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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/487,371	02/16/2016	9262864	63341US008	7315

32692 7590 01/27/2016
3M INNOVATIVE PROPERTIES COMPANY
PO BOX 33427
ST. PAUL, MN 55133-3427

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Janos Rohaly, Concord, MA;
3M INNOVATIVE PROPERTIES COMPANY, St. Paul, MN;
Robert N. Nazzal, Waltham, MA;
Edward K. Tekeian, Cambridge, MA;
ILYA A. Kriveshko, Boxborough, MA;
Eric B. Paley, Somerville, MA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 or **Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

32692 7590 12/24/2015
 3M INNOVATIVE PROPERTIES COMPANY
 PO BOX 33427
 ST. PAUL, MN 55133-3427

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/487,371	09/16/2014	János Rohaty	61341US008	7315

TITLE OF INVENTION: SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	03/24/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELAHL, SHANE	2486	348-043000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

3M INNOVATIVE PROPERTIES COMPANY

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

SAINT PAUL, MINNESOTA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☒ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature

Lance L. Vietzke

Date

1/8/16

Typed or printed name Lance L. Vietzke

Registration No. 36,708

Electronic Patent Application Fee Transmittal

Application Number:	14487371			
Filing Date:	16-Sep-2014			
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA			
First Named Inventor/Applicant Name:	Janos Rohaly			
Filer:	Lance L. Vietzke/Paula Bick			
Attorney Docket Number:	63341US008			
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:				
Utility Appl Issue Fee	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				960

Electronic Acknowledgement Receipt

EFS ID:	24572923
Application Number:	14487371
International Application Number:	
Confirmation Number:	7315
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
First Named Inventor/Applicant Name:	Janos Rohaly
Customer Number:	32692
Filer:	Lance L. Vietzke/Paula Bick
Filer Authorized By:	Lance L. Vietzke
Attorney Docket Number:	63341US008
Receipt Date:	08-JAN-2016
Filing Date:	16-SEP-2014
Time Stamp:	15:42:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$960
RAM confirmation Number	2227
Deposit Account	133723
Authorized User	VIETZKE, LANCE

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

Charge any Additional Fees required under 37 CFR 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 CFR 1.19 (Document supply fees)

Charge any Additional Fees required under 37 CFR 1.20 (Post Issuance fees)

Charge any Additional Fees required under 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	Issue Fee Payment (PTO-85B)	Issue_Fee_Trans_63341US008.pdf	399469	no	1
			56b757528de40d72e54d2399f54c39bd79cf2c16		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30901	no	2
			eb68e7116162af9c1f0b35c8bca6dcb8cdd3f67c		

Warnings:

Information:

Total Files Size (in bytes):			430370
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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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United States Patent and Trademark Office
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

32692 7590 12/24/2015
3M INNOVATIVE PROPERTIES COMPANY
PO BOX 33427
ST. PAUL, MN 55133-3427

EXAMINER

ELAHI, SHAN E

ART UNIT

PAPER NUMBER

2486

DATE MAILED: 12/24/2015

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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14/487,371

09/16/2014

Janos Rohaly

63341US008

7315

TITLE OF INVENTION: SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	03/24/2016

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

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32692 7590 12/24/2015
3M INNOVATIVE PROPERTIES COMPANY
PO BOX 33427
ST. PAUL, MN 55133-3427

Certificate of Mailing or Transmission

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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/487,371	09/16/2014	Janos Rohaly	63341US008	7315

TITLE OF INVENTION: SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	03/24/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELAHI, SHAN E	2486	348-043000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached. ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.	2. For printing on the patent front page, list (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____ (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____ 3 _____
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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
☐ Applicant asserting small entity status. See 37 CFR 1.27
☐ Applicant changing to regular undiscounted fee status.

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NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____
 Typed or printed name _____ Registration No. _____



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
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/487,371	09/16/2014	Janos Rohaly	63341US008	7315

32692	7590	12/24/2015
3M INNOVATIVE PROPERTIES COMPANY		
PO BOX 33427		
ST. PAUL, MN 55133-3427		

EXAMINER	
ELAHI, SHAN E	

ART UNIT	PAPER NUMBER
2486	

DATE MAILED: 12/24/2015

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 14/487,371	Applicant(s) ROHALY ET AL.	
	Examiner SHAN ELAHI	Art Unit 2486	AIA (First Inventor to File) Status No

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/16/2015.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1-20. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some *c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. ☒ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ 3. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material 4. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____. | <ol style="list-style-type: none"> 5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____. |
|---|--|

/SHAN ELAHI/
Primary Examiner, Art Unit 2486

DETAILED ACTION

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

Oath/Declaration

2. The applicant's oath/declaration had been reviewed by the examiner and is found to conform to the requirements prescribed in 37.C.F.R.1.63.

Priority

3. As required by M.P.E.P.201.14(c), acknowledgement is made of applicant's claim for priority based on continuing application filed on November 15th 2010 (US/12/666,464), PAT 8,866,883 and a 371 application filed on June 27th 2008 (PCT/US08/68522) and claim benefit of the provisional application (US/60/947,009) filed on June 29th 2007.

Status of Claims

4. This Office Action is in response to the amendments filed on October 16th 2015. Claims 1-20 are allowed.

The Examiner called the Applicant's representative Mr. Robert Mazzaresse at (617)-916-2658 on November 2nd 2015 and requested to file Terminal Disclaimer. Mr. Mazzaresse indicated that Applicant will file Terminal Disclaimer by November 3rd 2015. Applicant filed Terminal Disclaimer on November 3rd 2015 and approved.

Response to Amendments

5. The objection to the claims 1, 3 and 15 has been withdrawn in view of amendments filed by Applicant.
6. The objection to the abstract has been withdrawn in view new abstract submitted by Applicant.
7. Applicant's filed Terminal Disclaimer on 11/03/2015 and approved on 11/3/2015 has been acknowledged by the Examiner.

Allowable Subject Matter

8. Claims 1-20 are allowed.

The following is an examiner's statement of reasons for allowance: Independent claim 1 requires inventive features of "rendering the three-dimensional model in a user interface of a display from a perspective; automatically selecting a video image with the processor from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective; displaying the video image in the user interface of the display concurrently with the three-dimensional model." Independent claim 2 requires inventive features of " a processor configured to render the three-dimensional model in the user interface from a perspective, select a video image from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective."

Independent claim 3 requires inventive features of "synchronizing the first window and the second window with the processor to provide a common perspective on the subject for both the three-dimensional model and the one of the plurality of images." Independent claims 9 requires inventive features of "a

processor configured to render the three-dimensional model in a second window displayed in the user interface concurrently with the one of the plurality of images in the first window and to synchronize the first window and the second window to provide a common perspective on the subject in both the three-dimensional model and the one of the plurality of images.” Independent claim 15 requires inventive feature of “automatically selecting one of the plurality of video images with the processor that shows the dentition from the perspective.” Independent claim 18 requires inventive feature of “a processor configured to select of one of the plurality of video images that shows the dentition from the perspective and display in a second window in the display the one of the plurality of video images concurrently with the three-dimensional model as an aid to visually determining a margin of the dentition.” The inclusion of such features, in combination with other features, in the claims renders the claims allowable. None of the prior arts on record whether taken singly or in combination discloses such inventive features. Dependent claims (4-8, 10-14, 16-17 and 19-20) are allowable for the same reason described above.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHAN ELAHI whose telephone number is (571)270-1442. The examiner can normally be reached on Monday to Friday 7:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SHAN ELAHI/
Primary Examiner, Art Unit 2486
December 21, 2015

Application/Control Number: 14/487,371
Art Unit: 2486

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	Examiner SHAN ELAHI		Art Unit 2486	Page 1 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2005/0089822 A1	04-2005	Geng, Z. Jason	433/215
*	B	US-2005/0020910 A1	01-2005	Quadling et al.	600/424
*	C	US-2006/0020363 A1	01-2006	Orth et al.	700/187
*	D	US-2003/0033151 A1	02-2003	Vozick et al.	704/275
*	E	US-2007/0183572 A1	08-2007	Drummond et al.	378/98.8
*	F	US-6,604,527 B1	08-2003	Palmisano, Richard George	128/848
*	G	US-2005/0212910 A1	09-2005	Singhal, Manoj Kumar	348/036
*	H	US-5,850,352	12-1998	Moezzi et al.	345/419
*	I	US-2006/0154198 A1	07-2006	Durbin et al.	433/029
*	J	US-2008/0015727 A1	01-2008	Dunne et al.	700/118
*	K	US-2006/0286501 A1	12-2006	Chishti et al.	433/024
*	L	US-2002/0064759 A1	05-2002	Durbin et al.	433/213
*	M	US-2003/0207235 A1	11-2003	der Zel, Joseph Maria Van	433/223

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 14/487,371		Applicant(s)/Patent Under Reexamination ROHALY ET AL.	
	Examiner SHAN ELAHI		Art Unit 2486	Page 2 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2007/0211081 A1	09-2007	Quadling et al.	345/632
*	B	US-2004/0218039 A1	11-2004	Cooper, David H.	348/066
*	C	US-2007/0098237 A1	05-2007	Yoo et al.	382/128
*	D	US-2005/0070782 A1	03-2005	Brodkin, Dmitri	600/407
*	E	US-6,974,323	12-2005	Weigl et al.	433/223
*	F	US-2006/0078842 A1	04-2006	Sachdeva et al.	433/024
*	G	US-7,077,646 B2	07-2006	Hilliard, Jack Keith	433/6
*	H	US-2006/0271229 A1	11-2006	Kopelman et al.	700/118
*	I	US-2004/0222945 A1	11-2004	Taira et al.	345/006
*	J	US-2005/0131924	06-2005	Jones, Dennis Benson	707/100
*	K	US-2007/0146234 A1	06-2007	Taira et al.	345/006
*	L	US-2012/0015316 A1	01-2012	Sachdeva et al.	433/24
*	M	US-2012/0290118 A1	11-2012	Kaigler, SR., Darnell	700/119

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
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U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2008/0070181 A1	03-2008	Abolfathi et al.	433/006
*	B	US-2012/0290118 A1	11-2012	Kaigler, SR., Darnell	700/119
*	C	US-2013/0003997 A1	01-2013	KASSAYAN et al.	381/151
*	D	US-8,866,883 B2	10-2014	Rohaly et al.	348/43
*	E	US-2005/0089822 A1	04-2005	Geng, Z. Jason	433/215
*	F	US-6,409,504 B1	06-2002	Jones et al.	433/24
*	G	US-2002/0102009 A1	08-2002	Jones et al.	382/100
*	H	US-7,110,594 B2	09-2006	Jones et al.	382/154
*	I	US-7,247,021 B2	07-2007	Jones et al.	433/213
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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	R					
	S					
	T					

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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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Search Notes 	Application/Control No. 14487371	Applicant(s)/Patent Under Reexamination ROHALY ET AL.
	Examiner SHAN ELAHI	Art Unit 2486

CPC- SEARCHED		
Symbol	Date	Examiner
A61C9/0053, G06F3/04815, G06F3/04847, G06T15/10, G06T17/10, H04N13/00, H04N13/0055, H04N5/14	6/19/2015	/SEE/
G06T17/20, G06T19/00, G06T17/00, G06T17/10, G06T17/005	6/19/2015	/SEE/

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
345	420	6/19/2015	/SEE/
348	43	10/29/2015	/SEE/

SEARCH NOTES		
Search Notes	Date	Examiner
Following databases were searched [US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO, DERWENT, IBM_TDB]	6/19/2015, 6/20/2015, 6/21/2016	/SEE/
Following class and subclass were searched 345/419, 345/423, 345/421, 345/629-641	6/19/2015	/SEE/
Assignee searched	6/20/2015	/SEE/
Inventors searched	6/20/2015	/SEE/
CPC search	6/19/2015	/SEE/
Espacenet search	6/21/2015	/SEE/
Google prior arts finder databases searched key words from claims for PGPUBs and PATENTs	6/21/2015	/SEE/
Google Scholar searched key words from claims for NPLs	6/21/2015	/SEE/
IEEE Xplore databases searched key words from claims for NPLs	6/21/2015	/SEE/
IP.COM databases searched key words from claims	6/21/2015	/SEE/
Following class/subclass were searched: ("345"/\$.cls. and "600"/\$.cls. and "433"/\$.cls.)	6/21/2015	/SEE/

	/SHAN ELAHI/ Primary Examiner.Art Unit 2486
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SEARCH NOTES

Search Notes	Date	Examiner
Following class/subclass were searched: ("345"/\$.ccls. and "600"/\$.ccls. and "433"/\$.ccls. and "348"/\$.ccls.)	6/21/2015	/SEE/
Interference searched for the following databases [US-PGPUB, USPAT, UPAD]	10/29/2015	/SEE/
Updated CPC search	10/29/2015	/SEE/
Updated search	10/29/2015	/SEE/

INTERFERENCE SEARCH

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
348	43	10/29/2015	/SEE/
A61C	9/0053	10/29/2015	/SEE/

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Primary Examiner.Art Unit 2486



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BIB DATA SHEET

CONFIRMATION NO. 7315

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/487,371	09/16/2014	348	2486	63341US008
RULE				
APPLICANTS 3M INNOVATIVE PROPERTIES COMPANY, St. Paul, MN;				
INVENTORS Janos Rohaly, Concord, MA; Robert N. Nazzal, Waltham, MA; Edward K. Tekeian, Cambridge, MA; ILYA A. Kriveshko, Boxborough, MA; Eric B. Paley, Somerville, MA;				
** CONTINUING DATA ***** This application is a CON of 12/666,464 11/15/2010 PAT 8866883 which is a 371 of PCT/US08/68522 06/27/2008 which claims benefit of 60/947,009 06/29/2007				
** FOREIGN APPLICATIONS *****				
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 09/22/2014				
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/SHAN E ELAHI/</u> Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY MA	SHEETS DRAWINGS 6	TOTAL CLAIMS 20
INDEPENDENT CLAIMS 6				
ADDRESS 3M INNOVATIVE PROPERTIES COMPANY PO BOX 33427 ST. PAUL, MN 55133-3427 UNITED STATES				
TITLE SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA				
FILING FEE RECEIVED 3000	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. 14487371	Applicant(s)/Patent Under Reexamination ROHALY ET AL.
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✓	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	07/09/2015	12/15/2015												
	1	✓	=												
	2	✓	=												
	3	✓	=												
	4	✓	=												
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	18	✓	=												
	19	✓	=												
	20	✓	=												

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S2	3	("12666464" "14487371")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:03
S3	3	S2 AND ((A61C9/0053 OR G06F3/04815 OR G06F3/04847 OR G06T15/10 OR G06T17/10 OR H04N13/00 OR H04N13/0055 OR H04N5/14).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:03
S4	29148	(A61C9/0053 OR G06F3/04815 OR G06F3/04847 OR G06T15/10 OR G06T17/10 OR H04N13/00 OR H04N13/0055 OR H04N5/14).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:03
S5	23092	(H04N13/00 OR G06T17/10 OR G06T15/10 OR H04N5/14 OR G06F3/04815 OR A61C9/0053 OR G06F3/04847 H04N13/00 OR G06T17/10 OR G06T15/10 OR H04N5/14 OR G06F3/04815 OR A61C9/0053 OR G06F3/04847).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:05
S6	24090	(G06T17/20 or G06T19/00 or G06T17/00 or G06T17/10 or G06T17/005).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:06
S7	3678	S4 and S5 and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:06
S8	4220	345/420.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:06
S9	13518	345/419.ccls.	US-PGPUB;	OR	ON	2015/06/19

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			08:07
S10	1616	345/423.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:07
S11	1244	345/421.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:07
S12	10753	345/629-641.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:07
S13	18	S8 and S9 and S10 and S11 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:07
S16	38	(stereoscopic and panoramic and three near2 dimensional near2 imag\$3) and (synchroniz\$3 and view\$3 same video same three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:09
S17	3	S4 and S5 and S6 and (synchroniz\$3 same view\$3 same video same three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:10
S18	141	("2301826" "2955156" "3059519" "3376381" "3504122" "3614314" "3670097" "3784738" "3833300" "4153913" "4190856" "4310849" "4559555" "4605959" "4636866" "4641178" "4647966" "4692792" "4695129" "4706117" "4743964").PN. OR ("4853764").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/19 11:03
S19	59	("3542948" "3560644" "4334245" "4355328" "4853764" "5130794" "5179440").PN. OR ("5448287").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/19 18:47
S20	15	(janos near2 rohaly and robert near2 nazzal and edward near2 tekeian and ilya	US-PGPUB; USPAT;	OR	ON	2015/06/20 10:24

		near2 kriveshko and eric near2 paley).IN.	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S22	34815	("3M").AS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 10:25
S23	1	(3M near2 innovative near2 properties near2 comapany).AS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 10:25
S27	658	(stereoscopic and panoramic and three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 11:15
S28	8	(creat\$3 and generat\$3) same (stereoscopic and panoramic and three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 11:15
S29	33	("3850505" "4221462" "4241985" "4429328" "4528587" "5396583" "6023588" "D312263").PN. OR ("6791598").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/20 15:27
S30	79	("0904212" "0986163" "1247646" "1259365" "1267689" "1371438" "1477541" "2050826" "2107464" "2158660" "2168273" "2270198" "2273512" "2279443" "2313561" "2403733" "2460864" "2566700" "2693128" "3019698" "3020341" "3275745" "3418044" "3457364" "3595995" "3608457" "3626404" "3705261" "3991266" "4006291" "4303316" "4393400" "4399456").PN. OR ("4528587").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/20 15:53
S31	2	"8866883".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:34
S32	3	"20050020910".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2015/06/21 10:35

			DERWENT; IBM_TDB			
S33	3	"20030033151".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:37
S34	2	"20050212910"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:39
S35	18	(dental near2 technology) and (model\$3 near2 three near2 dimensional near2 dental) and (three near2 dimensional near2 dental near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:43
S36	19	(dental near2 technology) and (three near2 dimensional near2 dental near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:46
S37	5	"6604527".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:48
S38	692	(dental same three near2 dimensional near2 imag\$3 and model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:57
S39	94	(dental same three near2 dimensional near2 imag\$3 and model\$3) and (processor\$1 and imag\$3 near2 process\$3 and stor\$3 and memory and computer near2 program)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:57
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S41	92	(dental same three near2 dimensional near2 imag\$3 and model\$3) and (processor\$1 and imag\$3 near2 process\$3 and stor\$3 and memory and computer near2 program)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:42
S42	301	("CAD" same "CAM" same dentistry)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:43
S43	6	("CAD" same "CAM" same dentistry) and (three near2 dimensional near2 dental near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:43
S44	99	("CAD" same "CAM" same dentistry) and (dental same three near2 dimensional same model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:44
S45	13	("CAD" same "CAM" same dentistry) and (dental same three near2 dimensional same model\$3) and (camera\$1 and video nar2 camera\$1) and (imag\$3 near2 process\$3) and (memory and storage and computer near2 program)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:45
S46	116	("2467432" "3660900" "3860803" "3916526" "3950851" "4014096" "4195046" "4324546" "4348178" "4478580" "4504225" "4505673" "4575805" "4611288" "4656860" "4663720" "4742464" "4755139" "4763791" "4793803" "4798534" "4837732" "4850864" "4856991" "4936862" "4937928" "4964770" "4975052" "5011405" "5017133" "5027281" "5035613" "5055039" "5059118" "5100316" "5121333" "5128870" "5131843" "5131844" "5139419" "5184306" "5186623" "5257203" "5273429" "5278756" "5338198" "5340309" "5342202" "5368478" "5382164" "5395238" "5431562" "5440496" "5447432" "5452219" "5454717" "5456600" "5474448" "5518397" "5528735" "5533895" "5542842" "5549476" "5587912" "5605459" "5607305" "5621648" "5645421" "5655653" "5683243" "5733126" "5740267" "5823778" "5879158" "5975893"	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:45

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S47	185	("2467432" "2531222" "4055895" "4073061" "4371336" "4433956").PN. OR ("4755139").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:45
S48	171	("20020006597" "20030009252" "20030139834" "20030224311" "20040128010" "20050055118" "20060078840" "20080090196" "20130029283" "2467432" "3407500" "3600808" "3660900" "3683502" "3738005" "3860803" "3916526" "3922786" "3950851" "3983628" "4014096" "4195046" "4253828" "4324546" "4324547" "4348178" "4478580" "4500294" "4504225" "4505673" "4526540" "4559013" "4575330" "4575805" "4591341" "4609349" "4611288" "4656860" "4663720" "4664626" "4676747" "4742464" "4755139" "4763791" "4793803" "4798534" "4836778" "4837732" "4850864" "4850865" "4856991" "4877398" "4880380" "4889238" "4890608" "4935635" "4936862" "4937928" "4941826" "4964770" "4975052" "4983334" "5011405" "5017133" "5027281" "5035613" "5055039" "5059118" "5100316" "5121333" "5125832" "5128870" "5130064" "5131843" "5131844" "5139419" "5145364" "5176517" "5184306" "5186623" "5257203" "5273429" "5278756" "5328362" "5338198" "5340309" "5342202" "5368478" "5382164" "5395238" "5431562" "5440326" "5440496" "5447432" "5452219" "5454717" "5456600" "5474448" "5518397" "5528735" "5533895" "5542842" "5549476" "5562448" "5587912" "5605459" "5607305" "5614075" "5621648" "5645420" "5645421" "5655653" "5683243" "5692894" "5725376" "5725378" "5733126" "5740267" "5742700" "5799100" "5800174" "5823778").PN. OR ("5848115" "5857853" "5866058" "5879158" "5880961" "5880962" "5934288" "5954500" "5957686" "5964587" "5971754" "5975893" "6015289" "6044309" "6049743" "6062861" "6068482" "6099314" "6123544" "6126443" "6152731" "6183248" "6190165" "6217325" "6217334" "6244861" "6309215" "6315553" "6322359" "6350120" "6382975" "6398548" "6402707" "6450807" "6482298" "6524101" "6554611" "6572372" "6629840" "6705863" "6722880" "8075309" "8152521" "8292617" "8308478" "8539955" "RE35169").PN. OR ("9022781").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:45

S49	191	("3510946" "4055895" "4505672" "4541800" "4591341").PN. OR ("4793803").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:46
S50	157	("3407500" "3510946" "4448735" "4505673" "4591341").PN. OR ("4856991").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:46
S51	208	("20020006597" "20020018981" "20020055800" "20030009252" "20030139834" "20030156111" "20030224311" "20040128010" "20040189633" "20050018885" "20050055118" "2467432" "3407500" "3600808" "3660900" "3683502" "3738005" "3860803" "3916526" "3922786" "3950851" "3983628" "4014096" "4195046" "4253828" "4324546" "4324547" "4348178" "4478580" "4500294" "4504225" "4505673" "4526540" "4575330" "4575805" "4591341" "4609349" "4611288" "4656860" "4663720" "4664626" "4676747" "4742464" "4755139" "4763791" "4793803" "4798534" "4836778" "4837732" "4850864" "4850865" "4856991" "4877398" "4880380" "4889238" "4890608" "4935635" "4936862" "4937928" "4941826" "4964770" "4975052" "4983334" "5011405" "5017133" "5027281" "5035613" "5055039" "5059118" "5100316" "5107444" "5121333" "5125832" "5128870" "5130064" "5131843" "5131844" "5139419" "5145364" "5176517" "5184306" "5186623" "5257203" "5273429" "5278756" "5328362" "5338198" "5340309" "5342202" "5368478" "5382164" "5395238" "5431562" "5440326" "5440496" "5447432" "5452219" "5454717" "5456600" "5474448" "5518397" "5528735" "5533895" "5542842" "5549476" "5562448" "5587912" "5590248" "5605459" "5607305" "5614075" "5621648" "5645420" "5645421" "5655653" "5683243" "5692894" "5725376" "5725378" "5733126" "5740267").PN. OR ("5742700" "5799100" "5800174" "5823778" "5848115" "5857853" "5866058" "5879158" "5880961" "5880962" "5882192" "5934288" "5957686" "5964587" "5971754" "5975893" "6015289" "6044170" "6044309" "6049743" "6054990" "6062861" "6068482" "6099314" "6123544" "6151404" "6152731" "6183248" "6190165" "6205243" "6210162" "6212442" "6217325" "6217334" "6227850" "6244861" "6250918" "6260000" "6300958" "6309215" "6315553" "6318994" "6322359" "6350119" "6350120"	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:47

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S53	66	(three near2 dimensional near2 display\$3 same synchroniz\$3 same windows)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2015/06/21 12:55

			EPO; JPO; DERWENT; IBM_TDB			
S54	12	(stereoscopic) and (three near2 dimensional near2 imag\$3) and (three near2 dimensional near2 display\$3 same synchroniz\$3 same windows)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 12:56
S55	10	("345"/\$.ccls. and "600"/\$.ccls. and "433"/\$.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 12:59
S56	2	("345"/\$.ccls. and "600"/\$.ccls. and "433"/\$.ccls. and "348"/\$.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 12:59
S57	2	"6318995".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 13:00
S58	41	("3738005" "4575805" "5011405" "5238404" "5368478" "5395238" "5431562" "5447432" "5454717" "5456600" "5464349" "5474448" "5518397" "5533895" "5542842" "5618176" "5879158" "5975893" "6068482" "6099314" "6217325" "6227850" "Re35169").PN. OR ("6318995").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 13:00
S59	10	"8107086".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 13:00
S60	44	("20040112978" "20040253824" "20050202363" "20060173637" "20070127756" "20080068619" "20080169044" "20100019170" "20100020070" "20100022893" "20100039534" "20100042002" "20100065793" "20100067756" "20110290005" "4841156" "5619330" "5717217" "5904651" "6339648" "6533062" "6621951" "6751494" "7286242" "7555356" "7606381").PN. OR ("8107086").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 13:01
S61	1	"14487371"	US-PGPUB; USPAT;	OR	ON	2015/10/29 11:04

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S62	32724	(A61C9/0053 OR G06F3/04815 OR G06F3/04847 OR G06T15/10 OR G06T17/10 OR H04N13/00 OR H04N13/0055 OR H04N5/14).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:05
S63	0	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition) and (render\$3 and display\$3) and (automatically near2 select\$3 near2 three near2 dimensional same user near2 interface same display near3 perspective)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:28
S64	0	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition) and (render\$3 and display\$3) and (automatically near2 select\$3 near2 three near2 dimensional near2 imag\$2) and (user near2 interface same display near3 perspective)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:29
S65	0	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition) and (render\$3 and display\$3) and (automatically near2 select\$3 near2 three near2 dimensional near2 imag\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:29
S66	0	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition) and (render\$3 and display\$3) and (automatically near2 select\$3 near2 three near2 dimensional near2 model\$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:29
S67	1	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition) and (render\$3 and display\$3) and (automatically same select\$3 same three near2 dimensional same model\$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:29
S68	1	(A61C9/0053 OR G06F3/04815 OR G06F3/04847 OR G06T15/10 OR G06T17/10 OR H04N13/00 OR H04N13/0055 OR H04N5/14).CPC. and (creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:30
S69	24	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:31

S70	3	(creat\$3 near2 three near2 dimensional near2 imag\$3 near4 dentition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 11:31
S80	1	(3M near2 innovative near2 properties near2 comapany).AS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 13:19
S81	0	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition) and (automatic\$4 near2 select\$3 near3 video near2 imag\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 13:20
S82	1	(creat\$3 near2 three near2 dimensional near2 imag\$3 same dentition) and (automatic\$4 same select\$3 same video near2 imag\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 13:20
S83	0	("2015/0002509").URPN.	USPAT	OR	ON	2015/10/29 13:21
S88	0	(provid\$3 same processor same user near2 interface same mark\$3 same margin same dentition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 15:37
S89	14	(provid\$3 and processor and user near2 interface and mark\$3 same margin same dentition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 15:39
S90	2	(provid\$3 and processor same user near2 interface and mark\$3 same margin same dentition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/10/29 15:39

Issue Classification 	Application/Control No. 14487371	Applicant(s)/Patent Under Reexamination ROHALY ET AL.	
	Examiner SHAN ELAHI	Art Unit 2486	

CPC						
Symbol					Type	Version
G06T		17	/	10	F	2013-01-01
H04N		13	/	00	I	2013-01-01
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G06T		15	/	10	I	2013-01-01
A61C		9	/	0053	I	2013-01-01
G06F		3	/	04815	I	2013-01-01
G06F		3	/	04847	I	2013-01-01
H04N		5	/	14	I	2013-01-01
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CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
		20	
(Assistant Examiner)	(Date)	O.G. Print Claim(s)	O.G. Print Figure
/SHAN ELAHI/ Primary Examiner.Art Unit 2486	12/15/2015	3	6
(Primary Examiner)	(Date)		

Issue Classification 	Application/Control No. 14487371	Applicant(s)/Patent Under Reexamination ROHALY ET AL.
	Examiner SHAN ELAHI	Art Unit 2486

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION										
CLASS		SUBCLASS				CLAIMED					NON-CLAIMED					
348		43				G	0	6	T	17 / 10 (2006.01.01)						
CROSS REFERENCE(S)																
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)															
348	42	44	45	46	47											

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/SHAN ELAHI/ Primary Examiner.Art Unit 2486 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 3	O.G. Print Figure 6

Issue Classification 	Application/Control No. 14487371	Applicant(s)/Patent Under Reexamination ROHALY ET AL.
	Examiner SHAN ELAHI	Art Unit 2486

☒ Claims renumbered in the same order as presented by applicant								☐ CPA		☒ T.D.		☐ R.1.47			
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		17												
	2		18												
	3		19												
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	14														
	15														
	16														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/SHAN ELAHI/ Primary Examiner.Art Unit 2486 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 3	O.G. Print Figure 6

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed		PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce
Electronic Petition Request	TERMINAL DISCLAIMER TO OBIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	
Application Number	14487371	
Filing Date	16-Sep-2014	
First Named Inventor	Janos Rohaly	
Attorney Docket Number	63341US008	
Title of Invention	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	
☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action ☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.		
Owner	Percent Interest	
3M INNOVATIVE PROPERTIES COMPANY	100%	
The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s) 8866883 as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns. In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later: - expires for failure to pay a maintenance fee; - is held unenforceable; - is found invalid by a court of competent jurisdiction; - is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; - has all claims canceled by a reexamination certificate; - is reissued; or - is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer. ☒ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.		

