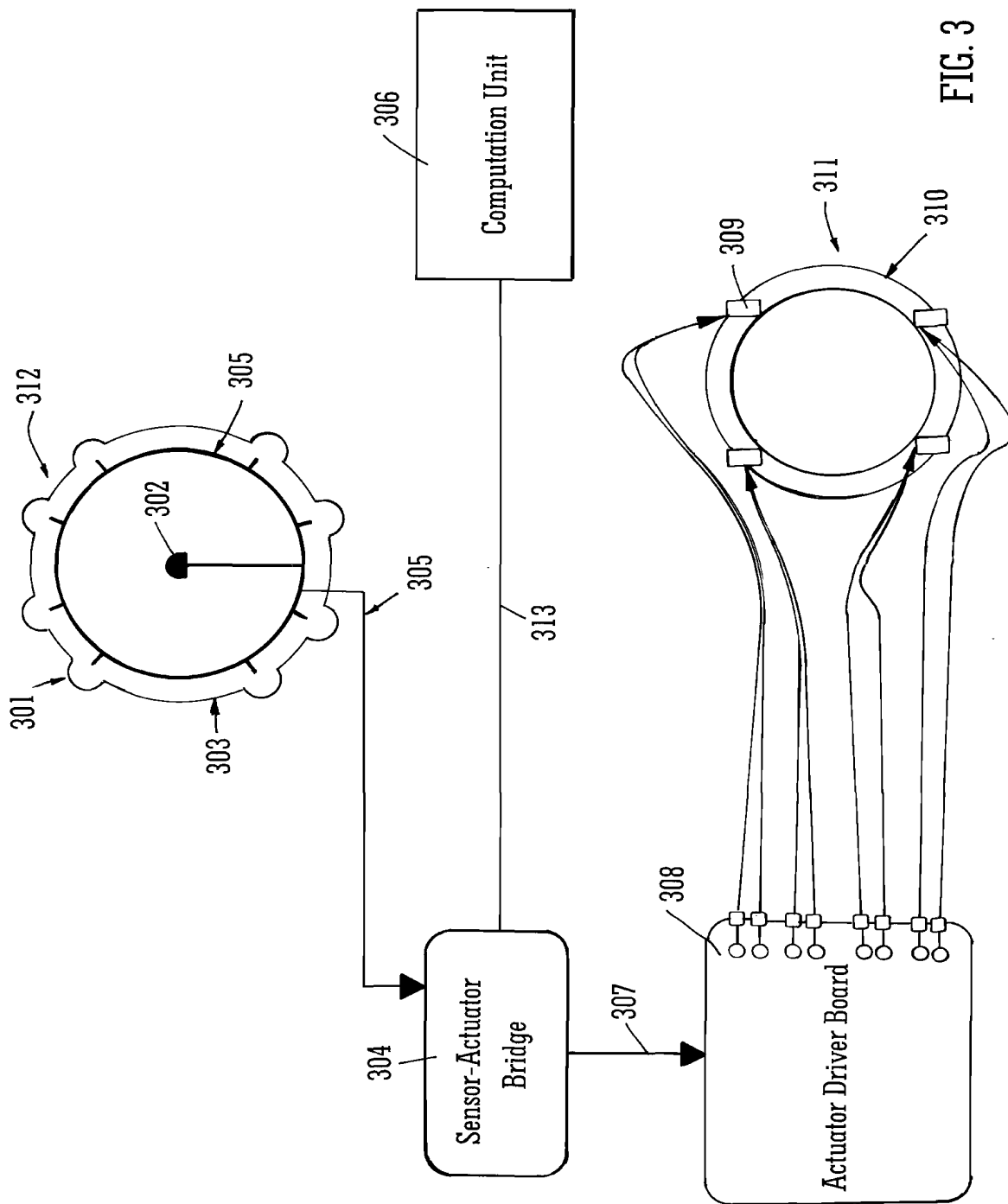


FIG. 3

4/8

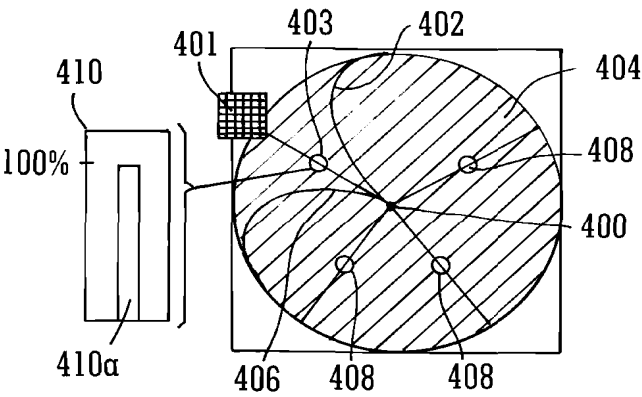


FIG. 4a

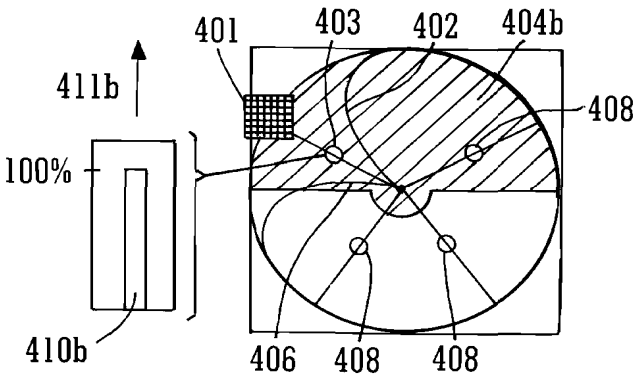


FIG. 4b

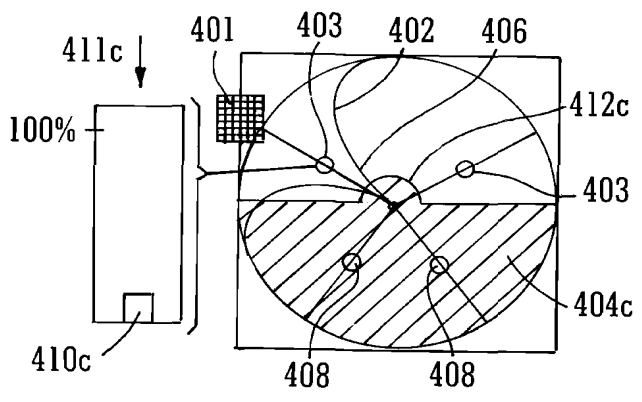


FIG. 4c

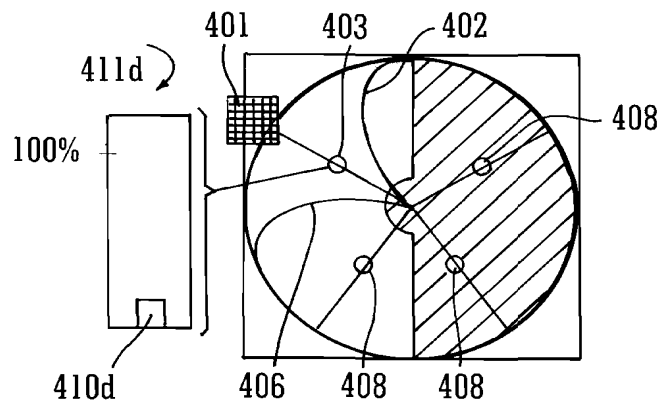


FIG. 4d

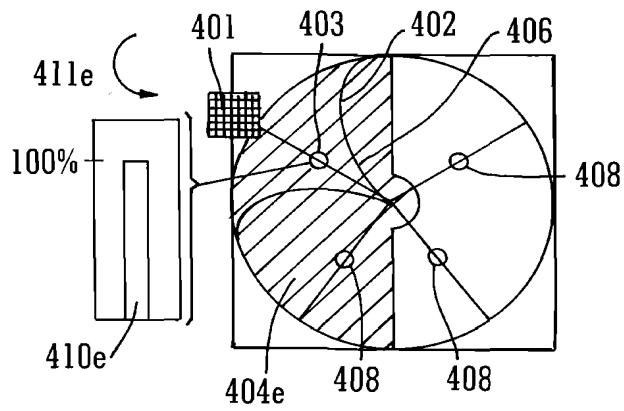


FIG. 4e

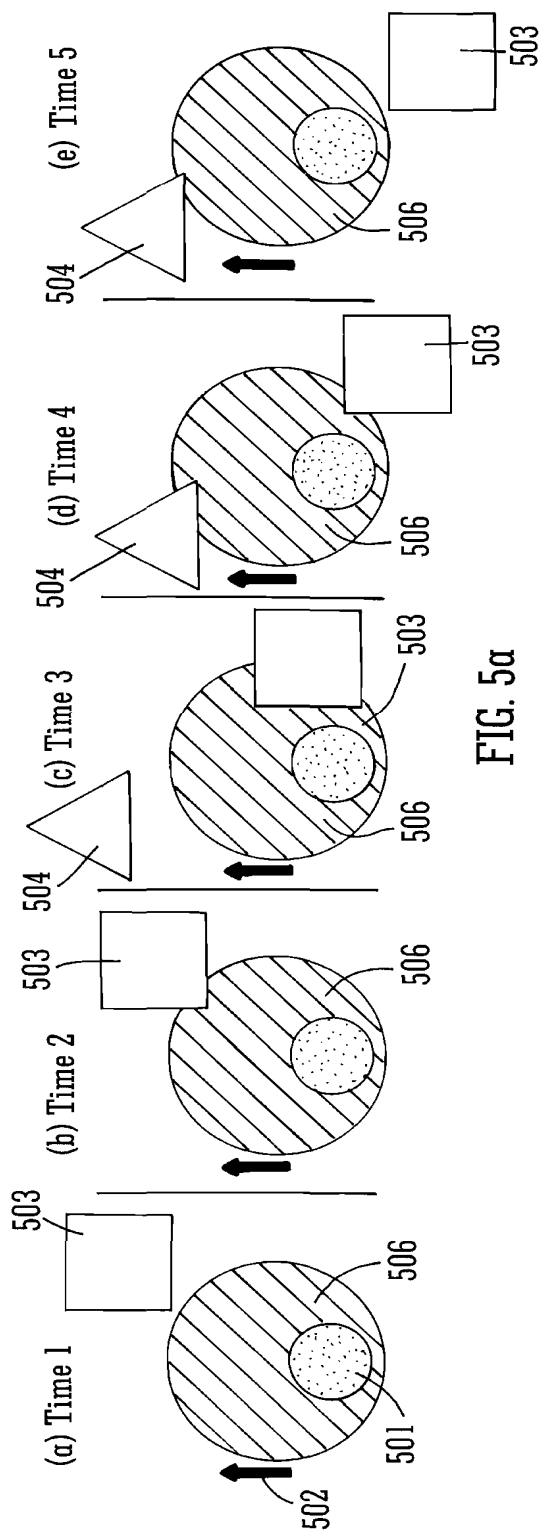


FIG. 5a

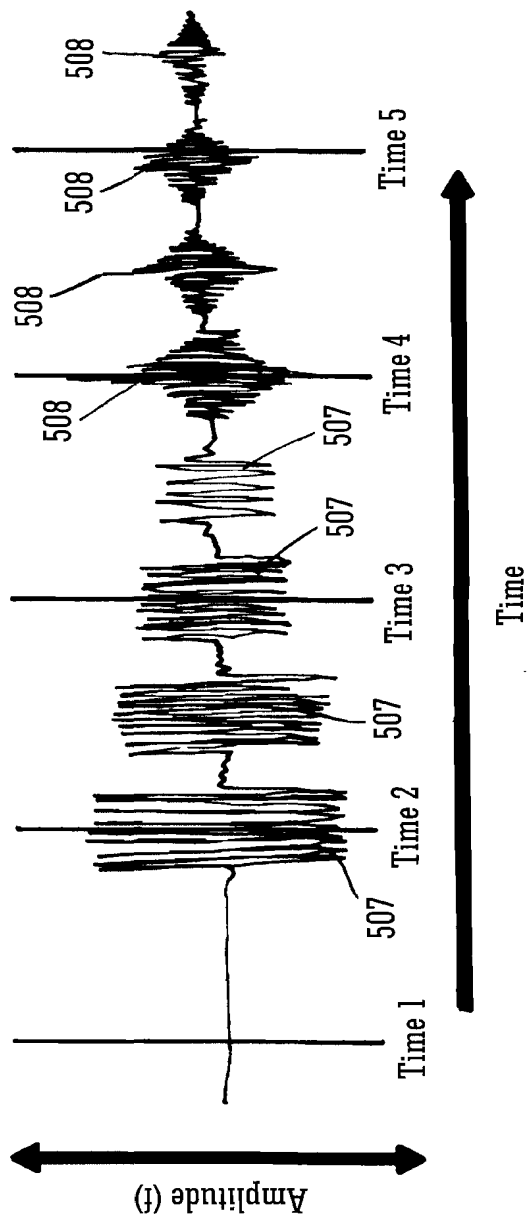


FIG. 5b

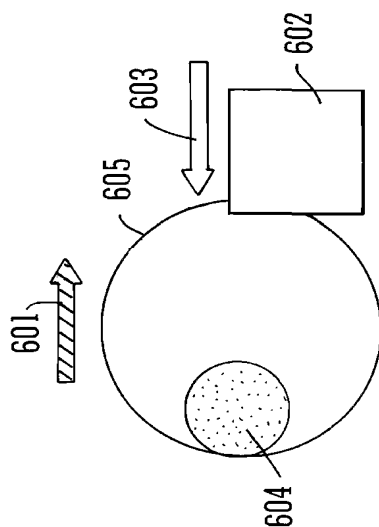


FIG. 6a

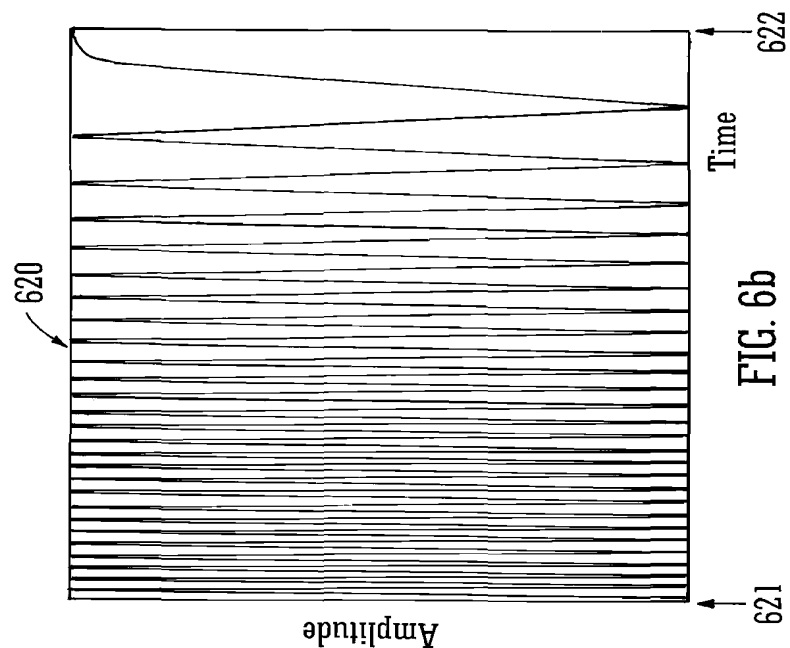


FIG. 6b

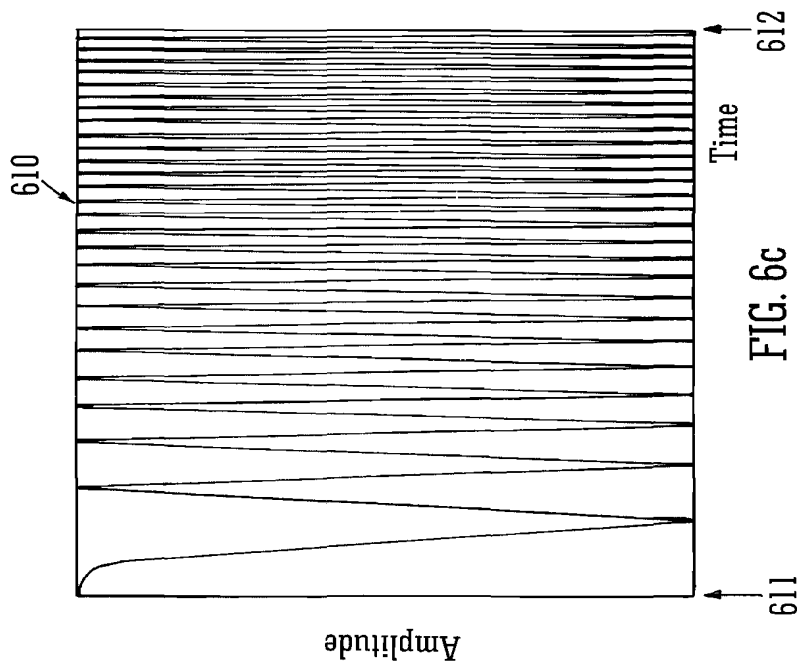


FIG. 6c

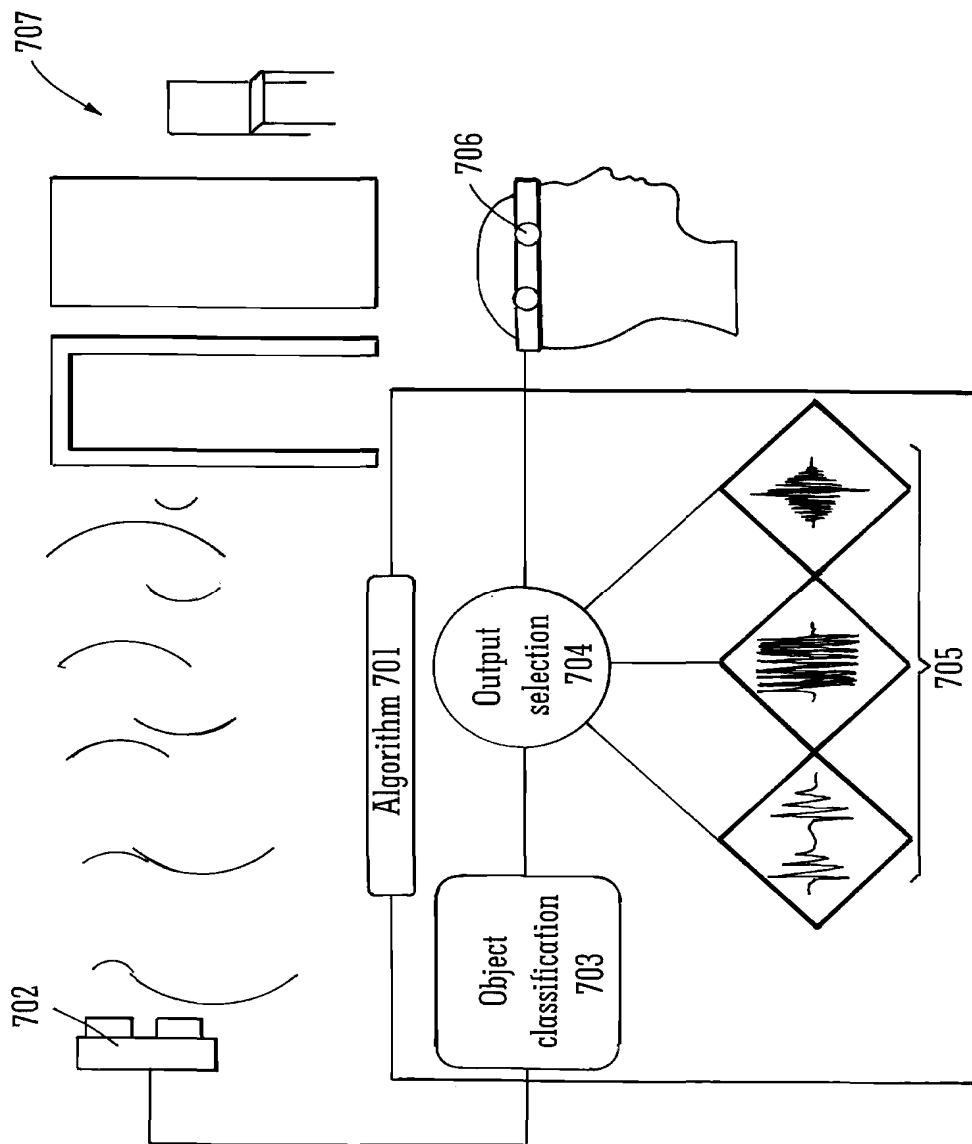


FIG. 7

Active Sensory Augmentation Device

[0001] The present invention relates to sensory augmentation devices and systems therefor.

5 BACKGROUND

[0002] Sensory augmentation devices, as known, have the purpose of reporting information about an environment or an object to a person beyond which, their normal senses are able to provide. They have shown potential for use by the visually impaired to provide them with sensory information to aid movement, for example.

10 **[0003]** Augmenting spatial awareness with Haptic Radar (Tenth International Symposium on Wearable Computers (ISWC)), Cassinelli, A., Reynolds, C. and Ishikawa, M., discloses a modular electronic device to allow users to perceive and respond simultaneously to multiple spatial information sources using haptic stimulus. Each module of this wearable
15 “haptic radar” acts as a narrow-field range detector capable of sensing obstacles, measuring their approximate distance from the user and transducing this information as a vibro-tactile cue on the skin directly beneath the module.

[0004] However, information imparted to the user by such a system is not attuned to the user's needs at the point when the information is imparted, or that the information is not specific or informative enough when it is needed or desired. At times, the system may also
20 overload the user with excessive or irrelevant information that could serve to distract the user and make it harder to achieve their goals.

[0005] Personnel working in restricted environments may benefit from sensory assistance. For example, firemen in smoke filled buildings may not be able to locate objects such as furniture, people, doorways, etc, visually and rely on the capacity to touch
25 and feel their way. Indeed the best-practice method employed by firemen in traversing smoke-filled environments has not changed in over 50 years, and involves the person staying in contact with a wall of the room and waving their hand in front of their face and body as they progress. Such personnel may benefit from sensory augmentation. However, in challenging environments, the information imparted to the user must not
30 inhibit their goals. An object of the present invention is to provide a system that overcomes these issues, or at least mitigates their undesirable effects.

BRIEF SUMMARY OF THE DISCLOSURE

[0006] In accordance with the present invention there is provided a sensory

augmentation device for wear by a user, comprising a sensory array to detect objects in an environment surrounding the user when the device is being worn, a tactile display to physically engage the user's body and provide information about said environment, and computing means between the sensory array and tactile display that includes an algorithm
5 controlling one or both of the sensory array and tactile display whereby the presentation of information to the user about an object is adapted to circumstances beyond the physical parameter of the object's proximity to the user, such circumstances including: rate of change of position of the object with respect to the user; the physical attributes of the object; the time since first detection of the object by the sensory array; and the current
10 situation or objectives of the user.

[0007] Active sensing means not merely receiving input passively as a sensory device happens to encounter a stimulus but instead involves influencing the receipt of inputs. This can be performed using a passive sensory device (for example when a blind person explores an environment with their walking stick). However, active sensing can also mean
15 controlling the perception of inputs from a sensor, or even a combination of direct control of a sensor to control inputs received and to control how they are perceived.

[0008] The design of the device and of its processing algorithms takes inspiration from active proximal sensing systems observed in the natural world. For instance, rodents, such as mice and rats, possess long facial whiskers that are moved back-and-forth in
20 order to explore the proximal environment surrounding the head. Studies of whisker motion have shown that these direct the whisker-tips towards surfaces of interest in the environment, causing increased contacts with such surfaces. Whisker motion is also controlled so that contacts (whisker bending) occur within a limited dynamic range. In the design of the present invention these principles have been generalised to non-contact
25 proximity sensors, and to aspects of active sensing control (described hitherto) not observed (or not confirmed) in the natural world.

[0009] In a preferred embodiment, said sensory array comprises one or more electromechanical range sensors comprising one or more emitting modules and one or more receiving modules, wherein the receiving modules are configured to receive and
30 detect signals emitted by the emitting modules and reflected by an object in the environment. Preferably, the sensory array comprises sensors with parameters set to be sensitive to the user's objectives as determined from the measurement of the user's acceleration, velocity, gyroscopic motion or position. Furthermore, the sensory array may be controlled by said algorithm such that the sensory array is active, through filtering
35 sensory inputs according to the user's objectives. Preferably, said tactile display is controlled by said algorithm such that said tactile display is active, through modifying said

tactile display according to the user's objectives.

[0010] In another preferred embodiment, the sensory array further comprises environment sensors with parameters set to be sensitive to environmental properties selected from temperature, humidity, light, sound or position or physical attributes of objects. Preferably, said sensory array is controlled by said algorithm such that the sensory array actively changes said sensing parameters in response to changes in the environment.

[0011] In a preferred embodiment, said computing means further comprises a timer and is adapted to determine the rate of change of the position of the object with respect to the user from a measurement of velocity change of the object position over a period of time.