☐ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: ☐ Small Entity ☐ Micro Entity ☒ Regular Undiscounted	
I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ☒ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number <u>36708</u> ☐ A sole inventor ☐ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ☐ A joint inventor; all of whom are signing this request	
Signature	/Lance Vietzke/
Name	Lance L Vietzke

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
 Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	14487371			
Filing Date:	16-Sep-2014			
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA			
First Named Inventor/Applicant Name:	Janos Rohaly			
Filer:	Lance L. Vietzke			
Attorney Docket Number:	63341US008			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Statutory or Terminal Disclaimer	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				160

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Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 14487371

Filing Date: 16-Sep-2014

Applicant/Patent under Reexamination: Rohaly et al.

Electronic Terminal Disclaimer filed on November 3, 2015

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt

EFS ID:	23969637
Application Number:	14487371
International Application Number:	
Confirmation Number:	7315
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
First Named Inventor/Applicant Name:	Janos Rohaly
Customer Number:	32692
Filer:	Lance L. Vietzke
Filer Authorized By:	
Attorney Docket Number:	63341US008
Receipt Date:	03-NOV-2015
Filing Date:	16-SEP-2014
Time Stamp:	11:36:56
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 160
RAM confirmation Number	10001
Deposit Account	133723
Authorized User	VIETZKE, LANCE

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Electronic Terminal Disclaimer-Filed	eTerminal-Disclaimer.pdf	33504	no	2
			b3e645cf4d0383d587c237eb1a8149d40a76f22		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30468	no	2
			39d552468aa7faeb453e48e3a763e5b9d2a5ae18		

Warnings:

Information:

Total Files Size (in bytes):	63972
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New Applications Under 35 U.S.C. 111

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

National Stage of an International Application under 35 U.S.C. 371

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	ROHALY, JANOS	Art Unit:	2486
Application No.:	14/487,371	Confirmation No.:	7315
Filed:	16 SEPT 2014	Examiner:	ELAHI, SHAN
Title:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA		

AMENDMENT AND REPLY

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

Dear Sir:

In response to the Office Action mailed on July 16, 2015, the applicant requests reconsideration of this application. Kindly enter the following prior to further consideration of this application:

Amendments to the Specification appear on page 2 of this paper.

Amendments to the Claims begin on page 3 of this paper.

Remarks begin on page 8 of this paper.

Amendments to the Specification

Please replace the Abstract with the following re-written Abstract:

-- ~~Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired during a three-dimensional scan of the model dentition provides a source of still images that can be displayed alongside a rendered three-dimensional model of the dentition, and the two views (model and still image) may be synchronized to provide a common perspective of the model's subject matter. This approach provides useful visual information for disambiguating surface features of the model during interactive model processing steps such as marking a margin of a prepared tooth surface for a restoration. ~~Interactive modeling tools may be similarly enhanced. For example, tools for margin marking may synchronize display of margin lines between the still image and the model so that a user can interact with either or both of the visual representations, with changes to a margin reflected in both displays.~~~~--

Amendments to the Claims

Please amend the claims according to the following claim listing, which replaces all prior versions of claims in this application:

1. (Currently amended) A method comprising:
 creating a three-dimensional model with a processor from a sequence of image sets stored in a memory, each image set including a plurality of images of a subject including dentition, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image;
 rendering the three-dimensional model in a user interface of a display from a perspective;
 automatically selecting a video image with the processor from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective;
 displaying the video image in the user interface of the display concurrently with the three-dimensional model; and
 providing a tool with the processor in the user interface for marking a margin of the dentition.
2. (Currently amended) A system comprising:
 a memory storing a three-dimensional model of a subject and a sequence of image sets used to create the three-dimensional model, each image set including a plurality of images of a subject including dentition, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image;
 a display configured to provide a user interface presenting the sequence of image sets;
and
 a processor configured to render the three-dimensional model in the user interface from a perspective, select a video image from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective, display the video image in the user interface concurrently with the three-dimensional model, and provide a tool for marking a margin of the dentition.

3. (Currently amended) A method comprising:
- creating a three-dimensional model with a processor from a sequence of image sets stored in a memory, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis;
 - displaying one of the plurality of images in a first window of a display;
 - rendering the three-dimensional model with the processor in a second window of the display; and
 - synchronizing the first window and the second window with the processor to provide a common perspective on the subject for both the three-dimensional model and the one of the plurality of images.
4. (Original) The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and rotating the three-dimensional model to maintain the common perspective.
5. (Original) The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective.
6. (Original) The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective.
7. (Original) The method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective.
8. (Original) The method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and creating a composite video image from two or more of the plurality of images to provide a common perspective on the subject.

9. (Currently amended) A system comprising:

a memory storing a three-dimensional model of a subject and a sequence of image sets used to create the three-dimensional model, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis;

a display configured to provide a user interface displaying one of the plurality of images in a first window; and

a processor configured to render the three-dimensional model in a second window displayed in the user interface concurrently with the one of the plurality of images in the first window and to synchronize the first window and the second window to provide a common perspective on the subject in both the three-dimensional model and the one of the plurality of images.

10. (Original) The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and rotate the three-dimensional model to maintain the common perspective.

11. (Original) The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and translate the three-dimensional model to maintain the common perspective.

12. (Original) The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and scale the three-dimensional model to maintain the common perspective.

13. (Original) The system of claim 9 wherein the processor is configured to receive a user selection of a different perspective of the three-dimensional model and select a new one of the plurality of images to maintain the common perspective.

14. (Original) The system of claim 9 wherein the processor is configured to receive a user selection of a different perspective of the three-dimensional model and create a composite video image from two or more of the plurality of images to provide a common perspective on the subject.

15. (Currently amended) A method comprising:
displaying a three-dimensional model of dentition from a perspective in a display;
providing a plurality of video images of the dentition in a memory;
automatically selecting one of the plurality of video images with the processor that shows the dentition from the perspective; and
displaying the one of the plurality of video images in a user interface of the display concurrently with the three-dimensional model as an aid to visually determining a margin of the dentition.

16. (Original) The method of claim 15 further comprising displaying a margin on one or more of the three-dimensional model or the one of the plurality of video images.

17. (Original) The method of claim 16 further comprising receiving a user modification of the margin and updating the display with a modified margin.

18. (Currently amended) A system comprising:
a display having a window for displaying a three-dimensional model of dentition from a perspective;
a camera providing a plurality of video images of the dentition; and
a processor configured to select of one of the plurality of video images that shows the dentition from the perspective and display in a second window in the display the one of the plurality of video images concurrently with the three-dimensional model as an aid to visually determining a margin of the dentition.

19. (Original) The system of claim 18 wherein the processor is configured to display a margin on one or more of the three-dimensional model or the one of the plurality of video images.

20. (Original) The system of claim 19 wherein the processor is configured to receive a user modification of the margin and update the display with a modified margin.

REMARKS***Status of the Claims***

Claims 1, 2, 3, 9, 15 and 18 are amended. Claims 1-20 are presented for examination, with claims 1, 2, 3, 9, 15 and 18 being independent.

Specification

The abstract of the disclosure has been objected to as containing too many words. The applicant has amended the abstract so that it is within the 150 word limit suggested by MPEP § 608.01(b). The applicant requests reconsideration and withdrawal of this objection.

Claim Objections

Claims 1, 3 and 15 are objected to as not being tied to a machine or hardware that performs the recited steps. Without conceding the propriety of this objection, the applicant has amended these claims to recite concrete hardware used to perform the various steps. The applicant requests reconsideration and withdrawal of these claim objections.

Claim Rejections – 35 U.S.C. § 102

One of the enduring challenges of dental restorations is correctly and accurately capturing the margin of a tooth – the line between soft tissue and the exposed tooth. With the advent of digital dentistry, this task has moved from an artisanal, hand-crafting, manual process performed by technicians in a dental laboratory to a computerized desktop process where the margin must be properly defined for downstream computerized fabrication. The applicants have devised a technique for tackling this challenge in the context of video-based three-dimensional imaging of dental subject matter.

On one hand, a system can store a three-dimensional model that was derived from a sequence of still frames of video data. This model renders the dental content in three-dimensional relief to provide spatial information. On the other hand, the source data – the sequence of still frames from the video feed – can be retained to provide visually clear two-dimensional data of dental content from a variety of poses that were used to generate the three-

dimensional model. The applicant has realized that these two data sources can usefully be presented into a single workspace to concurrently provide the two different and useful sources of visual information as visual context for accurately determining a margin. The claims have been amended to clarify this inventive concept, and to more explicitly claim at least three distinct features: a three-dimensional model rendered in a display, two-dimensional source images for the model, also rendered in the display, and a margin marking tool that enable a user to mark margin data using both of these sources of visual information. The art of record does not appear to fairly contemplate this combination of features.

Geng

Claims 1-20 stand rejected under 35 U.S.C. § 102 as anticipated by U.S. Pat. Pub. No. 2005/0089822 to *Geng* (“*Geng*”).

According to the outstanding rejection, *Geng* discloses rendering a three-dimensional model from a perspective in ¶¶ [0009] and [0021]-[0024].

In ¶ [0009], *Geng* mentions a CAD system that “includes a graphical user interface for displaying at least one three-dimensional (3D) image for reviewing by an operator.”¹ In ¶ [0021], *Geng* appears to describe a structured light 3D reconstruction system in which “the system (100) is configured to project a multicolored light, or rainbow projection, onto the patient’s (108) tooth structure,” after which a camera captured positions of the light and a “series of mathematical calculations produces a large data set of 3D coordinate points.”² The next paragraph states summarily that either a camera or a computer can do the preprocessing for this reconstruction technique,³ and the following paragraph recites a number of devices that can be used, such as “a desktop, laptop, pocket PC, personal digital assistant (PDA), tablet PC, or other known forms of personal computers.”⁴ Thus it appears that *Geng* fairly contemplates capturing and rendering a 3D model.

With respect to the concurrent display of a video image, the outstanding rejection has identified ¶¶ [0009] and ¶ [0039]. In the first cited paragraph, *Geng* generally mentions a user

¹ *Geng*, ¶ [0009].

² *Geng*, ¶ [0021].

³ *Geng*, ¶ [0022].

⁴ *Geng*, ¶ [0023].

interface, which is described as “a prosthesis design module providing design tools for creating a virtual 3D model of a dental prosthesis responsive to operator input.”⁵ This does not appear to suggest any specific use of two-dimensional data. In fact, the only specific reference to two-dimensional data that the applicant could locate in this context (e.g., in ¶¶ [0032]-[0039], all cited by the examiner) appears in ¶ [0038], where *Geng* generally provides that “both 2D and 3D image data can be acquired by the capturer.”⁶ This falls fall short of the applicant’s claimed invention, which explicitly includes a number of specific features distinguishable from *Geng*.

In one aspect, claim 1 explicitly requires that the three-dimensional model be displayed concurrently with the video image. This is more than a passing distinction. This feature provides a significant advantage over the art of record because it yields the concurrent display of two different types of visual data that contain different information of potential use during a margin marking procedure or the like.

In another aspect, claim 1 explicitly requires that the three-dimensional model be created from a sequence of images that includes the two-dimensional image being concurrently displayed. This is also more than a passing distinction. The model was created from the sequence of images, which means that a source two-dimensional image should generally be available for any perspective on the surface of the three-dimensional model that a user might choose.⁷

In another aspect, claim 1 explicitly requires a common, shared perspective (simple “the perspective” in the claims) in the view provided by the three-dimensional model and the view provided by the two-dimensional image. Again, this is more than a passing distinction. By maintaining synchronized visual content between these two different sources of visual content, a user can more easily use both views concurrently to resolve spatial ambiguities, identify surface blemishes, and so forth.

Geng does not appear to suggest any of these features, and cannot anticipate the invention of claim 1, which requires all three. For at least these reasons, *Geng* cannot anticipate

⁵ *Geng*, ¶ [0009].

⁶ *Geng*, ¶ [0038].

⁷ The applicant has also devised a triscopic imaging technique in which two side channels with offset axes are used to image a surface for 3D reconstruction, and a center channel concurrently captures a center channel of conventional video data, e.g., for navigation by a human user. While this yields the possibility that the conventional video image is not actually used in the 3D reconstruction (although it may still optionally be used for disambiguation or other calculation refinements), it nonetheless leads to the same result – that at least one video image is available for each point on the exterior surface of the three-dimensional model.

claim 1. The remaining independent claims have been similarly amended, and for similar reasons, cannot be anticipated by *Geng*.

Orth

Claim 1 further stands rejected under 35 U.S.C. § 102 as anticipated by U.S. Pat. Pub. No. 2006/0020363 to *Orth, et al.* (“*Orth*”). *Orth* appears to generally contemplate tools for working with, and more specifically modifying, digitized workpieces “by altering the surface data of the workpiece by means of a tool which acts on a local zone of action (3) on the surface (2).”⁸ This appears to be highly useful in, e.g., modifying a tooth model or other dental workpiece according to a dental plan. But this has little to do with the applicant’s technique for concurrently displaying a two-dimensional image and a three-dimensional model from a common perspective and providing a margin marking tool for a user to employ in this context.

As amended, claim 1 explicitly requires that a three-dimensional model be displayed concurrently with a video image. Claim 1 also explicitly requires that the three-dimensional model be created from a sequence of images that includes the two-dimensional image being concurrently displayed. Claim 1 still further explicitly requires a common, shared perspective (simple “the perspective” in the claims) in the view provided by the three-dimensional model and the view provided by the two-dimensional image. *Orth* does not appear to disclose any of these features, and cannot anticipate claim 1, or render claim 1 obvious in combination with the other cited art of record.

For at least these reasons, claim 1 is patentable over *Orth*, and claims 1, 2, 3, 9, 15 and 18 are patentable over *Geng*. The remaining claims depend from an allowable base claim and are likewise believed to be in condition for allowance. The applicant respectfully requests reconsideration and allowance of the pending claims.

⁸ *Orth*, Abstract.

Conclusion

In view of the foregoing, the applicant believes that the currently pending claims are in condition for allowance and respectfully requests a corresponding Notice of Allowance.

The applicant believes that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed.

Nothing in this paper should be construed as intent to concede any issue with regard to any claim, except as specifically stated in this paper. The amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

The Director is hereby authorized to charge any fees or to credit any overpayments associated with this filing to Deposit Account No. 50-4262. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (617) 916-2658.

Respectfully submitted

STRATEGIC PATENTS, P.C.

/Robert Mazzaresse/

Robert A. Mazzaresse

Reg. No. 42,852

Tel.: (617)-916-2658

October 16, 2015

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Respectfully submitted

STRATEGIC PATENTS, P.C.

/Robert Mazzaresse/

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Reg. No. 42,852

Tel.: (617)-916-2658

October 16, 2015

Electronic Acknowledgement Receipt

EFS ID:	23802618
Application Number:	14487371
International Application Number:	
Confirmation Number:	7315
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
First Named Inventor/Applicant Name:	Janos Rohaly
Customer Number:	32692
Filer:	Robert A. Mazzaresse/Paula Ng
Filer Authorized By:	Robert A. Mazzaresse
Attorney Docket Number:	63341US008
Receipt Date:	16-OCT-2015
Filing Date:	16-SEP-2014
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Application Type:	Utility under 35 USC 111(a)

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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		BRNT-0031-P02_101615_OAResponse.pdf	116706 ffe42b85ddf0cc78ae9bf703abc088b05255a432	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	2
	Claims	3	7
	Applicant Arguments/Remarks Made in an Amendment	8	12

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New Applications Under 35 U.S.C. 111

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

National Stage of an International Application under 35 U.S.C. 371

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

New International Application Filed with the USPTO as a Receiving Office

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/487,371	Filing Date 09/16/2014	☐ 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	10/16/2015	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 6	Minus	***6	= 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.

LIE
/CAROLYN THOMAS/

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.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/487,371	09/16/2014	Janos Rohaly	63341US008	7315

32692 7590 07/16/2015
3M INNOVATIVE PROPERTIES COMPANY
PO BOX 33427
ST. PAUL, MN 55133-3427

EXAMINER

ELAHI, SHAN E

ART UNIT	PAPER NUMBER
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2486

NOTIFICATION DATE	DELIVERY MODE
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07/16/2015

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):

LegalUSDocketing@mmm.com

Office Action Summary	Application No. 14/487,371	Applicant(s) ROHALY ET AL.	
	Examiner SHAN ELAHI	Art Unit 2486	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 09/16/2014.
☐ 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) 1-20 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) 1-20 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 09/16/2014 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 <u>01/20/2015</u> | 4) ☐ Other: _____ |

DETAILED ACTION

1. The claims and only the claims form the metes and bounds of the invention.
“Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. In re Morris, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir.1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. In re Prater, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)” (MPEP p 2100-8, c 2, I 45-48; p 2100-9, c 1, I 1-4). The Examiner has full latitude to interpret each claim in the broadest reasonable sense. The Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

Oath/Declaration

2. The applicant's oath/declaration had been reviewed by the examiner and is found to conform to the requirements prescribed in 37.C.F.R.1.63.

Priority

3. As required by M.P.E.P.201.14(c), acknowledgement is made of applicant's claim for priority based on continuing application filed on November 15th 2010 (US/12/666,464), PAT 8,866,883 and a 371 application filed on June 27th 2008 (PCT/US08/68522) and claim benefit of the provisional application (US/60/947,009) filed on June 29th 2007.

Status of Claims

4. This Office Action is in response to the application filed on September 16th 2014. Claims 1-20 are pending examination. The present application is being examined under the pre-AIA first to invent provisions.
- The Examiner acknowledged PCT opinion on patentability and PCT search opinion.

Information Disclosure Statement

5. The information disclosure statement (IDS) submitted on 01/20/2015 is noted. The submission is in compliance with the provisions of 37 CFR 1.97 and 1.98. Accordingly, the information disclosure statement is being considered by the examiner.

Examiner Comments

6. A search for the terms "dentistry", "three dimensional dental model", "digital dental model", "create and generate three dimensional dental model", "processors", "image processing", "computer program", "memory", "storage",

“computer algorithms”, “CAD/CAM tools”, “display” generated results which tended to fall into two broad areas:

(1) A computer generated images which uses imaging system includes and imaging device, processor and display device, the processor included processing tools for designing, modeling, creating and modeling a 3D model of dental prosthesis would be more or less be sufficient to meet the limitations of the claims.

(2) An apparatus, systems, and methods for a dental computer imaging system for creating a three-dimensional model of a dental prosthetic item would be more or less be sufficient to meet the limitations of the claims.

The Examiner indicated multiple rejections based on the above search. See rejection(s) below.

Specification

7. The abstract of the disclosure is objected to because the abstract content more than 150 words. Correction is required. See MPEP § 608.01(b).

Claim Objections

8. Claims 1, 3 and 15 are objected to because of the following informalities: The method claims should tie to a machine/hardware in order to perform the steps for example creating a three-dimensional model of the plurality of images. There

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may be 101 issues with the method claims (See case law, ***Alice Corporation Pty. Ltd. v. CLS Bank International, et al***). Appropriate correction is required.

Claim Rejections - 35 USC § 102

9. 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.
10. 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 –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
11. Claims 1-20 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Geng (US Publication No. 2005/0089822 A1).

Regarding Claim 1, Geng disclose a method comprising:

creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject including dentition, each one of the

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plurality of images captured from a different optical axis, the plurality of images including at least one video image (Geng: Abstract disclosed a systems and methods for interactive three-dimensional dental imaging ..., Fig.1, and Fig.4-Fig.5 and paragraphs [0020]-[0021]);

rendering the three-dimensional model in a user interface from a perspective (Geng: paragraphs [0009], [0021]-[0024]);

selecting a video image from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective (Geng: paragraphs [0032]-[0035]);

displaying the video image in the user interface (Geng: Abstract, and [0009], [0039]); and

providing a tool for marking a margin of the dentition (Geng: paragraph [0042]).

Regarding Claim 2, Geng disclose a system comprising:

a memory storing a three-dimensional model of a subject and a sequence of image sets used to create the three-dimensional model, each image set including a plurality of images of a subject including dentition, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image (Geng: paragraphs [0023]);

a display configured to provide a user interface presenting the sequence of image sets (Geng: paragraph [0039]);

and a processor (Geng: paragraph [0023]) configured to render the three-dimensional model in the user interface from a perspective, select a video image from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective, display the video image in the user interface, and provide a tool for marking a margin of the dentition (Geng: paragraphs [0023]-[0027]).

Regarding Claim 3, Geng disclose a method comprising:

creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis (Geng: Fig.1 and paragraph [0021]... the system configured to project multicolored light ...);

displaying one of the plurality of images in a first window (Geng: Fig.1 and paragraphs [0020]-[0024], [0033], [0039]);

rendering the three-dimensional model in a second window (Geng: paragraphs [0033], [0039]); and

synchronizing the first window and the second window to provide a common perspective on the subject (Geng: paragraph [0034] the GUI and file

management module for storage and retrieval of 3D images and paragraph [0042] the merger provides tools that enable ... and paragraphs [0043]-[0046]).

Regarding Claim 4, Geng disclose the method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and rotating the three-dimensional model to maintain the common perspective (Geng: paragraphs [0024], [0028], [0071]).

Regarding Claim 5, Geng disclose the method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective (Geng: paragraph [0051], [0072]).

Regarding Claim 6, Geng disclose the method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective (Geng: paragraphs [0032], [0074]-[0075]).

Regarding Claim 7, Geng disclose the method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective (Geng: paragraphs [0032]-[0035]).

Regarding Claim 8, Geng disclose the method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and creating a composite video image from two or more of the plurality of images to provide a common perspective on the subject (Geng: paragraphs [0039]-[0043]).

Regarding Claim 9, Geng disclose a system comprising:

a memory storing a three-dimensional model of a subject and a sequence of image sets used to create the three-dimensional model, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis (Geng: Fig.1, Fig.3 and paragraphs [0020]-[0025] and [0037]-[0043]);

a display configured to provide a user interface displaying one of the plurality of images in a first window (Geng: paragraph [0039]); and

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a processor configured to render the three-dimensional model in a second window displayed in the user interface and synchronize the first window and the second window to provide a common perspective on the subject (Geng: paragraph [0023]).

Regarding Claim 10, Geng disclose the system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and rotate the three-dimensional model to maintain the common perspective (Geng: paragraphs [0032]-[0035], [0028]).

Regarding Claim 11, Geng disclose the system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and translate the three-dimensional model to maintain the common perspective (Geng: paragraphs [0017]-[0021]).

Regarding Claim 12, Geng disclose the system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and scale the three-dimensional model to maintain the common perspective (Geng: paragraphs [0020]-[0023]).

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Regarding Claim 13, Geng disclose the system of claim 9 wherein the processor is configured to receive a user selection of a different perspective of the three-dimensional model and select a new one of the plurality of images to maintain the common perspective (Geng: paragraphs [0009], [0020]).

Regarding Claim 14, Geng disclose the system of claim 9 wherein the processor is configured to receive a user selection of a different perspective of the three-dimensional model and create a composite video image from two or more of the plurality of images to provide a common perspective on the subject (Geng: paragraphs [0036]-[0046]).

Regarding Claim 15, Geng disclose a method comprising:

displaying a three-dimensional model of dentition from a perspective (Geng: paragraph [0039]);

providing a plurality of video images of the dentition (Geng: paragraph [0031]-[0025]);

selecting one of the plurality of video images that shows the dentition from the perspective (Geng: paragraph [0019], [0021]); and

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displaying the one of the plurality of video images in a user interface with the three- dimensional model as an aid to visually determining a margin of the dentition (Geng: paragraphs [0042]-[0046]).

Regarding Claim 16, Geng disclose the method of claim 15 further comprising displaying a margin on one or more of the three-dimensional model or the one of the plurality of video images (Geng: paragraph [0021]-[0025], [0017]-[0021]).

Regarding Claim 17, Geng disclose the method of claim 16 further comprising receiving a user modification of the margin and updating the display with a modified margin (Geng: paragraph [0039]).

Regarding Claim 18, Geng disclose a system comprising:

a display having a window for displaying a three-dimensional model of dentition from a perspective (Geng: paragraph [0039]);

a camera providing a plurality of video images of the dentition (Geng: Fig.1 paragraphs [0020]-[0021]); and

a processor configured to select of one of the plurality of video images that shows the dentition from the perspective and display in a second window in the

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display the one of the plurality of video images as an aid to visually determining a margin of the dentition (Geng: paragraphs [0023]-[0025]).

Regarding Claim 19, Geng disclose the system of claim 18 wherein the processor is configured to display a margin on one or more of the three-dimensional model or the one of the plurality of video images (Geng: paragraphs [0033], [0042]).

Regarding Claim 20, Geng disclose the system of claim 19 wherein the processor is configured to receive a user modification of the margin and update the display with a modified margin (Geng: paragraphs [0042]-[0046]).

Claim Rejections - 35 USC § 102

12. 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 –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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13. Claim 1 is rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Orth et al hereafter Orth (US Publication No. 2006/0020363 A1).

Regarding Claim 1, Orth disclose a method comprising:

creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject including dentition, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image (Orth: Abstract disclosed a method for processing a three dimensional model of a dental prosthetic item ... and paragraphs [0009], [0038], [0070]);

rendering the three-dimensional model in a user interface from a perspective (Orth: paragraphs [0038], [0070], Claim 1);

selecting a video image from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective (Orth: paragraphs [0009], [0014], Fig.1 paragraphs [0038]-[0043] and [0050], *Orth implicitly disclosed a video image*; as evidence by Quadling (US 2005/0020910 A1) teaches video images);

displaying the video image in the user interface (Orth: paragraph [0021], [0043]);
and

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providing a tool for marking a margin of the dentition (Orth: paragraph [0004], [0011], [0050], Fig.1 paragraph [0038]).

10. Examiner has cited particular paragraph(s)/column(s) and line number(s) in the references applied to the claims above for the convenience of the applicant.

Although the specified citations are representative of the teachings of the prior art(s) and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art(s) or disclosed by the Examiner.

14. ***References cited, not relied upon**

The prior art made of record and not relied upon is considered pertinent to applicants disclosure. Below the list of the references are:

1. US 2007/0211081 A1 – (see at least abstract for video imagery of an actual dental restoration and a 3D scan).
2. US 2004/0218039 A1 – (see at least abstract for a dental video imaging system).
3. US 2005/0089822 A1 – (see at least abstract for 3D image and a

virtual 3D model of a dental prosthesis).

4. US 7,474,932 B2 – (see at least abstract for a 3D model of a dental prosthesis).
5. US 2007/0098237 A1 – (see at least abstract for a method of dental microscopic procedure and paragraph [0028] stored images in thumbnail and paragraph [0031] a image data taking device for dental treatment).

Conclusion

15. The above rejections are based upon the broadest reasonable interpretation of the claims. Applicant is advised that the specified citations of the relied upon prior art, in the above rejections, are only representative of the teachings of the prior art, and that any other supportive sections within the entirety of the reference (including any figures, incorporation by references, claims and/or priority documents) is implied as being applied to teach the scope of the claims. Applicant is encouraged to take into consideration the prior art made of record but not relied upon, as it is considered pertinent to the applicant's disclosure. Please see Form PTO-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHAN ELAHI whose telephone number is

Art Unit: 2486

(571)270-1442. The examiner can normally be reached on Monday to Friday 7:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SHAN ELAHI/
Examiner, Art Unit 2486

Application/Control Number: 14/487,371
Art Unit: 2486

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Notice of References Cited	Application/Control No. 14/487,371		Applicant(s)/Patent Under Reexamination ROHALY ET AL.	
	Examiner SHAN ELAHI		Art Unit 2486	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2005/0089822 A1	04-2005	Geng, Z. Jason	433/215
*	B	US-2005/0020910 A1	01-2005	Quadling et al.	600/424
*	C	US-2006/0020363 A1	01-2006	Orth et al.	700/187
*	D	US-2003/0033151 A1	02-2003	Vozick et al.	704/275
*	E	US-2007/0183572 A1	08-2007	Drummond et al.	378/98.8
*	F	US-6,604,527 B1	08-2003	Palmisano, Richard George	128/848
*	G	US-2005/0212910 A1	09-2005	Singhal, Manoj Kumar	348/036
*	H	US-5,850,352	12-1998	Moezzi et al.	345/419
*	I	US-2006/0154198 A1	07-2006	Durbin et al.	433/029
*	J	US-2008/0015727 A1	01-2008	Dunne et al.	700/118
*	K	US-2006/0286501 A1	12-2006	Chishti et al.	433/024
*	L	US-2002/0064759 A1	05-2002	Durbin et al.	433/213
*	M	US-2003/0207235 A1	11-2003	der Zel, Joseph Maria Van	433/223

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 14/487,371		Applicant(s)/Patent Under Reexamination ROHALY ET AL.	
	Examiner SHAN ELAHI		Art Unit 2486	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2007/0211081 A1	09-2007	Quadling et al.	345/632
*	B	US-2004/0218039 A1	11-2004	Cooper, David H.	348/066
*	C	US-2007/0098237 A1	05-2007	Yoo et al.	382/128
*	D	US-2005/0070782 A1	03-2005	Brodkin, Dmitri	600/407
*	E	US-6,974,323	12-2005	Weigl et al.	433/223
*	F	US-2006/0078842 A1	04-2006	Sachdeva et al.	433/024
*	G	US-7,077,646 B2	07-2006	Hilliard, Jack Keith	433/6
*	H	US-2006/0271229 A1	11-2006	Kopelman et al.	700/118
*	I	US-2004/0222945 A1	11-2004	Taira et al.	345/006
*	J	US-2005/0131924	06-2005	Jones, Dennis Benson	707/100
*	K	US-2007/0146234 A1	06-2007	Taira et al.	345/006
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Main Concept Text

three dimensional dental models and images and...

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50 Selected Documents

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1 - 50 Results

Total Matched: 1186

4 Results

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COLLAPSE MENU

- Synchronized views of video data and three-dimensional model data**
Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired...
ASSIGNMENT: 3M INNOV PROPERTIES CO
US8864883 | US PATENTS | 21-OCT-2014
- Method and apparatus for the production of dental prostheses**
A method for the production of dental prostheses, wherein a model of a jaw impression of the patient is produced and digital images of the model are evaluated, characterized in that - the first images of the directly from the jaw impression model obtained in a defined position to a camera and with a...
ASSIGNMENT: GAESLER ZAHN TECH GMBH
DE10215821B4 | GERMAN PATENTS | 08-NOV-2007
- Synchronized views of video data and three-dimensional model data**
Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired...
ASSIGNMENT: 3M INNOV PROPERTIES CO
US20150042509 | US APPLICATIONS | 01-JAN-2015
- Synchronized views of video data and three-dimensional model data**
Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired...
ASSIGNMENT: ROHALY, János [+4]
US20110050848 | US APPLICATIONS | 03-MAR-2011
- Real time display of acquired 3D dental data**
The systems and methods disclosed herein provide real time display of three-dimensional dental data acquired intraorally from a dental patient.
ASSIGNMENT: 3M INNOV PROPERTIES CO
US7912257 | US PATENTS | 22-MAR-2011
- Synchronized views of video data and three-dimensional model data**
Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired...
ASSIGNMENT: 3M INNOV PROPERTIES CO
EP2171689A2 | EUROPEAN APPLICATIONS | 07-APR-2010
- Synchronized views of video data and three-dimensional model data**
Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired...
ASSIGNMENT: 3M INNOV PROPERTIES CO
WO2009066273A2 | WIPO APPLICATIONS | 08-JAN-2009
- Registration of 3D imaging of 3D objects**

Sample

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0 Results

2 Results

1184 Results

Publication Date

FULL VIEW

1974

2015

Assignment by Relevance

FULL VIEW

3M INNOV PROPERTIES CO (54)

GAESLER ZAHN TECH GMBH (2)

ROHALY, János (4)

ACTRA TECH INC (8)

View More Visualizations

New Query	A three-dimensional-based modeling method and system designed for dentistry and related medical (and appropriate non-medical) applications. Data capture means produces a point cloud representing the three-dimensional surface of an object (e.g., dental arch). Three-dimensional recognition objects are... ASSIGNMENT:ASTPA TECH INC US7551760 US PATENTS 23-JUN-2009
Save Query	
Export Results	9. Method and system for three-dimensional modeling of object fields
Quick Downloads	A method and system for creating three-dimensional models of implant-bearing dental arches, and other anatomical fields of view, employs three-dimensional scanning means to capture images of an anatomical field of view wherein there have been positioned (and preferably affixed to an anatomical...
Recent Items	ASSIGNMENT:SCHARLACK, RONALD E. (+1) US6925198 US PATENTS 02-AUG-2005
Collapse Results	10. Video-assisted margin marking for dental models Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired... ASSIGNMENT:BOHALL, JANCOS (+4) US20100281379 US APPLICATIONS 04-NOV-2010 11. Computer-aided fabrication of a removable dental prosthesis A method and system for fabricating a dental prosthesis are provided. High resolution digital scanned images of a patient's oral structures are acquired. Three dimensional (3D) cone beam X-ray images of hard and soft oral tissues are acquired. The scanned images are integrated with the 3D cone beam... ASSIGNMENT:HANKOOKIN LLC US8352069 US PATENTS 08-JAN-2013 12. Dental prosthesis manufacturing method, by superimposing digital images of model with and without tooth structure formed from modeling or tooth material It is a device as well as a method for the production of dental prostheses is proposed, wherein a model (6) consists of a jaw impression of the patient is produced and digital images of the model (6) are evaluated. According to the invention, a construction planning with low investment costs, on a... ASSIGNMENT:GAESLER ZAHN TECH GMBH DE10215821A1 GERMAN APPLICATIONS 06-NOV-2003 13. Registration of 3D imaging of 3D objects A three-dimensional-based modeling method and system designed for dentistry and related medical (and appropriate non-medical) applications. Data capture means produces a point cloud representing the three-dimensional surface of an object (e.g., dental arch). Three-dimensional recognition objects are... ASSIGNMENT:ATLANTIC COMPONENTS INC US20090092869 US APPLICATIONS 03-JAN-2009 14. Dental computer-aided design (CAD) methods and systems The present specification describes systems and methods for interactive three-dimensional dental imaging. More specifically, the present methods and systems provide for interactive computer-aided design (CAD) in dental applications. According to one of many possible embodiments, an interactive... ASSIGNMENT:TECHNIST HLDG INC US7474932 US PATENTS 06-JAN-2009 15. Method and system for forming a dental prosthesis A system and method for use in constructing a prosthesis/complete restoration that obtains a digital dentition model, such as a 3D geometric surface model or a 3D volumetric image model, processes the digital dentition model to form a virtual model, forms a virtual mold including a digital... ASSIGNMENT:INNOV HEALTH TECH LLC US8255071 US PATENTS 28-AUG-2012 16. Method and system for three-dimensional modeling of object fields

New Query	A method and system for creating three-dimensional models of implant-bearing dental models, and other anatomical features, employs three-dimensional scanning means to capture images of an anatomical field of view wherein there have been positioned (and preferably affixed to an anatomical... ASSIGNMENT: SCHARLACK RONALD S (+1) US20930219148 US APPLICATIONS 27-NOV-2003
Save Query	
Export Results	17. Synchronized view of the three-dimensional model data and the video data
Quick Downloads	Tools for the preparation for use in dental restoration manufacturing process, a digital dental model, in addition, systems and methods related is described. Dental modeling is improved by supplementing a still image of a subject that has been modeled, the view of the three-dimensional model...
Recent Items	ASSIGNMENT: スリーエムイノベーションズ株式会社 JP2010533098A JAPANESE APPLICATIONS 21-OCT-2010
Collapse All	
	18. Visual feedback of 3D scan parameters
	The systems and methods disclosed herein provide visual feedback concerning one or more scanning parameters to a user during acquisition of a three dimensional scan.
	ASSIGNMENT: 3M INNOV PROPERTIES CO US7813591 US PATENTS 12-OCT-2010
	19. Three-dimensional digital magnifier operation supporting system
	The simulation regarding the state change of the subject in a real space provides a system which represents impacts to three-dimensional computer graphics caused by changes of state of three-dimensional computer graphics composed and fixed to subject, and state of image taking space by simulation...
	ASSIGNMENT: TAKAHASHI, ATSUSHI CA2727585A1 CANADIAN APPLICATIONS 24-SEP-2009
	20. Real time display of acquired 3d dental data
	The systems and methods disclosed herein provide real time display of three-dimensional dental data acquired intraorally from a dental patient.
	ASSIGNMENT: FALEY, ERIC B (+5) US20080199829 US APPLICATIONS 21-AUG-2008
	21. Registration of 3-D imaging of 3-D objects
	A three-dimensional-based modeling method and system designed for dentistry and related medical (and appropriate non-medical) applications. Data capture means produces a point cloud representing the three-dimensional surface of an object (e.g., dental arch). Three-dimensional recognition objects are...
	ASSIGNMENT: ASTRATECH INC US7362890 US PATENTS 22-APR-2008
	22. Three-dimensional digital magnifier operation supporting system
	The simulation regarding the state change of the subject in a real space provides a system which represents impacts to three-dimensional computer graphics caused by changes of state of three-dimensional computer graphics composed and fixed to subject, and state of image taking space by simulation...
	ASSIGNMENT: ATSUSHI, TAKAHASHI US8253778 US PATENTS 28-AUG-2012
	23. Method and system for imaging and modeling a three dimensional structure
	Systems and methods for generating a three-dimensional (3D) model of a structure include coating the structure with a luminescent substance to enhance the image quality, the luminescent substance having an excitation range, and capturing one or more images of the structure through at least one image...
	ASSIGNMENT: DUBBIN, DUANE (+1) US8592371 US PATENTS 15-JUL-2003
	24. Dental computer-aided design (CAD) methods and systems
	The present specification describes systems and methods for interactive three-dimensional dental imaging. More specifically, the present methods and systems provide for interactive computer-aided design (CAD) in dental applications. According to one of many possible embodiments, an interactive...
	ASSIGNMENT: GENG ZI

	US20050063827 US APPLICATIONS 28-APR-2005
	Manage Discover MapIt
New Query	25. Video-assisted margin marking for dental models Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired...
Save Query	
Export Results	ASSIGNMENT: 3M INNOV PROPERTIES CO EP2184424A2 EUROPEAN APPLICATIONS 24-MAR-2010
Quick Downloads	26. Navigating among images of an object in 3d space A three-dimensional model of an object is employed to aid in navigation among a number of images of the object taken from various viewpoints. In general, an image of an object such as a digital photograph is displayed in a user interface or the like. When a user selects a point within the display...
Recent Items	ASSIGNMENT: KRIVESHKO, ILYA A [+1] US20100203781 US APPLICATIONS 11-NOV-2010
COLLAPSE MENU	27. Synchronized views of video data and three-dimensional model data The invention claims a method for preparing dental restoration component the preparation technique for use in digital dental model claims a tool and the said relevant system and method for. By using for modelling object of static image of the supplementary of the three-dimensional model view...
	ASSIGNMENT: 3M INNOV PROPERTIES CO CN101689309A CHINESE APPLICATIONS 31-MAR-2010
	28. Registration of 3-d imaging of 3-d objects A three-dimensional-based modeling method and system designed for dentistry and related medical (and appropriate non-medical) applications. Data capture means produces a point cloud representing the three-dimensional surface of an object (e.g., dental arch). Three-dimensional recognition objects are...
	ASSIGNMENT: ATLANTIS COMPONENTS INC WO2007011909A1 WIPO APPLICATIONS 25-JAN-2007
	29. Video-assisted margin marking for dental models Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired...
	ASSIGNMENT: 3M INNOV PROPERTIES CO WO200906303A2 WIPO APPLICATIONS 08-JAN-2009
	30. Registration of 3-D imaging of 3-D objects A three-dimensional-based modeling method and system designed for dentistry and related medical (and appropriate non-medical) applications. Data capture means produces a point cloud representing the three-dimensional surface of an object (e.g., dental arch). Three-dimensional recognition objects are...
	ASSIGNMENT: SCHARACK RONALD S US20060072910 US APPLICATIONS 06-APR-2006
	31. Medical simulation apparatus and method for controlling 3-dimensional image display in the medical simulation apparatus A medical simulation apparatus is provided, which is capable of performing a simulation by correlating a three-dimensional image with an entity model. Coordinates of measurement marks MP1, MP2, MP3 on a surface of a lower dental arch model 62 in a coordinate system defined by three reference marks...
	ASSIGNMENT: IMAGHOSIS INC US7292716 US PATENTS 06-NOV-2007
	32. Method and system for imaging and modeling dental structures A system optically images a dental structure within an oral cavity. The system includes an intra-oral track adapted to be inserted inside the oral cavity; an image aperture movably coupled to the intra-oral track and adapted to capture one or more images of the dental structure; and an image...
	ASSIGNMENT: DUBBIN, DUANE MILFORD [+1] US6364660 US PATENTS 02-APR-2002

New Query	23. Superposition for visualization of three-dimensional data acquisition The systems and methods disclosed herein employ superposition of two-dimensional video and a rendered, three-dimensional image to provide visual feedback during acquisition and analysis of three-dimensional data. These systems and methods may be usefully employed in a context such as dentistry to... ASSIGNMENT:BM INNOV PROPERTIES CO US7840642 US PATENTS 23-NOV-2010
Save Query	
Export Results	
Quick Downloads	34. Method and system for forming a dental prosthesis A system and method for use in constructing a prosthesis/complete restoration that obtains a digital dentition model, such as a 3D geometric surface model or a 3D volumetric image model, processes the digital dentition model to form a virtual model, forms a virtual mold including a digital... ASSIGNMENT:WAGLER, SR., DANIEL US20120296118 US APPLICATIONS 15-NOV-2012
Recent Items	
COLLAPSE MENU	
	35. Dental examination support method and system PROBLEM TO BE SOLVED: To provide a dental examination support method by which high -degree dentistry treatment information can be provided at low cost. SOLUTION: The dental examination support method is constituted of a step 1. connecting terminals for member dentists and servers via a communication... ASSIGNMENT:HO HIDEFUMU (+1) JP2007037687A JAPANESE APPLICATIONS 15-FEB-2007
	36. Method and system for forming a dental prosthesis A system and method for use in constructing a prosthesis/complete restoration that obtains a digital dentition model, such as a 3D geometric surface model or a 3D volumetric image model, processes the digital dentition model to form a virtual model, forms a virtual mold including a digital... ASSIGNMENT:INNOV HEALTH TECH LLC CA2742326A1 CANADIAN APPLICATIONS 20-MAY-2010
	37. Method and system for creating dental models from imagery Creating a dental model from a series of images of an intra-oral object includes the steps of (a) capturing a series of images of an intra-oral object from a plurality of capture positions, where the object includes common surface features and a control target arranged with respect to the object to... ASSIGNMENT:EASTMAN KODAK CO US7065243 US PATENTS 26-JUN-2006
	38. Computer user interface for orthodontic use In a computer system that includes a Central Processing Unit and an associated input device, storage device and display device, a method for displaying on the display device a virtual three-dimensional (3D) dental model at desired preset views, for orthodontic use. The virtual 3D dental model is... ASSIGNMENT:CADENT LTD US6664986 US PATENTS 16-DEC-2003
	39. System and method for 3-D digital reconstruction of an oral cavity from a sequence of 2-D images Systems and methods are provided through which a model-based vision system for dentistry which assists in diagnosis, treatment planning and surgical simulation. The present invention includes an integrated computer vision system that constructs a three-dimensional (3-D) model of the patient's dental... ASSIGNMENT:UNIV LOUISVILLE RESCH FIDN INC US7094868 US PATENTS 01-AUG-2006
	40. Local enforcement of accuracy in fabricated models The systems and methods disclosed herein employ a combination of digital three-dimensional modeling and rapid fabrication technologies to provide pre-indexed, pre-registered, and/or pre-cut components for articulated dental models. Dental articulators and components of dental models as described... ASSIGNMENT:BM INNOV PROPERTIES CO US7698614 US PATENTS 13-APR-2010
	41. Visualization of three-dimensional data acquisition

New Query	The systems and methods disclosed herein employ superposition of two-dimensional images and a reference three-dimensional image to provide visual feedback during acquisition and analysis of three-dimensional data. These systems and methods may be usefully employed in a context such as dentistry to... ASSIGNMENT:3M INNOV PROPERTIES CO WO2007084647A2 WIPO APPLICATIONS 26-JUL-2007
Save Query	
Export Results	42. Method and system for forming a dental prosthesis A system and method for use in constructing a prosthesis/complete restoration that obtains a digital dentition model, such as a 3D geometric surface model or a 3D volumetric image model, processes the digital dentition model to form a virtual model, forms a virtual mold including a digital...
Quick Downloads	
Recent Items	ASSIGNMENT:KAIGLER, ER, DARNELL US20100119396 US APPLICATIONS 13-MAY-2010
COLLAPSE RESULTS	43. Local enforcement of accuracy in fabricated models The systems and methods disclosed herein employ a combination of digital three-dimensional modeling and rapid fabrication technologies to provide pre-indexed, pre-registered, and/or pre-cut components for articulated dental models. Dental articulators and components of dental models as described... ASSIGNMENT:3M INNOV PROPERTIES CO US8262368 US PATENTS 11-SEP-2012
	44. Local enforcement of accuracy in fabricated models The systems and methods disclosed herein employ a combination of digital three-dimensional modeling and rapid fabrication technologies to provide pre-indexed, pre-registered, and/or pre-cut components for articulated dental models. Dental articulators and components of dental models as described... ASSIGNMENT:3M INNOV PROPERTIES CO US8738349 US PATENTS 27-MAY-2014
	45. Dental articulator with positioning key The systems and methods disclosed herein employ a combination of digital three-dimensional modeling and rapid fabrication technologies to provide pre-indexed, pre-registered, and/or pre-cut components for articulated dental models. Dental articulators and components of dental models as described... ASSIGNMENT:3M INNOV PROPERTIES CO US8215956 US PATENTS 10-JUL-2012
	46. Local enforcement of accuracy in fabricated models The systems and methods disclosed herein employ a combination of digital three-dimensional modeling and rapid fabrication technologies to provide pre-indexed, pre-registered, and/or pre-cut components for articulated dental models. Dental articulators and components of dental models as described... ASSIGNMENT:3M INNOV PROPERTIES CO US8274714 US PATENTS 12-FEB-2013
	47. Method and system for imaging and modeling a three dimensional structure A system (Figure 1) and a method for generating a 3D model of a dental structure include coating the structure with a luminescent substance to enhance the image quality. The system having an intra-oral scanner (100) for capturing images of various dental structures in the mouth and communicates this... ASSIGNMENT:SONARAY INC (+1) CA2430674A1 CANADIAN APPLICATIONS 12-SEP-2002
	48. Method and system for imaging and modeling a three dimensional structure Systems and methods for generating a three-dimensional (3D) model of a structure include coating the structure with a luminescent substance to enhance the image quality, the luminescent substance having an excitation range; and capturing one or more images of the structure through at least one image... ASSIGNMENT:DURBIN, DUANE (+1) US20020055082 US APPLICATIONS 09-MAY-2002
	49. System and apparatus for haptically enabled three-dimensional scanning

New Query

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Described herein is a three-dimensional scanning system that features a camera integrated with a touch-guided input interface device. The system allows an operator, through the sense of touch, to intuitively and interactively identify optimum locations for obtaining images or scans of an object. The...

US8849015 | US PATENTS | 30-SEP-2014

50. Visual feedback of 3d scan parameters

The systems and methods disclosed herein provide visual feedback concerning one or more scanning parameters to a user during acquisition of a three dimensional scan.

ASSIGNMENT: PALEY, ERIC S. [+5]
US20070172112 | US APPLICATIONS | 26-JUL-2007

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 63341WO003	FOR FURTHER ACTION	See item 4 below
International application No. PCT/US2008/068522	International filing date (<i>day/month/year</i>) 27 June 2008 (27.06.2008)	Priority date (<i>day/month/year</i>) 29 June 2007 (29.06.2007)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant 3M INNOVATIVE PROPERTIES COMPANY		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 <i>bis</i> 1(a).																								
2.	This REPORT consists of a total of 10 sheets, including this cover sheet. In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	This report contains indications relating to the following items: <table style="width: 100%; border: none;"> <tr> <td style="width: 10%; text-align: center;">☒</td> <td style="width: 30%;">Box No. I</td> <td style="width: 60%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	☒	Box No. I	Basis of the report	☐	Box No. II	Priority	☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	☒	Box No. IV	Lack of unity of invention	☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	☐	Box No. VI	Certain documents cited	☐	Box No. VII	Certain defects in the international application	☐	Box No. VIII	Certain observations on the international application
☒	Box No. I	Basis of the report																							
☐	Box No. II	Priority																							
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																							
☒	Box No. IV	Lack of unity of invention																							
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																							
☐	Box No. VI	Certain documents cited																							
☐	Box No. VII	Certain defects in the international application																							
☐	Box No. VIII	Certain observations on the international application																							
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis.2).																								

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Date of issuance of this report 05 January 2010 (05.01.2010)
Facsimile No. +41 22 338 92 70	Authorized officer Beate Giffo-Schmitt
e-mail: pt03.pct@wipo.int	

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2008/068522

International filing date (day/month/year)
27.06.2008

Priority date (day/month/year)
29.06.2007

International Patent Classification (IPC) or both national classification and IPC
INV. G06T15.00

Applicant
3M INNOVATIVE PROPERTIES COMPANY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 68.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Kulak, Eray

Telephone No. +49 30 25901-410



WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2008/068522

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 25-81

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

☒ no international search report has been established for the whole application or for said claims Nos. 25-81

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.

☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.

☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13ter.1(a) or (b).

☐ a meaningful opinion could not be formed without the tables related to the sequence listings; the applicant did not, within the prescribed time limit, furnish such tables in electronic form complying with the technical requirements provided for in Annex C-bis of the Administrative Instructions, and such tables were not available to the International Searching Authority in a form and manner acceptable to it.

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in electronic form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.

☐ See Supplemental Box for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2008/068522

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:
- ☐ paid additional fees
 - ☐ paid additional fees under protest and, where applicable, the protest fee
 - ☐ paid additional fees under protest but the applicable protest fee was not paid
 - ☒ not paid additional fees
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☒ the parts relating to claims Nos. 1-24

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-24</u>
	No: Claims	<u>-</u>
Inventive step (IS)	Yes: Claims	<u>-</u>
	No: Claims	<u>1-24</u>
Industrial applicability (IA)	Yes: Claims	<u>1-24</u>
	No: Claims	<u>-</u>

2. Citations and explanations

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/US2008/068522

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-24

determining an orientation and a direction of travel for each vehicle of a plurality of vehicles and identifying each of the plurality of vehicles.

2. Claims: 25-54

scaling the images and obtaining a length to pixel ratio

3. Claims: 55-72

detecting entry and exit of an object/vehicle within a field of view of the camera.

4. Claims: 73-81

determining a region of interest(ROI); generating a blob image by segmentation in ROI; determining the major and minor diameters of blobs;

1. The following document (D1-D2) is referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1: WO 2004/100067 A (D3D L P [US]; QUADLING HENLEY [US]; QUADLING MARK [US]; BLAIR ALAN [US] 18 November 2004 (2004-11-18)

D2: WO 2007/103918 A (D4D TECHNOLOGIES LLC [US]) 13 September 2007 (2007-09-13)

2. INVENTIVE STEP

The claims 1-24 do not involve an inventive step in the sense of Article 33(3) PCT.

D1 discloses a method comprising:

- creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, the plurality of images including at least one video image (D1, claim 1, the first two paragraphs);
- selecting a video image from the sequence of image sets, the video image containing a view of the subject from a perspective; displaying the video image in a user interface (D1, claim 1, the last paragraph); and
- rendering the three dimensional model in the user interface from the perspective (D1, claims 10 and 15).

Claim 1 differs from D1 in that each one of the plurality of images are captured from a different optical axis. This means that, according to the current application, the 3D model of a subject is created through the known parallax effect in its source images. This feature is detailed with more clear words in dependent claims 7 and 8. On the other hand, D1 obtains the 3D model by scanning.

Both modelling techniques are very well known to the skilled person. They are standard methods in 3D modelling field and they may be used interchangeable to create 3D models. All modelling books in the computer graphics field disclose the parallax(stereo) technique to create 3D models. Therefore, independent claim 1 does not involve inventive step. The same objection and reasoning apply to the corresponding computer program product claim 9 and system claim 17.

The subject-matter of the dependent claims 2,5,6 are disclosed in D1 (claims 10,15,18).

Dependent claims 3 and 4 disclose that the video image can be selected by the user through different selection methods. It should be noted that D1 uses a see-through screen to determine the field of view (D1, claim 17) and this screen can be used also to determine an area of interest in the image (D1, claims 18-20). Other video selection features are simply minor design alternatives in implementation which do not add anything inventive significance to the subject matter of independent claims.

It should be further noted that, augmented reality in dental imaging is very well known and claim 1 discloses a classical application of this field. In augmented reality, rich media can be registered and displayed together. It is a frequently used technique also for many other biomedical application areas. D2, which may be used under EPC, is cited here to show another augmented reality system example for the dentition field.

3. INDUSTRIAL APPLICABILITY:

The current set of claims 1-24 discloses technical features to implement a computer graphics method of rendering and therefore, the subject matter of claims 1-24 is industrially applicable.

4. SPECIAL TECHNICAL FEATURES (STF) AND UNDERLYING OBJECTIVE PROBLEMS

Document D1 is considered to be the closest state of the art. The differences between the disclosure of D1 and the four potential inventions can be defined as follows:

4.1. 1st subject:

Considering D1, the special technical features (STF) of the 1st subject consist in:

- creating a three-dimensional model from a sequence of image sets
- selecting a video image
- displaying the video image
- rendering the three-dimensional model from the perspective of the video image

The underlying objective problem solved by the above STF is to model and render a 3D object.

4.2. 2nd subject

Considering D1, the special technical features (STF) of the 2nd subject consist in:

- creating a three-dimensional model from a sequence of image sets

- rendering the three-dimensional model from a perspective
- selecting a video image that contains a view of the subject most closely corresponding to the perspective
- displaying the video image

The underlying objective problem solved by the above STF is to select a video image among others.

4.3. 3rd subject

Considering D1, the special technical features (STF) of the 3rd subject consist in:

- creating a three-dimensional model from a sequence of image sets
- displaying the images in a first window
- displaying the three-dimensional model in a second window
- synchronizing the first and second window to provide a common perspective.