[0012] In another preferred embodiment, said sensory array has means for detecting the physical attributes of the object and said algorithm comprises a library of physical attributes wherein said algorithm is adaptable to match said detected physical attributes to an item in said library. Said library may contain a corresponding vibrotactile symbol for said item and said tactile display is configurable to display said corresponding vibrotactile symbol. Preferably, the algorithm comprises means to store in a memory of said computing means, said detected physical attributes of the objects that have been detected by said sensors and whereby said presentation is adapted to display the time since first detection of the object, wherein said adapted display is pulsed and the amplitude of each pulse relating to the object decreases according to the time since it was first detected.

[0013] In a further preferred embodiment, said computing means further comprises a graphical user interface. In certain embodiments said algorithm may be programmable by said graphical user interface, to enable the objectives of the user to be entered into the algorithm.

[0014] In another preferred embodiment, the computing means may be adapted to control the emitting module to emit signals in a specific time frame, direction or form.

[0015] Preferably, said tactile display is controlled by said algorithm to present information to the user within a comfortable dynamic range, preferably user specific. Said comfortable dynamic range may be user specific and comprise a lower limit where the user cannot feel the tactile display and an upper limit where the tactile display is perceived as painful by the user. Preferably the computing means is adapted to adapt said comfortable dynamic range in real time through feedback of the user's reaction to the tactile display. Furthermore, said graphical user interface may be adapted to enter the comfortable dynamic range of the user.

[0016] In a preferred embodiment said tactile display comprises a plurality of vibrotactile

elements configured to present a vibrotactile language to the user. Preferably, said plurality of vibrotactile elements are actuators. In certain preferred embodiments, said vibrotactile language is built from a combination of drive parameters of the tactile display, comprising; amplitude, frequency, pulse width, pulse frequency. Said vibrotactile language
 5 may further comprise ascending or descending frequency pulses. Preferably, the tactile display is positionable over an area of the body of the user to engage with the cognitive core of the user, wherein the cognitive core of the user is the set of skills, habits and abilities, in perception and action, that a person can rely on without effortful deliberation and that may be interfaced to through vibrotactile stimulation of body surfaces. Preferably,
 10 said area of the body is locatable on a skin position that is well served by nerve endings, or, said area of the body is locatable on a skin position in close proximity to a trigeminal nerve of the user. Said tactile display may be locatable about the temples of the user's head.

[0017] Preferably, the tactile display promotes a user reaction which is used to feedback
 15 to the control algorithm, and may directly affect the sensory array.

[0018] In accordance with the present invention, there is also provided a method for sensory augmentation, wherein information about an environment comprising objects surrounding a user is presented to the user, said method comprising the steps of:

- a) sensing the presence of said objects to generate output data about said objects;
 20 and using an algorithm in computing means, either
 - i. to modify said sensing to affect said output data; and/or
 - ii. to process what is sensed to generate said output data; and either or both:

in response to circumstances of the user, said circumstances selected from the group comprising:

- 25
 - a rate of change of position of the object with respect to the user;
 - physical attributes of the object;
 - time since first detection of the object by the sensory array;
 - objectives of the user; and,
 - environmental parameters, and
- 30 b) presenting said output data to the user in a tactile display, such that the user is presented with information about objects in the environment beyond the physical presence of the object.

[0019] In a preferred embodiment, step a) further comprises emitting a signal into said

environment using emitters and receiving in receivers a signal reflected from said objects in said environment. Preferably, said one or more objectives of the user comprises their orientation, heading, velocity, acceleration. Preferably, said environmental parameters comprise temperature, humidity, light levels, noise levels.

5 **[0020]** In a preferred embodiment, the method for sensory augmentation further comprises the steps of:

- a) sensing the velocity and/or acceleration of the user and the presence of said objects in said environment;
- b) determining the direction of heading of the user;
- 10 c) applying a filter to increase sensory information processed for objects in the direction of heading and reduce sensory information processed for objects not in the direction of heading;

whereby, said output data set is modified.

15 **[0021]** In another preferred embodiment, the method for sensory augmentation further comprises the steps of:

- a) retaining sensory information about said objects as obtained at a first time;
- b) matching said sensory information about said objects as obtained at a later second time to said first time;
- 20 c) applying a time-dependent reduction to matched sensory information as obtained at said second time to produce said output data,

whereby, said presentation of said output data is time-dependent.

[0022] In a preferred embodiment, the method for sensory augmentation further comprises the steps of:

- a) retaining sensory information about said objects as obtained at a first time;
- 25 b) matching said sensory information about said objects as obtained at a later second time to said first time;
- c) determining the velocity of said one or more objects;
- d) comparing the velocity of said user to the velocity of said objects to produce said filtered information;

30 whereby, said presentation of said output data is velocity dependent. Preferably, said velocity dependent presentation of output data changes frequency over time according to the velocity, whereby:

- the frequency of the presentation of objects towards a user varies with time in a first way; and
- the frequency of the presentation of objects moving away from the user varies with time in a second way;

5 wherein, said first way is opposite to said second way.

[0023] In a preferred embodiment, said presentation of said output data is pulsed.

[0024] In a preferred embodiment, the method for sensory augmentation further comprises the step of:

10 comparing, within said algorithm, said sensory information to a library of sensory signatures, whereby said comparison is used to classify a property of the object wherein said classification of said object is presented to said user through a tactile presentation specific to said classification.

[0025] In a preferred embodiment said tactile display presents a vibrotactile language which is programmable or learnable by said user. Preferably said method for sensory
15 augmentation is performed using the apparatus as hereinbefore described.

[0026] In accordance with the invention, there is further provided a sensory augmentation device configured to implement the method as hereinbefore described.

BRIEF DESCRIPTION OF THE DRAWINGS

20 **[0027]** Embodiments of the invention are further described hereinafter with reference to the accompanying drawings, in which:

Figure 1 shows a user wearing a sensory augmentation device according to the prior art;

25 Figure 2 shows a schematic representation of a sensory augmentation device, in use, according to an embodiment of the present invention;

Figure 3 is a circuit diagram of a sensory augmentation device according to an embodiment of the present invention;

Figure 4 is a schematic of sensitivity zones according to an embodiment of the present invention;

30 Figure 5 is an illustration of time-dependent vibrotactile cues in the presence of multiple objects according to an embodiment of the present invention;

Figure 6 is a schematic illustrating velocity-dependent vibrotactile cues according to an embodiment of the present invention; and,

Figure 7 is an illustration of selection of vibrotactile symbols according to an embodiment of the present invention.

5

DETAILED DESCRIPTION

[0028] Figure 1 illustrates the prior art. It shows a user 1 in an environment defined by the objects 2 it contains. Light beams 3 are used to sense the objects and the information is relayed to the user by vibration motors mounted on a head piece 4.

10 **[0029]** Figure 2 illustrates data pathways between components of a system according to the present invention. The figure shows a sensory augmentation apparatus 100 in an environment 108 which is defined by objects 107 therein. The sensory augmentation device comprises a sensory array 101 in communication with a control algorithm 103 which in turn communicates with a tactile display 102. The tactile display is connected 204
15 to the user 1 as per the head piece 4 shown in Figure 1.

[0030] Returning to Figure 2, the sensory array 101 further comprises one or more emitting modules 105 and one or more receiving modules 106. The emitting modules emit a signal 208 into the environment 108 and the receiving modules receive a signal 209 reflected from an object 107 or physical property, such as temperature. The sensory array
20 is controlled through instruction 202 by the control algorithm 103 and returns information 201 to the control algorithm.

[0031] The information returned 201 by the sensory array 101 comprises information about the environment. The information which is returned is dependent on the number of emitting 105 and receiving 106 modules, their type and the instructions 202 which they
25 operate under. In a preferred embodiment, there is a variety of sensor types in the array 101 so that the array is sensitive to conditions such as:

the position of objects 107 in relation to the user 1;
the temperature levels in areas of the environment;
light levels in the environment;
30 the position and orientation of the user; and,
the direction of movement of the user.

Through this, the sensory array receives a sufficiently complete description of the environment 108.

[0032] The instructions 202 which are sent to the sensory array have the purpose of
35 enhancing information gathering. The loop between the sensory array 101 and the control

algorithm 103 through lines 201 and 202 are such that the sensory array is continuously adapting to the environment 108 and the objects 107 which it detects.

5 **[0033]** Signals 201 fed into the control algorithm 103 from the sensory array are filtered by the algorithm which interprets the information to build a 'picture' of the environment. The algorithm uses this information both to instruct 202 the sensory array and further to operate 203 the tactile display.

10 **[0034]** The tactile display consists of one or more vibrotactile elements which are placed on the user 1. The vibrotactile elements are used to present 204 a vibrotactile language to the user. The vibrotactile language is made up of a combination of vibrotactile parameters comprising, amplitude, frequency, pulse width, pulse frequency.

15 **[0035]** The algorithm 103 operates the tactile display using the vibrotactile language through interpretation of the sensory information 201 provided by the sensory array 101. The interpretation by the algorithm of the environment prevents a direct representation of the information received by the sensory array and allows for determination of salient information, which the algorithm decides on a run-time basis. Once the algorithm has processed the information it operates 203 the tactile display through implementation of the vibrotactile language.

20 **[0036]** Placement of the tactile display 102 will facilitate integration with the cognitive core of the user. In a preferred embodiment, this is performed by placing the vibrotactile elements on sensitive areas of the user's body, that is areas which have a high number of nerve endings.

25 **[0037]** Once the tactile display 102 presents 204 a stimulus to the cognitive core 104 a user reaction 105 is promoted. The user reaction is indirectly fed (206) back into the control algorithm 103 via 205 sensors which are sensitive to the position and orientation of the user. Such sensors may include but are not limited to acceleration and orientation (verticality, compass direction) sensors. The information is passed 201 to the control algorithm which makes run-time adjustments of the tactile display 102 to prevent the user 1 from feeling discomfort and to ensure that the user remains aware of the tactile display.

30 **[0038]** The comprising parts of the device 100 are interactive such that the device can react to changes in the environment 208, actively sensing these and presenting them to the user 1. A suitable application for this device may be for those that are visually impaired or subject to an occluded environment.

35 **[0039]** Thus the present invention provides a device which is controlled to present information about a surrounding environment to a user. The device is to be worn, and provides 'sensory augmentation' (or 'sensory substitution', depending on application

domain). Sensory information is presented to the user by means of a sensor-to-wearer mapping algorithm provided by the computing means.

[0040] The device preferably uses “actively” controlled electromechanical sensors to gather information about the physical geometry of the wearer’s proximal environment.

5 “Salient” aspects of this information may be conveyed to the wearer through a ‘vibrotactile’ display (an array of vibrotactile elements). Intrinsic to this process is a computational algorithm that transforms the raw sensory information into optimal signals to deliver the salient information about the environment to the user in an intuitive way. This algorithm may be application-specific (or, at least, tuned to the application).

10

[0041] Sensory Array and Tactile Display

[0042] An example of the system of the current invention is configured as shown in Figure 3. Here, sensors 301, 302 are placed on a firefighter’s helmet 303. The sensors are connected to a sensor-actuator bridge 304 via an interconnect bus 305. The sensor-actuator bridge is programmed using a computation unit 306. It will be appreciated that the computation unit 306 can be directly attached to the sensor-actuator bridge, incorporated therein, or used to program the sensor-actuator bridge remotely. A second interconnect 307, connects the sensor-actuator bridge to an actuator driver board 308.

15

[0043] The actuator-driver board 308 is connected to the tactile display 311 which, for example, includes actuators 309 which are disposed on an elastic headband 310 as worn under the helmet 303 by the user. It will be appreciated that alternative arrangements of tactile display are in the scope of this invention.

20

[0044] The sensor-actuator bridge 304 is a microcontroller based board that acts as a bridge between the computation unit 306 and the sensors and actuators, reads the sensor values and sends them to the computation unit.

25

[0045] The computation unit 306 receives the sensor-data, executes the algorithm, generates the actuation commands and sends them back to the bridge 304 for onward transmission to the actuators. The bridge 304 relays the actuation commands to the actuator driver board 308. The actuator driver board interprets the commands, prepares the waveform and drives the actuators through amplifiers.

30

[0046] Example 1: Physical system.

[0047] The example physical system contains:

- i. Computation Unit 306
- ii. Sensory Array 312

- iii. Ultrasound modules 301
- iv. Actuators 309
- v. Digital Triaxial Accelerometer 302
- vi. Sensor-Actuator Control Bridge 304
- vii. Actuator Driver Board 308
- viii. Interconnects 305, 307

[0048] i. Computation Unit. The computation unit is the controller of the whole system, it reads the sensor data, executes the algorithm, and sends the actuation commands to the actuators. In this example, it is a small netbook running Matlab in a Windows 7 environment. This unit is portable.

[0049] ii. Sensory Array. The sensors scan the proximity of the wearer and send the information to the computation unit 306 through a bridge 304 on an I2C (Inter-Integrated Circuit) interconnect (bus) 305. The helmet shell 303 is instrumented with a ring of ultrasonic range finders 301. All sensors share the same serial I2C 305, so that a single four-core umbilical carries power and the bus lines back from the computation unit 306.

[0050] iii. Ultrasound modules. The Ultrasound modules 301 are part of the sensory array 312. In the present example, each sensor module 301 is either an SRF08 or an SRF10 (Devantech http://robot-electronics.co.uk/acatalog/Ultrasonic_Rangers.html) having characteristics according to Table 1.

Metric	SRF08	SRF10
Connectivity	0V, +5V, I2C-I, I2C-C	As SRF08
Max Current	15mA	As SRF08
Frequency (US)	40kHz	As SRF08
Range	3-600 cm	As SRF08
Weight	12g	14g
Size	43x20x17 mm	32x15x10 mm

Table 1

[0051] iv. Actuators. An example actuator could be TactileLabs haptuator model TL002-14-A, displaying the specification as shown in Table 2, (<http://www.tactilelabs.com/main/products/haptuator>). The haptuators 309 receive the commands from the control unit (306) through the bridge 304.

Model Number	TL002-14-A
Outer Dimension (diameter x length)	14 x 29 mm
Weight	~30 grams
Acceleration @ 3V input, 125 Hz	3.0 G 29.4 m/s
Rated Bandwidth	50 – 500 Hz
Typical Impedance	6.0 Ohms
Maximum Input Voltage	3.0 V
Maximum Input Current	0.5 A

Table 2

[0052] v. Digital Triaxial Accelerometer. The accelerometer 302 provides high resolution (14 bit) measurements of acceleration along three vertical axes enabling measurement of tilt and motion along these axes. An example accelerometer is the BMA180 by Bosch (<http://www.bosch-sensortec.com/content/language1/downloads/BST-BMA180-FL000-03.pdf>). It is mounted on a breakout board from Sparkfun Electronics (<http://www.sparkfun.com/products/9723>). The accelerometer is connected to the same I2C 305. It receives its commands from the computation unit via the bridge 304 and sends the measurements back via the same route.

[0053] vi. Sensor-Actuator Control Bridge. The example uses a board with a microcontroller running at 16MHz. The bridge 304 acts as the I2C bus 305 master and an interface between the ultrasonic sensors 301, the digital accelerometer 302, the actuator driver board 308, and the computation unit 306.

[0054] vii. Actuator Driver Board. The actuators 309 in this example use a 3V RMS (Route Mean Square) (peak) signal to drive them. To achieve the required power the example features a separate board with a PIC (Peripheral Interface Controller) microcontroller, one or more amplifiers and other necessary circuitry. This board is connected to the bridge 304 through a UART (Universal Asynchronous Receiver/Transmitter) bus 307. The onboard PIC receives the actuation commands, interprets the commands, prepares the output waveform and drives the amplifiers. The amplifiers then send their output to the actuators 309.

[0055] viii. Interconnects. Three main interconnects are used in the current example:

1) Computation Unit to Sensors-Actuator Bridge

This is a standard USB (Universal Serial Bus) 2.0 standard cable 313 with Type-A plug and Type-B plugs.

2) Sensors-Actuator Bridge to Sensors

5 This is an I2C bus cable 305 connecting the sensors to the bridge. In the current example, it is driven at 100 KHz by the board which acts as an I2C master and controls the sensors 301, 302. This interconnect 305 is coupled with power lines that supply all the sensors 301, 302 on the shell 303.

3) Sensors-Actuator Bridge to Actuators Driver Board

10 This is a UART connection between the bridge 304 and the PIC microcontroller on the actuator driver board 308. It is unidirectional as the PIC receives the actuation commands and does not send any responses upstream (to the computation unit 306). It is appreciated that a bidirectional cable may be required for alternative embodiments.

15 **[0056]** It is appreciated that the equipment described in Example 1 may be replaced or augmented by alternative apparatus in order to achieve the required algorithm inputs. For example, the control of an ultrasonic sensor may be supplemented by automatic temperature compensation using information from temperature sensors. By means of a further example, pulse shaping techniques can preferably be used to distinguish both
20 between pulses emitted by other sensors and in other time windows, allowing a substantial increase in sample rate but more advanced signal processing.

[0057] Another strategy may be to use continuous emission (rather than a series of pulses) to maximise the information gathered and, effectively, provide an unlimited sample rate. This approach is also much more robust to noise, though it does require more
25 energy (therefore its applicability may depend on application domain). Through using continuous emission, a discrete number of sensors positioned on the helmet can be mapped to a continuous circle using Gaussian mapping. A discrete number of actuators are then mapped to the circle using the same technique. By using this technique, the number of sensors and actuators can vary. For example, eight sensors can be mapped to
30 four actuators. An example protocol for adopting this strategy consists of the following steps:

- a) Emit signals into the environment
- b) Wait for new sensor data: If new data is available, proceed; If no new data is available, wait

- c) Read the sensor data
- d) Calculate the values for individual sensors
- e) Map the sensors to a circle using Gaussian mapping
- f) Map the circle back to the actuators using Reverse Gaussian mapping
- 5 g) Prepare response for corresponding actuators
- h) Send the response to the actuators
- i) Return to step b)

[0058] This approach has some overlap with the algorithms as exemplified below. It is understood that the algorithm can interpret sensor data in this way and its interpretation varies according to the physical arrangement that are used. As such, the algorithm is programmed according to the physical arrangement.

[0059] A further strategy is to use a small number of emitting modules (as few as one, possibly) for a large number of receiving modules. This removes ambiguity over the source of an emitted pulse whilst reducing energy requirements.

15 [0060] In one specific embodiment of the invention, ultrasonic (US) range finders are used in the sensory array to detect the position of objects relative to the user. These are effective in a visually occluded environment (including a particulate suspension). In an alternative arrangement, electromagnetic range finders may be used.

20 [0061] The Environment

[0062] The device may be worn for a variety of uses and exposed to a variety of environments. Some examples of use include but are not limited to:

- **Everyday use**

25 Visually impaired persons might make use of the device for sensory substitution, allowing them to navigate in the world with greater confidence and/or negate the need for other sensory aids (e.g. the long cane). For this application, the device might take the form of a hat.

- **Emergency use**

30 In some emergency environments, vision is occluded, and non-impaired persons might make use of the device, also for sensory substitution. For example, fire-fighters often work in a smoke-filled environment: currently, they rely heavily on 'arm waving' to ensure the space in front of them is clear before moving into it.

- **Safety equipment**

Even those with unimpaired vision are blind to the sides, above, and behind.

Incorporation of the device into, e.g., a construction worker's helmet might provide forewarning of danger. This is thus a sensory augmentation rather than substitution.

- **Miscellaneous uses**

There may be a variety of other domains where sensory augmentation would be of benefit, for example in some sports such as basketball or American football or pot-holing, diving, mountain biking.

10 **[0063]** Application in such environments demands that the algorithm and indeed the sensory device are adapted to the environment and the needs of the user. Salient features of the environment such as the walls, furniture, and exit points (i.e. doorways) are important features that should be presented to the user.

15 **[0064] The Algorithm**

[0065] The algorithm is performed by the computation unit 306 and is used to control the sensory array, analyse data from it and supply data to the tactile display. It processes raw sensor data (multi-directional range information) into drive signals for the tactile display (that generates mechanical stimulations that are, in turn, sensed by the wearer through the skin) as well as providing control signals for the sensors themselves. The algorithm provides for active sensing and has as its focus: a high information bandwidth; minimisation of the processing the brain has to do (low cognitive load); and avoidance of distraction or discomfort for the user

25 **[0066]** The terms 'active' and 'active sensing' will be understood to refer to run-time changes in the sensing parameters and in sensory processing, depending on environmental changes that serve to boost salient information. That is, sensor behaviour may be dependent on the current knowledge of the environment (e.g. range to local objects may affect the working range of the sensor, sampling rate, emissive power and/or emissive angle), and on the setting in which the device is being used. For example, a collision-avoidance device may be tuned to detect and emphasize objects immediately in front of the head and in the direction of travel, and at a range which is modified according to speed of travel (so that there is adequate time to initiate an avoidance response).

30 **[0067]** The algorithm is therefore adapted to circumstances beyond the physical parameter of the object's proximity to the user. Such circumstances may comprise: the

rate of change of position of the object with respect to the user; the physical attributes of the object; and the time since first detection of the object by the sensory array.

[0068] This can be performed by the distinction between what sensor information is salient and what can be discarded. For example, once a user has entered a room and the device has displayed this information to the user, the information becomes less salient and a new object entering the room becomes more salient and is therefore presented to the user. Such information may be gathered by active sensing as herein described.

[0069] For example, the algorithm comprises the steps of:

- i. Processing raw sensor data to generate a data set that the device will convey to the user. This processing, for instance, may heighten the representation of more salient data (e.g. a nearby obstacle or a moving object) and lessen the representation of less salient data (e.g. stationary objects or objects far from the user) including discarding some data entirely (e.g. the location of distant objects).
- ii. Conveying the processed data to the wearer through the tactile display. The tactile display cannot directly represent “range” or “obstacle” (because its language is “amplitude” and “pulse frequency”). The algorithm represents the former in the language of the latter, conveying the salient information to the wearer in an optimal way.
- iii. Guiding the “active sensing” of the environment - that is, to control active features of the sensors, and sensory processing, to improve their performance at data gathering under the local and current conditions.
- iv. Measuring the human involvement through the ongoing response to tactile stimulation and the impressions of the environment that this affords. By moving, the wearer may also contribute deliberately (or not) to the repositioning of the sensory apparatus in a manner that boosts information acquisition.
- v. Modifying the parameters of the sensing device through controllable user-interfaces.

[0070] It will be appreciated that these steps are not necessarily chronological and are not entirely independent. Furthermore, the chronology of the algorithm is dependent on both design-time and run-time feedbacks between these processes. An example of design-time feedback is that the nature of perceptions generated in the wearer iv) by the tactile display ii) will impact upon the representation used in i). An example of run-time feedback is that changes in the operation of the sensors due to active sensing iii) will affect both the nature and the salience of representations i) as well as requiring that a different

set of information be conveyed ii).

[0071] The data processing step may be best understood by means of an example. Consider a hypothetical situation where the wearer is navigating an office. The low level data represents range in each direction to the nearest obstacle. Whilst this could be conveyed directly to the user for their brain to make sense of, if the information is first “sorted” (or “filtered”) such that only the most salient information is conveyed, more advantage can be taken of the limited bandwidth and the user's cognitive load.

[0072] If the user begins to move towards one of these obstacles, the presence of the obstacle becomes salient again (the user may have forgotten the presence of the obstacle), and the representation, thus, stronger, warning the user of the danger of collision. If someone were to enter the office (a moving obstacle), this would represent a salient feature and would be highlighted to the user. The symbolic representation of a moving object might differ from that of a stationary object, helping the user to distinguish between the two. If the user passes near a doorway, a further representation can be used to indicate the affordance offered by the doorway – that is, the opportunity to pass through it.

[0073] The algorithm's control over the tactile display conveys to the user through the vibrotactile language, which converts the salient information identified in the data processing step to physical parameters that are felt by the user. The salient data (hazards, affordances) is mapped into the vibrotactile language, in a way that is high bandwidth and intuitive. By intuitive, it is meant that the user will require little training to understand and interpret the vibrotactile language. The algorithm therefore takes advantage of the wearer's intuitive perceptions of drive signals, such that the need for user training is mitigated or eliminated entirely.

[0074] An example system of this sort integrates algorithmic ideas with array configuration and with “active sensing” which, as above, can be defined as modifying the behaviour of the sensor during use in a way that improves its performance in the given context. To illustrate the definition, specific examples of active sensing would include purely electrical changes such as changing the sampling rate of a range sensor as the range varies or turning off a sensor when the information it is collecting is not going to be used, as well as electromechanical changes such as physically redirecting a sensor at a salient part of the environment. Active sensing may operate to boost the quality, quantity or “saliency” of the information collected or to reduce energy requirements.

[0075] The “saliency” of information or of aspects of information depends on the current motivations and past experience of the user. The salience varies from situation to situation and time to time, and with the task that the user is pursuing. However, it will be

understood in the context of the present invention that “salient” information is that which the device determines is useful to the user in certain situations beyond the raw information that the sensors detect and could pass on to the user. Examples 2 to 5 indicate how salient information can be filtered. These aspects may be defined in advance of use or at run-time.

[0076] The algorithm informs active sensing at some or multiple levels. A low level operation might include changing the sampling frequency. For example, when an obstacle is detected nearby, a higher sampling frequency is used (due to the relationship of the sample time with object range through the speed of sound). Whereas a high level operation might include changing sensor direction. For example, locomotion may be sensed such that when the user is walking through the environment (as indicated by supplemental sensors), sensors towards the front may be redirected downwards to better detect trip hazards, or sensors towards the side redirected somewhat forwards. Note that this does not imply the necessary movement of the sensors through some actuation mechanism although this is possible. Instead it can relate to increasing sampling density or sampling frequency, using fixed sensors such as those described above, in the direction(s) of interest. Aspects such as this are best illustrated in the following examples.

[0077] Example 2

[0078] With reference to Figures 4(a) to (e), these examples demonstrate how the sensor range changes as the user moves about the environment.

[0079] Referring first to Figure 4(a) a user 400 is located with respect to an object 401. Sensors on the user’s helmet (neither shown), capable of detecting the object, are active over a full rotation about the user and this is illustrated by the hatched region 404 of the drawing. The response of the sensors to the presence of the object 401 is a spike 406 in a circular base line around the user 400. Haptoactuators 403,408 are disposed around the head of the user at four locations around the user’s horizon. The degree to which each actuator is actuated depends on the presence of a spike 406 and the activation 404 of the sensors. That degree of actuation (of haptoactuator 403) is illustrated in bar chart 410, and varies between zero and 100% actuation. In this instance, the presentation of a stimulus (actuation of the haptoactuators) is conditional upon the orientation and movement of the user and in turn, the goals and intentions of the user.

[0080] The goals, intentions and demands of a user frequently will correlate with the user’s movement. If the user is moving forwards, it may be more useful to receive information from further ahead of the user than behind. An accelerometer (or a similar device, e.g. gyroscope, compass, etc) can be used to measure the user’s movement. This movement information can be used to change the sensory array, or the signals transmitted

to the user, to reflect the demands of the user thereby making the sensory array active.

[0081] Figure 4(a) to (e) shows the effect of changing the active sensor range, dependent on user movement (measured with an accelerometer (not shown)). In each of Figure 4a-e, the user is moving in a different way. In Figure 4a, the user is stationary but is facing forwards (upwardly in the drawing); in Figure 4b, the user is moving forwards in the direction of the arrow 411b; in Figure 4c, the user is moving backwards (while facing forwards) in the direction of the arrow 411c; in Figure 4d, the user is rotating clockwise in the direction of the arrow 411d; in Figure 4e, the user is rotating anti-clockwise in the direction of the arrow 411e.

[0082] The object 401 appears at the left front side of the user respective to their direction of heading in all examples. This causes a change in the sensor readings 402 shown as the spike 406 in the sensor readings in that part of the field. Actuators 403, 408 are placed on the user as hereinbefore described at four locations. Because of the relative position of the object, only one actuator is activated by the algorithm following the change in the readings. In each case, the output of the activated actuator 403, 408 is displayed by a bar 410a-e. It should be appreciated that the actuator output is inversely proportional to the object distance over the sensor range. The sensor range 404 is modified according to the user's motion. *The modified sensor range directly affects the actuation. For example, if the modified sensor range is less than the distance from the object, the actuation reduces.*

[0083] In Figure 4(a), the user is stationary and therefore the sensor range is in its default setting meaning that the sensor range is equal in all directions. It is appreciated that the range of the sensor in this example is shown to be maximum in all directions, but it may reduce when the user is stationary or in a confined environment, as discussed below. As the object 401 enters the sensor range, the sensor input 402 changes in the direction from which the object enters, as shown by the spike 406. The algorithm interprets this input and passes a signal to the actuator control for the actuator 403 at or near to the direction of the object 401. The output 410a of the actuator is shown to be 100% of the possible output. The remaining actuators 408 are not activated because there is no input in those directions and the actuator 403 is precisely on line with the object 401 (clearly, objects at different angles may cause actuation of two actuators with the relative value of the actuation being indicative of the angle of direction of the object).

[0084] Figure 4(b), shows the range 404b as the user is moving forwards (arrow 411b). Here the range is modified such that the sensors in the forward direction have a long range and those in the reverse direction have a shorter range. This is performed by either computationally filtering out any input from those sensors over a certain range or reducing

the range of those sensors physically as hereinbefore described. In the examples shown, it is the former of these two approaches that are applied (because the spike 406 is still evident in full). The object 401 is presented by the actuator 403 in the same way as Figure 4(a).

5 **[0085]** Figure 4(c), shows the user moving backwards (arrow 411c), while facing forwards. The sensory range is modified accordingly such that the signal from the forwards facing sensors is filtered and that from the backwards facing sensors are not. The object 401 is in the same place as before and causes the spike in the sensor input 402. However, due to the filtered sensor range, the object's appearance at the actuator
10 403 is minimised (see output 410c). It should be noted that this is preferably not zero as the sensory range is not completely absent in the forward direction and as shown by 412c has a minimum range.

[0086] In Figures 4(b) and (c), a threshold is applied such that only when the forward or reverse acceleration is greater than the threshold is the sensory range modified in the way
15 shown. It is appreciated that there may be multiple threshold levels which when overcome, extend the range of the sensors in the direction of motion at defined levels. It should also be understood that the movement sensor may be velocity sensitive such that *continued movement (without acceleration) in a particular direction retains the sensor range in that direction.*

20 **[0087]** Figure 4(d) shows how the sensory range is modified when the user is rotating clockwise (arrow 411d), or moving to the right (in the drawing). The sensor range in this example is modified such that the sensors facing the right side of the user are receptive (or at least the interpretation of their signals is not filtered), and those on the left side are restricted or filtered. The result of an object 401 entering the field causes the spike 406 in
25 the front left part of the sensor input. However, due to the range of the sensors, as per the example in Figure 4(c), the spike lies outside the sensitive range and the actuator 403 signal 410d is minimised.

[0088] Figure 4(e) shows the user rotating anticlockwise (arrow 411e), or moving left (in the drawing). The sensor range is modified such that the sensors on the left hand side of
30 the user are given a larger range 404e. The presentation of the object 401 in the field causes the spike 406 in the sensor input 402 and it is inside the sensor range. Therefore, the presentation 410e of the object through the actuator is maximised.

[0089] As in Figures 4(b) and (c), rotational movement may also have a threshold acceleration or velocity value such that the user's rotation must overcome this for
35 modification of the sensor range.

[0090] Additional parameter changes can be programmed. For example, increased movement speed could also change the extent of sensory asymmetry, for example sensor range ahead of the user may increase in proportion to forward velocity.

[0091] As briefly discussed above, the range adaptation can be achieved in at least three ways. Method one by adjusting the range of the ultrasonic sensor 'on the fly' during operation, which is possible with some sensors. Method two by filtering the input from the sensors according to the motion of the user. Method three by adjusting the range of signals that are transmitted to the user through the tactile display. The result of methods two and three is such that the sensors could be programmed to sense over a range of 2 meters, for example, but only objects within the closest 1 meter of the direction of motion elicit a vibration in the tactile display.

[0092] The sensor array could also be adapted for a particular task, through simple re-programming by the user or using a graphical user interface (GUI). The purpose is to allow the user to select only to detect moving objects, or far objects. The sensors could also be programmed to change their range depending on experience. For example, the sensitive range could reduce with the time that the user spent in a small environment, like a narrow corridor or lift.

[0093] Example 3

[0094] The salience of objects can depend on parameters other than their distance from the user. As briefly mentioned above, the time which the object has been in the sensor range may directly relate to the presentation of that object, through the actuators, to the user. Figures 5(a) to (f) demonstrates the salience of objects with time.

[0095] A continuous signal can be overbearing to the user if the device is used for extended periods of time. Continuous signals can also reduce a person's responsiveness to a sensory signal, for example listening to a constant loud noise will reduce a person's sensitivity to quieter noises (this is known as adaptation). One way to avoid these problems is to present information in a series of pulses. The pulses could be presented at a consistent interval, or could be triggered by head movement (using accelerometer information). Pulsed signals can also be useful for transmitting additional information about objects. The duration of a pulse could signify the object's speed for example, and the length of time between pulses could signify the object's proximity.

[0096] By using decaying pulses, triggered at the detection of a particular object, it is possible to convey the duration of time since first detecting that object. In Figures 5(a) to (e), the user wearing the device 501 according to the present invention is moving in a straight line through the environment in the direction of the arrow 502. In that environment,

two objects 503, 504 are encountered, which can be identified by the device 501 in the method described in Example 5. Upon detection of a particular object, the presentation (vibrotactile symbol; here a unique waveform) of the object corresponding to that symbol is delivered to the user through the tactile display as a series of pulses. Over time the amplitude of each pulse is reduced, allowing new information to be presented without overloading the user. This is in addition to the active sensing described above, the present example describing active display of information depending on experience.

[0097] At Time 1 (Figure 5(a) and Time 1 in Figure 5(f)) no objects are within the sensor range. No new information is presented to the user.

[0098] At Time 2 (Figure 5(b) and Time 2 in Figure 5(f)) the first object 503 appears within the sensor range. The symbol for object 1 is presented to the user with large amplitude.

[0099] At Time 3 (Figure 5(c) and Time 3 in Figure 5(f)) the first object 503 is still within the sensor range, but no new objects have appeared. The first symbol 507 for the first object continues to be presented to the user but with reduced amplitude.

[00100] At Time 4 (Figure 5(d) and Time 4 in Figure 5(f)) the first object 503 is still within the sensor range and a second object 504 also appears within the sensor range. The first symbol 507 for the first object continues to be presented to the user but with further reduced amplitude, and the second symbol 508 for the second object is presented with large amplitude.

[00101] At Time 5 (Figure 5(e) and Time 5 in Figure 5(f)) the first object 503 has left the sensor range but the second object 504 remains therein. The symbol for the first object is now absent and the symbol for the second object has decreased.

[00102] Example 4

[00103] It may also be important to the user to display other salient features. Example 4 illustrates how the algorithm can be configured to display the rate of change of object position in the sensor range.

[00104] The example, as shown in Figure 6(a) to (c), uses 'chirps' in the vibrotactile language. A chirp is a signal in which the frequency increases with time ('up-chirp' 610, Figure 6(c)) or decreases with time ('down-chirp' 620, Figure 6(b)).

[00105] Referring to Figure 6(a), accelerometer information 601 and object (602) movement velocity 603 (determined by computing the rate of change of object range, dr/dt , with axes reflecting the heading of the user i.e. velocities towards the user are negative) are recorded by the sensory augmentation device 604 which is worn by the user (not

shown). As the object enters the range 605 of the sensors which may or may not be modified by the accelerometer information according to Example 2, the velocity 603 of the object is measured.

5 **[00106]** The algorithm uses this information to determine the relative object movement velocity with respect to the user. The relative velocity of the object (V_{relative}) is calculated as the difference between the velocity of the user (V_{user} 601) and that of the object (V_{object} 603) see Equation 1.

$$V_{\text{relative}} = V_{\text{user}} - V_{\text{object}} \quad \text{Equation 1}$$

10 **[00107]** Following the calculation, the user is presented with a tactile stimulus which describes the relative velocity of the object (Figures 6(b) and (c)). In the present example, a vibrotactile up-chirp 610 is used to signify an object moving towards the user, and a down-chirp 620 to signify an object moving away from the user. The set of conditions applied by the algorithm, determine the output chirp are therefore:

- If $V_{\text{relative}} > 0$. → output ascending chirp.
- 15 • If $V_{\text{relative}} < 0$. → output descending chirp
- If $V_{\text{relative}} = 0$. → no output chirp (stationary objects)

20 **[00108]** The up-chirp 610, as shown in Figure 6(c) is a tactile vibration, which is presented using aforementioned apparatus, whose frequency of vibration increases with time. For example, at time 611, the vibration could have a frequency of 1Hz which rises to 100Hz at a later time 612. These values vary according to the user and the environment for reasons discussed further below.

25 **[00109]** The down-chirp 620, as shown in Figure 6(b) is a tactile vibration, which is presented using aforementioned apparatus, whose frequency of vibration decreases with time. For example, at time 621, the vibration could have a frequency of 100Hz which falls to 1Hz at a later time 622. These values vary according to the user and the environment for reasons discussed further below.

[00110] Example 5

30 **[00111]** Ultrasonic sensors can be used to determine the shapes or textures of objects. Classically this is used on submarines to distinguish such objects as landmasses and battle ships. Ultrasonic sensors have also been used for building maps on board autonomous robots. Using symbols from the vibrotactile language the current example algorithm is able to inform the user of the shape and texture of the sensed object. Figure 7 illustrates the organisation of the algorithm according to this example.

[00112] Sensor measurements are taken by ultrasonic sensors 702 as in previous

examples. An object classification 703 is performed on the data (using standard object recognition software such as a neural network or template matching). When an object 707 is detected a specific vibrotactile symbol is selected from a library 705. The symbols for each object 707 are set by or learnt by the user before use (the sensor measurement for each object 707 varies). The waveform of the selected vibrotactile symbol is then sent to the actuators (vibrotactile display) 706 through the sensor-actuator board and actuator driver board.

[00113] Vibrotactile Language

[00114] Examples 4 and 5 show how vibrotactile symbols can be used to relay specific information about the environment to the user. The vibrotactile symbols are used to create the vibrotactile language which is a set of conventions or rules mapping raw tactile information (e.g. range) into a series of symbols to be presented to a user through the tactile display. This provides a rich encoding of the world, allowing the user to "see" objects, as opposed to merely way-find by being given a heading.

[00115] The tactile display may be controlled by the algorithm such that the information presented to the user comprises the vibrotactile language. It is understood that vibrotactile language is used to define the presentation of information to the user through the tactile display in such a way that it is intuitive to the user and requires little training by the user. The vibrotactile language may be built from different drive parameters. These may include, but are not limited to, amplitude, frequency, pulse width, pulse frequency. Such parameters may form a vibrotactile stimulus alphabet which is used to construct a language.

[00116] The vibrotactile language can be set according to the user's needs through modification of the algorithm's parameters, or learnt by a user through experience with the device. Example features relayed by the vibrotactile language include:

- Identity: An affordance, perhaps a doorway, might be represented by one particular symbol (e.g. a gentle rising-then-falling flutter); a hazard, such as a hole in the floor, by another (perhaps a hard-edged and insistent buzz).
- Proximity: In the same symbol space (language), proximity might be indicated by the frequency of the recurring symbols (with the symbols coming faster as the object is approached).
- Direction: The direction of the object might be indicated by the set of locations on the skin at which the symbol is presented.

- Parameters: In the case of an aperture (such as a doorway or a hole), its size might be indicated by the carrier frequency of the symbol (such a mapping of parameters may be entirely different for different symbols).
- Saliency: Saliency of any object might, at simplest, be mapped just into the amplitude of the vibration symbol. These mappings from sensory space to symbol space would likely be non-linear, reflecting the non-linear relationships between dimensions of raw tactile space (such as range) and saliency to the user.

[00117] It should be understood that the vibrotactile language is not restricted to a particular set of rules and these may be adapted according to the environment where the system is in use or the user for which the device is intended.

[00118] The user

[00119] In embodiments of the present invention, the algorithm is adaptive to the user's reaction and learns from that reaction to display information in a different manner. The user's reaction may include a movement, for example, which is recorded by the accelerometer or other suitable sensor. As such, the algorithm is sensitive to user (human) feedback. For example, as the wearer gets used to the device, they will, without prompting, begin to adopt strategies for its best use. Sensors may be placed to read the user's reactive movements using an accelerometer, so the device can respond at run-time as well and modulate its behaviour accordingly. Active training improves learning.

[00120] The current invention also permits increased information transfer by taking the logarithmic Weber-Fechner law of human sensory perception (that the just-noticeable difference between two stimuli is proportional to the magnitude of the stimuli) in to consideration. This can be achieved using a hyperbolic transfer function Equation 2.

$$(f(x) = \text{MAX_DIST} - x / \text{MAX_DIST})^3 \quad \text{Equation 2}$$

[00121] Where $f(x)$ indicates the output function, x is the input e.g. reported distance, and MAX_DIST indicates the maximum range of the sensor. Literature suggests that the most sensitive frequency range: for a human is 150Hz (Morley and Rowe 1990) where at this frequency, "the different mechanosensory afferents are differentially recruited as amplitude is varied". An example protocol for achieving this information transfer comprises the following steps:

- Emit signals into the environment
- Wait for new sensor data. If new sensor data is available, continue; if no new sensor data is available, wait

- c) Read the sensor data
- d) Calculate the values for individual sensors
- e) Prepare response for corresponding actuators using hyperbolic function (Equation 2)
- 5 f) Send the responses to the actuators
- g) Return to step b)

[00122] User comfort is important to ensure practical use over long periods of time. Certain low frequency vibrations (around 80Hz) are less comfortable when used consistently over long periods of time. This is perhaps due to the haptuator stimulators that are used having their largest amplitude response at this frequency. However, different people have slightly different comfortable frequency ranges, or prefer certain sensory information/vibrotactile mappings. The current invention provides for simple adjustment of the ranges of parameters, or which mappings to use in a particular task through a GUI interface.

15 **[00123]** By utilising active sensory approaches it is possible to use the sensory apparatus more efficiently (focusing the sensory elements on regions and parameters of interest), and to streamline the presentation of information to the user (only providing the most salient or useful information from moment to moment).

20 **[00124]** In a further example, the tactile display is auto-regulated so that the parameters of skin stimulation (e.g. amplitude) stay within a comfortable dynamic range. The comfortable dynamic range is user specific with an upper limit being set by a pain threshold of the user, above which the user would be uncomfortable. Thus, whilst confinement in a small space must feel distinct from being in an open space, there is not a simple or monotonic mapping from physical range to any particular drive signal parameter.

25 **[00125]** The present invention therefore provides a device that is integrated with the human psychology, which integration may be adapted in several different ways that will be apparent to the skilled person whereby the precise form of the algorithm will vary from application to application and will be subject to personal choice of the designer.

30 **[00126]** Throughout the description and claims of this specification, the words “comprise” and “contain” and variations of them mean “including but not limited to”, and they are not intended to (and do not) exclude other moieties, additives, components, integers or steps. Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is

used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

[00127] Features, integers, characteristics, or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith. All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive. The invention is not restricted to the details of any foregoing embodiments. The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

15

CLAIMS

1. A sensory augmentation device (100) for wear by a user, comprising a sensory array (101) to detect physical parameters of objects (107) in an environment (108) surrounding the user when the device is being worn, a tactile display (102) to physically engage (204) the user's body and provide information about said environment, and computing means between the sensory array and tactile display that includes an algorithm (103) controlling one or both of the sensory array (101) and the tactile display (102), whereby the presentation of an object (107) is adapted to circumstances beyond the physical presence of the object, selected from the group comprising:
 - rate of change of position of the object with respect to the user;
 - physical attributes of the object;
 - time since first detection of the object by the sensory array;
 - objectives of the user; and,
 - environmental changes.
2. A sensory augmentation device as claimed in claim 1, wherein the sensory array (101) comprises one or more electromechanical range sensors comprising one or more emitting modules (105) and one or more receiving modules (106), wherein the receiving modules (106) are configured to receive and detect signals (209) emitted (208) by the emitting modules (105) and reflected by an object (107) in the environment (108).
3. A sensory augmentation device as claimed in claim 1 or 2 wherein the sensory array (101) comprises sensors with parameters set to be sensitive to the user's objectives as determined from the measurement of the user's acceleration, velocity, gyroscopic motion or position.
4. A sensory augmentation device as claimed in claim 3 wherein said sensory array (101) is controlled (202) by said algorithm (103) such that the sensory array is active, through filtering sensory inputs according to the user's objectives.
5. A sensory augmentation device as claimed in any of claims 3 or 4, wherein said tactile display (102) is controlled by said algorithm such that said tactile display is active, through modifying said tactile display according to the user's objectives.

6. A sensory augmentation device as claimed in any preceding claim wherein the sensory array (101) further comprises environment sensors with parameters set to be sensitive to environmental properties selected from temperature, humidity, light, sound or position or physical attributes of objects.
- 5 7. A sensory augmentation device as claimed in claim 6 wherein said sensory array (101) is controlled (202) by said algorithm (103) such that the sensory array actively changes said sensing parameters in response to changes in the environment.
8. A sensory augmentation device as claimed in any preceding claim wherein said computing means further comprises a timer and is adapted to determine the rate of
10 change of the position of the object with respect to the user from a measurement of velocity change of the object position over a period of time.
9. A sensory augmentation device as claimed in any preceding claim wherein the sensory array has means for detecting the physical attributes of the object and said algorithm comprises a library of physical attributes wherein said algorithm is adaptable
15 to match said detected physical attributes to an item in said library.
10. A sensory augmentation device as claimed in claim 9 wherein said library contains a corresponding vibrotactile symbol for said item and said tactile display is configurable to display said corresponding vibrotactile symbol.
11. A sensory augmentation device as claimed in claim 9 or 10 wherein the algorithm
20 comprises means to store in a memory of said computing means, said detected physical attributes of the objects that have been detected by said sensors and whereby said presentation is adapted to display the time since first detection of the object, wherein said adapted display is pulsed and the amplitude of each pulse relating to the object decreases according to the time since it was first detected.
- 25 12. A sensory augmentation device as claimed in any preceding claim wherein said computing means further comprises a graphical user interface.
13. A sensory augmentation device as claimed in claim 12 when dependent on claim 3, wherein the algorithm is programmable by said graphical user interface, to enable the objectives of the user to be entered into the algorithm.
- 30 14. A sensory augmentation device as claimed in claim 2, wherein the computing means is adapted to control the emitting module to emit signals in a specific time frame, direction or form.

15. A sensory augmentation device as claimed in any preceding claim wherein said tactile display (102) is controlled (203) by said algorithm (103) to present (204) information to the user within a comfortable dynamic range, preferably user specific.
- 5 16. A sensory augmentation device as claimed in claim 15 wherein said comfortable dynamic range is user specific and comprises a lower limit where the user cannot feel the tactile display and an upper limit where the tactile display is perceived as painful by the user.
- 10 17. A sensory augmentation device as claimed in claim 16 wherein the computing means is adapted to adapt said comfortable dynamic range in real time through feedback (205, 206) of the user's reaction (105) to the tactile display.
18. A sensory augmentation device as claimed in claim 15 when dependent on claim 12, wherein the graphical user interface 306 is adapted to enter the comfortable dynamic range of the user.
- 15 19. A sensory augmentation device as claimed in any preceding claim wherein said tactile display (102) comprises a plurality of vibrotactile elements configured to present (204) a vibrotactile language to the user.
20. A sensory augmentation device as claimed in claim 19 wherein said plurality of vibrotactile elements are actuators.
- 20 21. A sensory augmentation device as claimed in claim 19 wherein said vibrotactile language is built from a combination of drive parameters of the tactile display, comprising; amplitude, frequency, pulse width, pulse frequency.
22. A sensory augmentation device as claimed in claim 19 wherein said vibrotactile language further comprises ascending or descending frequency pulses.
- 25 23. A sensory augmentation device as claimed in any preceding claim wherein the tactile display (102) is positionable over an area of the body of the user to engage with the cognitive core (104) of the user, wherein the cognitive core of the user is the set of skills, habits and abilities, in perception and action, that a person can rely on without effortful deliberation and that may be interfaced to through vibrotactile stimulation of body surfaces.
- 30 24. A sensory augmentation device as claimed in claim 23 wherein said area of the body is locatable on a skin position that is well served by nerve endings.
25. A sensory augmentation device as claimed in claim 23 wherein said area of the body is locatable on a skin position in close proximity to a trigeminal nerve of the user.

26. A sensory augmentation device as claimed in claim 24 wherein the tactile display is locatable about the temples of the user's (1) head.
27. A sensory augmentation device according to any preceding claim wherein the tactile display promotes a user reaction (105) which is used to feedback (207) to the control algorithm, and may directly affect (206) the sensory array (101).
28. A sensory augmentation device substantially as hereinbefore described with reference to the accompanying drawings.
29. A method for sensory augmentation, wherein information about an environment comprising objects surrounding a user is presented to the user, said method comprising the steps of:
- a) sensing the presence of said objects to generate output data about said objects; and using an algorithm in computing means, either
- i. to modify said sensing to affect said output data; and/or
- ii. to process what is sensed to generate said output data; and either or both:
- in response to circumstances of the user, said circumstances selected from the group comprising:
- a rate of change of position of the object with respect to the user;
 - physical attributes of the object;
 - time since first detection of the object by the sensory array;
 - objectives of the user; and,
 - environmental parameters, and
- b) presenting said output data to the user in a tactile display, such that the user is presented with information about objects in the environment beyond the physical presence of the object.
30. A method for sensory augmentation as claimed in claim 29, wherein step a) further comprises emitting a signal into said environment using emitters and receiving in receivers a signal reflected from said objects in said environment.
31. A method for sensory augmentation as claimed in claim 29 or 30, wherein said one or more objectives of the user comprise their orientation, heading, velocity, acceleration.
32. A method for sensory augmentation as claimed in claim 29, 30 or 31, wherein said environmental parameters comprise temperature, humidity, light levels, noise levels.