The underlying objective problem solved by the above STF is to synchronize a render of a 3D object and its source images on display.

4.4. 4th subject

Considering D1, the special technical features (STF) of the 4th subject consist in:

- displaying a three dimensional model of dentition from a perspective
- providing a plurality of video images of the dentition
- selection one of the plurality of video images
- displaying the video image with the three dimensional model as an aid to visually determining a margin of the dentition.

The underlying objective problem solved by the above STF is to determine a margin of the dentition on an electronic display.

5. The special technical features (STF) are obviously not identical. Moreover, they are not corresponding, i.e. they do not function in an equivalent, complementary or cooperative manner and are not specially adapted to

each other. In particular, these special technical features can not be regarded as being corresponding because they solve different problems.

Therefore, the application claims four inventions not so linked as to form a single general inventive concept as they don't have same or corresponding special technical features. Hence, the requirements of Rule 13.1 and 13.2 PCT are therefore not met.

6. If the applicant opts to restrict the claims, it is suggested to erase the claims corresponding to the subjects which are not examined. In the absence of any response from the applicant, the examination will be restricted to the first subject.



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BIB DATA SHEET

CONFIRMATION NO. 7315

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/487,371	09/16/2014	348	2486	63341US008
RULE				
APPLICANTS 3M INNOVATIVE PROPERTIES COMPANY, St. Paul, MN;				
INVENTORS Janos Rohaly, Concord, MA; Robert N. Nazzal, Waltham, MA; Edward K. Tekeian, Cambridge, MA; ILYA A. Kriveshko, Boxborough, MA; Eric B. Paley, Somerville, MA;				
** CONTINUING DATA ***** This application is a CON of 12/666,464 11/15/2010 PAT 8866883 which is a 371 of PCT/US08/68522 06/27/2008 which claims benefit of 60/947,009 06/29/2007				
** FOREIGN APPLICATIONS *****				
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 09/22/2014				
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/SHAN E ELAHI/</u> Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY MA	SHEETS DRAWINGS 6	TOTAL CLAIMS 20
INDEPENDENT CLAIMS 6				
ADDRESS 3M INNOVATIVE PROPERTIES COMPANY PO BOX 33427 ST. PAUL, MN 55133-3427 UNITED STATES				
TITLE SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA				
FILING FEE RECEIVED 3000	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	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S2	3	("12666464" "14487371")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:03
S3	3	S2 AND ((A61C9/0053 OR G06F3/04815 OR G06F3/04847 OR G06T15/10 OR G06T17/10 OR H04N13/00 OR H04N13/0055 OR H04N5/14).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:03
S4	29148	(A61C9/0053 OR G06F3/04815 OR G06F3/04847 OR G06T15/10 OR G06T17/10 OR H04N13/00 OR H04N13/0055 OR H04N5/14).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:03
S5	23092	(H04N13/00 OR G06T17/10 OR G06T15/10 OR H04N5/14 OR G06F3/04815 OR A61C9/0053 OR G06F3/04847 H04N13/00 OR G06T17/10 OR G06T15/10 OR H04N5/14 OR G06F3/04815 OR A61C9/0053 OR G06F3/04847).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:05
S6	24090	(G06T17/20 or G06T19/00 or G06T17/00 or G06T17/10 or G06T17/005).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:06
S7	3678	S4 and S5 and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:06
S8	4220	345/420.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:06
S9	13518	345/419.ccls.	US-PGPUB;	OR	ON	2015/06/19

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S11	1244	345/421.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:07
S12	10753	345/629-641.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:07
S13	18	S8 and S9 and S10 and S11 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:07
S16	38	(stereoscopic and panoramic and three near2 dimensional near2 imag\$3) and (synchroniz\$3 and view\$3 same video same three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:09
S17	3	S4 and S5 and S6 and (synchroniz\$3 same view\$3 same video same three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/19 08:10
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S20	15	(janos near2 rohaly and robert near2 nazzal and edward near2 tekeian and ilya	US-PGPUB; USPAT;	OR	ON	2015/06/20 10:24

		near2 kriveshko and eric near2 paley).IN.	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S22	34815	("3M").AS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 10:25
S23	1	(3M near2 innovative near2 properties near2 comapany).AS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 10:25
S27	658	(stereoscopic and panoramic and three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 11:15
S28	8	(creat\$3 and generat\$3) same (stereoscopic and panoramic and three near2 dimensional near2 imag\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/20 11:15
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S30	79	("0904212" "0986163" "1247646" "1259365" "1267689" "1371438" "1477541" "2050826" "2107464" "2158660" "2168273" "2270198" "2273512" "2279443" "2313561" "2403733" "2460864" "2566700" "2693128" "3019698" "3020341" "3275745" "3418044" "3457364" "3595995" "3608457" "3626404" "3705261" "3991266" "4006291" "4303316" "4393400" "4399456").PN. OR ("4528587").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/20 15:53
S31	2	"8866883".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:34
S32	3	"20050020910".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2015/06/21 10:35

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S34	2	"20050212910"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:39
S35	18	(dental near2 technology) and (model\$3 near2 three near2 dimensional near2 dental) and (three near2 dimensional near2 dental near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:43
S36	19	(dental near2 technology) and (three near2 dimensional near2 dental near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:46
S37	5	"6604527".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:48
S38	692	(dental same three near2 dimensional near2 imag\$3 and model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:57
S39	94	(dental same three near2 dimensional near2 imag\$3 and model\$3) and (processor\$1 and imag\$3 near2 process\$3 and stor\$3 and memory and computer near2 program)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 10:57
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S42	301	("CAD" same "CAM" same dentistry)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:43
S43	6	("CAD" same "CAM" same dentistry) and (three near2 dimensional near2 dental near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:43
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S45	13	("CAD" same "CAM" same dentistry) and (dental same three near2 dimensional same model\$3) and (camera\$1 and video nar2 camera\$1) and (imag\$3 near2 process\$3) and (memory and storage and computer near2 program)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/06/21 12:45
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S49	191	("3510946" "4055895" "4505672" "4541800" "4591341").PN. OR ("4793803").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:46
S50	157	("3407500" "3510946" "4448735" "4505673" "4591341").PN. OR ("4856991").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:46
S51	208	("20020006597" "20020018981" "20020055800" "20030009252" "20030139834" "20030156111" "20030224311" "20040128010" "20040189633" "20050018885" "20050055118" "2467432" "3407500" "3600808" "3660900" "3683502" "3738005" "3860803" "3916526" "3922786" "3950851" "3983628" "4014096" "4195046" "4253828" "4324546" "4324547" "4348178" "4478580" "4500294" "4504225" "4505673" "4526540" "4575330" "4575805" "4591341" "4609349" "4611288" "4656860" "4663720" "4664626" "4676747" "4742464" "4755139" "4763791" "4793803" "4798534" "4836778" "4837732" "4850864" "4850865" "4856991" "4877398" "4880380" "4889238" "4890608" "4935635" "4936862" "4937928" "4941826" "4964770" "4975052" "4983334" "5011405" "5017133" "5027281" "5035613" "5055039" "5059118" "5100316" "5107444" "5121333" "5125832" "5128870" "5130064" "5131843" "5131844" "5139419" "5145364" "5176517" "5184306" "5186623" "5257203" "5273429" "5278756" "5328362" "5338198" "5340309" "5342202" "5368478" "5382164" "5395238" "5431562" "5440326" "5440496" "5447432" "5452219" "5454717" "5456600" "5474448" "5518397" "5528735" "5533895" "5542842" "5549476" "5562448" "5587912" "5590248" "5605459" "5607305" "5614075" "5621648" "5645420" "5645421" "5655653" "5683243" "5692894" "5725376" "5725378" "5733126" "5740267").PN. OR ("5742700" "5799100" "5800174" "5823778" "5848115" "5857853" "5866058" "5879158" "5880961" "5880962" "5882192" "5934288" "5957686" "5964587" "5971754" "5975893" "6015289" "6044170" "6044309" "6049743" "6054990" "6062861" "6068482" "6099314" "6123544" "6151404" "6152731" "6183248" "6190165" "6205243" "6210162" "6212442" "6217325" "6217334" "6227850" "6244861" "6250918" "6260000" "6300958" "6309215" "6315553" "6318994" "6322359" "6350119" "6350120"	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:47

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S52	153	("20020006597" "2467432" "3407500" "3600808" "3660900" "3683502" "3738005" "3860803" "3916526" "3922786" "3950851" "3983628" "4014096" "4195046" "4253828" "4324546" "4324547" "4348178" "4478580" "4500294" "4504225" "4505673" "4526540" "4575330" "4575805" "4591341" "4609349" "4611288" "4656860" "4663720" "4664626" "4676747" "4742464" "4755139" "4763791" "4793803" "4798534" "4836778" "4837732" "4850864" "4850865" "4856991" "4877398" "4880380" "4889238" "4890608" "4935635" "4936862" "4937928" "4941826" "4964770" "4975052" "4983334" "5011405" "5017133" "5027281" "5035613" "5055039" "5059118" "5100316" "5121333" "5125832" "5128870" "5130064" "5131843" "5131844" "5139419" "5145364" "5176517" "5184306" "5186623" "5257203" "5273429" "5278756" "5328362" "5338198" "5340309" "5342202" "5368478" "5382164" "5395238" "5431562" "5440326" "5440496" "5447432" "5452219" "5454717" "5456600" "5474448" "5518397" "5528735" "5533895" "5542842" "5549476" "5562448" "5587912" "5605459" "5607305" "5614075" "5621648" "5645420" "5645421" "5655653" "5683243" "5692894" "5725376" "5725378" "5733126" "5740267" "5742700" "5799100" "5800174" "5823778" "5848115" "5857853" "5866058" "5879158" "5880961" "5880962" "5934288" "5957686" "5964587" "5971754" "5975893").PN. OR ("6015289" "6044309" "6049743" "6062861" "6068482" "6099314" "6123544" "6152731" "6183248" "6190165" "6205716" "6217334" "6244861" "6309215" "6315553" "6322359" "6350120" "6382975" "6398548" "6524101" "6554611" "RE35169").PN. OR ("7905725").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 12:47
S53	66	(three near2 dimensional near2 display\$3 same synchroniz\$3 same windows)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2015/06/21 12:55

			EPO; JPO; DERWENT; IBM_TDB			
S54	12	(stereoscopic) and (three near2 dimensional near2 imag\$3) and (three near2 dimensional near2 display\$3 same synchroniz\$3 same windows)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 12:56
S55	10	("345"/\$.ccls. and "600"/\$.ccls. and "433"/\$.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 12:59
S56	2	("345"/\$.ccls. and "600"/\$.ccls. and "433"/\$.ccls. and "348"/\$.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 12:59
S57	2	"6318995".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 13:00
S58	41	("3738005" "4575805" "5011405" "5238404" "5368478" "5395238" "5431562" "5447432" "5454717" "5456600" "5464349" "5474448" "5518397" "5533895" "5542842" "5618176" "5879158" "5975893" "6068482" "6099314" "6217325" "6227850" "Re35169").PN. OR ("6318995").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 13:00
S59	10	"8107086".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/21 13:00
S60	44	("20040112978" "20040253824" "20050202363" "20060173637" "20070127756" "20080068619" "20080169044" "20100019170" "20100020070" "20100022893" "20100039534" "20100042002" "20100065793" "20100067756" "20110290005" "4841156" "5619330" "5717217" "5904651" "6339648" "6533062" "6621951" "6751494" "7286242" "7555356" "7606381").PN. OR ("8107086").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/21 13:01

EAST Search History (Interference)

<This search history is empty>

6/ 21/ 2015 1:03:51 PM

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/068522

A. CLASSIFICATION OF SUBJECT MATTER INV. 606115/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) 6061		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data bases consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data, INSPEC		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004/100067 A (63D L P [US]; QUADLING HENLEY [US]; QUADLING MARK [US]; BLAIR ALAN [US] 18 November 2004 (2004-11-18) abstract; claims 14,15,18	1-24
P,X	WO 2007/103918 A (D40 TECHNOLOGIES LLC [US]) 13 September 2007 (2007-09-13) the whole document	1-24
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claims or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document relating 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 "Z" document member of the same patent family		
Date of the actual completion of the international search 9 October 2008		Date of mailing of the international search report 19/01/2009
Name and mailing address of the ISA European Patent Office, P.B. 5015 Patentlaan 2 NL - 2280 HV Rijswijk Tel: (+31-70) 340-2040 Fax: (+31-70) 340-2016		Authorized officer Kulak, Eray

Form PCT/ISA/210 (second sheet) (April 2008)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/069522

Box No. II Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-24

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-24

rendering a 3D model with a perspective obtained from its associated video

2. claims: 25-54

selecting a video image with the perspective of a rendered 3D object

3. claims: 55-72

synchronizing an image and a rendered 3D model on two windows

4. claims: 73-81

selecting a dentition video image with the perspective if a rendered 3D object to determine a margin of dentition

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2003/068522

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2004100067 A	18-11-2004	AU 2004237202 A1	18-11-2004
		CA 2524213 A1	18-11-2004
		EP 1617759 A2	25-01-2006
		JP 2007528743 T	18-10-2007
WO 2007103918 A	13-09-2007	US 2007211081 A1	13-09-2007

Form PCT/ISA/210 (patent family annex) (April 2005)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 63341WO003	FOR FURTHER ACTION		See item 4 below
International application No. PCT/US2008/068522	International filing date (<i>day/month/year</i>) 27 June 2008 (27.06.2008)	Priority date (<i>day/month/year</i>) 29 June 2007 (29.06.2007)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant 3M INNOVATIVE PROPERTIES COMPANY			

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 <i>bis</i> 1(a).																								
2.	This REPORT consists of a total of 10 sheets, including this cover sheet. In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	This report contains indications relating to the following items: <table style="width: 100%; border: none;"> <tr> <td style="width: 5%; text-align: center;">☒</td> <td style="width: 30%;">Box No. I</td> <td style="width: 65%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	☒	Box No. I	Basis of the report	☐	Box No. II	Priority	☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	☒	Box No. IV	Lack of unity of invention	☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	☐	Box No. VI	Certain documents cited	☐	Box No. VII	Certain defects in the international application	☐	Box No. VIII	Certain observations on the international application
☒	Box No. I	Basis of the report																							
☐	Box No. II	Priority																							
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																							
☒	Box No. IV	Lack of unity of invention																							
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																							
☐	Box No. VI	Certain documents cited																							
☐	Box No. VII	Certain defects in the international application																							
☐	Box No. VIII	Certain observations on the international application																							
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).																								

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 92 70	Date of issuance of this report 05 January 2010 (05.01.2010) Authorized officer Beate Giffo-Schmitt e-mail: pt03.pct@wipo.int
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Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2008/068522

International filing date (day/month/year)
27.06.2008

Priority date (day/month/year)
29.06.2007

International Patent Classification (IPC) or both national classification and IPC
INV. G06T15.00

Applicant
3M INNOVATIVE PROPERTIES COMPANY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 65.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office - Gitschiner Str. 103
D-10963 Berlin
Tel. +49 30 25901-0
Fax: +49 30 25901-840

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Kulak, Eray

Telephone No. +49 30 25901-410



WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2008/068522

Box No. I Basis of the opinion

1. With regard to the language, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2008/068522

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 25-81

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

☒ no international search report has been established for the whole application or for said claims Nos. 25-81

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.

☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.

☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13ter.1(a) or (b).

☐ a meaningful opinion could not be formed without the tables related to the sequence listings; the applicant did not, within the prescribed time limit, furnish such tables in electronic form complying with the technical requirements provided for in Annex C-bis of the Administrative Instructions, and such tables were not available to the International Searching Authority in a form and manner acceptable to it.

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in electronic form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.

☐ See Supplemental Box for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2008/068522

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:
- ☐ paid additional fees
 - ☐ paid additional fees under protest and, where applicable, the protest fee
 - ☐ paid additional fees under protest but the applicable protest fee was not paid
 - ☒ not paid additional fees
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☒ the parts relating to claims Nos. 1-24

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-24</u>
	No: Claims	<u>:</u>
Inventive step (IS)	Yes: Claims	<u>:</u>
	No: Claims	<u>1-24</u>
Industrial applicability (IA)	Yes: Claims	<u>1-24</u>
	No: Claims	<u>:</u>

2. Citations and explanations

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/US2008/068522

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-24

determining an orientation and a direction of travel for each vehicle of a plurality of vehicles and identifying each of the plurality of vehicles.

2. Claims: 25-54

scaling the images and obtaining a length to pixel ratio

3. Claims: 55-72

detecting entry and exit of an object/vehicle within a field of view of the camera.

4. Claims: 73-81

determining a region of interest(ROI); generating a blob image by segmentation in ROI; determining the major and minor diameters of blobs;

1. The following document (D1-D2) is referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1: WO 2004/100067 A (D3D L P [US]; QUADLING HENLEY [US]; QUADLING MARK [US]; BLAIR ALAN [US] 18 November 2004 (2004-11-18)

D2: WO 2007/103918 A (D4D TECHNOLOGIES LLC [US]) 13 September 2007 (2007-09-13)

2. INVENTIVE STEP

The claims 1-24 do not involve an inventive step in the sense of Article 33(3) PCT.

D1 discloses a method comprising:

- creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, the plurality of images including at least one video image (D1, claim 1, the first two paragraphs);
- selecting a video image from the sequence of image sets, the video image containing a view of the subject from a perspective; displaying the video image in a user interface (D1, claim 1, the last paragraph); and
- rendering the three dimensional model in the user interface from the perspective (D1, claims 10 and 15).

Claim 1 differs from D1 in that each one of the plurality of images are captured from a different optical axis. This means that, according to the current application, the 3D model of a subject is created through the known parallax effect in its source images. This feature is detailed with more clear words in dependent claims 7 and 8. On the other hand, D1 obtains the 3D model by scanning.

Both modelling techniques are very well known to the skilled person. They are standard methods in 3D modelling field and they may be used interchangeable to create 3D models. All modelling books in the computer graphics field disclose the parallax(stereo) technique to create 3D models. Therefore, independent claim 1 does not involve inventive step. The same objection and reasoning apply to the corresponding computer program product claim 9 and system claim 17.

The subject-matter of the dependent claims 2,5,6 are disclosed in D1 (claims 10,15,18).

Dependent claims 3 and 4 disclose that the video image can be selected by the user through different selection methods. It should be noted that D1 uses a see-through screen to determine the field of view (D1, claim 17) and this screen can be used also to determine an area of interest in the image (D1, claims 18-20). Other video selection features are simply minor design alternatives in implementation which do not add anything inventive significance to the subject matter of independent claims.

It should be further noted that, augmented reality in dental imaging is very well known and claim 1 discloses a classical application of this field. In augmented reality, rich media can be registered and displayed together. It is a frequently used technique also for many other biomedical application areas. D2, which may be used under EPC, is cited here to show another augmented reality system example for the dentition field.

3. INDUSTRIAL APPLICABILITY:

The current set of claims 1-24 discloses technical features to implement a computer graphics method of rendering and therefore, the subject matter of claims 1-24 is industrially applicable.

4. SPECIAL TECHNICAL FEATURES (STF) AND UNDERLYING OBJECTIVE PROBLEMS

Document D1 is considered to be the closest state of the art. The differences between the disclosure of D1 and the four potential inventions can be defined as follows:

4.1. 1st subject:

Considering D1, the special technical features (STF) of the 1st subject consist in:

- creating a three-dimensional model from a sequence of image sets
- selecting a video image
- displaying the video image
- rendering the three-dimensional model from the perspective of the video image

The underlying objective problem solved by the above STF is to model and render a 3D object.

4.2. 2nd subject

Considering D1, the special technical features (STF) of the 2nd subject consist in:

- creating a three-dimensional model from a sequence of image sets

- rendering the three-dimensional model from a perspective
- selecting a video image that contains a view of the subject most closely corresponding to the perspective
- displaying the video image

The underlying objective problem solved by the above STF is to select a video image among others.

4.3. 3rd subject

Considering D1, the special technical features (STF) of the 3rd subject consist in:

- creating a three-dimensional model from a sequence of image sets
- displaying the images in a first window
- displaying the three-dimensional model in a second window
- synchronizing the first and second window to provide a common perspective.

The underlying objective problem solved by the above STF is to synchronize a render of a 3D object and its source images on display.

4.4. 4th subject

Considering D1, the special technical features (STF) of the 4th subject consist in:

- displaying a three dimensional model of dentition from a perspective
- providing a plurality of video images of the dentition
- selection one of the plurality of video images
- displaying the video image with the three dimensional model as an aid to visually determining a margin of the dentition.

The underlying objective problem solved by the above STF is to determine a margin of the dentition on an electronic display.

5. The special technical features (STF) are obviously not identical. Moreover, they are not corresponding, i.e. they do not function in an equivalent, complementary or cooperative manner and are not specially adapted to

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/US2008/068522

each other. In particular, these special technical features can not be regarded as being corresponding because they solve different problems.

Therefore, the application claims four inventions not so linked as to form a single general inventive concept as they don't have same or corresponding special technical features. Hence, the requirements of Rule 13.1 and 13.2 PCT are therefore not met.

6. If the applicant opts to restrict the claims, it is suggested to erase the claims corresponding to the subjects which are not examined. In the absence of any response from the applicant, the examination will be restricted to the first subject.

Substitute for form 1449A/PTO (modified) INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary) Page 1 of 1	Application Number	14/487371
	Filing Date	16-SEP-2014
	First Named Inventor	Janos Rohaly
	Confirmation Number	7315
	Attorney Case Number	63341US008

United States Patent Documents					
Exam. Init.*	Cite No.	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Doc. Number-(Kind Code if Known)			
/S.E./	A1	4,846,577	07-11-1989	Grindon	
/S.E./	A2	5,175,616	12-29-1992	Milgram	
/S.E./	A3	6,674,461	01-06-2004	Klapman	
/S.E./	A4	7,474,932	01-06-2009	Geng	
/S.E./	A5	2003/0033151	02-13-2003	Vozick	
/S.E./	A6	2004/0218039	11-04-2004	Cooper	
/S.E./	A7	2004/0247174	12-09-2004	Lyons	
/S.E./	A8	2005/0020910	01-27-2005	Quadling	
/S.E./	A9	2005/0089822	04-28-2005	Geng	
/S.E./	A10	2005/0185711	08-25-2005	Pfister	
/S.E./	A11	2005/0212910	09-29-2005	Singhal	
/S.E./	A12	2006/0238617	10-26-2006	Tamir	
/S.E./	A13	2006/0281971	12-14-2006	Sauer	
/S.E./	A14	2007/0030342	02-08-2007	Wilburn	
/S.E./	A15	2007/0098237	05-03-2007	Yoo	
/S.E./	A16	2007/0103460	05-10-2007	Zhang	
/S.E./	A17	2007/0211081	09-13-2007	Quadling	
/S.E./	A18	2008/0013943	01-17-2008	Rohaly	

Foreign Patent Documents							
Exam. Init.*	Cite No.	Foreign Patent Document		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation (Check if yes)
		Ctry. Code	Number-Kind Code (if known)				
/S.E./	B1	WO	2004/100067	11-18-2004	Quadling		
/S.E./	B2	WO	2007/103918	09-13-2007	Quadling		

OTHER DOCUMENTS			
Exam. Init.*	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, page(s), volume-issue number(s), publisher, city and/or country where published	Translation (Check if yes)
	C1		

*Examiner: /Shan Elahi/	Date Considered: 06/21/2015
EXAMINER: Initial if reference 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.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.E./



Espacenet

Bibliographic data: US2015002509 (A1) — 2015-01-01

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

Inventor(s): ROHALY JANOS [US]; NAZZAL ROBERT N [US]; TEKEIAN EDWARD K [US]; KRIVESHKO ILYA A [US]; PALEY ERIC B [US]
 ± (ROHALY JANOS, ; NAZZAL ROBERT N, ; TEKEIAN EDWARD K,
 ; KRIVESHKO ILYA A, ; PALEY ERIC B)

Applicant(s): 3M INNOVATIVE PROPERTIES CO [US] ± (3M INNOVATIVE PROPERTIES COMPANY)

Classification: - **international:** A61C9/00; G06F3/0481; G06F3/0484; G06T15/10; G06T17/10; H04N5/14
 - **cooperative:** A61C9/0053; G06F3/04815; G06F3/04847; G06T15/10; G06T17/10; H04N13/00; H04N5/14; H04N13/0055

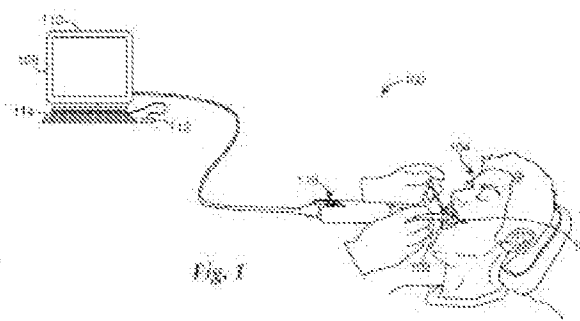
Application number: US201414487371 20140916

Priority number(s): US201414487371 20140916 ; US20100666464 20101115 ; WO2008US68522 20080627 ; US20070947009P 20070629

Also published as: WO2009006273 (A2) WO2009006273 (A3) US2011050848 (A1) US2011050848 (A1) US8866883 (B2) US8866883 (B2) JP2010533008 (A) EP2171689 (A2) CN101689309 (A) less

Abstract of US2015002509 (A1)

Tools are described for preparing digital dental models for use in dental restoration production processes, along with associated systems and methods. Dental modeling is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired during a scan of the model provides a source of still images that can be displayed alongside a rendered three-dimensional model, and the two views (model and still image) may be



synchronized to provide a common perspective of the model's subject matter. This approach provides useful visual information for disambiguating surface features of the model during processing steps such as marking a margin of a prepared tooth surface for a restoration. Interactive modeling tools may be similarly enhanced. For example, tools for margin marking may synchronize display of margin lines between the still image and the model so that a user can interact with either or both of the visual representations, with changes to a margin reflected in both displays.