33. A method for sensory augmentation as claimed in any of claims 29 to 32 further comprising the steps of:

- a) sensing the velocity and/or acceleration of the user and the presence of said objects in said environment;
 - 5 b) determining the direction of heading of the user;
 - c) applying a filter to increase sensory information processed for objects in the direction of heading and reduce sensory information processed for objects not in the direction of heading;
- whereby, said output data set is modified.

10 34. A method for sensory augmentation as claimed in any of claims 29 to 33 further comprising the steps of:

- a) retaining sensory information about said objects as obtained at a first time;
 - b) matching said sensory information about said objects as obtained at a later second time to said first time;
 - 15 c) applying a time-dependent reduction to matched sensory information as obtained at said second time to produce said output data,
- whereby, said presentation of said output data is time-dependent.

35. A method for sensory augmentation as claimed in any of claims 29 to 34 further comprising the steps of:

- 20 a) retaining sensory information about said objects as obtained at a first time;
 - b) matching said sensory information about said objects as obtained at a later second time to said first time;
 - c) determining the velocity of said one or more objects;
 - d) comparing the velocity of said user to the velocity of said objects to produce
 - 25 said filtered information;
- whereby, said presentation of said output data is velocity dependent.

36. A method for sensory augmentation as claimed in claim 35 wherein said velocity dependent presentation of output data changes frequency over time according to the velocity, whereby:

- 30 • the frequency of the presentation of objects towards a user varies with time in a first way; and
- the frequency of the presentation of objects moving away from the user varies with time in a second way;

wherein, said first way is opposite to said second way.

37. A method for sensory augmentation as claimed in any of claims 29 to 36 wherein said presentation of said output data is pulsed.
38. A method for sensory augmentation as claimed in any of claims 29 to 37 further comprising the step of:
- 5 comparing, within said algorithm, said sensory information to a library of sensory signatures, whereby said comparison is used to classify a property of the object wherein said classification of said object is presented to said user through a tactile presentation specific to said classification.
39. A method for sensory augmentation as claimed in any of claims 29 to 38 wherein said
10 tactile display presents a vibrotactile language which is programmable or learnable by said user.
40. A method for sensory augmentation as claimed in any of claims 29 to 39, as performed using the apparatus as claimed in any of claims 1 to 28.
41. A method for sensory augmentation as hereinbefore described with reference to the
15 accompanying drawings.
42. A sensory augmentation device configured to implement the method of any of claims 30 to 40.



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Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 3, 12, 29	Kris Walters; Seungyon Lee; Starner T; Rüdiger Leibbrandt; Lawo M, "Touchfire: Towards a glove-mounted tactile display for rendering temperature readings for firefighters" Wearable Computers (ISWC), 2010, pages 1-4, ISBN 978-1-4244-9046-2
X	1, 10, 12, 19, 24, 29	Pradeep V; Medioni G; Weiland J, "A wearable system for the visually impaired", 2010, 2010 annual international conference of the IEEE Engineering in Medicine and Biology Society : (EMBC 2010) ; Buenos Aires, Argentina, 31 August - 4 September 2010, pages 6233-6236, ISBN: 978-1-4244-4123-5 Especially page 6234
X	1, 12, 29	Schwerdt H N; Tapson J; Etienne-Cummings R, "A color detection glove with haptic feedback for the visually disabled", Information Sciences and Systems, 2009. CISS 2009. 43rd Annual Conference, IEEE, Piscataway, NJ, USA, pages 681-686, ISBN 978-1-4244-2733-8
X	1, 12, 29	US2008/120029 A1 See abstract
X	1, 12, 29	WO2010/011045 A2 See English language abstract, WPI accession number 2010-B13116[11]
X,P	1, 12, 29	WO2011/117794 A1 (Ariel University) See page 5 paragraph 2, page 7 paragraphs 3, 4

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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(54) Title: TACTILE COMMUNICATION DEVICE FOR THE NECK

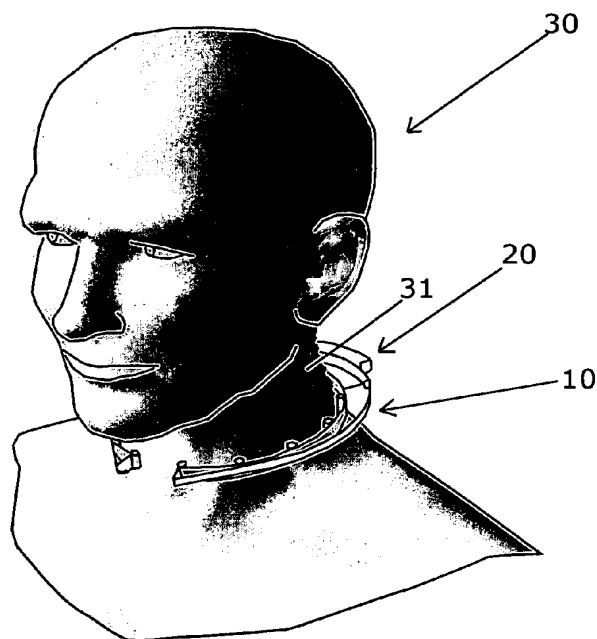


FIG 1

(57) Abstract: A device 10 comprised of a plurality of evenly spaced tactile actuators 11 arranged in the form of a generally C-shaped structure and worn snug around the neck 20 by a subject 30 to apply tactile stimuli to the subject's neck skin. An electronic controller operated by a computer program controls the actuators 11 of the device 10 based on signals received from an external source. The device impresses sequences of tactile stimuli around the subject's neck to provide intelligible information, cues and warnings or certain game-related sensations.

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TACTILE COMMUNICATION DEVICE FOR THE NECK SPECIFICATION

BACKGROUND OF THE INVENTION

This Application claims the benefit of U.S. Provisional Application Serial
5 No. 61/340,966, filed on 03/25/2010; U.S. Provisional Application Serial No.
61/397,336, filed on 06/10/2010; and U.S. Provisional Application Serial No.
61/397,621, filed on 06/14/2010, respectively.

This invention relates generally to man-machine interaction and tactile
communication. Particularly, this invention relates to the communication of precise
10 and intelligible information or sensations utilizing a device placed around the neck of
a person and using tactile actuators to stimulate the neck skin from various angles or
peripheral locations.

The five senses of a human provide an individual with cues about location,
distance, velocity, acceleration and other properties of surrounding items. In
15 simulated or virtual worlds such as electronic video games, the senses are restricted
by the limited size of the video screen, low sound quality and the limited tactile
sensations provided by the vibration of a hand-held controller, for example.

Vibrating game controllers are known and have been devised (Nishiumi,
Koshima and Ohta, 2006) and used to create, in the player, a sense of interaction with
20 the physical world. For instance, in a car racing game, as the vehicle leaves the
pavement, the hand-held game controller vibrates. In first person shooter games, the
subject may be informed of having been hit by a projectile through the vibration of
the game controller, for example. With the advent of controller-less game systems,
the prior art means by which tactile information was provided to the subject has been
25 further limited because these new systems no longer enable user interaction using
hand-held controllers (pad, joystick, etc.). The KINECT gaming system developed by
the Microsoft Corporation is an example of a controller-less game system. Thus, a
need exists in the art to provide detailed tactile information to a video game player,
for example.

30

Tactile Communication

Tactile communication methods, systems and devices have been devised to
provide an individual with the ability to understand text and commands, or to augment
situational awareness. These inventions primarily relate to artificial vision for the

blind (MIT Touchlab, 2005) and to remote communication with individuals (Gilson & Christopher (2007), Rupert & Kolev (2008) and Zelek & Holbein (2008)).

Tactile displays, as the visual-to-tactile information translation is often called, have been extensively investigated by research organizations such as the MIT Touch
5 Lab (MIT Touchlab, 2005).

Research and prior art in the area of tactile displays has generally been concentrated around passing tactile information to the skin, and the mechanical and physiological parameters that limit the complexity and bandwidth, (amount of information per unit time) that can be transmitted with no particular interest in the
10 neck skin as a high-resolution sensory organ.

The Tactile Situation Awareness System (TSAS) is a wearable tactile display intended to provide spatial orientation cues (Zelek & Holbein, 2008; Rupert & Kolev, 2008). A belt equipped with transducers and worn around the waist (Gilson & Christopher, 2007) was devised to provide orientation cues to soldiers. This prior art
15 uses tactile stimulus at various positions around the torso and the belt area to pass on information on the location of an incoming threat to the subject. However, the neck skin as a high-resolution sensory organ was not considered or suggested.

The Neck Skin As A High-Resolution Sensory Organ

20 One measure of the effectiveness of a form of communication is how fast complex information can be communicated to an individual through a specified form of communication. In information theory, this is typically measured by how many characters can be communicated to an individual, and at what rate these characters can be comprehended by the individual.

25 The skin of an untrained individual is an imprecise sensory organ. While a person can discriminate between tactile stimuli applied to individual fingers, toes, other body parts or far-apart skin locations, the ability to discriminate between neighboring skin locations is greatly limited. However, tactile stimulus applied at various angles or peripheral locations around the neck can be discerned despite the
30 closeness of the application points. An untrained individual is often capable of discriminating as many as 8 to 12 different angular or peripheral locations around his or her neck (Figure 2). A simple test shows that an individual may be trained to distinguish the location of tactile stimuli applied to many more angular or peripheral locations around the neck.

Consider a horizontal clock face 28 facing up and centered on the subject's neck (Figure 2). If the clock is oriented in such a way that 12 o'clock points towards the front of the subject, one can devise an experiment where the neck of the subject is touched at various angular or peripheral locations around the neck and the subject names the hour mark corresponding to the point of contact. For instance, when the subject is touched straight behind the neck, he or she will say: "6 o'clock". An untrained subject can, in general, "tell apart" or distinguish each of the 12 hour marks. This ability to distinguish the 12 different angular or peripheral locations corresponds to a resolution of 12 or, in digital terms, between 8 ($=2^3$, or 3-bit resolution) and 16 ($=2^4$, or 4-bit resolution).

With such a resolution, an individual is not only able to tell directions but can also distinguish between combinations of stimulation points. By simultaneously stimulating several locations around the neck, with some training, it is then possible to communicate complex information to an individual simply through tactile communication (see Table 1, Table 2, Table 3, and Table 4 shown and discussed below).

The neck skin has a unique property that enables a person to accurately discriminate tactile stimuli applied from various directions onto its surface. The present invention exploits this discriminatory stimuli property to convey information and sensations to a subject immersed in a simulated or virtual world such as an electronic video game. Embodiments of the invention utilizing this methodology of tactile stimuli may also be used, for example, to communicate with pilots, the blind, the autistic, musicians and those unable to communicate verbally or visually.

SUMMARY OF THE INVENTION

The invention provides a device comprised of a plurality of tactile actuators (solenoids, micro-vibrators, motors, buzzers, speakers, hot/cold sources, electrodes, and the like) arranged at regular intervals in a semi-circle and worn snug around the neck by the subject. An electronic controller powered by a power source, such as a small rechargeable battery pack, and operated by a computer program that operates the device based on signals received from an external source through a Bluetooth or similar wireless receiver. Based on signals received from the external source, which may be a video game console, computer or mobile communication device, for example, the controller commands the device to impress sequences of tactile stimuli

at specified locations around the subject's neck, thereby providing the subject with intelligible game-related information, cues and warnings or game-related sensations.

The device is constructed generally in the form of a pair of headphones connected by flexible and spring-loaded metal strips resting around the neck of a user.

5 Actuators are positioned in an extensible and adjustable holster that may be shortened or elongated based on how far the metal strips are pulled out of the sleeve, to provide equidistantly spaced actuators independent of the subject's neck size. The design structure ensures that it is properly oriented (front facing to the front of the subject), and that the same size device can fit individuals of varying neck sizes. Furthermore,
10 the device may be combined with a pair of speaker/headphones and a microphone, to provide a complete sensory audio-visual and tactile environment to the user.

 A benefit of the present invention, embodied as a collection of equally-spaced actuators worn as an adjustable and comfortable generally C-shaped collar worn snug around the neck is to provide an additional sensory channel through which game-
15 related sensations and stimuli can be transmitted to the subject to substantially enhance the subject's gaming experience.

 Another benefit of the invention is to provide a device which allows individual players during video gaming to receive private communication from the game console and to be rewarded.

20 A further benefit of the invention is to provide a device which may provide rhythmic tactile patterns as an accompaniment to music, for example, as a tactile metronome to provide organized tactile patterns or marquis patterns for use by musicians, dancers, singers, etc. or by providing a tactile feel of music through a one-to-one mapping between each note of a song and each actuator. The device may
25 further be utilized as a means for the deaf to sense music.

 An advantage of the invention is to provide small micro-vibration motors as vibrating actuators and pulse-operated motors to cause gentle rubbing against the skin.

 Another advantage of the invention is to provide semaphores for representing the distance and bearing of a target, and semaphores for conveying a sense of
30 acceleration. Distance may be represented by turning groups of actuators on and off at a certain frequency or by varying the electrical current input to the actuators. Acceleration may be represented by activating groups of actuators to represent pressure due to acceleration.

These and other benefits of this invention will become apparent from the following description by reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

5 **FIGURE 1** is a perspective view showing the tactile communication device of the present invention worn around the neck of a subject;

FIGURE 2 is a perspective view showing a subject with a peripheral pattern of stimuli corresponding to the face of a clock;

10 **FIGURE 3** is a perspective view showing the construction of the device of the invention;

FIGURE 4 is a perspective view showing an alternative construction of the device of the invention;

FIGURE 5 is a perspective view showing a subject wearing the tactile communication device of the invention utilizing pulsing actuators;

15 **FIGURES 6A-6C** are perspective views showing successive rotating positions of the pulsing actuator of **FIGURE 5**;

FIGURE 7 is a depiction of a target approaching the device of the invention;

FIGURE 8 is a depiction of a neck axis showing the location P of an actuator that turns on if the neck axis strays from the vertical axis Z;

20 **FIGURE 9** is another depiction of a neck axis 21 corresponding to a device having twelve actuators and indicating the active actuator when the neck axis strays from the vertical axis 22; and

FIGURES 10A-10C are depictions of the expression of acceleration by the device of the invention;

25

DESCRIPTION OF THE PREFERRED EMBODIMENTS

 The present invention relates to a tactile communication device for the neck of a user. The skin of the neck as a high-resolution sensory organ is discussed above. **Figures 1-10** show the structure of the device and its operation. Tactile patterns or Marquis Patterns are discussed as a means of communicating certain sensations in a simulated or virtual environment and examples of Marquis Patterns are discussed with respect to **Tables 1-4** set forth below. Applications of the invention are further discussed with respect to the drawing **Figures 1-10** and the **Tables 1-4**.

30

Figure 1 shows the device 10 of the invention embodied as a collection of equally-spaced actuators 11 worn as an adjustable, and comfortable C-shaped collar worn snug around the neck 20 of a subject 30. The device 10 provides an additional sensory channel through which game-related sensations and stimuli can be transmitted to the subject in order to substantially enhance the subject's gaming experience. The device 10 is shown disposed around the neck not unlike a pair of headphones that are not in use. The open C shape of the device 10 and its adjustable structure provides a fit for a range of neck sizes and which is properly oriented, namely, open end facing the larynx or Adam's apple of the subject 30.

Figure 2 shows a clock face 28 with 12 directions with respect to the subject's neck orientation. The design of the device ensures that it remains properly oriented with respect to the subject's neck 20. 12 o'clock corresponds to the front actuator 24 and 6 o'clock refers to the back actuator 24 of the subject's neck 20.

Figure 3 shows the device 10 structure to be a generally solid skeleton constructed of two curved metal strips 13 sliding from a solid sleeve 14. The skeleton maintains a flexible holster 12 to hold a plurality of actuators 11 taut around the subject's neck 20, as shown in **Figure 1**. The device 10 may be adjusted to different neck sizes by pushing or pulling the metal strips 13 in and out of the sleeve 14.

The holster 12 may be constructed of an elastic textile material or the like, and having a plurality of equally spaced actuators 11. The holster 12 is shown to have 13 actuators 11, with the two forward actuators 11 operating in unison. The latter being similar to placing 12 actuators 11 on a circle with one actuator being placed on the front of the neck, however, in this embodiment of an open C design, the 13 actuator design is an approximation of a 12-actuator design.

The holster 12 is shown anchored at its ends to the free ends of the metal strips 13 by means of two solid or rigid anchors 16. The anchors 16 ensure that when the device 10 is worn, the holster 12 remains taut and snug around the subject's neck 20. The holster 12 is maintained aligned with the sleeve 14 and the metal strips 13 by means of three springs 17 which ensure that the holster 12 remains taut, close to the sleeve 14 and spaced from the neck. When the device 10 is worn, the skeleton comprised of the sleeve 14 and the metal strips 13 ensures that the holster 12 and the actuators 11 fit snug around the neck 20 while leaving the frontal area around the subject's Adam's apple open, thereby ensuring that the subject doesn't feel "choked" by the device.

Figure 4 shows an alternate design constructed similar to the device 10 of **Figure 3**. However, instead of 13 actuators 11 placed at equal distance along the holster 12, three rows of 25 actuators 19 are placed on the holster 12. The 75 actuators 19 can convey a richer set of information to the subject by relying on the subject's ability to discriminate between three actuators located at the same angular or peripheral location and at three different heights on the neck skin.

The actuators 11 are in communication with the electronics contained within the contoured box 15. The contoured electronic box 15 is shown attached to the back of the sleeve 14 and which houses the electronics, i.e., batteries, Bluetooth and radio or transmission devices utilized for the operation of the device. The communication may be wireless or via wires extending from box 15 through springs 17 and through the flexible holster 12 material to each actuator 11.

The actuators 11 may have a number of embodiments and structures. For examples, as shown in **Figure 3**, the generally cylindrical structures may be flexible and deformable to thereby permit a small, or variable, force from within the cylindrical actuator to "touch" the user's neck skin. Alternately, the cylindrical structure may be movable from and with respect to the holster 12 to thereby impart a "touching" force to the user's neck skin. In a similar manner, a vibration may be provided from within the actuator body or by the movement of the actuator body itself. The actuators 11 of **Figure 4** are shown to be formed of cylindrical, button-like shapes which may also move or be moved in a similar manner described with respect to the actuators of **Figure 3**. The actuators may also be structured so as to impart a small electrical discharge or to provide a temperature change to the neck skin of the user.

In summary, the tactile stimulators 11 as shown and described with respect to **Figures 3-5** may have various structures and may be disposed with respect to the neck skin in various patterns. For example, the stimulators are preferably equidistantly spaced and extend from the inside periphery of the holster which is adjustably placed about the user's neck circumference. The stimulators are positioned to angularly or peripherally touch the neck skin of the user. The tactile stimulators may also be constructed and arranged to tangentially rub, vibrate or touch from an oblique angle, apply a change in temperature, or provide a small electric discharge to the neck skin. The spacing of the actuators as well as the number of columns and rows of actuators shown and described herein are exemplary and may vary. Further, the structure of the

device 10 and its adjustability are exemplary. The important aspect of the invention being the tactile communication provided by the actuators held to the neck skin of the subject.

Figure 5 shows the device worn around a user's neck 20 having actuators or pulse motors 25 that are mounted at hinge-like connection 27 to the inside of the flexible holster 12 and spaced around the user's neck. The hinge-like connection 27 allows the actuators or motors 25 to rotationally move with respect to the holster 12 body structure. The pulsing of the motor 25 causes a gentle rub against the neck skin 31 as power is suddenly delivered to the motor 25. Similar to that of **Figure 1**, device 10 is shown having a generally solid skeleton constructed of the curved metal strips 13 that slide into solid sleeve 14. Flexible holster 12 is shown carrying motors 25 and held taut on the user's neck by metal strips 13. Anchors 16 ensure that holster 12 remains about the user's neck and a contoured electronic housing or box 15 is shown attached to sleeve 14 and which contains the electronics for the device for communication between the spaced motors 25 and the electronics in box 15 via wires or wirelessly.

Figures 6A-6C show three successive positions of a motor 25 as the body or stator of the motor rotates about the hinge axis depicted by a vector 26, thereby gently rubbing against the neck skin of the device user. Each motor or actuator 25 is shown attached to holster 12 in a manner so that the attachment point acts as a hinge 27, enabling the body of motor 25 to rotate as a result of the initial power-up torque to the motor and to thereby rub the user's neck skin 31.

Figure 7 shows how the device 10 may be used to communicate the direction (bearing) and the distance (range) of a target 18 to the subject. From top to bottom, as the target 18, represented by a square, approaches the subject from the South-East, the number of active actuators 11 (represented by black dots) increases. Far away, only one actuator 11 pointing to the direction of the target is active. As the target approaches, the patch of active actuators 11 enlarges, with the average direction of the patch pointing towards the target 18. When the target 18 is the closest to the subject, nearly half of the actuators in the direction of the target are active. The relationship between the number of active actuators and distance described herein is exemplary and may vary.

Semaphores for Representing Distance and Bearing of a Target

Figure 7 shows that the device can be used to communicate the direction (bearing) and the distance (range) of a target to the subject. As the target approaches, the patch of active actuators enlarges, with the average direction of the patch of active actuators pointing towards the target. This methodology has limitations, for example, as the target approaches, the number of active actuators increases resulting in a decrease in the directionality and accuracy of the device in pointing to the object. Further, multiple approaching objects may not be tracked with this method because as individual objects approach, their respective active actuator patches merge creating a single large patch that no longer represents the initial individual objects. The latter limitations may be dealt with as follows:

Representing Distance by Turning Actuators On and Off:

Alternatively, instead of representing the location of an object with one or several continuously active actuators, a single actuator pointing in the direction of the object may be turned on and off at a certain or specified frequency depending on the distance of the object to the subject. As the object approaches, the on/off frequency is increased. When the object is very close to the subject, the frequency is maximal. As the object withdraws, the frequency is reduced.

By linking the distance of an object (to the subject) to the on/off frequency of actuators, multiple objects located at various distances from the subject may be tracked, each represented by a single actuator pointing in that direction and turning on and off at a frequency representing the distance of that object of the subject.

Representing Distance by Varying the Electrical Current Input to Actuators:

As an object approaches, the intensity of the current fed to an actuator pointing to the direction of the object may be increased thereby increasing the intensity of the stimulation impressed upon the skin. As an object withdraws, the electrical current is diminished. By controlling the electrical current fed to each actuator, multiple objects located at various distances from the subject may be tracked, each represented by a single actuator pointing to that object and operating at an intensity based on the current supplied to it which represents the distance of that object to the subject.

Semaphores indicating departure from the vertical Axis

One application of this invention is as an aid to pilots in avoiding loss of horizon: a dangerous condition caused by bad weather, and low visibility, and resulting in disorientation and accidents. Loss of horizon occurs when all visual cues about the “up” and “down” directions are lost. Most aircraft are equipped with electronic navigational systems, including gyroscopes. A gyroscope keeps track of the horizon and the current attitude of the aircraft and, with the help of the onboard navigational systems, displays the horizon through an instrument called artificial horizon. However, in certain emergencies, a visual display of the horizon may be confusing to a pilot who must scan multiple instruments, under extreme workloads. The attitude of the aircraft may be represented by a vector aligned with the axis of the pilot’s neck. The electronic navigational system of the aircraft can calculate the relative position of neck axis the vertical axis OZ, as depicted in **Figure 8**.

Figure 8 shows a neck axis, represented by vector $\vec{n}$, being tilted with respect to the vertical axis OZ, the actuator located at point P on the device 10 is activated indicating to the subject the direction the neck should be tilted to realign it with the vertical axis OZ. Point P is defined as the intersection of a vertical plane containing vector $\vec{n}$ and axis OZ, and the circle Σ .

Figure 9 shows that as the neck axis, illustrated by vector 21 on clock face 28, is tilted with respect to the vertical direction indicated by vector 22, the actuator 23 is activated to indicate to the subject the direction in which the neck should be tilted to realign it with the vertical axis.

Semaphores for representing acceleration

In racing games, the acceleration experienced by a player may not be easily conveyed with visual or auditory cues. The present invention may be used to convey the direction and intensity of acceleration, experienced in a game, to a player. **Figures 10A-10C** show that as the acceleration experienced by the user increases in intensity and changes direction, the patch of active actuators 11 increases in size as a function of the intensity of acceleration, and the average direction of the patch of active actuators points in the opposite direction of the acceleration vector (32, 33 and 34). Thus, the player experiences in-game acceleration as if a yoke placed around his neck drags and accelerates him in various directions, with the size and direction of the

patch of active actuators, controlled by the game console, computer or mobile device, providing variable pressure to the neck skin by the actuators 11.

Construction of the Device

- 5 1. **Micro-vibration motors as vibrating actuators.** Small micro-vibration motors may be used as actuators in the device. Micro-vibration motors are used in mobile phones and pagers as silent alert mechanisms. As actuators in the device of the present invention, micro-vibration motors apply a localized vibration around the neck.
- 10 2. **Pulse-operated motors to cause a gentle rub against the skin.** When power is suddenly applied to an electric motor an initial torque is produced that forces the body (stator) of the motor to rotate counter to the direction of rotation of the rotor. This effect is used as a means to gently rub the body of the motor against the skin of the user. Each motor is fixed along its side, as
15 shown in **Figure 5**, which acts as a hinge when power is suddenly applied to the motor and causes it to rotate around the hinge-like structure. Pulse-operation of a motor consumes less electricity and may, in certain applications of the device, be more comfortable to the user.
- 20 3. **Addition of a positioning mechanism to the device.** An optical beacon using light-emitting diodes (LED's) may be placed on the device to enable a video camera working in concert with the video game system to locate the device and communicate the position and orientation (with respect to the video
25 screen) of a player wearing the device to the video game system. The knowledge of the location and orientation (direction to which a layer is facing with respect to the video screen) allows for more complex and interesting video game designs.

Organized Tactile Patterns (Marquis Patterns) As A Means Of Communicating Certain Sensations In A Simulated Or Virtual Environment

- 30 **Table 1** shows an example of repetitive marquis patterns causing a rotating point of contact around the neck of the subject. This pattern creates the sensation that the point of application of the stimulus is turning or rotating around the neck. Dark circles represent active actuators and the clear circles are inactive. The numbers indicate the sequence in which the actuators are activated.

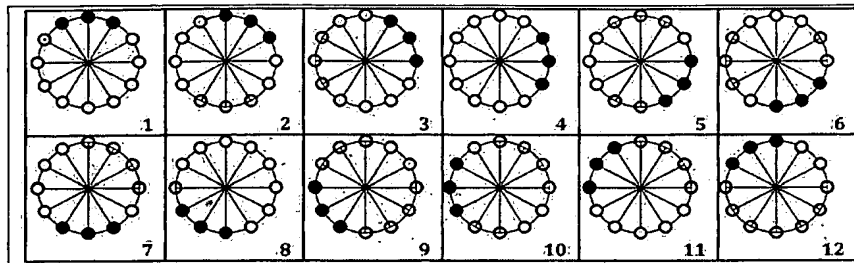


Table 1

- 5 **Table 2** shows an example of repetitive marquis patterns causing a sensation of back and forth movement of the pressure point of contact on the left and right sides of the neck of the subject. Dark circles represent active actuators and the clear circles are inactive. The numbers indicate the sequence in which the actuators are activated.

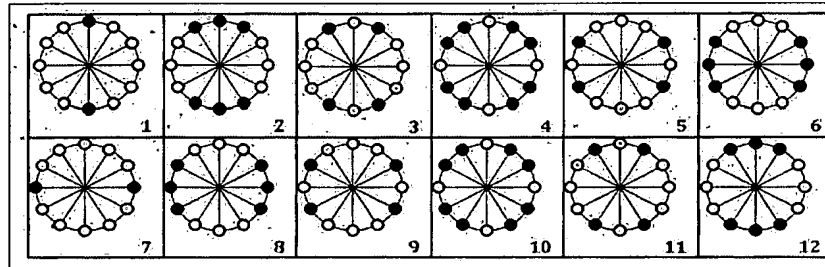


Table 2

10 **Table 3** shows an example of marquis pattern causing a repetitive constriction around the neck of the subject resulting from the repetitive and simultaneous firing or activation of all actuators.

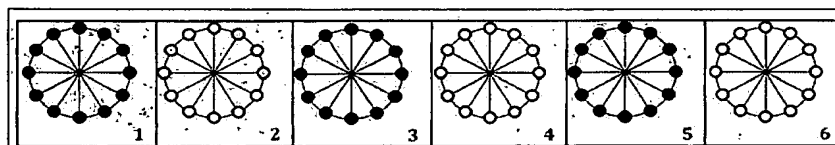


Table 3

- 15 Such patterns and the sensations provoked to the player may be used as a way to convey certain game conditions to the subject. These conditions may be
20 “diminishing health”, “about to be shot by a virtual component”, “falling” or “dying”.

Table 4 shows an example of a tactile alphabet based on the static patterns of tactile stimulation using 12 actuators placed at regular intervals around the neck.

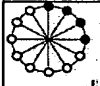
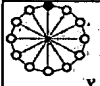
							
A	B	C	D	E	F	G	H
							
I	J	K	L	M	N	O	P
							
Q	R	S	T	U	V	W	X
							
Y	Z	0	1	2	3	4	5
							
6	7	8	9	period	comma	space	apostrophe
							
colon	semi-colon	quotation	\$	%	&	?	!

Table 4

Applications of the Invention

1. The device 10 (Figs. 1-5) is worn around the neck in a manner similar to an unused pair of headphones at rest around the neck. The device 10 enables players of electronic video games to receive tactile feedback (pressure, vibration, temperature change or electrical discharge) around their neck through an array of actuators 11. Using this device 10, video game players can orient themselves, feel the direction of an oncoming object, feel acceleration, and sense certain game-specific situations such as health level, success, failure and death.
2. The device 10 is particularly useful when used in conjunction with controller-less video game systems such as Microsoft Xbox's KINECT system. Controller-less game systems allow one to interact with an electronic video game without the use of any gamepad, joystick, etc. Instead, several cameras and an image-processing software are used to identify the player and read the movement of his/her body parts as input to the video game. The device 10 enables video game players to receive tactile feedback around the player's neck when there are no hand-held controllers to convey tactile feedback through controller vibrations, for example.

3. The computer program runs on the controller and fires the actuators in a certain sequence generating patterns and sequences of tactile stimulation on the neck of the subject in order to communicate specified information or sensations to the subject.
- 5 4. The physical design of the device 10 ensures that the actuators 11 remain equidistant from each other, and stay snug and in direct contact with the neck skin as the device is adjusted to various neck sizes. The device 10 has a generally C-shaped design structure ensuring that it remains properly oriented around the neck 20 (Figure 1) with the open end facing the front of the neck and the forward actuators bracketing the subject's Adam's apple as the subject moves or speaks. Further, the C-shaped design ensures that the subject's neck is not entirely surrounded by the device and does not feel "choked" by it. Throughout this application, the device 10 is shown with 13 actuators 11 with the two forward actuators 11 operating in unison at the 12 o'clock position. This design is equivalent to a fully closed design with 12 actuators 11.
- 10 5. The use of the neck 20 as a unique area of the human skin, and the exploitation of this uniqueness by stimulating it in a tactile fashion and from various angular or peripheral directions (Figure 2) thereby enabling the subject to identify, with a high level of accuracy, combinations of tactile stimuli applied at the various angular or peripheral locations around the neck.
- 15 6. An alphabet (Table 4) of patterns of tactile stimulation with 12 actuators 11 placed at regular or equidistant intervals around the neck for the purpose of communicating with a subject wearing the device. In this alphabet, each letter is represented by certain combinations of active actuators, firing simultaneously or consecutively. This alphabet may be used to communicate with a subject who, for pathological or other reasons such as visual or auditory information overload, is unable to receive communications through normal visual or auditory channels.
- 20 25 30 7. The use of certain organized tactile patterns referred to as "marquis patterns" to convey certain sensations signifying certain states of a video game or certain conditions (Table 1 and Table 2). For instance, in an electronic video game, "falling from a height" may be represented by a

sensation of a fast-rotating pressure point around the neck (Table 1). A sensation of fast back-and-forth movement of two pressure points on both sides of the neck (Table 2) may be used to convey a sensation of "Power Boost". Finally, the repetitive firing of all actuators (Table 3) may be used to convey the feeling of "losing" or "getting shot".

8. The device may be used to communicate with subjects unable to process text- or voice-based information due to autism or other neurological disorders. A small set of tactile semaphores based on the marquis patterns, or a simplified alphabet may be used, in conjunction with training and conditioning, to communicate with these individuals.

9. In an alternate design, the device may use several layers of actuators (Figure 4) conferring to the device an additional dimension that may be used to convey a richer set of information to the subject.

10. The computer program controlling the device may be programmed to produce sequences of marquis patterns (Table 1, Table 2 and Table 3) that provide bio-feedback or a soothing neck message to the subject.

11. The device may be used to communicate with individuals who can't see or hear, for example, due to visual and auditory overload or impairment. In such cases, the device may be used, for instance, to guide a subject toward a target or warn a blind subject of the bearing and range of an oncoming quiet vehicle such as an electric or hybrid automobile.

12. Blind individuals are increasingly taking part in sports and leisure activities. To safely practice these activities, the blind individual must follow a guide who carries a small bell or speaks continuously so the blind subject can locate them. In ball sports, the ball emits a continuous sound to allow the blind to locate it. The device may be used in conjunction with a radio-transmitter carried by a guide or a ball, and a directional radio-receiver carried by the subject, to communicate both the bearing and range (direction and distance) of the guide or the ball to the subject using tactile patterns on the neck of the subject (Figure 7).

13. The device can assist pilots, divers, skydivers or the like to recover their sense of up and down following disorientation due to a loss of visual and mental cues about the horizon. Loss of horizon is a serious concern and has been shown to be at the origin of many aviation and diving accidents.

When the subject's neck axis is in the vertical direction, no stimulation is applied to the neck. When the subject's neck axis deviates from the vertical direction, tactile signals indicate to the subject the direction in which he or she must tilt their neck to realign it with the vertical direction (Figure 8 and Figure 9).

14. An optical LED beacon (not shown) may also be used with the device 10 of the invention. Video game systems may include a camera placed near video screens to look back at users or the video game players. The camera may communicate with the beacon and determine the location of device 10 and, thus, the user as well as the orientation of the device and user with respect to the camera and video screen. The knowledge of the location and orientation (direction to which a player is facing with respect to the video screen) allows for more complex and interesting video game designs.

15 Application of the Device Related to Video Gaming

1. **Private communication with individual players.** In multi-player video games where several players are physically located in front of the same system, screen and set of speakers, the device may be used by the video game system to communication privately with individual players. Private prompting and communication with individual players allows for more competitive, complex and interesting game designs.
2. **Rewarding players.** The device may be used by a video game system as a means to reward individual players with soothing tactile sensations around the player's neck. These tactile sensations may be produced as sequences of **Marquis Patterns** as shown and described herein.

Application of the Device as an Accompaniment to Music

A computer, video gaming system, personal music delivery device such as an iPod, or a public music delivery system may use the device to simultaneously deliver music and rhythmic organized tactile patterns to listeners.

An example of such an application is the use of the device as a **tactile metronome** delivering a complex beat pattern in the form of sequences of organized tactile patterns (**Marquis Patterns**). In this fashion, a musician may use the device as a **tactile metronome** to "feel" complex beats while playing his/her instruments.

Another application may be in a dance club or in a choir where dancers or singers wearing the device receive rhythmic organized tactile patterns along with the music helping them to dance or sing in unison.

5 **Application of the Device as a Means for the Deaf to Sense Music**

Using the device, music may be translated to patterns of tactile stimulations and impressed on the neck skin of a deaf person. Each note of a musical scale may be mapped to a specific actuator or group of actuators, which may be turned on and left on for a duration equal to the timing value of that specific note. In this fashion, the production of tactile patterns on the neck may be made synchronous to the music itself, and hearing individuals may hear and feel the music as a synchronous and complete musical experience.

To translate music into an intuitive tactile experience, contiguous notes may be mapped to contiguous actuators, for example, with higher-pitched notes mapped to the front of the neck (corresponding to the 12 o'clock position) and the lower-pitched notes mapped to the back of the neck (6 o'clock position). The tactile sensing of music may be made more pleasant by mapping each note simultaneously to pairs of symmetrical actuators located on the left and right side of the neck, thus providing the subject with a more symmetrical tactile experience.

Although the device of the present invention is shown and described for use with respect to a high-resolution sensory organ of a user, such as the neck skin, the device may also be utilized on other body parts which may exhibit less sensory resolution.

As many changes are possible to the tactile communication device embodiments of this invention, utilizing the teachings thereof, the description above and the accompanying drawings should be interpreted in the illustrative and not in the limited sense.

THAT WHICH IS CLAIMED IS:

1. A device for tactile communication with the neck skin of a person comprising a compact adjustable, generally C-shaped structure having a plurality of spaced actuators mounted thereto and constructed for tactile communication with the neck skin of the person.
2. A tactile communication device for the neck comprising:
 - a) means to position a plurality of actuators for spacing around the neck of a user, each actuator positioned for contact with the skin of the neck of the user; and
 - b) means to actuate each said actuator to provide tactile communication to the skin of the neck of the user.
3. The tactile communication device of **Claim 2**, wherein said means to actuate include software programmed to provide marquis patterns and semaphores to said actuators.
4. The tactile communication device of **Claim 3**, wherein said marquis patterns and semaphores represent depictions selected from the group of depictions consisting of the letters of the alphabet, numbers, musical notes, location of an object, speed of an object and the vertical orientation of the device when worn about the neck of a user.
5. The tactile communication device of **Claim 2**, wherein said means to position said actuators is comprised of a holster assembly having an elongated and flexible structure, forming a generally C-shaped structure about the neck of the user and wherein an extendable support strip is disposed on the outside of said elongated flexible structure.
6. The tactile communication device of **Claim 2**, wherein said plurality of actuators are generally equidistantly spaced from each other to form a clock face arrangement about the neck of a user and wherein said actuators are

selected from the group of actuators consisting of solenoids, micro-vibrators, buzzers, motors, speakers, electrical discharge and hot/cold sources.

- 5 7. The tactile communication device of **Claim 2**, wherein said actuators are pulse operated motors, each mounted along an off-center axis for rotation about said axis or wherein on/off means are provided for each said actuator, said on/off means including timing and frequency means.
- 10 8. The tactile communication device of **Claim 2**, wherein an optical beacon is mounted to said device to provide a positioning mechanism.
9. The tactile communication device of **Claim 2**, wherein each said actuator is operated by a variable electrical current.
- 15 10. The tactile communication device of **Claim 2**, wherein music note coordination means are provided in communication with said actuators to provide tactile stimulation patterns to the skin of a user in synchronization with musical notes.
- 20 11. A tactile communication device for the neck comprising:
 - a) a holster assembly having an elongated extendable and flexible structure with an inner surface and an outer surface;
 - b) a plurality of actuators disposed about and extending from said inner surface of said elongated flexible structure of said holster assembly, said actuators being constructed and arranged generally equidistantly from each other for contact with the skin of the neck of a user;
 - 25 c) an extendable support strip disposed on the outside of said extendable flexible structure; and
 - d) a housing mounted to said extendable strip for containing electronic elements in communication with said actuators.
- 30 12. The tactile communication device of **Claim 11**, wherein said actuators are disposed generally in a circle about the neck of the user and wherein said actuators being disposed in the form of a clock face and having 13 actuators.

13. The tactile communication device of **Claim 11**, wherein software is provided and wherein said device is controlled by said software to convert external signals to actuator activity and wherein said actuators are constructed and arranged to provide touch, temperature change, vibration, and an electrical discharge.
14. The tactile communication device of **Claim 13**, wherein said software is adapted to convert external activity into marquis patterns and semaphores to said actuators.
15. The tactile communication device of **Claim 11**, wherein said actuators are formed of an elongated, generally cylindrical structures and are axially disposed on said inner surface of said elongated flexible structure.
16. The tactile communication device of **Claim 15**, wherein said actuators are comprised of pulse operated micro-vibration motors.
17. The tactile communication device of **Claim 11**, wherein an optical beacon is mounted to said device to provide a positioning mechanism.
18. The tactile communication device of **Claim 11**, wherein on/off means are provided for each said actuator, said on/off means including timing and frequency means.
19. The tactile communication device of **Claim 11**, wherein each said actuator is operated by an electrical current and wherein a variable electrical current output is provided for communication with said actuators.
20. The tactile communication device of **Claim 11**, wherein music note coordination means are provided in communication with said actuators to provide tactile stimulation patterns to the skin of a user in synchronization with musical notes.