<i>Index of Claims</i> 	Application/Control No. 14487371	Applicant(s)/Patent Under Reexamination ROHALY ET AL.
	Examiner SHAN ELAHI	Art Unit 2486

✓	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	07/09/2015							
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	20	✓							



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Inventor Name Search Result

Your Search was:

Last Name = ROHALY

First Name = JANOS

Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Name	Inventor Name
06251043	4144959		150	04/06/1981	TERPENE DERIVATIVES AND INSECTICIDAL COMPOSITIONS CONTAINING TERPENES	FAN,JANE	ROHALY, JANOS
06358288	Not Issued		168	03/15/1982	NEW TERPENE DERIVATIVES, A PROCESS FOR THE PREPARATION THEREOF, AND INSECTICIDAL COMPOSITIONS CONTAINING THEM	FAN,JANE	ROHALY, JANOS
06367289	Not Issued		161	04/13/1982	NEW 13-OXA-PROSTACYCLINE DERIVATIVES AND PROCESS FOR THE PREPARATION THEREOF	DENTZ,BERNARD	ROHALY, JANOS
10862257	7124665	20040062420	150	09/15/2003	METHOD OF MULTI-RESOLUTION ADAPTIVE CORRELATION PROCESSING	BITAR,NANCY	ROHALY, JANOS
10864412	Not Issued	20040155975	161	09/17/2003	3-D imaging system	NGUYEN,THONG	ROHALY, JANOS
11270135	7695817	20070103460	150	11/09/2005	DETERMINING CAMERA MOTION	NGUYEN,PHU	ROHALY, JANOS
11421573	7666424	20070189637	150	06/01/2006	COMBINED FORWARD AND REVERSE CORRELATION	RAHMJOO,MANUCHEHR	ROHALY, JANOS
11469869	7848042	20070172101	150	09/03/2006	SUPERPOSITION FOR VISUALIZATION OF THREE-DIMENSIONAL DATA ACQUISITION	ANSARI,TAHMINA	ROHALY, JANOS
11469870	7912257	20080199829	150	09/03/2006	REAL TIME DISPLAY OF ACQUIRED 3D DENTAL DATA	HEIDEMANN,JASON	ROHALY, JANOS
11469871	7813591	20070172112	150	09/03/2006	VISUAL FEEDBACK OF 3D SCAN PARAMETERS	SETH,MANAV	ROHALY, JANOS
11530413	7819581	20080013943	150	09/08/2006	MONOCULAR THREE-DIMENSIONAL IMAGING	FULLER,RODNEY	ROHALY, JANOS
11530420	7646550	20070188769	150	09/08/2006	THREE-CHANNEL CAMERA SYSTEMS WITH COLLINEAR APERTURES	SPECTOR,DAVID	ROHALY, JANOS
11530428	7372642	20070188601	150	09/08/2006	THREE-CHANNEL CAMERA SYSTEMS WITH NON-COLLINEAR APERTURES	SPECTOR,DAVID	ROHALY, JANOS
11534570	7742655	20070075997	150	09/22/2006	ARTIFACT MITIGATION IN THREE-DIMENSIONAL IMAGING	HUNG,YUBIN	ROHALY, JANOS
12117116	7746568	20080204900	150	05/08/2008	THREE-CHANNEL CAMERA SYSTEMS WITH NON-COLLINEAR APERTURES	SCHWARTZ,JORDAN	ROHALY, JANOS
12161259	8454365	20090298017	150	06/02/2009	DIGITAL DENTISTRY	LEWIS,RALPH	ROHALY, JANOS
12279097	8675290	20100007718	150	09/15/2009	MONOCULAR THREE-DIMENSIONAL IMAGING	WILKES,ZACHARY	ROHALY, JANOS
12343694	7961954	20090304288	150	08/19/2009	SUB-PIXEL ACCURACY AND VALID CORRELATION SIGNAL DETECTION BY FORWARD AND REVERSE CORRELATION	RAHMJOO,MANUCHEHR	ROHALY, JANOS
12368124	7956862	20100013909	150	09/28/2009	DETERMINING CAMERA MOTION	NGUYEN,PHU	ROHALY, JANOS
12664988	Not Issued	20100281370	124	07/06/2010	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	POHLMAN,JAMES	ROHALY, JANOS
12665464	8266883	20110050848	150	11/15/2010	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	ROHALY, JANOS
12811236	8830309	20110007137	150	09/22/2010	HIERACHICAL PROCESSING USING IMAGE DEFORMATION	MIKESKA,NEIL	ROHALY, JANOS
12811237	Not Issued	20110043613	124	09/22/2010	THREE-DIMENSIONAL MODEL REFINEMENT	MIKESKA,NEIL	ROHALY, JANOS
12811242	8593763	20110164810	150	11/15/2010	IMAGE SIGNATURES FOR USE IN MOTION-BASED THREE-DIMENSIONAL RECONSTRUCTION	PATEL,NIRAV	ROHALY, JANOS

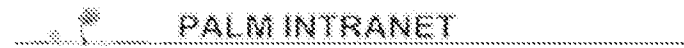
13292245	8675291	20120057000	150	11/09/2011	MONOCULAR THREE-DIMENSIONAL IMAGING	WILKES,ZACHARY	ROHALY, JANOS
13477381	Not Issued	20120231421	41	05/22/2012	DIGITAL DENTISTRY	LAUGHLIN,NATHAN	ROHALY, JANOS
14056817	Not Issued	20140104395	30	10/17/2013	Methods of and Systems for Three-Dimensional Digital Impression and Visualization of Objects Through an Elastomer	DASTOURI,MEHRDAD	ROHALY, JANOS
14201835	Not Issued	20140253717	30	03/08/2014	CONTINUOUS CONTACT-BASED THREE-DIMENSIONAL MEASUREMENT	DASTOURI,MEHRDAD	ROHALY, JANOS
14427371	Not Issued	20150002509	30	09/16/2014	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	ROHALY, JANOS
60411211	Not Issued		159	09/16/2002	Multi-resolution adaptive correlation processing		ROHALY, JANOS
60411561	Not Issued		159	09/17/2002	Monocular quantitative 3-D microscope imaging		ROHALY, JANOS
60720238	Not Issued		159	09/22/2005	Method and apparatus for real-time acquisition, processing, and correction of acquired image data corresponding to a three-dimensional object using a look up table		ROHALY, JANOS
60760902	Not Issued		159	01/20/2006	Image set processing		ROHALY, JANOS
60761078	Not Issued		159	01/20/2006	Digital dentistry		ROHALY, JANOS
60773132	Not Issued		159	02/13/2006	Monocular three-dimensional imaging		ROHALY, JANOS
60773253	Not Issued		159	02/13/2006	Sub-pixel accuracy and valid correlation signal detection by forward and reverse correlation		ROHALY, JANOS
60775643	Not Issued		159	02/22/2006	Image set processing		ROHALY, JANOS
60947009	Not Issued		159	06/29/2007	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA		ROHALY, JANOS
60947012	Not Issued		159	06/29/2007	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS		ROHALY, JANOS
61019159	Not Issued		159	01/04/2008	THREE-DIMENSIONAL IMAGING SYSTEMS AND METHODS		ROHALY, JANOS
61171243	Not Issued		159	04/21/2009	THREE-DIMENSIONAL IMAGING SYSTEM ENHANCEMENTS		ROHALY, JANOS
61714762	Not Issued		159	10/17/2012	Three-dimensional Digital Impression and Visualization of Objects through a Clear Elastomer		ROHALY, JANOS
61774953	Not Issued		159	03/08/2013	Methods of and Systems for Inspection and Measurement of Relatively Large Surfaces		ROHALY, JANOS

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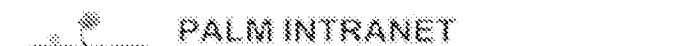
Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Name	Inventor Name
62164272	Not Issued		20	05/20/2015	MULTI-COLORED MILL BLANKS	,	NAZZAL, ROBERT
10701157	7774239	20040261030	150	11/03/2003	FEEDBACK MECHANISM TO MINIMIZE FALSE ASSERTIONS OF A NETWORK INTRUSION	GEE,JASON	NAZZAL, ROBERT N.
10803167	7698736	20050206650	150	03/16/2004	SERVICE DETECTION	COLIN,CARL	NAZZAL, ROBERT N.
10880112	Not Issued	20050289219	30	06/28/2004	Rule based alerting in anomaly detection	BELANI,KISHIN	NAZZAL, ROBERT N.
12664983	Not Issued	20100281370	124	07/06/2010	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	POHLMAN,JAMES	NAZZAL, ROBERT N.
12866464	8866883	20110050848	150	11/15/2010	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	NAZZAL, ROBERT N.
14482371	Not Issued	20150002509	30	09/16/2014	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	NAZZAL, ROBERT N.
60947009	Not Issued		159	06/29/2007	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	,	NAZZAL, ROBERT N.
60947012	Not Issued		159	06/29/2007	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	,	NAZZAL, ROBERT N.
10137744	7581023	20030204621	150	04/30/2002	ARCHITECTURE TO THWART DENIAL OF SERVICE ATTACKS	BARQADLE,YASIN	NAZZAL, ROBERT NADER
60423557	Not Issued		159	11/04/2002	Algorithms for network anomaly detection in the mazu network profiler	,	NAZZAL, ROBERT NADER
60427294	Not Issued		159	11/18/2002	Anomaly detection and role classification in a distributed computing network	,	NAZZAL, ROBERT NADER
60429050	Not Issued		159	11/25/2002	Role classification of hosts within enterprise networks based on connection patterns	,	NAZZAL, ROBERT NADER

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Last Name = TEKEIAN

First Name = EDWARD

Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Name	Inventor Name
13372277	Not Issued	20140046722	61	08/10/2012	SYSTEM FOR ON-SITE ENVIRONMENT MONITORING	GARCIA-GUERRA,DARLENE	TEKEIAN, EDWARD
11469871	7813591	20070172112	150	09/03/2006	VISUAL FEEDBACK OF 3D SCAN PARAMETERS	SETH,MANAV	TEKEIAN, EDWARD K.
12161252	8454365	20090298017	150	06/02/2009	DIGITAL DENTISTRY	LEWIS,RALPH	TEKEIAN, EDWARD K.
12664988	Not Issued	20100281370	124	07/06/2010	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	POHLMAN,JAMES	TEKEIAN, EDWARD K.
12666464	8866883	20110050848	150	11/15/2010	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHL,SHAN	TEKEIAN, EDWARD K.
13477381	Not Issued	20120231421	41	05/22/2012	DIGITAL DENTISTRY	LAUGHLIN,NATHAN	TEKEIAN, EDWARD K.
14487371	Not Issued	20150002509	30	09/16/2014	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHL,SHAN	TEKEIAN, EDWARD K.
60947009	Not Issued		159	06/29/2007	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	,	TEKEIAN, EDWARD K.
60947012	Not Issued		159	06/29/2007	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	,	TEKEIAN, EDWARD K.
61019159	Not Issued		159	01/04/2008	THREE-DIMENSIONAL IMAGING SYSTEMS AND METHODS	,	TEKEIAN, EDWARD K.

Inventor Search Completed: No Records to Display.

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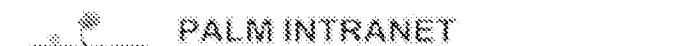
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Inventor Name Search Result

Your Search was:

Last Name = KRIVESHKO

First Name = ILYA

Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Name	Inventor Name
09883889	Not Issued		160	06/18/2001	On-line configurator for interactive virtual product customization and product display	,	KRIVESHKO, ILYA
60212884	Not Issued		159	06/19/2000	Floral configurator	,	KRIVESHKO, ILYA
11337182	8035637	20070236494	150	01/20/2006	THREE-DIMENSIONAL SCAN RECOVERY	HOANG,PHI	KRIVESHKO, ILYA A.
11383623	7940263	20070171220	150	05/16/2006	THREE-DIMENSIONAL SCAN RECOVERY	HOANG,PHI	KRIVESHKO, ILYA A.
11469869	7840632	20070172101	150	09/03/2006	SUPERPOSITION FOR VISUALIZATION OF THREE-DIMENSIONAL DATA ACQUISITION	ANSARI,TAHMINA	KRIVESHKO, ILYA A.
11469871	7813591	20070172112	150	09/03/2006	VISUAL FEEDBACK OF 3D SCAN PARAMETERS	SETH,MANAV	KRIVESHKO, ILYA A.
12664288	Not Issued	20100281370	124	07/06/2010	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	POHLMAN,JAMES	KRIVESHKO, ILYA A.
12664464	8866883	20110050848	150	11/15/2010	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	KRIVESHKO, ILYA A.
12811236	8830309	20110007137	150	09/22/2010	HIERACHICAL PROCESSING USING IMAGE DEFORMATION	MIKESKA,NEIL	KRIVESHKO, ILYA A.
12811237	Not Issued	20110043613	124	09/22/2010	THREE-DIMENSIONAL MODEL REFINEMENT	MIKESKA,NEIL	KRIVESHKO, ILYA A.
12811268	Not Issued	20100283781	61	06/30/2010	NAVIGATING AMONG IMAGES OF AN OBJECT IN 3D SPACE	NGUYEN,PHONG	KRIVESHKO, ILYA A.
14009442	Not Issued	20130329020	30	08/20/2013	HYBRID STITCHING	DASTOURI,MEHRDAD	KRIVESHKO, ILYA A.
14009446	Not Issued	20130335417	30	08/20/2013	SPACE CARVING IN 3D DATA ACQUISITION	WILSON,NICHOLAS	KRIVESHKO, ILYA A.
14483458	Not Issued		30	09/11/2014	COMPUTER-IMPLEMENTED METHODS AND SYSTEMS FOR WHEELIE CONTROL IN DIWHEEL-TYPE AUTONOMOUS MOBILE ROBOTS	TRAN,KHOI	KRIVESHKO, ILYA A.
14487371	Not Issued	20150002509	30	09/16/2014	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	KRIVESHKO, ILYA A.
60761078	Not Issued		159	01/20/2006	Digital dentistry	,	KRIVESHKO, ILYA A.
60947609	Not Issued		159	06/29/2007	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	,	KRIVESHKO, ILYA A.
60947612	Not Issued		159	06/29/2007	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	,	KRIVESHKO, ILYA A.
61019159	Not Issued		159	01/04/2008	THREE-DIMENSIONAL IMAGING SYSTEMS AND METHODS	,	KRIVESHKO, ILYA A.
61171243	Not Issued		159	04/21/2009	THREE-DIMENSIONAL IMAGING SYSTEM ENHANCEMENTS	,	KRIVESHKO, ILYA A.
61445464	Not Issued		159	02/22/2011	HYBRID STITCHING	,	KRIVESHKO, ILYA A.
61445499	Not Issued		159	02/22/2011	SPACE CARVING IN 3D DATA ACQUISITION	,	KRIVESHKO, ILYA A.
61876401	Not Issued		159	09/11/2013	WHEELIE CONTROLLER FOR DIWHEEL-TYPE AUTONOMOUS MOBILE ROBOTS	,	KRIVESHKO, ILYA A.
61931191	Not Issued		159	01/24/2014	METHOD AND SYSTEM FOR OBJECT PLACEMENT USING AUTONOMOUS MOBILE ROBOTS	,	KRIVESHKO, ILYA A.
61976748	Not Issued		159	04/08/2014	METHOD AND SYSTEM FOR AUTOMATIC FRONTIER MANAGEMENT BY AUTONOMOUS MOBILE ROBOTS DURING	,	KRIVESHKO, ILYA A.

					COLLECTION OR CONSOLIDATION OF OBJECTS POSITIONED IN A GIVEN AREA	
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Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Name	Inventor Name
11467866	7698613	20080015727	150	08/28/2006	LOCAL ENFORCEMENT OF ACCURACY IN FABRICATED MODELS	MASINICK,MICHAEL	PALEY, ERIC B.
11469870	7912257	20080199829	150	09/03/2006	REAL TIME DISPLAY OF ACQUIRED 3D DENTAL DATA	HEIDEMANN,JASON	PALEY, ERIC B.
11469871	7813591	20070172112	150	09/03/2006	VISUAL FEEDBACK OF 3D SCAN PARAMETERS	SETH,MANAV	PALEY, ERIC B.
12161252	8454365	20090298017	150	06/02/2009	DIGITAL DENTISTRY	LEWIS,RALPH	PALEY, ERIC B.
12664983	Not Issued	20100281370	124	07/06/2010	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	POHLMAN,JAMES	PALEY, ERIC B.
12866464	8866823	20110050848	150	11/15/2010	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	PALEY, ERIC B.
12718697	8738346	20100152871	150	02/23/2010	LOCAL ENFORCEMENT OF ACCURACY IN FABRICATED MODELS	SAXENA,AKASH	PALEY, ERIC B.
12718721	8262388	20100152872	150	02/23/2010	LOCAL ENFORCEMENT OF ACCURACY IN FABRICATED MODELS	MAI,HAO	PALEY, ERIC B.
12718722	8174714	20100152873	150	02/23/2010	LOCAL ENFORCEMENT OF ACCURACY IN FABRICATED MODELS	MASINICK,MICHAEL	PALEY, ERIC B.
13477381	Not Issued	20120231421	41	05/22/2012	DIGITAL DENTISTRY	LAUGHLIN,NATHAN	PALEY, ERIC B.
14487371	Not Issued	20150002509	30	09/16/2014	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	ELAHI,SHAN	PALEY, ERIC B.
60761078	Not Issued		159	01/20/2006	Digital dentistry	,	PALEY, ERIC B.
60947009	Not Issued		159	06/29/2007	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA	,	PALEY, ERIC B.
60947012	Not Issued		159	06/29/2007	VIDEO-ASSISTED MARGIN MARKING FOR DENTAL MODELS	,	PALEY, ERIC B.

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Year

Single Year

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From

To

2000

2014

Author

Affiliation

Publication Title

Conference Location

☐ Accelerated polyhedral visual hulls using OpenCL

Duckworth, T.; Roberts, D.J.

Virtual Reality Conference (VR), 2011 IEEE

Year: 2011

Pages: 203 - 204, DOI: 10.1109/VR.2011.5759469

Cited by: Papers (3)

IEEE Conference Publications

Abstract

(250 Kb)

Standards Dictionary
Terms

[Browse »](#)☐ A 3-D reconstruction system for the human jaw using a sequence of optical images

Yamany, S.M.; Farag, A.A.; Tasman, D.; Farman, A.G.

Medical Imaging, IEEE Transactions on

Year: 2000, Volume: 19, Issue: 5

Pages: 538 - 547, DOI: 10.1109/42.870264

Cited by: Papers (15) | Patents (18)

IEEE Journals & Magazines

Abstract

(1380 Kb)

☐ On photo-realistic 3D reconstruction of large-scale and arbitrary-shaped environments

Bondarev, E.; Heredia, F.; Favier, R.; Lingni Ma; de With, P.H.N.

Consumer Communications and Networking Conference (CCNC), 2013 IEEE

Year: 2013

Pages: 621 - 624, DOI: 10.1109/CCNC.2013.6468511

Cited by: Papers (1)

IEEE Conference Publications

Abstract

(354 Kb)

☐ 3-D reconstruction of the human jaw using space carving

Ahmed, M.T.; Eid, A.H.; Farag, A.A.

Image Processing, 2001. Proceedings. 2001 International Conference on

Year: 2001, Volume: 2

Pages: 323 - 326 vol.2, DOI: 10.1109/ICIP.2001.958493

Cited by: Papers (1)

IEEE Conference Publications

Abstract

(392 Kb)

- Fast dense 3D reconstruction using an adaptive multiscale discrete-continuous variational method
 Zhuoliang Kang; Medioni, G.
 Applications of Computer Vision (WACV), 2014 IEEE Winter Conference on
 Year: 2014
 Pages: 53 - 60, DOI: 10.1109/WACV.2014.6836118
 IEEE Conference Publications

Abstract (3788 Kb)

- Modeling arbitrarily oriented slanted planes for efficient stereo vision based on block matching
 Ranft, B.; Strauss, T.
 Intelligent Transportation Systems (ITSC), 2014 IEEE 17th International Conference on
 Year: 2014
 Pages: 1941 - 1947, DOI: 10.1109/ITSC.2014.6957990
 IEEE Conference Publications

Abstract (3077 Kb)

- 3D Images processing of structural building using Digital Close-Range Photogrammetric Approach
 Asyraf Hamdani, M.; Hashim, K.A.; Adnan, R.; Samad, A.M.
 Signal Processing and its Applications (CSPA), 2011 IEEE 7th International Colloquium on
 Year: 2011
 Pages: 318 - 321, DOI: 10.1109/CSPA.2011.5759695
 Cited by: Papers (3)
 IEEE Conference Publications

Abstract (5115 Kb)

- Binocular Vision-based Position Determination Algorithm and System
 Wei Sun; Long Chen; Bo Hu; Long Ren; Xianxiang Wu
 Computer Distributed Control and Intelligent Environmental Monitoring (CDCIEM), 2012 International Conference on
 Year: 2012
 Pages: 170 - 173, DOI: 10.1109/CDCIEM.2012.47
 IEEE Conference Publications

Abstract (300 Kb)

- Real-time 3D human capture system for mixed-reality art and entertainment
 Nguyen, T.H.D.; Qui, T.C.T.; Xu, K.; Cheok, A.D.; Teo, S.L.; Zhou, Z.Y.; Mallawaarachchi, A.; Lee, S.P.; Liu, W.; Teo, H.S.; Thang, L.N.; Li, Y.; Kato, H.
 Visualization and Computer Graphics, IEEE Transactions on
 Year: 2005, Volume: 11, Issue: 6
 Pages: 706 - 721, DOI: 10.1109/TVCG.2005.105
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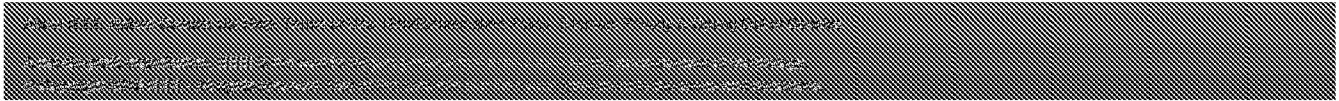
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- ☐ data and three-dimensional
- ☐ dentition
- ☐ rendered three-dimensional model

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Process and outcome measures of expert/novice performance on a haptic virtual reality system

S Suebnukam, N Phatthanassathienkul... - Journal of dentistry, 2009

... 16 These questions were: (1) name the parts of a **computer**; (2) use a word ... Kinematics of the haptic device were collected using the **Application Programmer's Interface (API)** provided by ... A custom user's performance **view program** was written by our group to interface with the ...

Data warehousing fundamentals: a comprehensive guide for IT professionals

P Ponniah - 2004

... and Operating Systems 1 Platform Options 150 1 Server Hardware 158 1 Database Software 164 1 ... 408 1 2 Cluster Detection 409 1 2 Decision Trees 411 1 2 **Memory-Based Reasoning** 413 ... 482 1 2 Preparing the Training **Program** 482 1 2 Delivering the Training **Program** 484 1 ...

Picture processing: 1982

A Rosenfeld - Computer Vision, Graphics, and Image Processing, 1983

... T-ASSP IEEE Transactions on Communications T-COMM IEEE Transactions on **Computers** T-COMP ... LE Druffel, Summary of the DARPA **image** understanding research program, *Ibid.*, 265-281 ... LS Haynes, Guest Ed., (Special Issue on) Highly Parallel **Computing**, **Computer** 15 (1 ...

Tool and Manufacturing Engineers Handbook Desk Edition

WH Cribbery - 1989

Computer graphics—computer art

HW Franke - 2012

... **Computing** involves control elements constructed in such a man- ner that they can carry out addition, subtraction, multiplication ... 4 Structure of the **Computer** A **digital computer** is made up of certain building elements, of which the most ... The satellite **computers** execute calculations ...

BIJU PATNIK UNIVERSITY OF TECHNOLOGY

SO Oriented

... Long Way, No looping, Address Modification, Looping Introduction to Assembly Language **Program** ... 2. **Computer Algorithms**: Introduction to Design & Analysis, 3rd edition-by Sara Baase, ... Desai, Galgotia Publications (2) Database System: concept, Design & **Application** by SK ...

3D treatment planning for orthopedic and trauma surgery

K Barina, A Johnb, F Matheweb, A Eglib, G Weisselsa... - Int J CARS, 2007

... of **software** components today allows orthopedic 3D therapy planning on standard **computers** and notebooks ... and a deformation measurement system which includes a camera and an **image** processing **computer**. ... runs on a nine node, AMD dual-core per node, **computing** cluster ...

Observations on the dynamic control of an articulatory synthesizer using speech production data

IMA Steiner - 2010

... only recently become a possibility in the wake of the fantastic developments in **computing** technology ... of producing lifelike output, and a control interface that can be used to **program** its utterances ... Depending on the domain of **application** and the quality of the speech **data**, such a ...

Optical measurement methods in biomechanics

JF Orr, JC Shelton - 1997

... strains on prototype structures have been realized more recently by the **application** of photoelastic ... Fringes appear corresponding to values $N = 0, 1, 2, 3$... as principal stress difference ... If a **three-dimensional model** is loaded and viewed directly in the trans- mission mode ...

Design culture now: The national design triennial

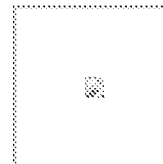
D Albrecht, E Lupton - 2000

A distributed spatial index for error-prone wireless data broadcast

B Zheng, WC Lee, KC Lee, DL Lee, M Shao - ... Journal on Very Large Data Bases, 2009

... Keywords Mobile **computing** · Location-based query · Wireless broadcast · Error resilience ... restaurant locations, nav- igation maps, weather condition, etc.) fosters a tremendous **application** base of ... sched- ule (spatially) near objects close to each other in the broad- cast **program**. ...

Application US20150002509



Synchronized vi
of video data an
three-dimension
model data

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Inventors: Janos Rohaly, Robert N. Naz
Edward K. Tekelen, Ilya A. Krivoshko, Er
Paley

Assignees: 3M innovative Properties
Company

Publication number: US20150002509

Application number: 14/487,371

Filing date: Sep 18, 2014

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The lifebox, the seashell, and the soul: what gnarly computation taught me about ultimate reality, the meaning of life, and how to be happy
R Rucker - 2008

Latice volume rendering
F Qiu - 2008

... Qiu, A. Kaufman, and K. Mueller, Melting and Flowing in Multiphase Environment, **Computers & Graphics** ... A. Kaufman, and S. Yoakum-Stover, GPU Cluster for High Performance **Computing**, ACM/IEEE ... uation domain into a grid of cells or points, because the **computer** can easily ...

Syllabus

M Tech - Material Science

... EB16ET103 Distributed **Computing** ... timing and Control-Instruction Cycle-Memory Reference Instructions-Input/Output Instructions - Complete **computer** Description, ... Stack Organization- Instruction formats-Addressing modes-Data Transfer and manipulation - **Program** Control, ...

E-topia: "urban life, Jim--but not as we know it"
WJ Mitchell - 2000

... Consequently, **computers** begin to lose their discrete spatial identities; any scattered collection of interconnected ... a bit before its time) by Sun Microsystems puts it, the network is the **computer**. ... largest exporter of teleservices, and the second-largest exporter of **software**.)¹³ Since ...

Real-time augmented reality for image-guided interventions
S Vogt - 2009

... Contributions to the field of data visualization and human-computer interfaces. The ... performed that **show** that three-dimensional graphics presented within the actual patient with ... Each **application** is described based upon an adaptation of the AR system to the particular clinical ...

Practical Aspects of Virtual Reality Technology in Research and Educational Environments
DM Germans - 2008

... A visualization pipeline can be created by calling C API functions from a **program**. ... for VR using OpenGL, the programmer needs to have a thorough knowledge of **computer** graphics and ... at a tiled display (multiple users, cost-effective) building such an **application** in combination ...

Computer vision and image processing techniques for mobile applications
X Liu - 2008

... Some unique limitations make the implementation of **computer** vision applications on the mobile devices ... focus on their device in the same way as they do with desk-top **computers**. ... G (EDGE) more computation may be done remotely and the "real" pervasive **computing** on the ...

LAMP-TR-151 November 2008 COMPUTER VISION AND IMAGE PROCESSING LARGE TECHNIQUES FOR MOBILE APPLICATIONS
X Liu, D Doermann

... Some unique limitations make the implementation of **computer** vision applications on the mobile devices fundamentally challenging. 1.3 Challenges ... top **computers**. This may become a problem when vision and/or recognition tasks ... pervasive **computing** on the phone will arrive. ...

Internal Policy/Procedures and Curriculum Plan for Under Graduate Credit Hour Engineering Programs
P Work

... Engineering Electrical Power and Machines Electronics and Electrical Communications **Computers** and Systems ... in order to improve it during the first five years **program** life cycle as ... technology and decision support systems, **Computer** graphics and **computer** systems needed ...

Computer assisted radiology-26th international congress and exhibition
I Matulewicz, K Siosarek - Int J CARS, 2012

... A Radiotherapy A Laser-driven electron linacs A Ultradense electron bunches A **Computer** simulation A ... A R&D **program** aimed to the realization of an innovative class of accelerators for ... error, the ease of use and the correspondence to users requirements of the **application** Fig. ...

Installations and Methods

HW Franks - Computer Graphics---Computer Art, 1988

... to quite an extent on these devices, they are often indicated, together with the **computers**, in the ... produce and superimpose a great variety of voltage forms with the help of analogue **computing** systems ... is called for - the values of x- and y-coordinates that the **computer** supplies are ...

Virtual, Augmented and Mixed Reality: Designing and Developing Augmented and Virtual Environments: 8th International Conference, VAMR 2014, Held as Part of ...

R Shumaker, L Stephanis - 2014

... interaction, addressing major advances in knowledge and effective use of **computers** in a ...
 Streit and Panos Markopoulos • Volume 22, LNCS 8531, **Social Computing** and Social ...
 HCI International 2015 The 15th International Conference on Human-Computer Interaction, HCI In ...

R. DAI

S Fiat - 1998

... Remote Control Program. A file transfer program used on the RDI Internet. It is similar to FTP. ... An ISO standards project for RDBMS **computers** to allow interoperability. The aim is universal **data-** base access and the ability to exchange **data** between different **computer** platforms. ...

Telecosm: How infinite bandwidth will revolutionize our world

G Geler - 2000

... Together with peripherals and hundreds of billions of embedded chips, Internet **computing** will use as ... The con- strains of million-transistor designs dictate that cellphone **computers** will be based on ... Reduced to irrelevance are all the conceptual foundations of the **computer** age. ...

A Study on DNA based Computation and Memory Devices

H Singh, H Kaur

... Păun, G. Rozenberg and A. Salomaa, "DNA **Computing**. New **Computing** Paradigms", Springer ... Macdonald Joanne, Stefanovic Darko and Stojanovic Milan N. "DNA **computers** for work ... International Journal of **Computer** Applications Technology and Research Volume 4- Issue 3 ...

Cardiac and Thoracic-Abdominal Surgery

H Meyers, I Nagya, A Knoll, EU Schimbeck - Int J CARS, 2008

... to produce an entire knot-tying behavior, without any pre-program- ming. ... In: Proceedings of the 2005 International conference on medical **image computing** and **computer** ... Robotics (CSTAR), London, ON, Canada bDepartment of Electrical and **Computer** Engineering, University ...

Development of magnetic induction machines for micro turbo machinery

JH Lang, SD Serturcu - 2002

... and for allowing me to run large simulations at their **computers**. I am also indebted to Mr. ... **Computer** memory and processing speed ... One of the direct consequences of this trend is an ever-increasing demand for systems offering mobile **computing** and telecommunication. ...

Cognitive radio architecture evolution: annals of telecommunications

J Nikolic III - annals of telecommunications-annales des ..., 2008

... with increasing interplay of radio engineering with related information services of **computer** vision [12 ... DARPA's XG program [41, 42] put substantial emphasis on the near-term potential of smart ... faces of participants at high **data** rate, followed by long-term application-assisted very ...

Generating anatomical substructures for physically-based facial animation

GO Aina - 2011

... 2.1.4. 16 Table 7.1 Runtime statistics for muscle generation on a laptop **computer** with a ... muscle generation on a PC with a 3.2GHz **processor** (single core) and 2Gb main memory. ... Figure 6.3 (a) **Computing** the position of an equivalent craniometric landmark q. The surface of the ...

USSR Report

OS Uniswiss

... 13 Device for **Computing** Modulus of Vector From Two Orthogonal Components (A. M. Kovalev, Yu, I ... Organization of Input of Constants to LSI Logarithm **Computers** (V. D. Baykov, A. I. Krye ... in the case of wide- band filters. The algorithm is constructed for **computer** calculation by ...

The Role of the Ethnos of Intellect in Legal and Informatical Observation of "Information Society"

G Tsvetkovskaya - Analysis

... production of biological tissue, design of robust electronic systems and the co-ordination of parallel **computing**. ... platform based on High Level Architecture is firstly proposed to support the **application** involving heterogeneous ... The results show that RTI_JADE works very efficiently ...

SIGGRAPH Executive Committee

JR Brown, A Chalmers, GM Paxinos, S Cunningham... - COMPUTER, 2001

... National Science Foundation Workshop on Universal Accessibility of Ubiquitous **Computing**: Providing for ... the technique we have come to know as motion control, with analog **computers**. ... the textbook, The Visualization Toolkit: An Object-Oriented Approach to

Computer Graphics ...Image and signal processing for networked e-health applications

IG Maglogiannis, K Karpouzis, M Wallace - Synthesis Lectures On Biomedical ... 2005

... and medical information anywhere and anytime, and the invisibility of **computing** modules when ... Since **computers** cannot handle or store continuous **data**, the first step of the conversion ... provide automated signal processing and classification without the need for a **host computer**. ...

Guide to Good Practice in the Digital Representation and Management of Cultural Heritage Materials

S Ross, R Sharp, P McKinney, A Gow, M Economou ... 2002

... Lorna Hughes, Assistant Director for Humanities **Computing** at New York University, arranged for the ... With funding from the Getty Grant **Program**, NINCH issued a request for ... planning tool by adding information about equipment specification (eg **computer processor** speed, RAM ...

BlackBerry PlayBook for Dummies

C Sandler - 2011

... Sandler studied journalism (and also found time to take courses to **program** a gigantic mainframe **computer**) at ... between PCs and Macs; I refer to either and both as personal or laptop **computers**. ... you how to use a USB cable to exchange files with a personal or laptop **computer**. ...

Natural Computing: DNA, Quantum Bits, and the Future of Smart Machines

DE Shasha, C Lazare - 2010

CACNews

LW Bradford

... Ray Pinker and Clark Sell-ers, of Los Angeles, who were also on the **program**. ... of Criminalists has to have some meaning beyond filling out an **application** and sending in ... and DNA recovery, Maurice Padilla from Applied Biosystems, who discussed valid **software** and validation ...

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Y New

... 66 **Software** Yap ... Patent Status: US patent **application** have been filed covering this novel technology ... Dr. Kirshenbaum and Mr. Yoo **show** in this invention that protease catalysis can be used to generate sequence-specific biomimetic macromolecules through the ligation of ...

Java...Java...Java

R Morelli, R Walde - 2012

... 300 multiplications per second, ran more than 500 times faster than other **computing** machines of ... contain **software** that enables them to be con- nected to various-sized networks of **computers**. Networks allow many in- dividual users to share costly **computer** resources, such as a ...

Functional and structural magnetic resonance imaging of humans and macaques

KA Bernheim - 2004

... human and non-human MRI and fMRI. Further **application** of these principles could be ... **image** would often **show** only a miniscule portion of cortex and be difficult to orient and interpret. ... as fMRI. Although, for purposes of length, examples of **computer** code produced to make ...

Managing for Value

SS Iyer - 2006

... productivity drivers, partnerships and alliances; "Just In time", "Zero Defects" **programs**; Kaizen, continuous ... hammer and tongs, will not easily transform into machinists of **computer** integrated manufacturing ... compete with others, broke the rule of **show-casing computers** in stores ...

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

DG Mittle

... The DoD holds **three** National SBIR Conferences a year and participates in many ... the possible duplication with other research or research and development, **program** balance, budget ... solution b. The potential for commercial (government or private sector) **application** and the ...

A History of the Amiga

J Reimer - Ars Technica, 2007

... Was the Amiga really just a footnote in **computing** history, contributing nothing new and different from the ... Xerox itself released the Star **computer** in 1981, but it cost \$17,000 and sold poorly ... Clearly, personal **computers** were price-sensitive, even if they had advanced new features ...

Computer Vision Metrics: Survey, Taxonomy, and Analysis

S Krig - 2014

System-ergonomic design of cognitive automation

R Orken, A Schulte - Studies in computational intelligence, 2010

... 1.1 A Classical Approach..... 251 6.2.1.2 A Soft-Computing Approach.....
255 ... they hardly realise that with the advent of powerful computers and the ... co-operate
among the different schools of psychology, computer science, organisational ...

Telemedicine and its application in telemedicine management

MA Algaet, M NOH, ZUL AZRI, AS Shihghatullah ... - 2014

... The concept of 'information technology' is usually related to computer science ...
Information technology is widely understood as a merge of telecommunications and
computing and hence ... The re- cent development in technology has produced faster
computers and wider bandwidth ...

Robert I. in retrospect

HR Everett - 2005

... and avoidance.....2-5 2-3. Originally intended for use in a fish-finder application, the
National ... 7-12 A-1. Flowchart of the interrupt handling software associated with ... A-6 A-4.
In response to input commands from the computer, hardwired logic circuitry on Interface
Board ...

Management communication

A-H Bell, DM Smith - 2010

... documents change as we begin to speak our words into the computer rather than ...
Companies rushed to install computers and laser printers that could enhance the corporate
image ... spoken words directly to their written words by automated speech recognition (ASR)
computing. ...

Electrophysiologic assessment of (central) auditory processing disorder in children with non-syndromic cleft lip and/or palate

X Ma, L Ma, B McPherson - Journal of the Acoustical Society of America, 2012

... for enclosed and unroofed spaces with similar decay rate do not show significant difference
... Drive, Newport, OR 97365), and Roland Stelzer (Austrian Society for innovative Computer
Sci- ences ... Total 22 tagged squids were released from the research vessel in three nights
and ...

Encyclopaedic dictionary of library and information science

VK Suraj - 2005

... Parity bit: In computing, a bit included in a unit of digital data to detect errors in ... week,
month, and year during which the services and resources of a library or computer system are
... Peer-to-peer (P2P) : File sharing between Internet users whose computers have been
assigned IP ...

SUNDAY, JULY 29

TSO Room - Medical Physics, 2012

... have included a significant focus on staffing; and some states' requirements for external
audits of clinical programs ... showed variations in dose calculations due to incorrect
application of anisotropy models and application of obsolete ... 3601 2012 AAPM Annual
Meeting Program ...

Risk factors and dental anomalies in children with orofacial clefts

O LINACRE - 2007

... probably reduces input activities in the hippocampus, thereby results in deficits in spatial
memory. ... P0019 The clinical application of buccal acrylic appliances HS NOH*, SH LEE,
IH ... and dumb) and promotion of an accessible and efficient educational programme at
community ...

Wi-Fi Enabled Healthcare

A Youssef, O McDonald II, J Linton, B Zemke, A Esato - 2014

... Policy Management and Software Defined Networking (SDN) The Rise of the Smart Phone
Application Performance and ... This network, known as ALCHAnet, was designed to connect
seven computers on four Hawaiian Islands wirelessly to a central computer located on the ...

Robert G. Eggleston

WP Janssen, S Adappa - AGARD, 1993

... system has a maximum update rate of 100 Eye-calibration time is short while the accuracy
of 1 samples/second. deg (RMS) is adequate for the application at hand. ... Macintosh
computer/monitor and the EPOG programme. ...

Atlas of Topographic Anatomy...1911

O Bownds' MindBlog - New Scientist, 2012

... As you practice on the go or at your computer you increase your coherence baseline and
your ability to take charge of your emotional ... Some questions raised during the program: ...
There are three programmes so far although the second and third haven't been subtitled yet.
...

Asian Journal of Management Technology and Changes

UK in

... who may influence your decision on what **computer** to buy. ... phone, and now include a wide range of devices like Personal Digital Assistants (PDA) and wireless **computers**. ... onsite and to instantly transmit them to the business centre has an invaluable **application** in processes ...

User's Gestural Exploration of Different Virtual Agents' Expressive Profiles (Short Paper)

M Courgeon, JC Martin, C Jacquemin - AAMAS'08 Proceedings of the 7th ..., 2008

... month = may, number = {1}, pages = {32–49}, title = {{Affective **computing** with primary ... pdf.pdf}, issn = {00950033}, journal = {ACM SIGMIS Database}, keywords = (**computer**-based presentations ... the domain of research, design, and applications of persuasive **computers**.in this ...

Consciousness: Confessions of a romantic reductionist

C Koch - 2012

... the Swartz Foundation, the Paul G. Allen Family Foundation, and the World Class University program of the ... And those can be mimicked, at least in principle, on a **computer**. ... and social network- ing, I foresee a time when humanity's teeming billions and their **computers** will be ...

Challenging Feelings.Challenging Feelings.

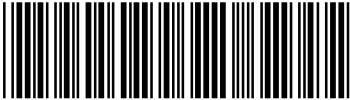
T Woodard

... to merge in order to create the first generation of commercially successful **computer** wearables. ... Smartphones and tablets brought **computers** out of offices into a variety of environments for personal ... With a **computing** device already in the pocket, will the added convenience of a ...

Pat 11/04/04 12/07/2007

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Search Notes 	Application/Control No. 14487371	Applicant(s)/Patent Under Reexamination ROHALY ET AL.
	Examiner SHAN ELAHI	Art Unit 2486

CPC- SEARCHED		
Symbol	Date	Examiner
A61C9/0053, G06F3/04815, G06F3/04847, G06T15/10, G06T17/10, H04N13/00, H04N13/0055, H04N5/14	6/19/2015	/SEE/
G06T17/20, G06T19/00, G06T17/00, G06T17/10, G06T17/005	6/19/2015	/SEE/

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
345	420	6/19/2015	/SEE/

SEARCH NOTES		
Search Notes	Date	Examiner
Following databases were searched [US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO, DERWENT, IBM_TDB]	6/19/2015, 6/20/2015, 6/21/2016	/SEE/
Following class and subclass were searched 345/419, 345/423, 345/421, 345/629-641	6/19/2015	/SEE/
Assignee searched	6/20/2015	/SEE/
Inventors searched	6/20/2015	/SEE/
CPC search	6/19/2015	/SEE/
Espacenet search	6/21/2015	/SEE/
Google prior arts finder databases searched key words from claims for PGPUBs and PATENTs	6/21/2015	/SEE/
Google Scholar searched key words from claims for NPLs	6/21/2015	/SEE/
IEEE Xplore databases searched key words from claims for NPLs	6/21/2015	/SEE/
IP.COM databases searched key words from claims	6/21/2015	/SEE/
Following class/subclass were searched: ("345"/\$.cls. and "600"/\$.cls. and "433"/\$.cls.)	6/21/2015	/SEE/

/SHAN ELAHI/ Examiner.Art Unit 2486	
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SEARCH NOTES		
Search Notes	Date	Examiner
Following class/subclass were searched: ("345"/\$.ccls. and "600"/\$.ccls. and "433"/\$.ccls. and "348"/\$.ccls.)	6/21/2015	/SEE/

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

/SHAN ELAHI/ Examiner.Art Unit 2486	
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Search Terms

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- ☐ computer program
☐ memory
☐ processors
☐ three dimensional dental models
☐ digital dental model
☐ synchronized views
☐ three-dimensional model data
☐ video data
☐ common perspective
☐ margin
☐ images
☐ views of video
☐ data and three-dimensional
☐ dentition
☐ rendered three-dimensional model

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Synchronized views of video data and three-dimensional model data

www.google.com/patents/US8866883

Grant - Filed Jan 27, 2008 - Issued Oct 21, 2014 - Janes Rahely - 3M Innovative Properties Company

Dental modeling is improved by supplementing views of three-dimensional models with ... **Video data** acquired during a scan of the model provides a source of still ... A computer program product comprising non-transitory computer executable code ... a processor configured to display the video image in an area of the user ...

Synchronized views of video data and three-dimensional model data

www.google.com/patents/EP2171686A2?cf=en

App - Filed Jan 27, 2008 - Published Apr 2, 2010 - Janes Rahely - 3M Innovative Properties Company

Dental modeling is improved by supplementing views of three-dimensional models ... **Video data** acquired during a scan of the model provides a source of still images ... the video image in a user interface; and rendering the three-dimensional model in ... A computer program product comprising computer executable code ...

Synchronized views of video data and three-dimensional model data

www.google.com/patents/WO200806273A2?cf=en

App - Filed Jan 27, 2008 - Published Jan 8, 2009 - Janes Rahely - 3M Innovative Properties Co

Dental modeling is improved by supplementing views of three-dimensional models with ... **Video data** acquired during a scan of the model provides a source of still ... For example, tools for margin marking may synchronize display of margin ... the video image in a user interface; and rendering the three-dimensional model in ...

Video-assisted margin marking for dental models

www.google.com/patents/US20100281370

App - Filed Jan 27, 2008 - Published Nov 4, 2010 - Janes Rahely - Janes Rahely

Dental modeling is improved by supplementing views of three-dimensional models with ... **Video data** acquired during a scan of the model provides a source of still ... For example, tools for margin marking may synchronize display of margin ... A graphical user interface for computer-assisted margin marking on dentition, the ...

Video-assisted margin marking for dental models

www.google.com/patents/WO200806303A2?cf=en

App - Filed Jan 27, 2008 - Published Jan 8, 2009 - Janes Rahely - 3M Innovative Properties Co

Tools are described for preparing digital dental models for use in dental ... **Dental modeling** is improved by supplementing views of three-dimensional models with still ... **Video data** acquired during a scan of the model provides a source of still ... For example, tools for margin marking may synchronize display of margin lines ...

Video-assisted margin marking for dental models

www.google.com/patents/EP2164424A2?cf=en

App - Filed Jan 27, 2008 - Published Mar 24, 2010 - Janes Rahely - 3M Innovative Properties Company

Tools are described for preparing digital dental models for use in dental ... **Dental modeling** is improved by supplementing views of three-dimensional models with still ... **Video data** acquired during a scan of the model provides a source of still ... For example, tools for margin marking may synchronize display of margin lines ...

Dental computer-aided design (CAD) methods and systems

www.google.com/patents/US7474932

Grant - Filed Oct 15, 2004 - Issued Jan 8, 2009 - Z. Jason Cheng - Teomed Holdings, Inc.

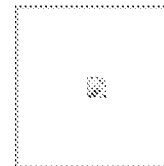
a three-dimensional camera configured to project a spatially varying pattern of ... representation of said three-dimensional (3D) model image for viewing by an ... configured to generate output data representative of said virtual 3D model in The dental CAD software (118) can be implemented to run on the computer (112) .

Augmented reality system for a dental laboratory

www.google.com/patents/WO2007103818A2?cf=en

App - Filed Mar 5, 2007 - Published Sep 13, 2007 - Henry S. Quessing - D&D

Application US20150002509


 Synchronized vi
of video data an
three-dimensior
model data

[Show Claims](#)

Inventors: Janes Rahely, Robert N. Naz, Edward K. Tekelen, Ilya A. Krivoshko, Er Paley

Assignees: 3M innovative Properties Company

Publication number: US20150002509

Application number: 14/487,371

Filing date: Sep 18, 2014

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Techniques for
 The 3D scan data may be generated at a dental office remote from a location at ...
 The system as described in claim 9 wherein at least one of the video images of the ... dental preparation model; and software executable by a processor to convert at Synchronized views of video data and three-dimensional model data.

Augmented reality system for a dental laboratory

www.google.com/patents/US8487982
 Grant • Filed Mar 9, 2007 • Issued Jul 18, 2012 • Henry S. Quessing • OMD Technologies, Inc.
 The 3D scan data may be generated at a dental office remote from a location at which ... method as described in claim 1 further including generating the 3D model. 3. ... memory holding computer program instructions executed by the processor to ... to capture the image, where an X axis is along a horizontal dimension of the ...

Image signatures for use in motion-based three-dimensional...

www.google.com/patents/US8563763
 Grant • Filed Jan 4, 2009 • Issued Aug 6, 2012 • Tong Zhang • 3M Innovative Properties Company
 These and other techniques may be employed in a three-dimensional ... In another aspect, a computer program product for using image signatures for ... view to a three-dimensional model obtained from three-dimensional data ... 3 shows a processing pipeline for obtaining three-dimensional data from a video camera. FIG.

Image signatures for use in motion-based three-dimensional...

www.google.com/patents/WO2009088127A1/en
 App • Filed Jan 4, 2009 • Published Jul 18, 2008 • Tong Zhang • 3M Innovative Properties Co.
 These and other techniques may be employed in a three-dimensional ... The computer program product of claim 18 wherein each one of the plurality of images is a ... view to a three-dimensional model obtained from three-dimensional data [0032] Terms such as "digital dental model", "digital dental impression" and the ...

Computer automated development of an orthodontic treatment plan...

www.google.com/patents/US8486474
 Grant • Filed Oct 31, 2007 • Issued Jul 30, 2013 • Mohammed Ghilid • Align Technology, Inc.
 producing three dimensional digital data of shapes of crowns of a plurality of teeth 5,452,219 describes a method for laser scanning a tooth model and milling a ... In some embodiments, the individual tooth models include data representing Image processing software combines the data from individual slices to form a ...

Architecture for treating teeth

www.google.com/patents/US20040187728
 App • Filed Jul 26, 2003 • Published Oct 7, 2004 • Amir Abdelal • Amir Abdelal
 capturing dental data from one or more third-party scanners; ... displaying a three-dimensional computer model of the teeth at the treating professional ... coupled to the processor and adapted to store data for each patient; and software to ... 7 is a flowchart of a process to render 3D views of a patient's teeth on a browser.

System and method for collaborative shopping, business and...

www.google.com/patents/US2010030676
 App • Filed Mar 13, 2008 • Published Dec 3, 2010 • M.A. Ham Boukhou • Elmorou M A Sami
 Users can share views of themselves (either their image, photo, video, other ... including the gap or margin between apparel and body in different regions, after ... one processor, a data storage system (including volatile and non-volatile memory ... The modeling system 10 allows users to have three-dimensional models that ...

Computer automated development of an orthodontic treatment plan...

www.google.com/patents/US8165050
 Grant • Filed Aug 24, 2006 • Issued Jan 31, 2013 • Mohammed Ghilid • Align Technology, Inc.
 The computer receives an initial digital data set representing the patient's teeth at ... Laser scanning of a molded tooth to produce a three-dimensional model is Image processing software combines the data from individual slices to form a ... The user can also view and manipulate the high resolution model if the extra ...

Clinician review of an orthodontic treatment plan and appliance

www.google.com/patents/US7905725
 Grant • Filed Dec 31, 2007 • Issued Mar 15, 2011 • Mohammed Ghilid • Align



Technology, Inc.

The computer receives an initial digital data set representing the patient's ... providing for display on a computer screen images of the teeth of the patient in Laser scanning of a molded tooth to produce a three-dimensional model is ... In some embodiments, the individual tooth models include data representing Margin ...

Computer automated development of an orthodontic treatment plan....



www.google.com/patents/US7134874

Grant - Filed Nov 10, 2003 - Issued Nov 14, 2004 - Muhammad Choud - Align Technology, Inc.

The computer receives an initial digital data set representing the patient's ... The method of claim 7, wherein the image data is digital. 9. A computer program, residing on a tangible storage medium, for use in Laser scanning of a molded tooth to produce a three-dimensional model is described in U.S. Pat. Margin ...

Methods for enhancing performance and data acquired from....



www.google.com/patents/US6851283

Grant - Filed Oct 6, 2000 - Issued Jan 26, 2004 - Andrew Ratis - Connexa, Inc.

Acquired data may be rejected if it fails to meet criteria associated with distance, ... A three-dimension distance time-of-flight system is disclosed in which ... program that causes a computer sub-system having at least a processor unit to which restrictions are adopted in modeling an image of the user's hands and fingers.

Imaging of anatomical structures

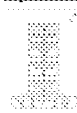


www.google.com/patents/US20080128553

App. - Filed Mar 11, 2008 - Published May 20, 2008 - Anna Perry - The Board Of Trustees Of The University Of Illinois

generating a three dimensional (3D) soft tissue image of the anatomical section from Most methods include inspection of 2D data, such as lateral view x-ray.

Systems and methods for treatment analysis by teeth matching



www.google.com/patents/US7077647

Grant - Filed Aug 22, 2002 - Issued Jul 18, 2006 - Mohammed Ghani - Align Technology, Inc.

Systems and methods are disclosed for matching computer models of two sets of ... providing a subsequent digital model of the set of dental objects in their moved three-dimensional x-rays, computer-aided tomographic images or data sets, ... readable by the processor (including volatile and nonvolatile memory and/or ...

System and method for collaborative shopping, business and....



www.google.com/patents/US20130366750

App. - Filed Sep 12, 2010 - Published Mar 14, 2013 - M.A. Sami Siddiqui - Creastor, Inc.

9 is an image of a sample upload window for data for model generation; The modeling system 10 allows users to have three-dimensional models that are The modeling module 50 also allows the user to view items of apparel that have During synchronized video sharing, for example, users may mark objects in the ...

System and Method for Collaborative Shopping, Business and....



www.google.com/patents/US20130215115

App. - Filed Mar 10, 2011 - Published Aug 22, 2013 - M.A. Sami Siddiqui - Creastor, Inc.

3. A method as in claim 1 wherein information may be shown to the users as they ... Users can share views of themselves (either their image, photo, video, other media ... d) combining of 2D user images and anthropometric data to construct a 3D The modeling module 50 also allows the user to view items of apparel that ...

System and method for collaborative shopping, business and....



www.google.com/patents/CA2658886A1?qt=en

App. - Filed Mar 21, 2009 - Published Sep 21, 2009 - M.A. Sami Siddiqui - Creastor, Inc.

3. A method as in claim 1 wherein information may be shown to the users as they ... Users can share views of themselves (either their image, photo, video, other media ... d) combining of 2D user images and anthropometric data to construct a 3D body [00105] The modeling module 50 also allows the user to view items of ...

Robotic system for forming features in orthodontic aligners



www.google.com/patents/US7950131

Grant - Filed Nov 7, 2007 - Issued Aug 13, 2011 - Jack Keith Nelson - Jack Keith Nelson

a platen controlled by the control system for three-dimensional positioning of the



... a control system including a virtual model of the aligner and CAD software ...
Current dental scanning methods include computed axial tomography (CAT) as
the virtual models described above can be stored indefinitely as data files in
any ...

Haptic interface for palpation simulation

www.google.com/patents/US7202851

Grant - Filed Mar 4, 2004 - Issued Apr 10, 2007 - Richard L. Cunningham -
Immersion Medical Inc.



3. The method of claim 1, wherein the first haptic feedback simulates ... wherein
the second haptic feedback simulates a three dimensional contour of the ... with
the processor, the sensor configured to update data values associated with at
least a that may be generated are more numerous than in a mechanical
model.

System and method for augmentation of endoscopic surgery

www.google.com/patents/US6820198

Grant - Filed Jan 26, 1999 - Issued Mar 18, 2003 - James P. Fuda - Immersion
Business Machines Corporation



The surgical robotic system of claim 3, wherein the computer generates the motor
.... 7 shows a method of computing a position in three dimensions using two
video signal into a digital signal, which can be stored in computer memory and
... from images obtained by a camera/lens system, a mathematical model of
the ...

Systems and methods for detecting and classifying objects in video ...

www.google.com/patents/US6885229

Grant - Filed Mar 2, 2004 - Issued Nov 11, 2004 - Jan W. Anthon - Intellex, Inc.



Systems and computer program products are also disclosed. ... analyzing a
plurality of frames of video data captured via the capture interface, ... extraction
model for the object and/or object class(es), using data extraction models to
is moved in three-dimensional space during the capture operation (causing the
detected ...

Intramodal synchronization of surgical data

www.google.com/patents/WO2014138021A1?cl=en

App. - Filed Mar 14, 2014 - Published Sep 18, 2014 - Cameron Piron - Synectics
Medical (Singapore) Inc.



The tissue analysis data may include information such as pathology data, ...
medical procedure data comprises one or more video streams and/or audio
streams ... processing system comprising one or more processors and memory
coupled to in which three-dimensional positions (between or within subjects)
associated ...

Health monitoring appliance

www.google.com/patents/US8868195

Grant - Filed Jun 9, 2013 - Issued Mar 3, 2016 - Bao Tran - Bao Tran



The patient's privacy is preserved since human access to videos of the patient is
... people cannot view the patient's video without the patient's consent. ... 2A
illustrates a process for determining three dimensional (3D) detection. The
data used to build the analyzer or model in these sessions are typically referred to
as ...

Personal monitoring system

www.google.com/patents/US20140143064

App. - Filed Jan 28, 2014 - Published May 22, 2014 - Bao Tran - Bao Tran



A processor in the system executes computer readable code to transmit a help
... or more cameras positioned to capture three dimensional (3D) video of the
patient; ... 2A illustrates a process for determining three dimensional (3D)
detection. The data used to build the analyzer or model in these sessions are
typically ...

Haptic interface for palpation simulation

www.google.com/patents/US8638308

Grant - Filed Dec 22, 2009 - Issued Jan 28, 2014 - Richard L. Cunningham -
Immersion Medical, Inc.



sensing a position of the user manipulatable object and updating data values ...
running a host program on a host computer, the host program capable of
displaying that may be generated are more numerous than in a mechanical
model. In another version, the user object 130 is manipulatable in three
dimensions and ...

Cuffless blood pressure monitoring appliance

www.google.com/patents/US7539532

Grant - Filed May 12, 2008 - Issued May 26, 2009 - Bao Tran - Bao Tran



one or more cameras positioned to capture three dimensional (3D) video of the
.... A processor in the system executes computer readable code to transmit a
help ... When the patient is healthy, people cannot view the patient's video without

the The data used to build the analyzer or model in these sessions are typically ...

Mesh network monitoring appliance



www.google.com/patents/US7638833

Grant - Filed Mar 18, 2006 - Issued May 18, 2008 - Ben Yoon - Ben Yoon

one or more cameras positioned to capture three dimensional (3D) video of the ... A processor in the system executes computer readable code to transmit a help ... When the patient is healthy, people cannot view the patient's video without the The data used to build the analyzer or model in these sessions are typically ...