1/5

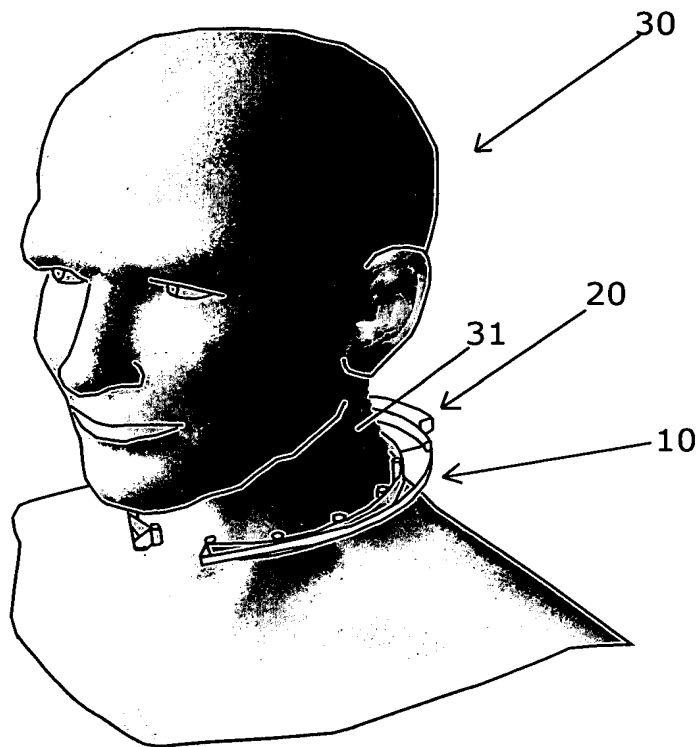


FIG 1

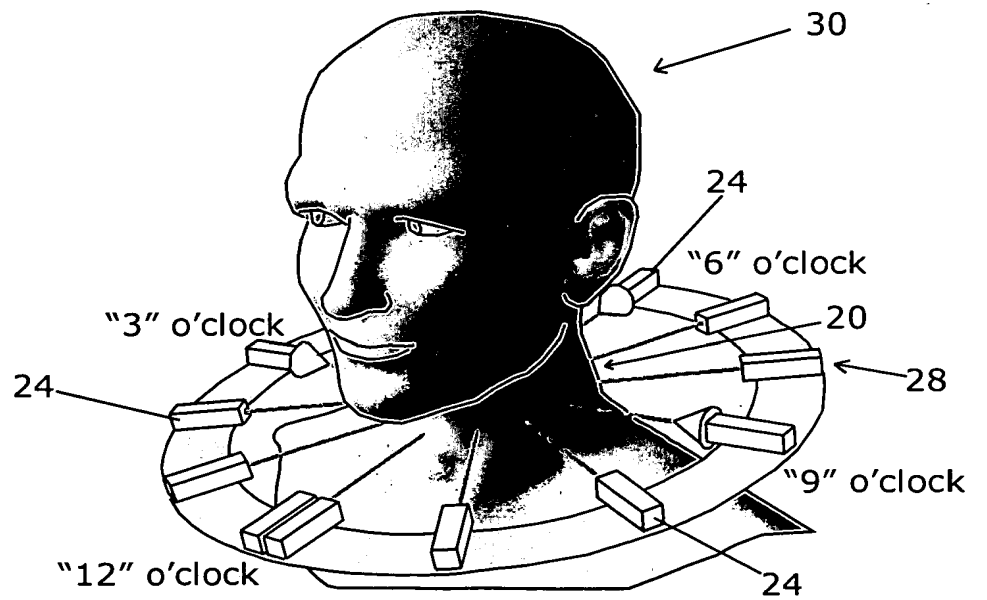


FIG 2

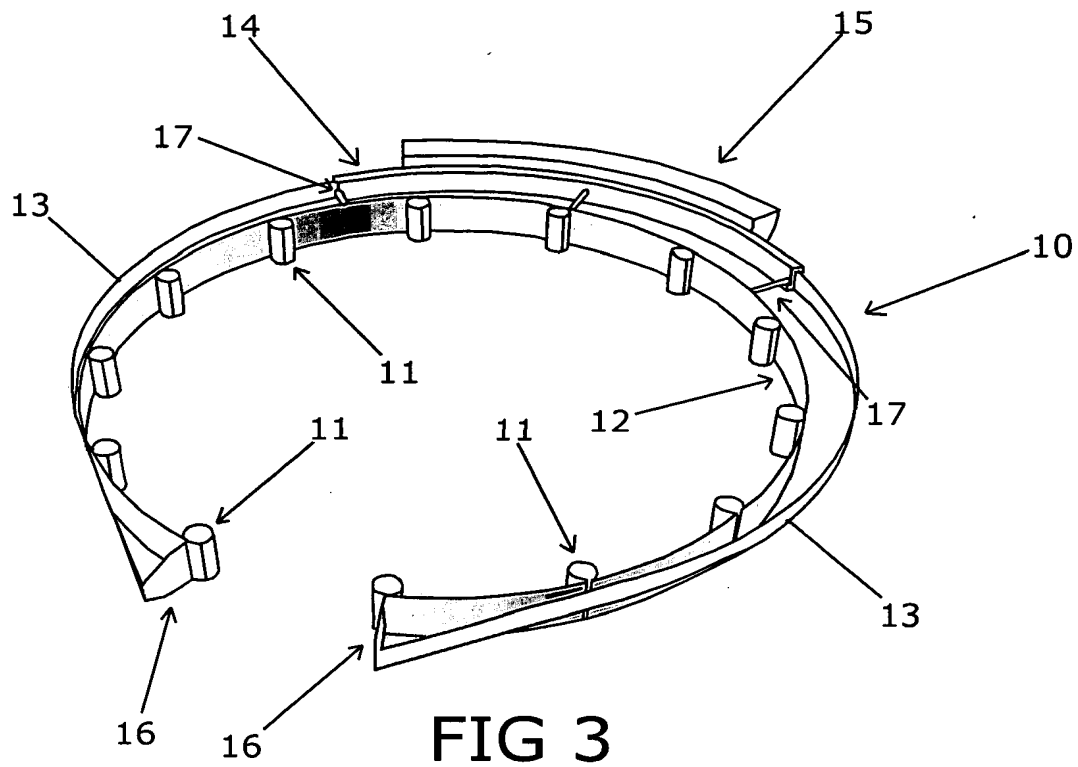


FIG 3

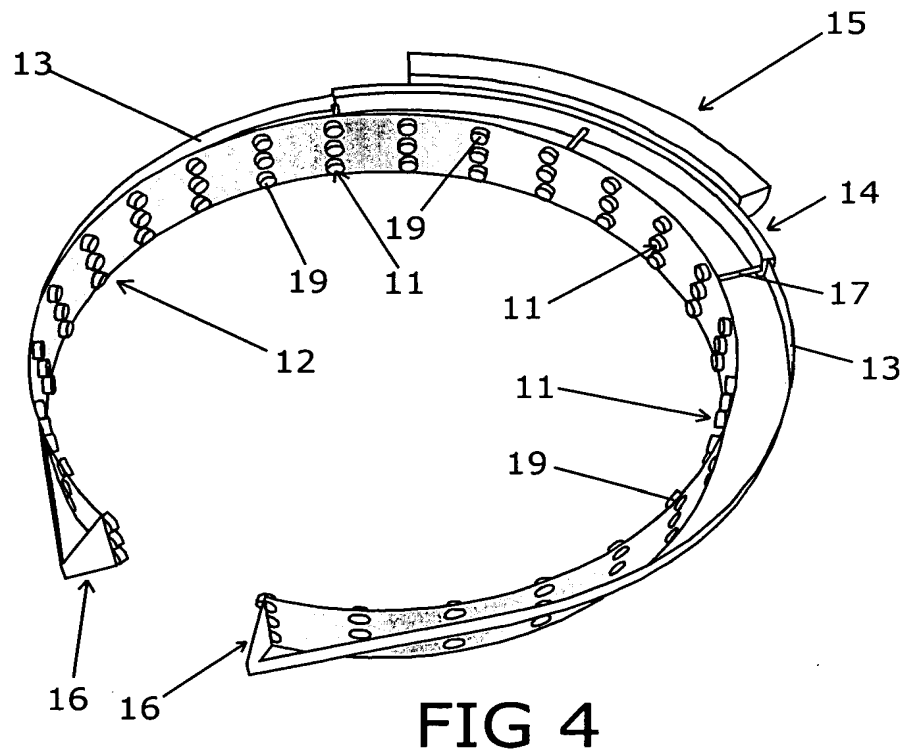


FIG 4

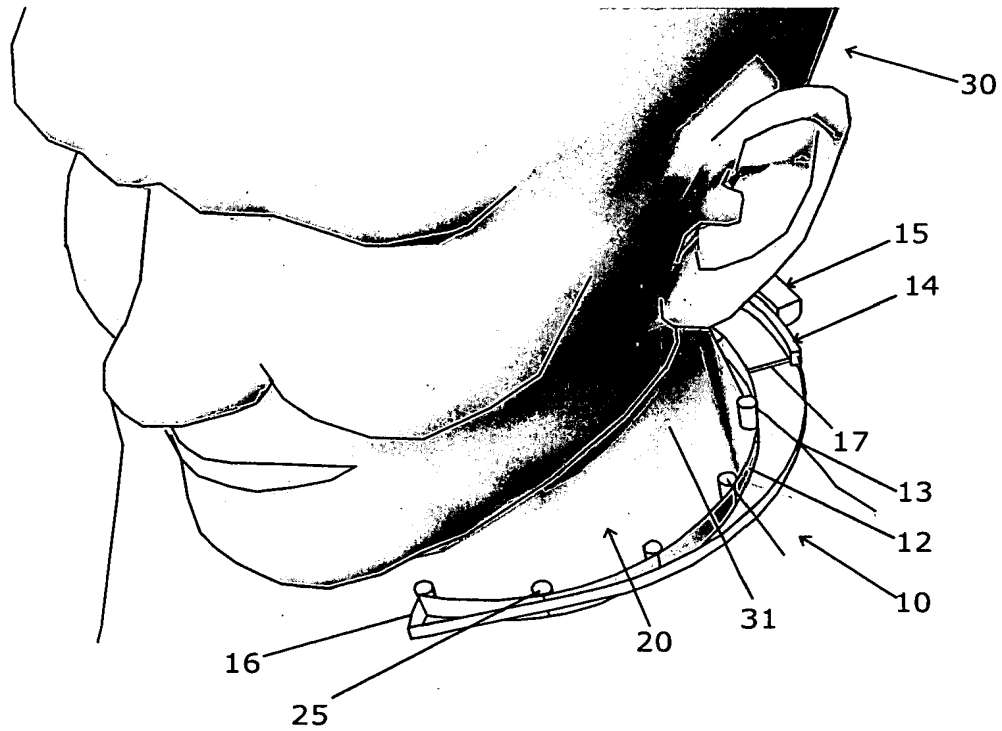


FIG 5

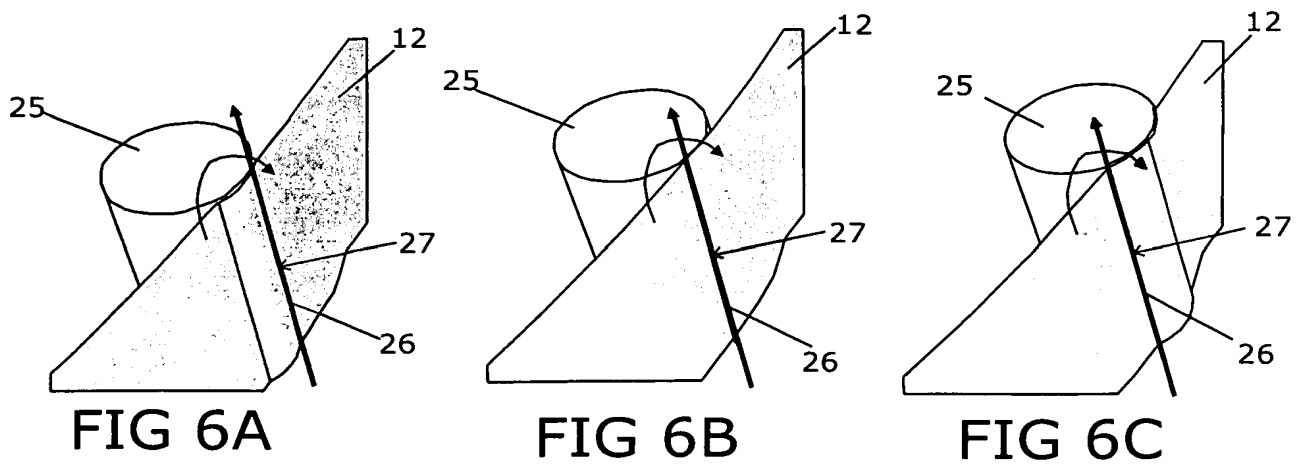


FIG 6A

FIG 6B

FIG 6C

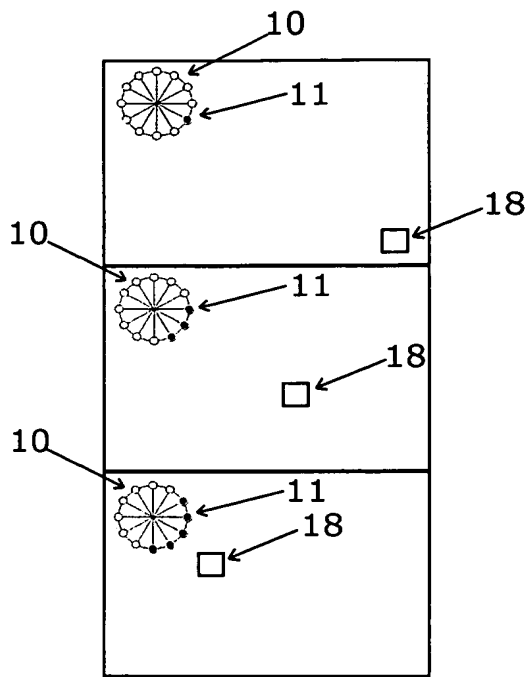


FIG 7

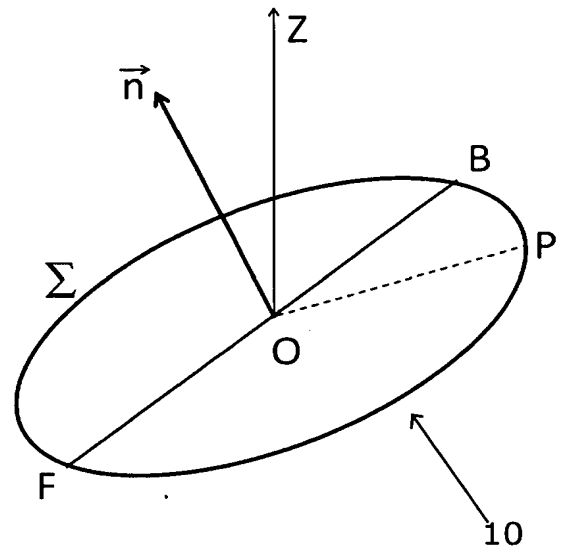


FIG 8

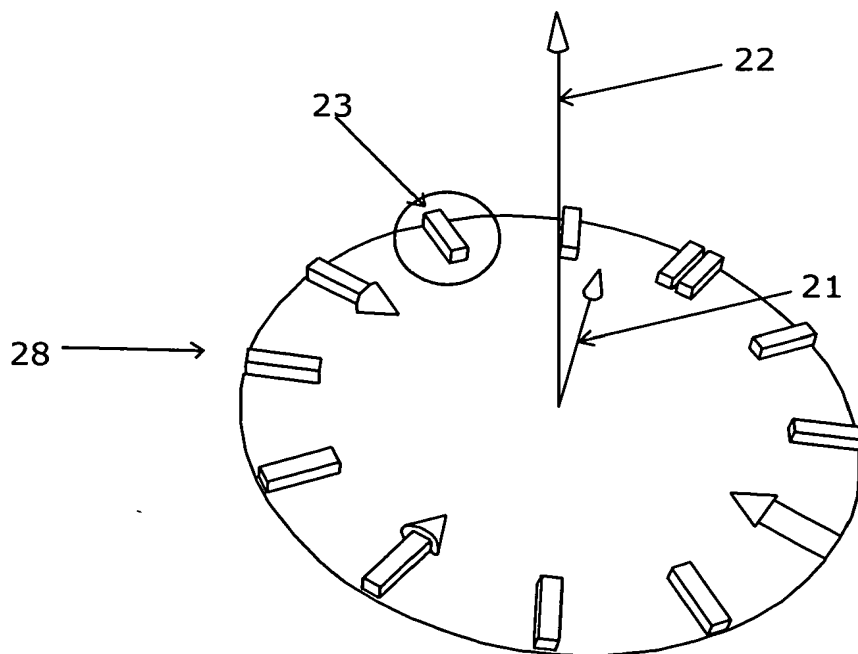


FIG 9

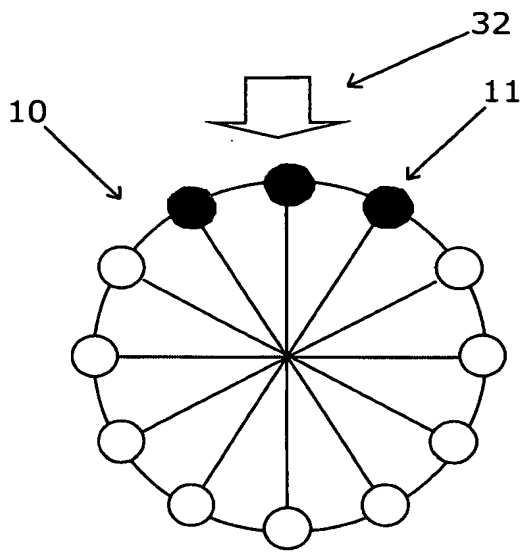


FIG 10A

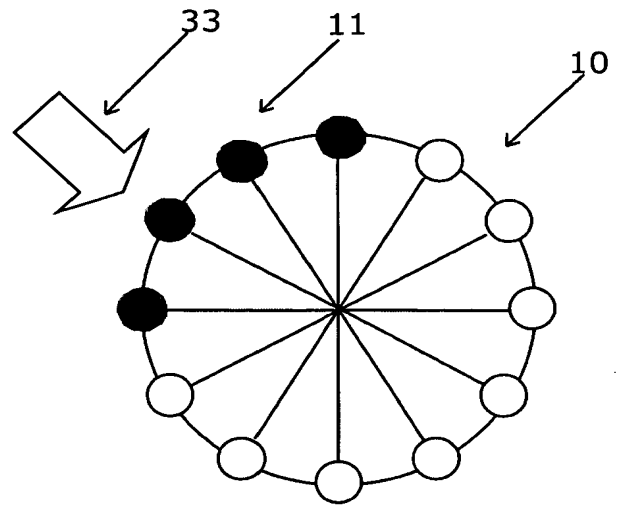


FIG 10B

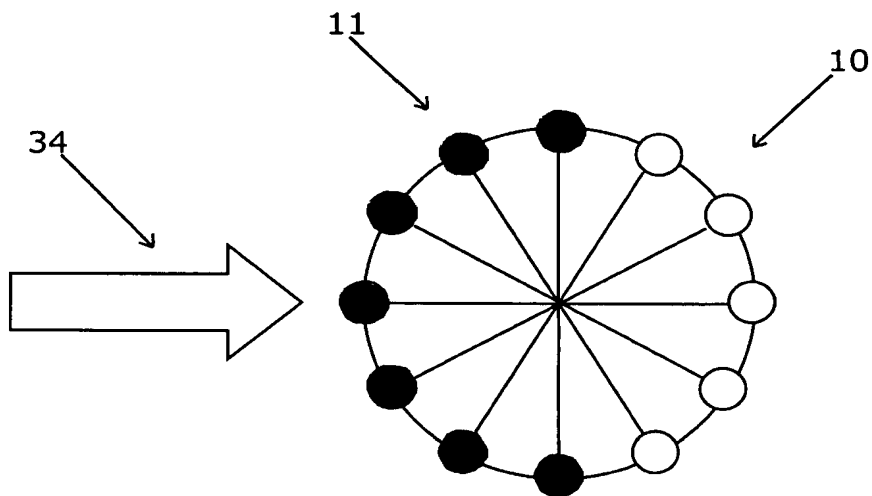


FIG 10C

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/00545

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H04B 3/36 (2011.01)

USPC - 340/407.2

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: H04B 3/36 (2011.01)

USPC: 340/407.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC: H04B 3/36 (2011.01)

USPC: 340/407.1, 407.2; 715/702 (keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

pubWEST(USPT,PGPB,EPAB,JPAB,USOCR); Google(Web); Search terms used: tactile haptic stimulator collar bracelet belt semaphore visual indicator feedback plurality multiple transducer actuators motors ring cylindrical radial axial clockwise equidistant vibration neck misc notes pitch position locating beacon clue hint cue synchronize time

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2009/0289778 A1 (King) 26 November 2009 (26.11.2009), entire document especially Fig. 5a to 5i, 7; para [0031]-[0035], [0063]-[0065]	2, 7, 9, 11-13, 15, 18, 19 ----- 1, 3-6, 8, 10, 14, 16, 17, 20
Y	US 2003/0044031 A1 (Son) 06 March 2003 (06.03.2003), para [0005], [0027], [0028], [0045]	6, 16
Y	US 2007/0191906 A1 (Iyer et al.) 16 August 2007 (16.08.2007), Fig. 17; para [0033], [0047]	1
Y	US 2008/0115653 A1 (Sagastegui) 22 May 2008 (22.05.2008), para [0033], [0039]	4, 10, 20
Y	US 4,520,501 A (DuBrucq) 28 May 1985 (28.05.1985), col. 11, ln. 32-46; col. 15, ln. 54 to col. 16, ln. 5)	8, 17
Y	US 6,326,901 B1 (Gonzales) 04 December 2001 (04.12.2001), Fig. 8a to 9a; col. 13, ln. 30-35; col. 13, ln. 55 to col. 14, ln. 55; col. 17, ln. 15-35	3, 4, 14
A	US 2009/0189748 A1 (Bergere) 30 July 2009 (30.07.2009), entire document	1-20
A	US 2008/0210176 A1 (Lalor) 04 September 2008 (04.09.2008), entire document	1-20

☐ 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

17 May 2011 (17.05.2011)

Date of mailing of the international search report

03 JUN 2011

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)

Electronic Acknowledgement Receipt

EFS ID:	28515691
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	142056
Filer:	John Christopher Reich/Kris Wacek
Filer Authorized By:	John Christopher Reich
Attorney Docket Number:	04887.0007USC1/IMM413C
Receipt Date:	02-MAR-2017
Filing Date:	24-JUL-2015
Time Stamp:	14:30:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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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)	2017-03-02-IDS-2-04887-0007USC1.PDF	69697	no	4
			ba9713cb6522d94239e8d50f57aa317c28993a6c		

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	GB2487672A.PDF	1822473 d235ef558156910e9c61be53737102ac8a5a0e5d	no	44
Warnings:					
Information:					
3	Foreign Reference	WO2011-119233A1.PDF	1231083 8e3535308bf07095b04397d0a7fa26b5ac12518b	no	28
Warnings:					
Information:					
4	Non Patent Literature	Extended-EP-Search-for-14159943-1-mailed-12-20-2016.PDF	182707 4ef88a4efe55768f00447f1dfdc09123abfe0bea	no	6
Warnings:					
Information:					
Total Files Size (in bytes):			3305960		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.					

S/N 14/808,740

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Allan Visitacion	Examiner:	Nguyen, Phung
Serial No.:	14/808,740	Group Art Unit:	2685
Filed:	July 24, 2015	Docket No.:	04887.0007USC1/ IMM413C1
Customer No.:	142056	Confirmation No.:	4726
Title:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

This paper is being filed electronically with the U.S. Patent Office

AMENDMENT AND RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents

This paper is provided in response to the Final Office Action mailed November 2, 2016:

- A List of Claims are reflected in the listing of claims that begins on page 2 of this paper.
- Remarks begin on page 8 of this paper.

Listing of Claims

The following claims replace all prior claims and listings of claims previously pending in this application:

1. (Original) A system comprising:
a wearable device;
a second device remote from and in communication with the wearable device;
a processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device; and
a haptic output device configured to provide haptic feedback based on the generated control signal.
2. (Original) The system according to claim 1, wherein the second device is a second wearable device.
3. (Original) The system according to claim 1, wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, or an indication that the wearable device or the second device recognizes an object in the environment.
4. (Original) The system according to claim 1, wherein the wearable device comprises the haptic output device.
5. (Original) The system according to claim 1, wherein the second device comprises the haptic output device.
6. (Original) The system according to claim 1, further comprising:
a sensor configured to sense one or more environmental conditions related to the

wearable device or the second device,

wherein the event comprises the one or more environmental conditions sensed by the sensor.

7. (Original) The system according to claim 1, further comprising:
a communication port configured to establish a wireless or wired communication channel between the wearable device and the second device,

wherein the processor is configured to receive a signal representative of an event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal.

8. (Original) The system according to claim 7, wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information.

9. (Original) The system according to claim 8, wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device.

10. (Original) A system comprising:
an augmented reality device configured to generate an augmented reality environment comprising an augmented reality space and a physical space, the augmented reality device comprising
a processor configured to
generate the augmented reality space coincident with the physical space,
recognize at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space, and
determine an event associated with the augmented reality environment,
and
generate a control signal based on the determined event;
a wearable device remote from and in communication with the augmented reality device;

a third device remote from and in communication with the wearable device and the augmented reality device; and

a haptic output device configured to provide haptic feedback based on the generated control signal.

11. (Original) The system according to claim 10, wherein the third device is a second wearable device.

12. (Original) The system according to claim 10, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.

13. (Original) The system according to claim 10, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.

14. (Original) The system according to claim 10, wherein the augmented reality device comprises the haptic output device.

15. (Original) The system according to claim 10, wherein the wearable device comprises the haptic output device.

16. (Original) The system according to claim 10, wherein the third device comprises the haptic output device.

17. (Original) A method comprising:

generating a control signal representative of an event occurring in an environment related to a wearable device and/or a second device with a processor; and
providing haptic feedback based on the generated control signal with a haptic output device.

18. (Original) The method according to claim 17, wherein the second device is a second wearable device.

19. (Original) The method according to claim 17, wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, or an indication that the wearable device or the second device recognizes an object in the environment.

20. (Original) The method according to claim 17, wherein the wearable device comprises the haptic output device and the haptic feedback is provided at the wearable device.

21. (Original) The method according to claim 17, wherein the second device comprises the haptic output device and the haptic feedback is provided at the second device.

22. (Original) The method according to claim 17, further comprising:
sensing one or more environmental conditions related to the wearable device or the second device with a sensor,
wherein the event comprises the one or more environmental conditions sensed by the sensor.

23. (Original) The method according to claim 17, further comprising:
establishing a wireless or wired communication channel between the wearable device and the second device with a communication port; and

receiving a signal representative of an event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal with the processor.

24. (Original) The method according to claim 23, wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information.

25. (Original) The method according to claim 24, wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device.

26. (Original) A method comprising:
generating an augmented reality environment comprising an augmented reality space and a physical space with an augmented reality device, said generating comprising
generating the augmented reality space coincident with the physical space with a processor,
recognizing at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space with the processor,
determining an event associated with the augmented reality environment with the processor, and
generating a control signal based on the determined event with the processor; and
providing haptic feedback based on the generated control signal with a haptic output device of the augmented reality device, a wearable device remote from and in communication with the augmented reality device, or a third device remote from and in communication with the wearable device and the augmented reality device.

27. (Original) The method according to claim 26, wherein the third device is a second wearable device.

28. (Original) The method according to claim 26, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.

29. (Original) The method according to claim 26, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.

REMARKS

The applicant provides the following remarks in response to the Final Office Action mailed on November 2, 2016. In the present response, no claims are currently amended, canceled, or new. Claims 1-29 are currently pending. The applicant respectfully requests reconsideration and withdrawal of the pending rejections in light of the following remarks.

Double Patenting

Claims 1-29 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2, 7-10, 20, 26, and 27 of U. S. Patent No. 9,092,954 in view of Haddick et al. (U.S. 2012/0242698). The applicant respectfully holds the double patenting rejection in abeyance until allowance of the pending claims so that a response can be provided appropriate to the allowed subject matter.

Rejections under 35 U.S.C. § 102

Claims 1-29 were rejected under 35 U.S.C. § 102(e) as being anticipated by Haddick et al. (U.S. 2012/0242698). The applicant respectfully traverses this rejection, and does not concede any characterizations of the claims, specification, or the reference as set forth in the Office Action.

Independent claim 1, and hence dependent claims 2-9, recite *inter alia* a wearable device, and second device remote from an in communication with the wearable device, and a processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device; and a haptic output device configured to provide haptic feedback based on the generated control signal. Independent claim 17, and hence dependent claims 18-25, recite similar elements. The cited portions of Haddick fail to disclose a combination of these elements. Rather they disclose and describe an eyepiece as illustrated in Figures 14 and 21. They do not disclose a wearable device, a remote device, and processor that generates a control signal representative of an event that occurs in the environment of the wearable and/or the second device. Nor does it disclose a haptic output device that provides haptic feedback in response to the control signal.

Therefore, Haddick does not disclose all of the elements recited in claims 1-9 or 17-25. For at least these reasons, the applicant respectfully submits the claims are not anticipated by Haddick and request withdrawal of the pending rejection.

Independent claim 10, and hence dependent claims 11-16, recite *inter alia* an augmented reality device configured to generate an augmented reality environment, a wearable device *remote* from and in communication with the augmented reality device, and a third device *remote* from and in communication with the wearable device *and* the augmented reality device. Independent claim 26, and hence claims 27-29, recites similar elements. Again, the cited portions of Haddick fail to disclose this combination of elements. They do not disclose the wearable device is *remote* from the augmented reality device *and* from the third device.

Therefore, Haddick does not disclose all of the elements recited in claims 10-16 or 26-29. For at least these reasons, the applicant respectfully submits the claims are not anticipated by Haddick and request withdrawal of the pending rejection.

Conclusion

For at least the reasons discussed above, the applicant respectfully submits that each of the pending claims is in condition for allowance and requests issuance of a Notice of Allowance. Although certain arguments regarding patentability are set forth herein, there may be other arguments and reasons why the claimed invention is patentably distinct from the cited references. The applicant reserves the right to raise these arguments in the future. The applicant also reserves the right to prosecute in the future any subject matter disclosed in this application or in related applications, including any claims as they existed before being amended or cancelled, and including any subject matter not previously claimed.

The examiner is encouraged to call the applicant's representative, as identified below, if there are any questions or if it would help to advance prosecution of this application.



Respectfully submitted,

MERCHANT & GOULD P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402-0903
(612) 332-5300

Date: May 2, 2017



John C. Reich
Reg. No. 37,703

Electronic Patent Application Fee Transmittal

Application Number:	14808740			
Filing Date:	24-Jul-2015			
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE			
First Named Inventor/Applicant Name:	Allan VISITACION			
Filer:	John Christopher Reich/Denise Chamberlin			
Attorney Docket Number:	04887.0007USC1/IMM413C			
Filed as Large 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(\$)
Extension - 3 months with \$0 paid	1253	1	1400	1400
Miscellaneous:				
Total in USD (\$)				1400

Electronic Acknowledgement Receipt

EFS ID:	29097299
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	142056
Filer:	John Christopher Reich/Denise Chamberlin
Filer Authorized By:	John Christopher Reich
Attorney Docket Number:	04887.0007USC1/IMM413C
Receipt Date:	02-MAY-2017
Filing Date:	24-JUL-2015
Time Stamp:	18:35:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1400
RAM confirmation Number	050317INTEFSW18360900
Deposit Account	132725
Authorized User	Denise Chamberlin

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 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	Extension of Time	2017-05-02-EOT-NFOA-2016-11-02--04887-0007 USC1.PDF	36596	no	2
			d25a3e9e0c994c8e940a2989f71c1637be94a7a5		
Warnings:					
Information:					
2		2017-05-02-Amendresp-NFOA-2016-11-02--04887-0007 USC1.PDF	73853	yes	10
			dfc3791b269a66037606988d79b02f42dcd39d55		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Claims		2	7	
	Applicant Arguments/Remarks Made in an Amendment		8	10	
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30922	no	2
			9370fcd9a1ae417f147f3a9d774a57028b39e46f		
Warnings:					
Information:					
Total Files Size (in bytes):			141371		

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.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional) 04887.0007USC1
Application Number 14/808,740	Filed July 24, 2015	
For SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		
Art Unit 2685	Examiner Nguyen, Phung	

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>	
☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____
☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____
☒ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ 1400.00
☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____
☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☒ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to
Deposit Account Number 132725.

☒ Payment made via EFS-Web.

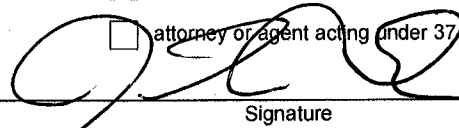
WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☒ attorney or agent of record. Registration number 37703

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____



 Signature
John C. Reich

 Typed or printed name

May 2, 2017

 Date
612-336-4608

 Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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: Mail Stop PCT, 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 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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 14/808,740		Filing Date 07/24/2015		☐ To be Mailed		
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO										
APPLICATION AS FILED – PART I										
(Column 1)			(Column 2)							
FOR		NUMBER FILED	NUMBER EXTRA			RATE (\$)		FEE (\$)		
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A			N/A				
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A	N/A			N/A				
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A			N/A				
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =	*			X \$ =				
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*			X \$ =				
☐ 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).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL				
APPLICATION AS AMENDED – PART II										
(Column 1)			(Column 2)		(Column 3)					
AMENDMENT	05/02/2017	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 29	Minus	** 29	= 0		X \$80 =		0	
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0		X \$420 =		0	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE		0		
(Column 1)			(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=		X \$ =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=		X \$ =			
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						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 number found in the appropriate box in column 1.										

LIE
MARCIA GORDON

This collection of information is required by 37 CFR 1.16. 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, 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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C	4726
142056	7590	07/20/2017	EXAMINER	
M&G Immersion			NGUYEN, PHUNG	
PO Box 2903			ART UNIT	PAPER NUMBER
Minneapolis, MN 55402			2685	
			NOTIFICATION DATE	DELIVERY MODE
			07/20/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

cofficeaction@appcoll.com
USPTO142056@MerchantGould.com

Office Action Summary	Application No. 14/808,740	Applicant(s) VISITACION ET AL.	
	Examiner PHUNG NGUYEN	Art Unit 2685	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05/02/2017.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ 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.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-29 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-29 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, 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.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) ☒ Notice of References Cited (PTO-892) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____. | 4) ☐ Other: ____. |

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Specification

2. Applicant is requested to update the status of U.S. Patent Application No. 13/841,551, filed March 15, 2013 indicated in the instant application.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-29 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2, 7-10, 20, 26, and 27 of U.S. Patent No. 9092954 in view of Haddick et al. US. 2012/0242698.