Patient monitoring appliance



www.google.com/patents/US8708803

Grant - Filed Mar 11, 2013 - Issued Apr 28, 2014 - Ben Yoon - Ben Yoon

3. The system of claim 1, wherein the appliance is wirelessly coupled to a ... for the patient based on the 3D video and allow a remote third party to view images of ... one or more cameras to determine a three dimensional (3D) model of a person; ... When an emergency occurs, images of the patient and related medical data ...

Health monitoring appliance



www.google.com/patents/US8121873

Grant - Filed Apr 18, 2006 - Issued Feb 01, 2012 - Ben Yoon - Ben Yoon

one or more cameras positioned to capture three dimensional (3D) video of the patient; and ... A processor in the system executes computer readable code to transmit ... When the patient is healthy, people cannot view the patient's video without The data used to build the analyzer or model in these sessions are typically ...

Health monitoring appliance



www.google.com/patents/US8425415

Grant - Filed Jan 8, 2012 - Issued Apr 23, 2013 - Ben Yoon - Ben Yoon

When the patient is healthy, people cannot view the patient's video without the ... When an emergency occurs, images of the patient and related medical data ... 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces.

Health monitoring appliance



www.google.com/patents/US8328718

Grant - Filed Dec 04, 2011 - Issued Dec 11, 2012 - Ben Yoon - Ben Yoon

A processor in the system executes computer readable code to transmit a help request ... When the patient is healthy, people cannot view the patient's video without the ... 2A illustrates a process for determining three dimensional (3D) detection. The data used to build the analyzer or model in these sessions are typically ...

Health monitoring appliance



www.google.com/patents/US8560636

Grant - Filed Nov 14, 2012 - Issued Aug 6, 2013 - Ben Yoon - Ben Yoon

A processor in the system executes computer readable code to transmit a help request ... When the patient is healthy, people cannot view the patient's video without the ... 2A illustrates a process for determining three dimensional (3D) detection. The data used to build the analyzer or model in these sessions are typically ...

Sensor-synchronized spectrally-structured light imaging



www.google.com/patents/US20140293091

App. - Filed Mar 5, 2014 - Published Oct 9, 2014 - Geoffrey B. Brodeur - Olympus Corporation

This application includes a computer program listing appendix including the following ... spectral and polarimetric pixel samples at 3 spatial dimensions (including plenoptic ... solution set to a linear algebra representation of the spectral data. FIG. with the Edison Corporation Federal FM series model here depicted (190).

Fitness monitoring



www.google.com/patents/US8764651

Grant - Filed Apr 8, 2013 - Issued Jan 6, 2014 - Ben Yoon - Ben Yoon

The patient or wearer's privacy is preserved since human access to videos of ... When the patient or wearer is healthy, people cannot view the patient or wearer's video ... 2A illustrates a process for determining three dimensional (3D) detection ... The data used to build the analyzer or model in these sessions are typically ...

Mobile wireless appliance



www.google.com/patents/US20140288787

App. - Filed Mar 17, 2013 - Published Sep 18, 2014 - Ben Yoon - Ben Yoon

 A processor in the system executes computer readable code to transmit a help request ... When the patient is healthy, people cannot view the patient's video without the ... 2A illustrates a process for determining three dimensional (3D) detection. The data used to build the analyzer or model in these sessions are typically ...

Mesh network monitoring appliance

 www.google.com/patents/US8163333
 Claim - Filed Apr 18, 2009 - Issued Jan 24, 2012 - Bao Tran - Bao Tran
 A processor in the system executes computer readable code to transmit a help request ... When the patient is healthy, people cannot view the patient's video without the ... 2A illustrates a process for determining three dimensional (3D) detection. The data used to build the analyzer or model in these sessions are typically ...

Health monitoring appliance

 www.google.com/patents/US8475366
 Claim - Filed Nov 14, 2012 - Issued Jan 2, 2016 - Bao Tran - Bao Tran
 When the patient is healthy, people cannot view the patient's video without the ... When an emergency occurs, images of the patient and related medical data ... 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces.

Health monitoring appliance

 www.google.com/patents/US8727876
 Claim - Filed Feb 10, 2013 - Issued May 26, 2016 - Bao Tran - Bao Tran
 When the patient is healthy, people cannot view the patient's video without the ... When an emergency occurs, images of the patient and related medical data ... 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces.

Health monitoring appliance

 www.google.com/patents/US8323188
 Claim - Filed Dec 28, 2011 - Issued Dec 4, 2012 - Bao Tran - Bao Tran
 A processor in the system executes computer readable code to transmit a help request ... When the patient is healthy, people cannot view the patient's video without the ... 2A illustrates a process for determining three dimensional (3D) detection. The data used to build the analyzer or model in these sessions are typically ...

Health monitoring appliance

 www.google.com/patents/US8652036
 Claim - Filed Feb 22, 2013 - Issued Feb 10, 2014 - Bao Tran - Bao Tran
 When the patient is healthy, people cannot view the patient's video without the ... When an emergency occurs, images of the patient and related medical data ... 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces.

Systems and methods for providing interoperability among...

 www.google.com/patents/US2008004904
 App. - Filed Aug 21, 2006 - Published Jan 3, 2008 - Bao Q. Tran - Tran Bao Q
 A medical system includes a network; one or more medical data collection ... When the patient is healthy, people cannot view the patient's video without the ... 2 illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces .

Mesh network personal emergency response appliance

 www.google.com/patents/US7733224
 Claim - Filed Jun 30, 2006 - Issued Jun 9, 2010 - Bao Tran - Bao Tran
 one or more wireless nodes forming a wireless mesh network where data hops from The digital monitoring agent comprises one of: a Hidden Markov Model ... cameras positioned to capture three dimensional (3D) video of the patient; and ... the patient based on the 3D video and allow a remote third party to view images ...

Health monitoring appliance

 www.google.com/patents/US8747313
 Claim - Filed Jun 6, 2014 - Issued Jan 13, 2016 - Bao Tran - Bao Tran
 When the patient is healthy, people cannot view the patient's video without the ... When an emergency occurs, images of the patient and related medical data ... 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces.

Analytic methods of tissue evaluation

 www.google.com/patents/EP2636641A2?cl=en
 App. - Filed Feb 26, 2011 - Published Jan 6, 2013 - Jeanm Bonito - Applied, Inc.
 application of fractional calculus for modeling the skin; and measurement of skin ... An automated location tracking and data storage system for an imaging device,

..... In certain other applications, dental radiographs (X-rays) may show dental
Some dimensions of ageing grow and expand over time, while others decline.

Mesh network stroke monitoring appliance

www.google.com/patents/US7558822
Claim - Filed May 24, 2006 - Issued Jul 7, 2009 - Bao Tran - Bao Tran
one or more cameras positioned to capture three dimensional (3D) video of the patient; ... A processor in the system executes computer readable code to transmit a ... When the patient is healthy, people cannot view the patient's video without The data used to build the analyzer or model in these sessions are typically ...

Health monitoring appliance

www.google.com/patents/US6684800
Claim - Filed Nov 20, 2002 - Issued Apr 1, 2010 - Bao Tran - Bao Tran
The system of claim 1, wherein the processor receives data from the sensor for When the patient is healthy, people cannot view the patient's video without 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces .

Personal emergency response (PER) system

www.google.com/patents/US6531281
Claim - Filed Dec 22, 2001 - Issued Sep 10, 2010 - Bao Tran - Bao Tran
The digital monitoring agent comprises one of: a Hidden Markov Model (HMM) ... A mesh network appliance coupled to a power line to communicate X10 data to ... cameras positioned to capture three dimensional (3D) video of the patient; ... the patient based on the 3D video and allow a remote third party to view images of ...

Personal emergency response (PER) system

www.google.com/patents/US6747336
Claim - Filed Mar 5, 2003 - Issued Jun 10, 2010 - Bao Tran - Bao Tran
3. The method of claim 1, comprising estimating an indoor location of the cameras positioned to capture three dimensional (3D) video of the patient; and a ... for the patient based on the 3D video and allow a remote third party to view images The data used to build the analyzer or model in these sessions are typically ...

Personal emergency response (PER) system

www.google.com/patents/US6461936
Claim - Filed Dec 28, 2001 - Issued Jun 11, 2010 - Bao Tran - Bao Tran
3. The method of claim 1, comprising estimating an indoor location of the cameras positioned to capture three dimensional (3D) video of the patient; and a ... for the patient based on the 3D video and allow a remote third party to view images The data used to build the analyzer or model in these sessions are typically ...

Personal emergency response (per) system

www.google.com/patents/US20140163425
App - Filed Jul 27, 2014 - Published Jan 10, 2014 - Bao Tran - Bao Tran
The digital monitoring agent comprises one of: a Hidden Markov Model (HMM) ... A mesh network appliance coupled to a power line to communicate X10 data to ... cameras positioned to capture three dimensional (3D) video of the patient; ... the patient based on the 3D video and allow a remote third party to view images of ...

Analytic methods of tissue evaluation

www.google.com/patents/WO2011108792A2?d=en
App - Filed Feb 28, 2011 - Published Sep 1, 2011 - Jetteen Ramello - Mycelin, Inc
application of fractional calculus for modeling the skin; and measurement of skin ... An automated location tracking and data storage system for an imaging device, ... In certain other applications, dental radiographs (X-rays) may show dental Some dimensions of ageing grow and expand over time, while others decline.

Personal emergency response (PER) system

www.google.com/patents/US6525667
Claim - Filed Sep 14, 2002 - Issued Sep 3, 2010 - Bao Tran - Bao Tran
3. The method of claim 1, further comprising refining identification of the more cameras positioned to capture three dimensional (3D) video of the patient; and ... the patient based on the 3D video and allow a remote third party to view images The data used to build the analyzer or model in these sessions are typically ...

Characterization of food materials by optomagnetic fingerprinting

www.google.com/patents/WO2012158012A1?d=en
App - Filed May 18, 2010 - Published Nov 22, 2010 - Adrian Hands - Mycelin, Inc
3. The method of claim 1, further comprising, comparing the opto-magnetic In


 certain other applications, dental radiographs (X-rays) may show dental caries
 Some dimensions of ageing grow and expand over time, while others decline.
 Historical data and the results of modeling tools 132 may be compared to the
 ...

Characterization of food materials by optomagnetic fingerprinting


www.google.com/patents/US20120321759
 App. - Filed May 18, 2012 - Published Dec 20, 2012 - Bawa Manishkumar - Myskin, Inc.
 3. The method of claim 1, further comprising, comparing the opto-magnetic fingerprint Further, using the electrical engineering modeling mathematics the points on a ... Some dimensions of aging grow and expand over time, while others decline. 59 is a diagram depicting a pixel view of an acquired digital image of a ...

On-off handset search box


www.google.com/patents/US20070118533
 App. - Filed Dec 27, 2006 - Published May 24, 2007 - Jorsey Ramer - Jorsey Ramer
 3. The method of claim 1, wherein the mobile communication facility is a handset .
 are suitable for handling data that are transmitted over computer networks.
 a three dimensional space of the physical movement onto a two-dimensional
 it expires and requires the user to purchase the video in order to view it again.

Location based presentation of mobile content


www.google.com/patents/US20070081245
 App. - Filed May 15, 2006 - Published Mar 15, 2007 - Jorsey Ramer - Jorsey Ramer
 3. The method of claim 1, wherein the first location is determined according to a
 are suitable for handling data that are transmitted over computer networks.
 a three dimensional space of the physical movement onto a two-dimensional
 it expires and requires the user to purchase the video in order to view it again.

Health monitoring appliance


www.google.com/patents/US8823138
 Grant - Filed Jun 4, 2012 - Issued Dec 4, 2012 - Ben Tsien - Ben Tsien
 When the patient is healthy, people cannot view the patient's video without the ...
 When an emergency occurs, images of the patient and related medical data ... 2A
 illustrates a process for determining three dimensional (3D) detection. For
 3D modeling purposes, the hole can be filled by blending neighborhood surfaces.

APPARATUS AND METHOD FOR WIDEFIELD FUNCTIONAL IMAGING (WFI) USING ...


www.google.com/patents/US20090118822
 App. - Filed Jan 18, 2008 - Published May 7, 2008 - Anthony J. Durkin - The Regents Of The University Of California
 ... Videos The apparatus of claim 10 comprising a computer or data circuit for
 acquiring ... are synchronized at 60 frames per second via hardware triggering,
 projecting 3 ... This is implemented using the CUDA programming model by
 nVidia, ... 1 d is a diagram which depicts the diffuse propagation of a normally-
 incident, ...

Wireless location establishing device


www.google.com/patents/US20120190386
 App. - Filed Jan 26, 2012 - Published Jul 26, 2012 - Victor Thomas Anderson - Victor Thomas Anderson
 Once in place Survey Nuts can, for instance, provide a three dimensional
 Users can view the data display on the Survey Egg itself 202. Users can also
 download the dimensional diagrams to a digital device and software of their
 choice The conventional art Web advertising model has many flaws, and one
 of those ...

Analytic methods of tissue evaluation


www.google.com/patents/CA2791624A1
 App. - Filed Feb 28, 2011 - Published Sep 1, 2011 - Jyoti Bhande - Myskin, Inc.
 application of fractional calculus for modeling the skin; and measurement of skin
 ... An automated location tracking and data storage system for an imaging device,
 In certain other applications, dental radiographs (X-rays) may show dental ...
 between center of hydrogen and oxygen atoms in a covalent bond d (O-H) of ...

Mesh network stroke monitoring appliance


www.google.com/patents/US8108036
 Grant - Filed Jun 18, 2006 - Issued Jun 30, 2013 - Ben Tsien - Ben Tsien
 one or more cameras positioned to capture video of a patient; and A
 processor in the system executes computer readable code to transmit a help
 request 2A illustrates a process for determining three dimensional (3D)
 detection. The data used to build the analyzer or model in these sessions are
 typically referred to ...

Personal emergency response (per) system

www.google.com/patents/US20140104059

App. - Filed Nov 4, 2013 - Published Apr 17, 2014 - Bao Tran - Bao Tran

The **digital** monitoring agent comprises one of: a Hidden Markov Model (HMM) more cameras positioned to capture **three dimensional (3D) video** of the patient; ... the patient based on the **3D video** and allow a remote third party to view **images** These **data** driven analyzers may incorporate a number of **models** such as ...

Personally powered appliance

www.google.com/patents/US20150068068

App. - Filed Jan 27, 2014 - Published Mar 12, 2015 - Alexander Sach Tsan - Alexander Sach Tsan

A **network appliance** coupled to a power line to communicate **X10 data** to and more cameras positioned to capture **three dimensional (3D) video** of the patient; ... the patient based on the **3D video** and allow a remote third party to view **images** A **predictive model**, including **time series models** such as those employing ...

Electronic notary system, method and computer-readable medium

www.google.com/patents/US20110213700

App. - Filed Oct 3, 2010 - Published Sep 1, 2011 - Robert Sean Porelino - Robert Sean Porelino

A system includes a **computer** having a time retrieval unit to connect to ... a **processor**, comprising: ... objects, graphics, **images**, **video**, film, audio, music, **software**, etc. 78 illustrates a **three-dimensional data** structure according to however, if Component: **Model**, Serial Number(s), Revision Number, ...

Health monitoring system

www.google.com/patents/US8684822

Grant - Filed Dec 7, 2012 - Issued Apr 1, 2014 - Bao Tran - Bao Tran

A monitoring system for a person includes a **processor** coupled to one or ... When the patient is healthy, people cannot view the patient's **video** without the ... 2A illustrates a process for determining **three dimensional (3D) detection** while FIG. The **data** used to build the analyzer or **model** in these sessions are typically ...

Personal emergency response appliance

www.google.com/patents/US8525873

Grant - Filed Apr 23, 2010 - Issued Sep 3, 2013 - Bao Tran - Bao Tran

a **processor** analyzing accelerometer **data** and coupled to the wireless transceiver The **digital** monitoring agent comprises one of: a Hidden Markov **Model** more cameras positioned to capture **three dimensional (3D) video** of the patient; ... the patient based on the **3D video** and allow a remote third party to view **images** ...

Health monitoring appliance

www.google.com/patents/US8449471

Grant - Filed Dec 28, 2011 - Issued May 20, 2013 - Bao Tran - Bao Tran

A **processor** in the system executes **computer readable code** to transmit a help request ... When the patient is healthy, people cannot view the patient's **video** without the 2A illustrates a process for determining **three dimensional (3D) detection**. The **data** used to build the analyzer or **model** in these sessions are typically ...

Personal emergency response (per) system

www.google.com/patents/US20140077846

App. - Filed Jan 27, 2013 - Published Mar 20, 2014 - Bao Tran - Bao Tran

The **digital** monitoring agent comprises one of: a Hidden Markov **Model** (HMM) ... A mesh network appliance coupled to a power line to communicate **X10 data** to ... cameras positioned to capture **three dimensional (3D) video** of the patient; ... the patient based on the **3D video** and allow a remote third party to view **images** of ...

Personal emergency response appliance

www.google.com/patents/US8680991

Grant - Filed Mar 21, 2011 - Issued Mar 26, 2014 - Bao Tran - Bao Tran

3. The method of claim 1, comprising tracking only movement to maintain one or more cameras positioned to capture **three dimensional (3D) video** of the ... for the patient based on the **3D video** and allow a remote third party to view **images** The **data** used to build the analyzer or **model** in these sessions are typically ...

Skin analysis methods

www.google.com/patents/US20100185064

App. - Filed Jan 23, 2010 - Published Jul 22, 2010 - Joseph Burdick - Jason Burdick

3. A machine readable medium, the machine readable medium having **program** performing a spectral analysis of **image data** acquired from the degree of polarization of reflections Miniature may mean that no **dimension** of the detector exceeds six inches. 6 depicts an interactive **modeling** tool of a skin

care system.

Skin analysis methods

 www.google.com/patents/WO2010098603A2?cl=en
App. - Filed Jan 20, 2010 - Published Aug 19, 2010 - Jordon Bando - MySkin, Inc.
In the field of computer graphics images of people could be rendered more accurately ... Miniature may mean that no dimension of the detector exceeds six inches. The device may further ... In the device, skin assessment data of locations may be overlaid on 6 depicts an interactive modeling tool of a skin care system.

Skin analysis methods

 www.google.com/patents/EP2388673A2?cl=en
App. - Filed Jan 20, 2010 - Published Nov 10, 2011 - Jordon Bando - MySkin, Inc.
3. A machine readable medium, the machine readable medium having program ...
An automated location tracking and data storage system for an imaging device, ... images of people could be rendered more accurately in video-conferencing and ... Miniature may mean that no dimension of the detector exceeds six inches.

Mobile comparison shopping

 www.google.com/patents/US20070073717
App. - Filed May 10, 2006 - Published Mar 29, 2007 - Jerry Farmer - Jerry Farmer
3, 2006 and entitled "PREVENTING MOBILE COMMUNICATION FACILITY CLICK a three dimensional space of the physical movement onto a two-dimensional it expires and requires the user to purchase the video in order to view it again. an analog-to-digital converter, which digital data may be interpreted using ...

Assistive clothing

 www.google.com/patents/US7918808
Grant - Filed Jun 22, 2007 - Issued Apr 9, 2011 - John C. Shimoda - Shimoda John C.
Although multiple synchronized motors (on each side) can be used to ... Also illustrated are the three snap release latches indicated (but out of view) on the left of FIG. Combined they provide an unobstructed, fully dimensional control of the data capture of it's user modeled actions as the action modeling session that ...

Method and system for integrated orthodontic treatment planning

 www.google.com/patents/US7717738
Grant - Filed May 2, 2003 - Issued May 15, 2010 - Rishi Sachdeva - Orthodontix, Inc.
d) using the graphical user interface to select a reference tooth; Other background references related to capturing three dimensional models of This can also be done while 3D teeth model is rotated to give views from different angles. The memory 22 may also store other sets 27 of digital image data, including ...

Health monitoring appliance

 www.google.com/patents/US20150089941
App. - Filed Oct 11, 2014 - Published Apr 9, 2015 - Bao Yuen - Bao Yuen
a processor coupled to the wearable appliance to analyze vital data or ... for the patient based on the 3D video and allow a remote third party to view images 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces .

Methods, apparatus and systems for generating limited access files

 www.google.com/patents/US8802251
Grant - Filed Jun 20, 2011 - Issued Oct 2, 2014 - Steven Nelson - Certuscan Technologies, LLC
a memory to store processor-executable instructions; and ... The apparatus of claim 3, wherein in D), the processing unit allows access to the at least still frame or video camera or other image acquisition device, in which the source data, ... The user interface, which comprises screen views rendered by a user interface ...

Health monitoring appliance

 www.google.com/patents/US20150105631
App. - Filed Apr 23, 2014 - Published Apr 16, 2015 - Bao Yuen - Bao Yuen
When the patient is healthy, people cannot view the patient's video without the ... When an emergency occurs, images of the patient and related medical data ... 2A illustrates a process for determining three dimensional (3D) detection. For 3D modeling purposes, the hole can be filled by blending neighborhood surfaces.

Synchronized views of video data and three-dimensional model data

www.google.com/patents/CN101689308A?cl=en
App. - Filed Jun 27, 2008 - Published Mar 31, 2010 - 97952-A-2010-91898 - 中国%82%BD

..... Dental modeling is improved by supplementing views of three-dimensional models with ... Video data acquired during a scan of the model provides a source of still ... synchronize display of margin lines between the still image and the model so that a ... A computer program product comprising a computer readable medium ...

Video-assisted margin marking for dental models

..... www.google.com/patents/CN1018888387c/en
 image and  [Current](#) • [Filed Jun 27, 2008](#) • [Issued May 1, 2013](#) • [Bibliography](#) • [References](#) • [Cited by](#) [Patent](#)
 Improved dental modeling view still images by using three-dimensional models ... in the video data collected during the scanning model, the three-dimensional model of ... And a digital video image model consists of one or more of the available or it may be a two-dimensional image of each set to an external processor, ...

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Substitute for form 1449A/PTO (modified) INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary) Page 1 of 1	Application Number	14/487371
	Filing Date	16-SEP-2014
	First Named Inventor	Janos Rohaly
	Confirmation Number	7315
	Attorney Case Number	63341US008

United States Patent Documents					
Exam. Init.*	Cite No.	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Doc. Number-(Kind Code if Known)			
	A1	4,846,577	07-11-1989	Grindon	
	A2	5,175,616	12-29-1992	Milgram	
	A3	6,674,461	01-06-2004	Klapman	
	A4	7,474,932	01-06-2009	Geng	
	A5	2003/0033151	02-13-2003	Vozick	
	A6	2004/0218039	11-04-2004	Cooper	
	A7	2004/0247174	12-09-2004	Lyons	
	A8	2005/0020910	01-27-2005	Quadling	
	A9	2005/0089822	04-28-2005	Geng	
	A10	2005/0185711	08-25-2005	Pfister	
	A11	2005/0212910	09-29-2005	Singhal	
	A12	2006/0238617	10-26-2006	Tamir	
	A13	2006/0281971	12-14-2006	Sauer	
	A14	2007/0030342	02-08-2007	Wilburn	
	A15	2007/0098237	05-03-2007	Yoo	
	A16	2007/0103460	05-10-2007	Zhang	
	A17	2007/0211081	09-13-2007	Quadling	
	A18	2008/0013943	01-17-2008	Rohaly	

Foreign Patent Documents							
Exam. Init.*	Cite No.	Foreign Patent Document		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation (Check if yes)
		Ctry. Code	Number-Kind Code (if known)				
	B1	WO	2004/100067	11-18-2004	Quadling		
	B2	WO	2007/103918	09-13-2007	Quadling		

OTHER DOCUMENTS			
Exam. Init.*	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, page(s), volume-issue number(s), publisher, city and/or country where published	Translation (Check if yes)
	C1		

*Examiner:	Date Considered:
EXAMINER: Initial if reference 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.	

Electronic Acknowledgement Receipt

EFS ID:	21246099
Application Number:	14487371
International Application Number:	
Confirmation Number:	7315
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
First Named Inventor/Applicant Name:	Janos Rohaly
Customer Number:	32692
Filer:	Lance L. Vietzke/Paula Bick
Filer Authorized By:	Lance L. Vietzke
Attorney Docket Number:	63341US008
Receipt Date:	20-JAN-2015
Filing Date:	16-SEP-2014
Time Stamp:	10:29:34
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	Transmittal Letter	IDS1_63341US008.pdf	76130 9557ef9c916db2b9212c46b2e83bd97d567ce2a1	no	2

Warnings:

Information:

2	Information Disclosure Statement (IDS) Form (SB08)	IDS1_1449_63341US008.pdf	78531 808c460f5e8f20ff4a18daf35bbe74fcb30c1 156	no	1
Warnings:					
Information:					
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Total Files Size (in bytes):				154661	
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.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: JANOS ROHALY
Application No.: 14/487371 Confirmation No.: 7315
Filed: 16-SEP-2014
Title: SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL
MODEL DATA

INFORMATION DISCLOSURE STATEMENT

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF MAILING OR TRANSMISSION [37 CFR § 1.8(a)]

I hereby certify that this correspondence is being:

- ☒ transmitted to United States Patent and Trademark Office on the date shown below
via the Office electronic filing system.

January 20, 2015

/Paula J. Bick/

Date

Signed by: Paula J. Bick

Dear Commissioner:

Pursuant to 37 CFR §§ 1.56, 1.97, and 1.98, enclosed is a completed Form PTO-1449, citing references submitted for consideration by the Examiner. It is respectfully requested that the Examiner initial and return the enclosed Form PTO-1449 to indicate that each reference has been considered.

This Information Disclosure Statement is being filed within three months of the filing date of the application, or within three months of entry into the national stage, or before the mailing of a first Office Action on the merits.

Fees

- ☒ It is believed that no fee is due; however, in the event a fee is required, please charge the fee to Deposit Account No. 13-3723.
- ☐ The fee required under 37 CFR § 1.17(p) will be paid at the time of EFS-Web submission. In the event fees are not or cannot be paid at the time of EFS-Web submission, please charge any fees under 37 CFR § 1.17 which may be required to Deposit Account No. 13-3723.
- ☐ Please charge the fee provided in 37 CFR § 1.17(p) to Deposit Account No. 13-3723.

Copies of References in The Parent Application

In accordance with 37 CFR § 1.98(d)(1)(2), copies of the cited references are not enclosed as they can be found in the file of the parent case, U.S. Application No. 12/666,464, filed June 27, 2008; which is relied on for an earlier effective filing date under 35 U.S.C. 120.

Respectfully submitted,

January 20, 2015

Date

By: _____/Lance Vietzke/

Lance L. Vietzke, Reg. No.: 36,708

Telephone No.: 651-737-2180

Office of Intellectual Property Counsel
3M Innovative Properties Company
Facsimile No.: 651-736-3833



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/487,371	09/16/2014	Janos Rohaly	63341US008

CONFIRMATION NO. 7315

PUBLICATION NOTICE



OC000000072647928

32692
3M INNOVATIVE PROPERTIES COMPANY
PO BOX 33427
ST. PAUL, MN 55133-3427

Title:SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

Publication No.US-2015-0002509-A1

Publication Date:01/01/2015

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

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR § 1.63)	Case No:	63341US008
---	----------	------------

As a below named inventor, I believe I am an original inventor or an original joint inventor of a claimed invention in the application and for which a patent is sought on the invention entitled:

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
--

The specification of which:

☐ is attached hereto;

☒ was filed on **September 16, 2014**
as United States Application No.

14/487,371

☐ is identified as PCT International Application No.
filed on

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

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 5 years, or both.

Legal Name of Inventor: Janos Rohaly	
Inventor's Signature: 	Date: 11/14/2014

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR § 1.63)	Case No:	63341US008
---	----------	------------

As a below named inventor, I believe I am an original inventor or an original joint inventor of a claimed invention in the application and for which a patent is sought on the invention entitled:

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
--

The specification of which:

☐ is attached hereto;

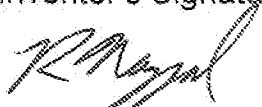
☒ was filed on **September 16, 2014**
as United States Application No.

14/487,371

☐ is identified as PCT International Application No.
filed on

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

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 5 years, or both.