Claims 1, 2, 7-10, 20, 26, and 27 of '954 patent claim all the limitations of the current application except the second device remote from and in communication with the wearable device. However, Haddick et al. disclose see-through near-eye display glasses with a multi-segment processor-controlled optical layer including the second device remote from and in

communication with the wearable device in the form of the eyepiece of the second user (paragraph 0365, lines 21-23). Since they both teach a system with wearable device and haptic output device, it would have been obvious to the skilled artisan to employ the teaching of Haddick et al. in the system of Visitacion et al. in order to extend the use of the device.

Claim Rejections - 35 USC § 102

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-29 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Haddick et al. (US 2012/0242698).

Regarding claim 1: Haddick et al. disclose see-through near-eye display glasses with a multi-segment processor-controlled optical layer comprising a wearable device; a second device remote from and in communication with the wearable device (paragraph 0365, lines 21-23); a

processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device; and a haptic output device configured to provide haptic feedback based on the generated control signal (paragraph 0231, 0370, and 0422).

Regarding claim 2: Haddick et al. disclose wherein the second device is a second wearable device (paragraph 0365, lines 22-23).

Regarding claim 3: Haddick et al. disclose wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, **or an indication that the wearable device or the second device recognizes an object in the environment** (paragraph 0422, lines 13-15).

Regarding claim 4: Haddick et al. disclose wherein the wearable device comprises the haptic output device (paragraph 0370).

Regarding claim 5: Haddick et al. disclose wherein the second device comprises the haptic output device (paragraph 0370).

Regarding claim 6: Haddick et al. disclose a sensor configured to sense one or more environmental conditions related to the wearable device or the second device, wherein the event comprises the one or more environmental conditions sensed by the sensor (paragraph 0007, lines 1-15).

Regarding claim 7: Haddick et al. disclose a communication port configured to establish a wireless or wired communication channel between the wearable device and the second device, wherein the processor is configured to receive a signal representative of an event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal (fig. 29, paragraph 0364).

Regarding claim 8: Haddick et al. disclose wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information (paragraph 0364, lines 1-6).

Regarding claim 9: Haddick et al. disclose wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device (paragraph 0365).

Regarding claim 10: Haddick et al. disclose a processor configured to generate the augmented reality space coincident with the physical space, recognize at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space (paragraph 0007, and 0481), and determine an event associated with the augmented reality environment, and generate a control signal based on the determined event; a wearable device remote from and in communication with the augmented reality device (paragraph 0007, and 0422); a third device (the eyepiece of the second user, para. 0365, lines 21-23) remote from and in communication with the wearable device and the augmented reality device (paragraph 0365); and a haptic output device configured to provide haptic feedback based on the generated control signal (paragraph 0370).

Regarding claim 11: Haddick et al. disclose wherein the third device is a second wearable device (paragraph 0365, lines 22-23).

Regarding claim 12: Haddick et al. disclose wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented (paragraph 0387 and 0487).

Regarding claim 13: Haddick et al. disclose wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device (paragraph 0422).

Regarding claim 14: Haddick et al. disclose wherein the augmented reality device comprises the haptic output device (paragraph 0370).

Regarding claim 15: Haddick et al. disclose wherein the wearable device comprises the haptic output device (paragraph 0370).

Regarding claim 16: Haddick et al. disclose wherein the third device comprises the haptic output device (paragraph 0365, lines 21-23).

Regarding claim 17: All the claimed subject matter is already discussed in respect to claim 1 above.

Regarding claim 18: Refer to claim 2 above.

Regarding claim 19: Refer to claim 3 above.

Regarding claim 20: Refer to claim 4 above.

Regarding claim 21: Refer to claim 5 above.

Regarding claim 22: Refer to claim 6 above.

Regarding claim 23: Refer to claim 7 above.

Regarding claim 24: Refer to claim 8 above.

Regarding claim 25: Refer to claim 9 above.

Regarding claim 26: All the claimed subject matter is already discussed in respect to claim 10 above.

Regarding claim 27: Refer to claim 11 above.

Regarding claim 28: Refer to claim 12 above.

Regarding claim 29: Refer to claim 13 above.

Response to Arguments

6. Applicant's arguments filed 05/02/2017 have been fully considered but they are not persuasive.

Applicant's argument:

a. Applicant argues that Haddick et al. do not teach “a wearable device, a remote device, and processor that generates a control signal representative of an event that occurs in the environment of the wearable and/or the second device, and a haptic output device that provides haptic feedback in response to the control signal”.

b. Applicant argues that Haddick et al. do not teach “the wearable device is remote from the augmented reality device and from the third device”.

Response to argument:

a. Examiner respectfully disagrees with the applicant’s argument because Haddick et al. clearly disclose “a wearable device in the form of the eyepiece of a user (para. 0365, lines 21-23), a remote device is met by the eyepiece of the second user (para. 0365, lines 21-23), and processor 2140 (fig. 21, para. 0231) that generates a control signal representative of an event that occurs in the environment of the wearable and/or the second device, and the haptic output device 1402 (see fig. 14) that provides haptic feedback in response to the control signal (paras. 0370 and 0422)”.

b. Examiner respectfully disagrees with the applicant’s argument because Haddick et al. clearly disclose “the wearable device (the eyepiece of a user) is remote from the augmented reality device (see paras. 0007, and 0422) and from the third device (the eyepiece of the second user, see para. 0365)”.

These are reasonable interpretation. Therefore, it’s believed that the limitations of the claims are still met and the rejections are still remained.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

Art Unit: 2685

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phung Nguyen whose telephone number is 571-272-2968. The examiner can normally be reached on Monday to Friday from 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hai Phan, can be reached on 571-272-6338. The fax phone number for this Group is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is 571-272-2600.

/PHUNG NGUYEN/

Primary Examiner, Art Unit 2685

Date: July 13, 2017

Application/Control Number: 14/808,740
Art Unit: 2685

Page 10

Notice of References Cited	Application/Control No. 14/808,740		Applicant(s)/Patent Under Reexamination VISITACION ET AL.	
	Examiner PHUNG NGUYEN		Art Unit 2685	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2012/0242698 A1	09-2012	Haddick; John D.	G02B27/0093	345/633
*	B	US-2013/0314303 A1	11-2013	Osterhout; Ralph F.	G06F3/005	345/8
*	C	US-7,584,158 B2	09-2009	Iwaki; Hidekazu	G06F3/011	706/45
*	D	US-2010/0007474 A1	01-2010	BEHM; GARY W.	A61H3/061	340/407.1
*	E	US-2013/0342570 A1	12-2013	Kinnebrew; Peter Tobias	G09G3/003	345/633
*	F	US-2015/0268721 A1	09-2015	JOO; Ga-hyun	G02B27/0093	345/156
*	G	US-9,215,293 B2	12-2015	Miller; Samuel A.	H04L67/38	1/1
*	H	US-9,189,021 B2	11-2015	Jerauld; Robert	G06F1/163	1/1
	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	CPC 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.

<i>Index of Claims</i> 	Application/Control No. 14808740	Applicant(s)/Patent Under Reexamination VISITACION ET AL.
	Examiner PHUNG NGUYEN	Art Unit 2685

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		DATE							
Final	Original	10/26/2016	07/13/2017						
	1	✓	✓						
	2	✓	✓						
	3	✓	✓						
	4	✓	✓						
	5	✓	✓						
	6	✓	✓						
	7	✓	✓						
	8	✓	✓						
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	27	✓	✓						
	28	✓	✓						
	29	✓	✓						



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BIB DATA SHEET

CONFIRMATION NO. 4726

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
14/808,740	07/24/2015	340	2685 04	387.0007USC1/IMM413C		
APPLICANTS IMMERSION CORPORATION, San Jose, CA;						
INVENTORS Allan VISITACION, Fremont, CA; Trevor JONES, Los Gatos, CA; Daniel Gregory PARKER, San Francisco, CA; Kohei IMOTO, Santa Clara, CA; Keith REED, San Jose, CA; Jessica E. FERRO, Redwood City, CA; Aaron KAPELUS, Montreal, CANADA; Neil OLIEN, Montreal, CANADA; Danny A. GRANT, Laval, CANADA; Robert LACROIX, San Jose, CA;						
** CONTINUING DATA ***** This application is a CON of 13/841,551 03/15/2013 PAT 9092954				PTN		
** FOREIGN APPLICATIONS *****				PTN		
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 08/07/2015						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/PHUNG NGUYEN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 6	TOTAL CLAIMS 29	INDEPENDENT CLAIMS 4
ADDRESS M&G Immersion PO Box 2903 Minneapolis, MN 55402 UNITED STATES						
TITLE SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE						
FILING FEE RECEIVED 2740	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			

Search Notes 	Application/Control No. 14808740	Applicant(s)/Patent Under Reexamination VISITACION ET AL.
	Examiner PHUNG NGUYEN	Art Unit 2685

CPC- SEARCHED		
Symbol	Date	Examiner
G06F3/016, G06F3/011, G06T1/00, G06T19/006, G02B27/017, G02B25/001	10/26/2016	PTN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
340	407.1,539.13,539.2,566,665,691.1	10/26/2016	PTN
345	633,7	10/26/2016	PTN

SEARCH NOTES		
Search Notes	Date	Examiner
Updated search	07/13/2017	PTN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

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		14808740
	Filing Date		2015-07-24
	First Named Inventor	Visitacion et al.	
	Art Unit	2685	
	Examiner Name	Nguyen, Phong	
	Attorney Docket Number	04887.0007USC1	

U.S.PATENTS						
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					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS						
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.

FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	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	2487672	GB	A	2012-01-08	The University of Sheffield		☐
	2	2011/119233	WO	A1	2011-09-29	Taghavi, Reza		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS								
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		14808740
	Filing Date		2015-07-24
	First Named Inventor	Visitacion et al.	
	Art Unit	2685	
	Examiner Name	Nguyen, Phung	
	Attorney Docket Number	04887.0007USC1	

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 European Search Report for Application No. 14159943.1 mailed December 20, 2016	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Phung Nguyen/	Date Considered	07/13/2017
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*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	14808740
Filing Date	2015-07-24
First Named Inventor	Visitacion et al.
Art Unit	2685
Examiner Name	Nguyen, Phung
Attorney Docket Number	04887.0007USC1

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).

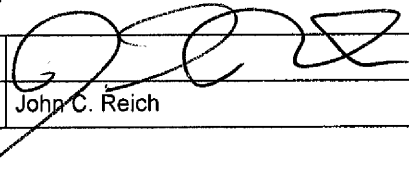
OR

- ☒ 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		Date (YYYY-MM-DD)	2017-03-02
Name/Print	John C. Reich	Registration Number	37,703

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 records.
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.

S/N 14/808,740

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Allan Visitation	Examiner:	Nguyen, Phung
Serial No.:	14/808,740	Group Art Unit:	2685
Filed:	July 24, 2015	Docket No.:	04887.0007USC1/ IMM413C1
Customer No.:	142056	Confirmation No.:	4726
Title:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

This paper is being filed electronically with the U.S. Patent Office

AMENDMENT AND RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents

This paper is provided in response to the Final Office Action mailed July 20, 2017:

- A List of Claims are reflected in the listing of claims that begins on page 2 of this paper.
- Remarks begin on page 8 of this paper.

Listing of Claims

The following claims replace all prior claims and listings of claims previously pending in this application:

1. (Currently Amended) A system comprising:
a wearable device;
a second device remote from and in communication with the wearable device;
a processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device, the processor configured to detect a plurality of events that occur in the environment related to the wearable device; and
a haptic output device configured to provide a plurality of haptic feedback signals based on the generated control signal.
2. (Original) The system according to claim 1, wherein the second device is a second wearable device.
3. (Original) The system according to claim 1, wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, or an indication that the wearable device or the second device recognizes an object in the environment.
4. (Original) The system according to claim 1, wherein the wearable device comprises the haptic output device.
5. (Original) The system according to claim 1, wherein the second device comprises the haptic output device.
6. (Original) The system according to claim 1, further comprising:

a sensor configured to sense one or more environmental conditions related to the wearable device or the second device,

wherein the event comprises the one or more environmental conditions sensed by the sensor.

7. (Currently Amended) The system according to claim 1, further comprising:
a communication port configured to establish a wireless or wired communication channel between the wearable device and the second device,

wherein the processor is configured to receive a signal representative of ~~[[an]]~~ the event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal.

8. (Original) The system according to claim 7, wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information.

9. (Original) The system according to claim 8, wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device.

10. (Currently Amended) A system comprising:
an augmented reality device configured to generate an augmented reality environment comprising an augmented reality space and a physical space, the augmented reality device comprising

a processor configured to detect a plurality of events that occur in the environment related to the wearable device, the processor configured to

generate the augmented reality space coincident with the physical space,
recognize at least one physical object in the physical space and augment
the at least one physical object with one or more virtual objects in the augmented
reality space, and
determine an event associated with the augmented reality environment,
and

generate a control signal based on the determined event;
a wearable device remote from and in communication with the augmented reality device;
a third device remote from and in communication with the wearable device and the augmented reality device; and
a haptic output device configured to provide a plurality of haptic feedback signals based on the generated control signal.

11. (Original) The system according to claim 10, wherein the third device is a second wearable device.

12. (Original) The system according to claim 10, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.

13. (Original) The system according to claim 10, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.

14. (Original) The system according to claim 10, wherein the augmented reality device comprises the haptic output device.

15. (Original) The system according to claim 10, wherein the wearable device comprises the haptic output device.

16. (Original) The system according to claim 10, wherein the third device comprises the haptic output device.

17. (Currently Amended) A method comprising:
detecting an event in an environment, performed at least in part with a processor,
generating a control signal representative of an event occurring in ~~[[an]]~~ the environment
related to a wearable device and/or a second device with a processor; and
providing a plurality of haptic feedback signals based on the generated control signal
with a haptic output device.

18. (Original) The method according to claim 17, wherein the second device is a
second wearable device.

19. (Original) The method according to claim 17, wherein the event comprises an
indication of a physical object within a predetermined proximity of the wearable device or the
second device, an indication of an environmental condition occurring in the environment, an
indication of a change in an environmental condition occurring in the environment, an indication
of a movement of an object within a predetermined proximity of the wearable device or second
device, an interaction between the wearable device or the second device and an object in the
environment, or an indication that the wearable device or the second device recognizes an object
in the environment.

20. (Original) The method according to claim 17, wherein the wearable device
comprises the haptic output device and the haptic feedback is provided at the wearable device.

21. (Original) The method according to claim 17, wherein the second device
comprises the haptic output device and the haptic feedback is provided at the second device.

22. (Original) The method according to claim 17, further comprising:
sensing one or more environmental conditions related to the wearable device or the
second device with a sensor,
wherein the event comprises the one or more environmental conditions sensed by the
sensor.

23. (Original) The method according to claim 17, further comprising:
establishing a wireless or wired communication channel between the wearable device and the second device with a communication port; and
receiving a signal representative of an event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal with the processor.

24. (Original) The method according to claim 23, wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information.

25. (Original) The method according to claim 24, wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device.

26. (Currently Amended) A method comprising:
generating an augmented reality environment comprising an augmented reality space and a physical space with an augmented reality device, said generating comprising
generating the augmented reality space coincident with the physical space with a processor,
recognizing at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space with the processor,
~~determining~~ detecting at least one ~~[[an]]~~ event associated with the augmented reality environment with the processor, and
generating a control signal based on the ~~determined at least one~~ event with the processor; and
providing a plurality of haptic feedback signals based on the generated control signal with a haptic output device of the augmented reality device, a wearable device remote from and in communication with the augmented reality device, or a third device remote from and in communication with the wearable device and the augmented reality device.

27. (Original) The method according to claim 26, wherein the third device is a second wearable device.

28. (Original) The method according to claim 26, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.

29. (Original) The method according to claim 26, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.

REMARKS

The applicant provides the following remarks in response to the Final Office Action mailed on July 20, 2017. In the present response, claims 1, 7, 10, 17, and 26 are currently amended, and no claims are canceled or added. Support for the amendments can be found throughout the specification includes, at least, paragraphs 0007 and 0044. Claims 1-29 are currently pending. The applicant respectfully requests reconsideration and withdrawal of the pending rejections in light of the following remarks.

Double Patenting

Claims 1-29 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2, 7-10, 20, 26, and 27 of U. S. Patent No. 9,092,954 in view of Haddick et al. (U.S. 2012/0242698). The applicant respectfully holds the double patenting rejection in abeyance until allowance of the pending claims so that a response can be provided appropriate to the allowed subject matter.

Rejections under 35 U.S.C. § 102

Claims 1-29 were rejected under 35 U.S.C. § 102(e) as being anticipated by Haddick et al. (U.S. 2012/0242698). The applicant respectfully traverses this rejection, and does not concede any characterizations of the claims, specification, or the reference as set forth in the Office Action.

Independent claim 1 has been amended to recite that the “processor is configured to detect a plurality of events that occur in the environment related to the wearable device... and a haptic output device configured to provide a plurality of haptic feedback signals...” Independent claims 10, 17, and 26 have been amended with similar limitations. After detecting whether an event occurs in the environment, the processor compares the received information to data related to events stored in the storage to determine whether the information is associated with an event (§0045). The processor then transmits event data for generation of a haptic signal corresponding to the event (§0044). The processor is capable of detecting a plurality of events, which correspond to a plurality of haptic feedback signals. An advantage of the claimed combination of elements is that the device is flexible and can be programed to recognize a variety of different

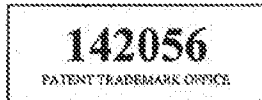
physical events and respond accordingly with haptic outputs that correspond to the different physical events. Haddick fails to disclose a system as recited in the pending claims, wherein a processor is configured to detect a plurality of events and capable of generating a plurality of haptic feedback signals. Haddick discloses a device that generates a haptic vibration upon recognizing a determined face or approaching object (§0422). Strictly speaking, Haddick only outputs a vibration when a face or object is recognized for a blind user of the eyepiece. Haddick not disclose a processor that can be programmed to detect a *variety of different events* and responds accordingly with *different* haptic signals for the different events. Haddick does not disclose this level of flexibility.

For at least these reasons, the applicant submits the pending claims are not anticipated by Haddick and requests withdrawal of the pending rejection.

Conclusion

For at least the reasons discussed above, the applicant respectfully submits that each of the pending claims is in condition for allowance and requests issuance of a Notice of Allowance. Although certain arguments regarding patentability are set forth herein, there may be other arguments and reasons why the claimed invention is patentably distinct from the cited references. The applicant reserves the right to raise these arguments in the future. The applicant also reserves the right to prosecute in the future any subject matter disclosed in this application or in related applications, including any claims as they existed before being amended or cancelled, and including any subject matter not previously claimed.

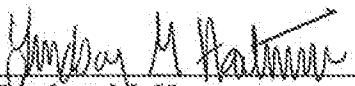
The examiner is encouraged to call the applicant's representative, as identified below, if there are any questions or if it would help to advance prosecution of this application.



Respectfully submitted,

MERCHANT & GOULD P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402-0903
(612) 332-5300

Date: October 20, 2017


Lindsay M. Hartman
Reg. No. 71,286

Electronic Acknowledgement Receipt

EFS ID:	30719529
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	142056
Filer:	Lindsay M. Hartman/Ryan Oswood
Filer Authorized By:	Lindsay M. Hartman
Attorney Docket Number:	04887.0007USC1/IMM413C
Receipt Date:	20-OCT-2017
Filing Date:	24-JUL-2015
Time Stamp:	16:36:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		RESP-2-048870007USC1.pdf	1524957	yes	10
			1e5a00b00bee20b877899ec907ff357d71d3d5f1		

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Response After Final Action	1	1	
Claims	2	7	
Applicant Arguments/Remarks Made in an Amendment	8	10	

Warnings:

Information:

Total Files Size (in bytes):	1524957
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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.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/808,740	Filing Date 07/24/2015	☐ To be Mailed
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ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO**APPLICATION AS FILED – PART I**

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =	
☐ 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).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	10/20/2017	CLAIMS REMAINING AFTER AMENDMENT	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 29	Minus	** 29	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X \$420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
						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 number found in the appropriate box in column 1.

SLIE
KAREN VESTAL

This collection of information is required by 37 CFR 1.16. 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, 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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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C	4726
142056	7590	11/02/2017	EXAMINER	
M&G Immersion			NGUYEN, PHUNG	
PO Box 2903			ART UNIT	PAPER NUMBER
Minneapolis, MN 55402			2685	
			NOTIFICATION DATE	DELIVERY MODE
			11/02/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ecofficeaction@appcoll.com
USPTO142056@MerchantGould.com

Advisory Action Before the Filing of an Appeal Brief	Application No. 14/808,740	Applicant(s) VISITACION ET AL.	
	Examiner PHUNG NGUYEN	Art Unit 2685	AIA (First Inventor to File) Status No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 10/201/2017 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;
 (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires _____ months from the mailing date of the prior Advisory Action or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because

a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);

b) ☐ They raise the issue of new matter (see NOTE below);

c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: A plurality of events and a plurality of haptic feedback signals are recited for the first time. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☒ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.

13. ☐ Note the attached Information *Disclosure Statement(s)*. (PTO/SB/08) Paper No(s). _____

14. ☐ Other: _____.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: _____
 Claim(s) objected to: _____
 Claim(s) rejected: 1-29.
 Claim(s) withdrawn from consideration: _____

/PHUNG NGUYEN/
Primary Examiner, Art Unit 2685

S/N 14/808,740

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Allan Visitation	Examiner:	Nguyen, Phung
Serial No.:	14/808,740	Group Art Unit:	2685
Filed:	July 24, 2015	Docket No.:	04887.0007USC1/ IMM413C1
Customer No.:	142056	Confirmation No.:	4726
Title:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

This paper is being filed electronically with the U.S. Patent Office

AMENDMENT AND RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents

This paper is provided in response to the Final Office Action mailed July 20, 2017:

- A List of Claims are reflected in the listing of claims that begins on page 2 of this paper.
- Remarks begin on page 8 of this paper.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL **(Submitted Only via EFS-Web)**

Application Number	14/808,740	Filing Date	2015-07-24	Docket Number (if applicable)	04887.0007USC1/IMM413C1	Art Unit	2685
First Named Inventor	Allan Visitation			Examiner Name	Nguyen, Phung		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☒ Other Response to Office Action filed on October 20, 2017

☒ Enclosed

☐ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☒ Other PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
 (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 132725

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

Signature of Registered U.S. Patent Practitioner			
Signature		Date (YYYY-MM-DD)	2018-01-22
Name	John C. Reich	Registration Number	37703

This collection of information is required by 37 CFR 1.114. 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 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, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional) 04887.0007USC1/IMM413C
Application Number 14/808,740	Filed July 24, 2015	
For SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		
Art Unit 2685	Examiner Nguyen, Phung	

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____
☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____
☒ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ 1400.00
☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____
☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☒ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to
Deposit Account Number 132725

☒ Payment made via EFS-Web.

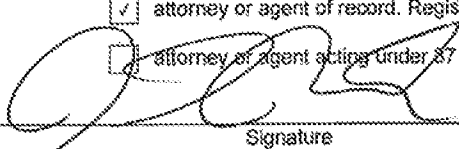
WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☒ attorney or agent of record. Registration number 37703

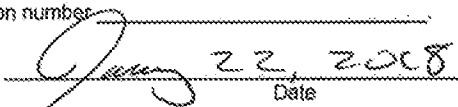
☐ attorney or agent acting under 37 CFR 1.34. Registration number _____



Signature

John C. Reich

Typed or printed name



Date

612-336-4608

Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below.

☒ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Electronic Patent Application Fee Transmittal

Application Number:	14808740			
Filing Date:	24-Jul-2015			
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE			
First Named Inventor/Applicant Name:	Allan VISITACION			
Filer:	John Christopher Reich/Ryan Oswood			
Attorney Docket Number:	04887.0007USC1/IMM413C			
Filed as Large 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(\$)
Extension - 3 months with \$0 paid	1253	1	1400	1400
Miscellaneous:				
RCE- 1st Request	1801	1	1300	1300
Total in USD (\$)				2700

Electronic Acknowledgement Receipt

EFS ID:	31566061
Application Number:	14808740
International Application Number:	
Confirmation Number:	4726
Title of Invention:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE
First Named Inventor/Applicant Name:	Allan VISITACION
Customer Number:	142056
Filer:	John Christopher Reich/Ryan Oswood
Filer Authorized By:	John Christopher Reich
Attorney Docket Number:	04887.0007USC1/IMM413C
Receipt Date:	22-JAN-2018
Filing Date:	24-JUL-2015
Time Stamp:	14:29:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 2700
RAM confirmation Number	012318INTEFSW14304300
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	RCEtrans-048870007USC1.pdf	262571	no	2
			aac8272ad53628ef08ec1cb3f720f81ab732d0c9		
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Extension of Time	EOT-048870007USC1.pdf	204107	no	1
			b15fef845734aac0e2ac52bbc4af8fb432445ab0		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32490	no	2
			c6aecfcfe99771666b147f13a057fdb8563a0983		
Warnings:					
Information:					
Total Files Size (in bytes):			499168		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C	4726
142056	7590	01/31/2018		
M&G Immersion PO Box 2903 Minneapolis, MN 55402			EXAMINER NGUYEN, PHUNG	
			ART UNIT	PAPER NUMBER
			2685	
			NOTIFICATION DATE	DELIVERY MODE
			01/31/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eoofficeaction@appcoll.com
USPTO142056@MerchantGould.com

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/808,740	07/24/2015	Allan VISITACION	04887.0007USC1/IMM413C	4726
142056	7590	02/14/2018	EXAMINER	
M&G Immersion			NGUYEN, PHUNG	
PO Box 2903			ART UNIT	PAPER NUMBER
Minneapolis, MN 55402			2685	
			NOTIFICATION DATE	DELIVERY MODE
			02/14/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eoofficeaction@appcoll.com
USPTO142056@MerchantGould.com

Office Action Summary	Application No. 14/808,740	Applicant(s) VISITACION ET AL.	
	Examiner PHUNG NGUYEN	Art Unit 2685	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01/22/2018.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ 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.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-29 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-29 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, 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.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) ☒ Notice of References Cited (PTO-892) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____. | 4) ☐ Other: ____. |

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Specification

2. Applicant is requested to update the status of U.S. Patent Application No. 13/841,551, filed March 15, 2013 indicated in the instant application.

Claim Rejections - 35 USC § 112

3. The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-9, and 17-25 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Regarding claims 1, and 17, the term "and/or" is a relative term which renders the claim indefinite. For example, A and/or B. It means embodiment A, or embodiment B, or embodiment A and B. It is clear that there are 3 embodiments in the claim. So, the use of such term is indefinite.

Claims 2-9, and 18-25 are rejected for incorporating the above deficiency by dependency.

Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-29 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2, 7-10, 20, 26, and 27 of U.S. Patent No. 9092954 in view of Haddick et al. US. 2012/0242698.

Claims 1, 2, 7-10, 20, 26, and 27 of '954 patent claim all the limitations of the current application except the second device remote from and in communication with the wearable device. However, Haddick et al. disclose see-through near-eye display glasses with a multi-segment processor-controlled optical layer including the second device remote from and in communication with the wearable device in the form of the eyepiece of the second user (paragraph 0365, lines 21-23). Since they both teach a system with wearable device and haptic output device, it would have been obvious to the skilled artisan to employ the teaching of Haddick et al. in the system of Visitacion et al. in order to extend the use of the device.

Claim Rejections - 35 USC § 103

6. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Haddick et al. (US 2012/0242698) in view of Company Bosch et al. (US 2012/0229264).

Regarding claim 1: Haddick et al. disclose see-through near-eye display glasses with a multi-segment processor-controlled optical layer comprising a wearable device; a second device remote from and in communication with the wearable device (paragraph 0365, lines 21-23); a processor configured to generate a control signal representative of an event occurring in an environment related to the wearable device and/or the second device; the processor configured to detect **a plurality of events** (e.g., a curb, doorway, or other object, para. 0422 lines 17-18) that occur in the environment related to the wearable device; and a haptic output device configured to provide haptic feedback based on the control signal (paragraph 0231, 0370, and 0422). Haddick et al. do not disclose a plurality of haptic feedback signals as claimed. However, providing a plurality of haptic feedback signals is old and well known in the art as taught by Company Bosch et al. (paragraph 0040). Since they both teach a haptic control system, it would have been

obvious to one of ordinary skill in the art at the time the invention was made to utilize the teaching of Company Bosch et al. in the system of Haddick in order to provide a plurality of feedback signals if needed. It is seen that providing a plurality of feedback signals would enhance the use of the device.

Regarding claim 2: Haddick et al. disclose wherein the second device is a second wearable device (paragraph 0365, lines 22-23).

Regarding claim 3: Haddick et al. disclose wherein the event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, **or an indication that the wearable device or the second device recognizes an object in the environment** (paragraph 0422, lines 13-15).

Regarding claim 4: Haddick et al. disclose wherein the wearable device comprises the haptic output device (paragraph 0370).

Regarding claim 5: Haddick et al. disclose wherein the second device comprises the haptic output device (paragraph 0370).

Regarding claim 6: Haddick et al. disclose a sensor configured to sense one or more environmental conditions related to the wearable device or the second device, wherein the event comprises the one or more environmental conditions sensed by the sensor (paragraph 0007, lines 1-15).

Regarding claim 7: Haddick et al. disclose a communication port configured to establish a wireless or wired communication channel between the wearable device and the second device, wherein the processor is configured to receive a signal representative of the event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal (fig. 29, paragraph 0364).

Regarding claim 8: Haddick et al. disclose wherein the received signal comprises sensory information, and wherein the event comprises one or more environmental conditions based on the sensory information (paragraph 0364, lines 1-6).

Regarding claim 9: Haddick et al. disclose wherein the received signal comprises information relating to a communication at the second device, and wherein the event comprises an indication of the communication at the second device (paragraph 0365).

Regarding claim 10: Haddick et al. disclose a processor configured to detect **a plurality of events** (e.g., a curb, doorway, or other object, para. 0422 lines 17-18) that occur in the environment related to the wearable device, the processor configured to generate the augmented reality space coincident with the physical space, recognize at least one physical object in the physical space and augment the at least one physical object with one or more virtual objects in the augmented reality space (paragraph 0007, and 0481), and determine an event associated with the augmented reality environment, and generate a control signal based on the determined event; a wearable device remote from and in communication with the augmented reality device (paragraph 0007, and 0422); a third device (the eyepiece of the second user, para. 0365, lines 21-23) remote from and in communication with the wearable device and the augmented reality device (paragraph 0365); and a haptic output device configured to provide haptic feedback

based on the control signal (paragraph 0370). Haddick et al. do not disclose a plurality of haptic feedback signals as claimed. However, providing a plurality of haptic feedback signals is old and well known in the art as taught by Company Bosch et al. (paragraph 0040). Since they both teach a haptic control system, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the teaching of Company Bosch et al. in the system of Haddick in order to provide a plurality of feedback signals if needed. It is seen that providing a plurality of feedback signals would enhance the use of the device.

Regarding claim 11: Haddick et al. disclose wherein the third device is a second wearable device (paragraph 0365, lines 22-23).

Regarding claim 12: Haddick et al. disclose wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented (paragraph 0387 and 0487).

Regarding claim 13: Haddick et al. disclose wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device (paragraph 0422).

Regarding claim 14: Haddick et al. disclose wherein the augmented reality device comprises the haptic output device (paragraph 0370).

Regarding claim 15: Haddick et al. disclose wherein the wearable device comprises the haptic output device (paragraph 0370).

Regarding claim 16: Haddick et al. disclose wherein the third device comprises the haptic output device (paragraph 0365, lines 21-23).

Regarding claim 17: All the claimed subject matter is already discussed in respect to claim 1 above.

Regarding claim 18: Refer to claim 2 above.

Regarding claim 19: Refer to claim 3 above.

Regarding claim 20: Refer to claim 4 above.

Regarding claim 21: Refer to claim 5 above.

Regarding claim 22: Refer to claim 6 above.

Regarding claim 23: Refer to claim 7 above.

Regarding claim 24: Refer to claim 8 above.

Regarding claim 25: Refer to claim 9 above.

Regarding claim 26: All the claimed subject matter is already discussed in respect to claim 10 above.

Regarding claim 27: Refer to claim 11 above.

Regarding claim 28: Refer to claim 12 above.

Regarding claim 29: Refer to claim 13 above.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phung Nguyen whose telephone number is 571-272-2968. The examiner can normally be reached on Monday to Friday from 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hai Phan, can be reached on 571-272-6338. The fax phone number for this Group is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is 571-272-2600.

/PHUNG NGUYEN/

Primary Examiner, Art Unit 2685

Date: February 7, 2018

Notice of References Cited	Application/Control No. 14/808,740	Applicant(s)/Patent Under Reexamination VISITACION ET AL.	
	Examiner PHUNG NGUYEN	Art Unit 2685	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2012/0229264 A1	09-2012	Company Bosch; Enrique	G06F3/016	340/407.1
	B	US-				
	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	CPC 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.

Search Notes 	Application/Control No. 14808740	Applicant(s)/Patent Under Reexamination VISITACION ET AL.
	Examiner PHUNG NGUYEN	Art Unit 2685

CPC- SEARCHED		
Symbol	Date	Examiner
G06F3/016, G06F3/011, G06T1/00, G06T19/006, G02B27/017, G02B25/001	10/26/2016	PTN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
340	407.1,539.13,539.2,566,665,691.1	10/26/2016	PTN
345	633,7	10/26/2016	PTN

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
Updated search	07/13/2017	PTN
Updated search	02/07/2018	PTN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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BIB DATA SHEET

CONFIRMATION NO. 4726

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/808,740	07/24/2015	340	2685 04	387.0007USC1/IMM413C
RULE				
APPLICANTS IMMERSION CORPORATION, San Jose, CA; INVENTORS Allan VISITACION, Fremont, CA; Trevor JONES, Los Gatos, CA; Daniel Gregory PARKER, San Francisco, CA; Kohei IMOTO, Santa Clara, CA; Keith REED, San Jose, CA; Jessica E. FERRO, Redwood City, CA; Aaron KAPELUS, Montreal, CANADA; Neil OLIEN, Montreal, CANADA; Danny A. GRANT, Laval, CANADA; Robert LACROIX, San Jose, CA;				
** CONTINUING DATA ***** This application is a CON of 13/841,551 03/15/2013 PAT 9092954 PTN ** FOREIGN APPLICATIONS ***** PTN ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 08/07/2015				
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/PHUNG NGUYEN/</u> Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 6	TOTAL CLAIMS 29
INDEPENDENT CLAIMS 4				
ADDRESS M&G Immersion PO Box 2903 Minneapolis, MN 55402 UNITED STATES				
TITLE SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE				
FILING FEE RECEIVED 2740	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	

<i>Index of Claims</i> 	Application/Control No. 14808740	Applicant(s)/Patent Under Reexamination VISITACION ET AL.
	Examiner PHUNG NGUYEN	Art Unit 2685

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant					☐ CPA					☐ T.D.					☐ R.1.47				
CLAIM		DATE																	
Final	Original	10/26/2016	07/13/2017	02/07/2018															
	1	✓	✓	✓															
	2	✓	✓	✓															
	3	✓	✓	✓															
	4	✓	✓	✓															
	5	✓	✓	✓															
	6	✓	✓	✓															
	7	✓	✓	✓															
	8	✓	✓	✓															
	9	✓	✓	✓															
	10	✓	✓	✓															
	11	✓	✓	✓															
	12	✓	✓	✓															
	13	✓	✓	✓															
	14	✓	✓	✓															
	15	✓	✓	✓															
	16	✓	✓	✓															
	17	✓	✓	✓															
	18	✓	✓	✓															
	19	✓	✓	✓															
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	22	✓	✓	✓															
	23	✓	✓	✓															
	24	✓	✓	✓															
	25	✓	✓	✓															
	26	✓	✓	✓															
	27	✓	✓	✓															
	28	✓	✓	✓															
	29	✓	✓	✓															

S/N 14/808,740

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Allan VISITACION	Examiner:	Nguyen, Phung
Serial No.:	14/808,740	Group Art Unit:	2685
Filed:	July 24, 2015	Docket No.:	04887.0007USC1/ IMM413C1
Customer No.:	142056	Confirmation No.:	4726
Title:	SYSTEM WITH WEARABLE DEVICE AND HAPTIC OUTPUT DEVICE		

This paper is being filed electronically with the U.S. Patent Office.
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AMENDMENT AND RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents

This paper is provided in response to the Non-Final Office Action mailed February 14, 2018:

- **Amendment to the Specification** begins on page 2 of this paper.
- **Amendments to the Claims** are reflected in the listing of claims that begins on page 3 of this paper.
- **Remarks** begin on page 9 of this paper.

Amendment to the Specification

Please replace paragraph [0001] with the following paragraph as amended below (changes marked):

[0001] This application is a continuation application claiming the benefit of priority of United States Patent Application Serial No. 13/841,551, filed March 15, 2013, now U.S. Patent No. 9,092,954, the entire content of which is incorporated herein by reference.

Listing of Claims

The following claims replace all prior claims and listings of claims previously pending in this application:

1. (Currently Amended) A system comprising:
a wearable device;
a second device remote from and in communication with the wearable device;
a processor configured to generate [[a]] at least a first control signal and a second control signal representative of [[an]] a first event and a second event, respectively, occurring in an environment related to the wearable device and/or the second device, the first event and the second event being different events the processor configured to detect a plurality of events that occur in the environment related to the wearable device; and
a haptic output device configured to provide a first haptic feedback signal and a second a plurality of haptic feedback signal[[s]] based on the first control signal and the second control signal, respectively.
2. (Original) The system according to claim 1, wherein the second device is a second wearable device.
3. (Currently Amended) The system according to claim 1, wherein at least one of the first event and second event comprises event-comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, or an indication that the wearable device or the second device recognizes an object in the environment.
4. (Original) The system according to claim 1, wherein the wearable device comprises the haptic output device.

5. (Original) The system according to claim 1, wherein the second device comprises the haptic output device.
6. (Currently Amended) The system according to claim 1, further comprising:
a sensor configured to sense one or more environmental conditions related to the wearable device or the second device,
wherein at least one of the first event and second event comprises the one or more environmental conditions sensed by the sensor.
7. (Currently Amended) The system according to claim 1, further comprising:
a communication port configured to establish a wireless or wired communication channel between the wearable device and the second device,
wherein the processor is configured to receive a signal representative of the first and second events occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal.
8. (Currently Amended) The system according to claim 7, wherein the received signal comprises sensory information, and wherein at least one of the first event and second event comprises one or more environmental conditions based on the sensory information.
9. (Currently Amended) The system according to claim 8, wherein the received signal comprises information relating to a communication at the second device, and wherein at least one of the first event and second event comprises an indication of the communication at the second device.
10. (Previously Presented) A system comprising:
an augmented reality device configured to generate an augmented reality environment comprising an augmented reality space and a physical space, the augmented reality device comprising
a processor configured to detect a plurality of events that occur in the environment related to the wearable device, the processor configured to

generate the augmented reality space coincident with the physical space,
recognize at least one physical object in the physical space and augment
the at least one physical object with one or more virtual objects in
the augmented reality space, and
determine an event associated with the augmented reality environment,
and
generate a control signal based on the determined event;
a wearable device remote from and in communication with the augmented reality device;
a third device remote from and in communication with the wearable device and the
augmented reality device; and
a haptic output device configured to provide a plurality of haptic feedback signals based
on the control signal.

11. (Original) The system according to claim 10, wherein the third device is a second wearable device.
12. (Original) The system according to claim 10, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.
13. (Original) The system according to claim 10, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.
14. (Original) The system according to claim 10, wherein the augmented reality device comprises the haptic output device.

15. (Original) The system according to claim 10, wherein the wearable device comprises the haptic output device.
16. (Original) The system according to claim 10, wherein the third device comprises the haptic output device.
17. (Currently Amended) A method comprising:
detecting an event in an environment, the detecting performed at least in part with a processor,
generating a control signal representative of an event occurring in the environment related to a wearable device and/or a second device with a processor, the generated control signal being a first control signal selected from at least first and second available control signals, the first control signal representative of the event, the second control signal representative of a different event; and
providing a plurality of haptic feedback signals based on the generated control signal with a haptic output device.
18. (Original) The method according to claim 17, wherein the second device is a second wearable device.
19. (Currently Amended) The method according to claim 17, wherein at least one of the event and the different event comprises an indication of a physical object within a predetermined proximity of the wearable device or the second device, an indication of an environmental condition occurring in the environment, an indication of a change in an environmental condition occurring in the environment, an indication of a movement of an object within a predetermined proximity of the wearable device or second device, an interaction between the wearable device or the second device and an object in the environment, or an indication that the wearable device or the second device recognizes an object in the environment.
20. (Original) The method according to claim 17, wherein the wearable device comprises the haptic output device and the haptic feedback is provided at the wearable device.

21. (Original) The method according to claim 17, wherein the second device comprises the haptic output device and the haptic feedback is provided at the second device.
22. (Currently Amended) The method according to claim 17, further comprising:
sensing one or more environmental conditions related to the wearable device or the second device with a sensor,
wherein at least one of the event and the different event comprises the one or more environmental conditions sensed by the sensor.
23. (Currently Amended) The method according to claim 17, further comprising:
establishing a wireless or wired communication channel between the wearable device and the second device with a communication port; and
receiving a signal representative of at least one of the [[an]] event and the different event occurring at the wearable device or the second device via the wireless or wired communication channel and generate the control signal based on the received signal with the processor.
24. (Currently Amended) The method according to claim 23, wherein the received signal comprises sensory information, and wherein at least one of the event and the different event comprises one or more environmental conditions based on the sensory information.
25. (Currently Amended) The method according to claim 24, wherein the received signal comprises information relating to a communication at the second device, and wherein at least one of the event and the different event comprises an indication of the communication at the second device.
26. (Currently Amended) A method comprising:
generating an augmented reality environment comprising an augmented reality space and a physical space with an augmented reality device, said generating comprising generating the augmented reality space coincident with the physical space with a processor,
recognizing at least one physical object in the physical space and augmenting

augment the at least one physical object with one or more virtual objects in the augmented reality space with the processor,
detecting at least one event associated with the augmented reality environment with the processor, and
generating a control signal based on the at least one event with the processor; and
providing a plurality of haptic feedback signals based on the control signal with a haptic output device of the augmented reality device, a wearable device remote from and in communication with the augmented reality device, or a third device remote from and in communication with the wearable device and the augmented reality device.

27. (Original) The method according to claim 26, wherein the third device is a second wearable device.

28. (Original) The method according to claim 26, wherein the event comprises an interaction with a virtual object, an interaction between the at least one physical object and the augmented reality environment, a confirmation of an action occurring with respect to the augmented reality environment, a confirmation that the at least one physical object is recognized by the augmented reality device, or a confirmation that an object in the physical space has been augmented.

29. (Original) The method according to claim 26, wherein the event comprises an indication of the at least one physical object within a predetermined proximity of the augmented reality device, an indication of an environmental condition occurring in an environment related to the augmented reality device, an indication of a change in an environmental condition occurring in the environment, or an indication of a movement of an object within a predetermined proximity of the augmented reality device.

REMARKS

The applicant provides the foregoing amendments and following remarks in response to the Office Action mailed on February 14, 2018. In the present response, claims 1, 3, 6-9, 17, 19, and 22-26 are currently amended, and no claims are currently canceled or new. Support for the amendments can be found throughout the specification and includes, at least, paragraphs [0043]-[0050]. Claims 1-29 are currently pending. The applicant respectfully requests reconsideration and withdrawal of the pending rejections in light of the following remarks.

Specification

The disclosure is objected to because of the following informalities: the Specification filed on March 15, 2013, page 1, paragraph [0001], is missing the U.S. Patent Number 9,092,954. The applicant has amended the specification to identify this patent, and respectfully requests withdrawal of this objection.

Rejections under 35 U.S.C. § 112

Claims 1-9 and 17-25 were rejected under 35 U.S.C. § 112(b) or 35 U.S.C. § 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA, the applicant regards as the invention.

The claims were rejected because the term "and/or" in independent claims 1 and 17 is allegedly indefinite. Applicant hereby traverses this rejection, and asserts the use of such alternative terms is not indefinite. In fact, the office action clearly and *definitely* states the scope of such terms. For at least these reasons, the applicant respectfully requests withdrawal of the rejection.

Double Patenting

Claims 1-29 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2, 7-10, 20, 26, and 27 of U. S. Patent No. 9,092,954 in view of Haddick et al. (U.S. 2012/0242698). The applicant respectfully traverses the double patenting rejection. Haddick and the present application are assigned to different and unrelated entities and have never had common ownership. Haddick is currently assigned to

Microsoft Technology Licensing, LLC, and the present application is currently assigned to Immersion Corporation. For at least these reasons, the applicant respectfully requests withdrawal of the pending double patenting rejection.

Rejections under 35 U.S.C. § 103

Claims 1-29 were rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Haddick et al. (US 2012/0242698) in view of Company Bosch et al. (US 2012/0229264). The applicant respectfully traverses this rejection, and does not concede any characterizations of the claims, specification, or the references as set forth in the Office Action.

a. No Prima Facie Case of Obviousness Established

The Office Action does not establish a *prima facie* the case of obviousness. The Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 538, 418, 82 USPQ2d 1385, 1396 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), *M.P.E.P.* 2142. Simply stating the principle (e.g., "art recognized equivalent," "structural similarity") without providing an explanation of its applicability to the facts of the case at hand is generally not sufficient to establish a *prima facie* case of obviousness. *M.P.E.P.* 2144.

In support of combining Haddick and Company Bosch, the Office Action states, "Since they both teach a haptic control system, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the teaching of Company Bosch et al. in the system of Haddick in order to provide a plurality of feedback signals if needed." *Office action at p. 4-5*. This explanation is a conclusory statement simply based on the two references being related to the same art. It provides no rational underpinning to support a combination of the references and hence no underpinning to support a legal conclusion of obviousness.

Therefore, the office action does not provide a *prima facie* case of obviousness, and the applicant respectfully requests withdrawal of the pending rejection.

b. The Claims are not Obvious in view of Haddick and Company Bosch

Claim 1 recites, *inter alia*, “a processor configured to generate at least a first control signal and a second control signal representative of a first event and a second event, respectively, occurring in an environment . . . , the first event and the second event being different events; and a haptic output device configured to provide a first haptic feedback signal and a second haptic feedback signal based on the first control signal and the second control signal, respectively.” Independent claims 10, 17, and 26 are similarly directed to a control signal based on the event detected in the environment, which enables different haptic signals to be delivered based on the detected event.

Haddick discloses a device that generates a haptic vibration upon recognizing an object. It discloses, “In other examples, object recognition may determine the user is approaching a curb, doorway, or other object and the glasses or controller would audibly or haptically warn the user.” *Haddick at* ¶ [0422]. Haddick does not disclose a system programmed to generate different control signals upon detecting different events, or detecting a *variety of different events* and responds accordingly with *different haptic* signals for the different events. Haddick does not disclose this level of flexibility.

Company Bosch is directed to a system that receives feedback from the connection to the actuator motor for a linear resonant actuator (LRA) and then adjusts the haptic drive signal in response to the received feedback. *Company Bosch at* [0005], [006], [0035]. It discloses sending a continuous drive signal to the haptic actuator and adjusting the drive signal while it is being sent to the actuator in an effort to maintain vibration of the LRA at its mechanical resonant frequency.

In support of the rejection, the office action cites paragraph [0040] which states, “The haptic controller 110 may provide a plurality of different haptic effects.” *Office action at p. 4*. Company Bosch does not make any other disclosure about different haptic effects or the context for different haptic effects. This sentence from Company Bosch teaches no more than the disclosed feedback system can be used with various haptic systems that are programmed to deliver different haptic effects. It does not teach that one haptic system can be programmed to deliver different haptic effects. Therefore, no combination of Haddick and Company Bosch can result in the claimed combination of elements.

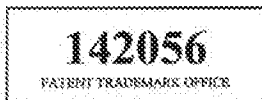
Furthermore, the pending claims have functionality that is not disclosed or contemplated in either Haddick or Company Bosch and is not possible by simply combining the elements disclosed in these references. For example, the claims enable systems and methods that can use haptic effects to identify an event occurring in an environment—not just whether an event occurred. Such systems and methods can communicate a host of different information to the user in a format or medium other than text or visual indicators, which provides more options for communication and enables effective communication in different environments when visual or audible communication is not effective or desirable. Furthermore, the pending claims provide more effective communication to disabled people, especially those with visual impairment or even a total loss of eyesight. For example, the system can distinguish between different types of events and the potential danger associated with an event. For example, the system can deliver one haptic effect for an approaching stationary object and a different haptic event for a rapidly approaching object such as a car in an intersection. Therefore, one skilled in the art would not look to combine Haddick and Company Bosch in an effort to arrive at the systems and methods recited in the pending claims.

For at least these reasons, the applicant respectfully submits the pending claims are not obvious over Haddick and Company Bosch and requests withdrawal of the pending rejection.

Conclusion

For at least the reasons discussed above, the applicant respectfully submits that each of the pending claims is in condition for allowance and requests issuance of a Notice of Allowance. Although certain arguments regarding patentability are set forth herein, there may be other arguments and reasons why the claimed invention is patentably distinct from the cited references. The applicant reserves the right to raise these arguments in the future. The applicant also reserves the right to prosecute in the future any subject matter disclosed in this application or in related applications, including any claims as they existed before being amended or cancelled, and including any subject matter not previously claimed.

The examiner is encouraged to call the applicant's representative, as identified below, if there are any questions or if it would help to advance prosecution of this application.



Respectfully submitted,

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