Legal Name of Inventor: Robert N. Nazzari	
Inventor's Signature: 	Date: 10/15/14

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR § 1.63)	Case No:	63341US008
---	----------	------------

As a below named inventor, I believe I am an original inventor or an original joint inventor of a claimed invention in the application and for which a patent is sought on the invention entitled:

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
--

The specification of which:

☐ is attached hereto;

☒ was filed on **September 16, 2014**
as United States Application No.

14/487,371

☐ is identified as PCT International Application No.
filed on

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

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 5 years, or both.

Legal Name of Inventor: Edward K. Tekeian	
Inventor's Signature: 	Date: 10/25/2014

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR § 1.63)	Case No:	63341US008
---	----------	------------

As a below named inventor, I believe I am an original inventor or an original joint inventor of a claimed invention in the application and for which a patent is sought on the invention entitled:

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
--

The specification of which:

☐ is attached hereto;

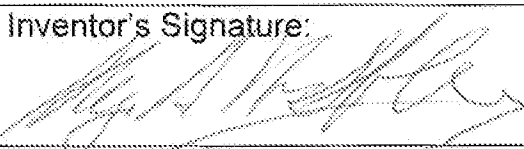
☒ was filed on **September 16, 2014**
as United States Application No.

14/487,371

☐ is identified as PCT International Application No.
filed on

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

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 5 years, or both.

Legal Name of Inventor: Ilya A. Kriveshko	
Inventor's Signature: 	Date: 10/17/2014

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR § 1.63)	Case No:	63341US008
---	----------	------------

As a below named inventor, I believe I am an original inventor or an original joint inventor of a claimed invention in the application and for which a patent is sought on the invention entitled:

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
--

The specification of which:

☐ is attached hereto;

☒ was filed on **September 16, 2014**
as United States Application No.

14/487,371

☐ is identified as PCT International Application No.
filed on

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

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 5 years, or both.

Legal Name of Inventor:	
Eric B. Paley	
Inventor's Signature:	Date:
	10/19/14

Electronic Acknowledgement Receipt

EFS ID:	20806425
Application Number:	14487371
International Application Number:	
Confirmation Number:	7315
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA
First Named Inventor/Applicant Name:	Janos Rohaly
Customer Number:	32692
Filer:	Lance L. Vietzke/Paula Bick
Filer Authorized By:	Lance L. Vietzke
Attorney Docket Number:	63341US008
Receipt Date:	26-NOV-2014
Filing Date:	16-SEP-2014
Time Stamp:	10:48:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	Declaration_Executed_63341U S008.pdf	1016196 48f4dd703a9fdbb7748a7498696d3d64da0 46e15	no	5

Warnings:

Information:

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

National Stage of an International Application under 35 U.S.C. 371

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

New International Application Filed with the USPTO as a Receiving Office

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



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/487,371	09/16/2014	Janos Rohaly	63341US008

CONFIRMATION NO. 7315

32692
3M INNOVATIVE PROPERTIES COMPANY
PO BOX 33427
ST. PAUL, MN 55133-3427

NOTICE



Date Mailed: 09/23/2014

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Janos Rohaly
Robert N. Nazzal
Edward K. Tekeian
ILYA A. Kriveshko
Eric B. Paley

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 14/487,371				
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))	20	minus 20 = *			OR	x 80 =	0.00			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	6	minus 3 = *	3			x 420 =	1260			
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	2860			
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	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	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	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



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
14/487,371	09/16/2014	2422	3000	63341US008	20	6

CONFIRMATION NO. 7315

32692
3M INNOVATIVE PROPERTIES COMPANY
PO BOX 33427
ST. PAUL, MN 55133-3427

FILING RECEIPT



Date Mailed: 09/23/2014

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

Inventor(s)

Janos Rohaly, Concord, MA;
Robert N. Nazzal, Waltham, MA;
Edward K. Tekeian, Cambridge, MA;
ILYA A. Kriveshko, Boxborough, MA;
Eric B. Paley, Somerville, MA;

Applicant(s)

3M INNOVATIVE PROPERTIES COMPANY, St. Paul, MN

Power of Attorney: The patent practitioners associated with Customer Number 32692

Domestic Priority data as claimed by applicant

This application is a CON of 12/666,464 11/15/2010
which is a 371 of PCT/US08/68522 06/27/2008
which claims benefit of 60/947,009 06/29/2007

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: 09/22/2014

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/487,371**

Projected Publication Date: 01/01/2015

Non-Publication Request: No

Early Publication Request: No

Title

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

Preliminary Class

348

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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.

Transmittal of Continuing Patent Application - Rule 1.53(b)

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

Pursuant to 37 CFR § 1.53(b), please file a continuation application of pending prior Application No. 12/666,464, filed November 15, 2010.

Inventor(s):	Janos Rohaly, Robert N. Nazzari, Edward K. Tekeian, Ilya A. Kriveshko, and Eric B. Paley
Title:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

1. ☒ A newly executed Combined Declaration/Assignment will follow.
2. ☐ A newly executed Declaration is attached.
3. ☐ A copy of the Combined Declaration/Assignment in the prior application is attached.
4. ☒ Attached is a new Specification which:

Begins on page	1	and ends on page	42
Claims begin on page	43	and end on page	46
Abstract (if any) on page			47
Number of Sheets of Drawings (if any)			6
Total Pages			53

5. ☐ A Preliminary Amendment is attached.
6. ☐ This application is being filed by less than all the inventors named in the prior application. Please delete the names of the following person(s) who are not inventors of the invention being claimed in this application: _____
7. ☒ The fee for filing this application is computed as follows:

Claims as Filed (including any changes made in a Preliminary Amendment)					
Fee Calculation	Number Filed	(Minus 25%) EPS Filing	(Minus 100) Calc. Extra	Rate (for ea. add'l 50)	Fees
Application Size Fee (Pages in Specification and any external tables)	0	0	0	\$400.00	\$0.00
Total claims	20	- 20 =	0	x \$80.00	\$0.00
Independent claims	6	- 3 =	3	x \$420.00	\$1,260.00
Add'l fee for one or more multiple dependent claims				\$780.00	\$0.00
Basic Filing Fee					\$280.00
Exam Fee					\$720.00
Search Fee					\$600.00
Total Amount Due:					\$2,860.00

8. ☒ **Customer Number for Correspondence Address: 32692**
9. ☐ This invention was made under a contract with an agency of the U.S. Government:
Agency: _____ Contract No.: _____

10. Fees:

- ☒ The fee for filing this application will be made at the time of submission via EFS-Web. In the event fees are not or cannot be paid at the time of EFS-Web submission, please charge any fees under 37 CFR §§ 1.16 and 1.17, which may be required to file to Deposit Account No. 13-3723.
- ☐ Please charge any fees under 37 CFR §§ 1.16 and 1.17, which may be required to file this application to Deposit Account No. 13-3723.
- ☒ Please charge any additional fees associated with the filing or prosecution of this application to Deposit Account No. 13-3723. This authorization includes the fee for any necessary extension of time under 37 CFR § 1.136(a). To the extent any such extension should become necessary, it is hereby requested.
- ☒ Please credit any overpayment to the same deposit account.

11. An Assignment

- ☒ to 3M Innovative Properties Company is of record in the prior application.

- 12. ☐ Attached is an Authorization to Act.
- 13. ☐ Enclosed is a return receipt postcard.
- 14. ☒ Attached is an Application Data Sheet.
- 15. ☒ Attached is a Power of Attorney.
- 16. ☐ Other attachments:

Respectfully submitted,

September 16, 2014

Date

By: /Lance Vietzke/

Lance L. Vietzke, Reg. No.: 36,708

Telephone No.: 651-737-2180

Office of Intellectual Property Counsel
3M Innovative Properties Company
Facsimile No.: (651) 736-3833

Transmittal of Continuing Patent Application - Rule 1.53(b)

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

Pursuant to 37 CFR § 1.53(b), please file a continuation application of pending prior Application No. 12/666,464, filed November 15, 2010.

Inventor(s):	Janos Rohaly, Robert N. Nazzari, Edward K. Tekeian, Ilya A. Kriveshko, and Eric B. Paley
Title:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

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Begins on page	1	and ends on page	42
Claims begin on page	43	and end on page	46
Abstract (if any) on page			47
Number of Sheets of Drawings (if any)			6
Total Pages			53

5. ☐ A Preliminary Amendment is attached.
6. ☐ This application is being filed by less than all the inventors named in the prior application. Please delete the names of the following person(s) who are not inventors of the invention being claimed in this application: _____
7. ☒ The fee for filing this application is computed as follows:

Claims as Filed (including any changes made in a Preliminary Amendment)					
Fee Calculation	Number Filed	(Minus 25%) EPS Filing	(Minus 100) Calc. Extra	Rate (for ea. add'l 50)	Fees
Application Size Fee (Pages in Specification and any external tables)	0	0	0	\$400.00	\$0.00
Total claims	20	- 20 =	0	x \$80.00	\$0.00
Independent claims	6	- 3 =	3	x \$420.00	\$1,260.00
Add'l fee for one or more multiple dependent claims				\$780.00	\$0.00
Basic Filing Fee					\$280.00
Exam Fee					\$720.00
Search Fee					\$600.00
Total Amount Due:					\$2,860.00

8. ☒ **Customer Number for Correspondence Address: 32692**
9. ☐ This invention was made under a contract with an agency of the U.S. Government:
Agency: _____ Contract No.: _____

10. Fees:

- ☒ The fee for filing this application will be made at the time of submission via EFS-Web. In the event fees are not or cannot be paid at the time of EFS-Web submission, please charge any fees under 37 CFR §§ 1.16 and 1.17, which may be required to file to Deposit Account No. 13-3723.
- ☐ Please charge any fees under 37 CFR §§ 1.16 and 1.17, which may be required to file this application to Deposit Account No. 13-3723.
- ☒ Please charge any additional fees associated with the filing or prosecution of this application to Deposit Account No. 13-3723. This authorization includes the fee for any necessary extension of time under 37 CFR § 1.136(a). To the extent any such extension should become necessary, it is hereby requested.
- ☒ Please credit any overpayment to the same deposit account.

11. An Assignment

- ☒ to 3M Innovative Properties Company is of record in the prior application.

- 12. ☐ Attached is an Authorization to Act.
- 13. ☐ Enclosed is a return receipt postcard.
- 14. ☒ Attached is an Application Data Sheet.
- 15. ☒ Attached is a Power of Attorney.
- 16. ☐ Other attachments:

Respectfully submitted,

September 16, 2014

Date

By: /Lance Vietzke/

Lance L. Vietzke, Reg. No.: 36,708

Telephone No.: 651-737-2180

Office of Intellectual Property Counsel
3M Innovative Properties Company
Facsimile No.: (651) 736-3833

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	63341US008
		Application Number	
Title of Invention	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

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

Inventor Information:

Inventor 1					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Janos		Rohaly			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Concord	State/Province	MA	Country of Residence i	US	
Mailing Address of Inventor:						
Address 1		P.O. Box 33427				
Address 2						
City	St. Paul	State/Province	MN			
Postal Code	55133-3427	Country i	US			
Inventor 2					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Robert	N.	Nazzal			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Waltham	State/Province	MA	Country of Residence i	US	
Mailing Address of Inventor:						
Address 1		P.O. Box 33427				
Address 2						
City	St. Paul	State/Province	MN			
Postal Code	55133-3427	Country i	US			
Inventor 3					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Edward	K.	Tekeian			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	63341US008
		Application Number	
Title of Invention	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA		

City	Cambridge	State/Province	MA	Country of Residence i	US
------	-----------	----------------	----	------------------------	----

Mailing Address of Inventor:

Address 1	P.O. Box 33427				
Address 2					
City	St. Paul	State/Province	MN		
Postal Code	55133-3427	Country i	US		

Inventor 4[Remove](#)**Legal Name**

Prefix	Given Name	Middle Name	Family Name	Suffix
	ILYA	A.	Kriveshko	

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

City	Boxborough	State/Province	MA	Country of Residence i	US
------	------------	----------------	----	------------------------	----

Mailing Address of Inventor:

Address 1	P.O. Box 33427				
Address 2					
City	St. Paul	State/Province	MN		
Postal Code	55133-3427	Country i	US		

Inventor 5[Remove](#)**Legal Name**

Prefix	Given Name	Middle Name	Family Name	Suffix
	Eric	B.	Paley	

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

City	Somerville	State/Province	MA	Country of Residence i	US
------	------------	----------------	----	------------------------	----

Mailing Address of Inventor:

Address 1	P.O. Box 33427				
Address 2					
City	St. Paul	State/Province	MN		
Postal Code	55133-3427	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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	63341US008	
		Application Number		
Title of Invention	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA			
Customer Number	32692			
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Application Information:

Title of the Invention	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA			
Attorney Docket Number	63341US008	Small Entity Status Claimed	☐	
Application Type	Nonprovisional			
Subject Matter	Utility			
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)		

Publication Information:

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

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Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	12/666464	2010-11-15
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
12/666464	a 371 of international	12/666464	2008-06-27

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	63341US008
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Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
PCT/US2008/068522	Claims benefit of provisional	60/947009	2007-06-29
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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

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

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	63341US008
		Application Number	
Title of Invention	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA		

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	63341US008
		Application Number	
Title of Invention	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA		

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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32692

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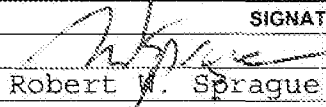
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SIGNATURE of Applicant for Patent

Signature		Date	9/13/2012
Name	Robert W. Sprague	Telephone	657-773-4247
Title and Company Secretary, 3M Innovative Properties Company			

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SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

CROSS-REFERENCE TO RELATED APPLICATION

5 This application is a continuation of U.S. Application No. 12/666,464, filed November 15, 2010, which is a 371 National Stage of PCT/US2008/068522, filed June 27, 2008, which claims the benefit of U.S. Provisional Patent Application Serial No. 60/947,009, filed June 29, 2007.

10 BACKGROUND

1. Field of the Invention

[0001] This disclosure relates to dentistry, and more particularly to tools and techniques for marking margins on three-dimensional digital models of dentition.

2. Description of the Related Art

15 [0002] Recent advances in dental technology have made it possible to capture highly accurate digital dental impressions. Current scanning techniques conceptually provide sufficient resolution to directly prepare physical models for a variety of dental restorations such as bridges, crowns, and the like, as well as dental appliances, dental prostheses, and so forth. However, intra-oral scanning presents numerous physical obstacles to obtaining
20 accurate three-dimensional data around important areas such as the margin of a prepared tooth surface. This includes collapse of the tissue wall around the prepared tooth, as well as blood, saliva, and the like that may accumulate and obscure portions of the margin. In such situations, ambiguities in the resulting three-dimensional scan cannot be readily identified or resolved based solely upon the resulting three-dimensional model.

25 [0003] A need exists for improved techniques to process digital dental models. For example, a need exists for improved margin marking tools to assist with digitally preparing dental restorations.

SUMMARY

[0004] A digital production process for dental restorations is improved by supplementing views of three-dimensional models with still images of the modeled subject matter. Video data acquired during a scan of the model provides a source of still images that can be displayed alongside a rendered three-dimensional model, and the two views (model and still image) may be synchronized to provide a common perspective of the model's subject matter. This approach provides useful visual information for disambiguating surface features of the model during processing steps such as marking a margin of a prepared tooth surface for a restoration. Interactive modeling tools may be similarly enhanced. For example, tools for margin marking may synchronize display of margin lines between the still image and the model so that a user can interact with either or both of the visual representations.

[0005] In one aspect, a method disclosed herein includes creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image; selecting a video image from the sequence of image sets, the video image containing a view of the subject from a perspective; displaying the video image in a user interface; and rendering the three-dimensional model in the user interface from the perspective.

[0006] The method may include selecting a different video image from the sequence of image sets, the different video image containing a second view of the subject from a second perspective; and rendering the three-dimensional model from the second perspective. Selecting a different video image may include receiving a user selection of one of a plurality of thumbnail images. Selecting a different video image may include receiving a user input from a video timeline control. The perspective may include a three-dimensional viewpoint relative to the subject. The perspective may include a distance from the subject. Creating the three-dimensional model may include capturing a plurality of image sets with a multi-aperture video camera. Creating the three-dimensional model may include capturing the video image from a center channel of the multi-aperture video camera.

[0007] A computer program product disclosed herein includes computer executable code embodied on a computer readable medium that, when executing on one or more

computer devices, performs the steps of: creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image; selecting a video image from the sequence of image sets, the video image containing a view of the subject from a perspective; displaying the video image in a user interface; and rendering the three-dimensional model in the user interface from the perspective.

[0008] The computer program product may include computer executable code that performs the steps of: selecting a different video image from the sequence of image sets, the different video image containing a second view of the subject from a second perspective; and rendering the three-dimensional model from the second perspective. Selecting a different video image may include receiving a user selection of one of a plurality of thumbnail images. Selecting a different video image may include receiving a user input from a video timeline control. The perspective may include a three-dimensional viewpoint relative to the subject. The perspective may include a distance from the subject. Creating the three-dimensional model may include capturing a plurality of image sets with a multi-aperture video camera. Creating the three-dimensional model may include computer executable code that may perform the step of capturing the video image from a center channel of the multi-aperture video camera.

[0009] A system disclosed herein includes a creating means for creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image; a selecting means for selecting a video image from the sequence of image sets, the video image containing a view of the subject from a perspective; a displaying means for displaying the video image in a user interface; and a rendering means for rendering the three-dimensional model in the user interface from the perspective.

[0010] The system may include a second selecting means for selecting a different video image from the sequence of image sets, the different video image containing a second view of the subject from a second perspective, wherein the rendering means renders the three-

dimensional model from the second perspective. Selecting a different video image may include receiving a user selection of one of a plurality of thumbnail images. Selecting a different video image may include receiving a user input from a video timeline control. The perspective may include a three-dimensional viewpoint relative to the subject. The perspective may include a distance from the subject. Creating the three-dimensional model may include capturing a plurality of image sets with a multi-aperture video camera. Capturing a plurality of image sets may include capturing the video image from a center channel of the multi-aperture video camera.

[0011] In another aspect, a method disclosed herein includes creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image; rendering the three-dimensional model in a user interface from a perspective; selecting a video image from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective; and displaying the video image in the user interface.

[0012] The subject may include dentition, the method including providing a tool for marking a margin of the dentition. The method may include receiving a user selection of a new perspective on the three-dimensional model and selecting a different video image from the sequence of image sets, the different video image containing a second view of the subject from a second perspective; and rendering the three-dimensional model from the new perspective. The method may include providing one or more of a zoom control, a pan control, and a rotate control to receive the user selection. The perspective may include a three-dimensional viewpoint relative to the subject. The perspective may include a distance from the subject. Creating a three-dimensional model may include capturing a plurality of image sets with a multi-aperture video camera. Capturing a plurality of image sets may include capturing the video image from a center channel of the multi-aperture video camera. The method may include selecting a plurality of video images from the sequence of image sets and synthesizing a composite video image that combines data from the plurality of video images to obtain the view of the subject. The composite video image may have a resolution higher than a resolution of any one of the plurality of video images.

[0013] A computer program product disclosed herein includes computer executable code embodied on a computer readable medium that, when executing on one or more computer devices, performs the steps of: creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image; rendering the three-dimensional model in a user interface from a perspective; selecting a video image from the sequence of image sets that contains a view of the subject most closely corresponding to the perspective; and displaying the video image in the user interface.

[0014] The subject may include dentition, the computer program product including providing a tool for marking a margin of the dentition. The computer program product may include computer executable code that performs the steps of: receiving a user selection of a new perspective on the three-dimensional model; selecting a different video image from the sequence of image sets, the different video image containing a second view of the subject from a second perspective; and rendering the three-dimensional model from the new perspective.

[0015] The computer program may further include computer executable code that performs the step of providing one or more of a zoom control, a pan control, and a rotate control to receive the user selection. The perspective may include a three-dimensional viewpoint relative to the subject. The perspective may include a distance from the subject. Creating a three-dimensional model may include capturing a plurality of image sets with a multi-aperture video camera. Capturing a plurality of image sets may include capturing the video image from a center channel of the multi-aperture video camera. The computer program may include computer executable code that performs the step of selecting a plurality of video images from the sequence of image sets and synthesizing a composite video image that combines data from the plurality of video images to obtain the view of the subject. The composite video image may have a resolution higher than a resolution of any one of the plurality of video images.

[0016] A system disclosed herein includes creating means for creating a three-dimensional model from a sequence of image sets, each image set including a plurality of

images of a subject, each one of the plurality of images captured from a different optical axis, the plurality of images including at least one video image; rendering means for rendering the three-dimensional model in a user interface from a perspective; selecting means for selecting a video image from the sequence of image sets that contains a view of the subject most
5 closely corresponding to the perspective; and displaying means for displaying the video image in the user interface.

[0017] The subject may include dentition, the system including providing a tool for marking a margin of the dentition. The selecting means may include means for receiving a user selection of a new perspective on the three-dimensional model and selecting a different
10 video image from the sequence of image sets, the different video image containing a second view of the subject from a second perspective; and rendering the three-dimensional model from the new perspective. The selecting means may include means for providing one or more of a zoom control, a pan control, and a rotate control to receive the user selection. The perspective may include a three-dimensional viewpoint relative to the subject. The
15 perspective may include a distance from the subject. The creating means may include means for capturing a plurality of image sets with a multi-aperture video camera. The creating means may include means for capturing the video image from a center channel of the multi-aperture video camera. The system may include second selecting means for selecting a plurality of video images from the sequence of image sets and synthesizing a composite video
20 image that combines data from the plurality of video images to obtain the view of the subject. The composite video image may have a resolution higher than a resolution of any one of the plurality of video images.

[0018] In another aspect, a method disclosed herein includes creating a three-dimensional model from a sequence of image sets, each image set including a plurality of
25 images of a subject, each one of the plurality of images in each image set captured from a different optical axis; displaying one of the plurality of images in a first window; rendering the three-dimensional model in a second window; and synchronizing the first window and the second window to provide a common perspective on the subject.

[0019] The method may include receiving a user selection of a different one of the
30 plurality of images and rotating the three-dimensional model to maintain the common

perspective. The method may include receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective. The method may include receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective. The method may include receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective. The method may include receiving a user selection of a different perspective of the three-dimensional model and creating a composite video image from two or more of the plurality of images to provide a common perspective on the subject.

[0020] A computer program product disclosed herein includes computer executable code that, when executing on one or more computing devices, performs the steps of: creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis; displaying one of the plurality of images in a first window; rendering the three-dimensional model in a second window; and synchronizing the first window and the second window to provide a common perspective on the subject.

[0021] The computer program product may include computer executable code that performs the step of receiving a user selection of a different one of the plurality of images and rotating the three-dimensional model to maintain the common perspective. The computer program product may include computer executable code that performs the step of receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective. The computer program product may include computer executable code that performs the step of receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective. The computer program product may include computer executable code that performs the step of receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective. The computer program product may include computer executable code that performs the step of receiving a user selection of a different perspective of the three-

dimensional model and creating a composite video image from two or more of the plurality of images to provide a common perspective on the subject.

[0022] A system disclosed herein includes creating means for creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis; displaying means for displaying one of the plurality of images in a first window; rendering means for rendering the three-dimensional model in a second window; and synchronizing means for synchronizing the first window and the second window to provide a common perspective on the subject.

[0023] The system may include control means for receiving a user selection of a different one of the plurality of images and rotating the three-dimensional model to maintain the common perspective. The system may further include control means for receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective. The system may include control means for receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective. The system may include control means for receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective. The system may include control means for receiving a user selection of a different perspective of the three-dimensional model and creating a composite video image from two or more of the plurality of images to provide a common perspective on the subject.

[0024] In another aspect, a method disclosed herein includes displaying a three-dimensional model of dentition from a perspective; providing a plurality of video images of the dentition; selecting one of the plurality of video images that shows the dentition from the perspective; and displaying the one of the plurality of video images in a user interface with the three-dimensional model as an aid to visually determining a margin of the dentition.

[0025] The method may include displaying a margin on one or more of the three-dimensional model or the one of the plurality of video images. Displaying the margin may further include receiving a user modification of the margin and updating the display with a modified margin.

[0026] A system disclosed herein includes a display having a window for displaying a three-dimensional model of dentition from a perspective; a camera providing a plurality of video images of the dentition; selecting means for selecting one of the plurality of video images that shows the dentition from the perspective; and a second window in the display for displaying the one of the plurality of video images as an aid to visually determining a margin of the dentition.

[0027] The system may include margin display means for displaying a margin on one or more of the three-dimensional model or the one of the plurality of video images. The margin display means may include margin modification means for receiving a user modification of the margin and updating the display with a modified margin.

[0028] A computer program product disclosed herein includes computer executable code that, when executing on one or more computing devices, performs the steps of: displaying a three-dimensional model of dentition from a perspective; providing a plurality of video images of the dentition; selecting one of the plurality of video images that shows the dentition from the perspective; and displaying the one of the plurality of video images in a user interface with the three-dimensional model as an aid to visually determining a margin of the dentition.

[0029] The computer program product may include computer executable code that performs the step of displaying a margin on one or more of the three-dimensional model or the one of the plurality of video images. Displaying the margin may include computer executable code that performs the step of receiving a user modification of the margin and updating the display with a modified margin.

BRIEF DESCRIPTION OF THE FIGURES

[0030] The invention and the following detailed description of certain embodiments thereof may be understood by reference to the following figures.

[0031] Fig. 1 shows a dental image capture system.

[0032] Fig. 2 is a block diagram of a generalized manufacturing process for dental objects.

[0033] Fig. 3 is a high-level flow chart of a dental object fabrication process.

[0034] Fig. 4 shows a generalized process for working with digital dental models using the tools described herein.

[0035] Fig. 5 depicts a graphical die cutting operation.

[0036] Fig. 6 depicts a graphical die cutting operation.

[0037] Fig. 7 depicts a graphical margin marking operation.

[0038] Fig. 8 depicts a graphical ditching operation.

[0039] Fig. 9 illustrates an automated margin marking technique.

[0040] Fig. 10 shows a user interface for visually-assisted margin marking.

DETAILED DESCRIPTION

[0041] Described herein are systems and methods of addressing the identification, refinement, and other manipulation of margins for dental restorations based upon three-dimensional digital data captured from an intraoral scan. While the description emphasizes certain scanning technologies and certain techniques specific to marking margins on digital dental impressions obtained therefrom, it will be understood that additional variations, adaptations, and combinations of the methods and systems below will be apparent to one of ordinary skill in the art, such as fabrication of dental restorations not specifically described, or use of the following techniques outside a dental context. For example, the techniques described herein may be usefully employed to refine three-dimensional animation models acquired from scans of physical objects, or in a machine vision context to mark or evaluate scanned objects. All such variations, adaptations, and combinations are intended to fall within the scope of this disclosure. It will also be appreciated that the methods and systems described herein may be usefully employed for model verification and validation, as well as any other applications where useful comparisons between a video image and a corresponding three-dimensional model might be made.

[0042] In the following description, the term “image” generally refers to a two-dimensional set of pixels forming a two-dimensional view of a subject within an image plane. The term “image set” generally refers to a set of related two dimensional images that might be resolved into three-dimensional data. The term “point cloud” generally refers to a three-dimensional set of points forming a three-dimensional view of the subject reconstructed from

a number of two-dimensional views. In a three-dimensional image capture system, a number of such point clouds may also be registered and combined into an aggregate point cloud constructed from images captured by a moving camera. Thus it will be understood that pixels generally refer to two-dimensional data and points generally refer to three-dimensional data, unless another meaning is specifically indicated or clear from the context.

[0043] The terms “three-dimensional surface representation”, “digital surface representation”, “three-dimensional surface map”, and the like, as used herein, are intended to refer to any three-dimensional surface map of an object, such as a point cloud of surface data, a set of two-dimensional polygons, or any other data representing all or some of the surface of an object, as might be obtained through the capture and/or processing of three-dimensional scan data, unless a different meaning is explicitly provided or otherwise clear from the context.

[0044] A “three-dimensional representation” may include any of the three-dimensional surface representations described above, as well as volumetric and other representations, unless a different meaning is explicitly provided or otherwise clear from the context.

[0045] In general, the terms “render” or “rendering” refer to a two-dimensional visualization of a three-dimensional object, such as for display on a monitor. However, it will be understood that three-dimensional rendering technologies exist, and may be usefully employed with the systems and methods disclosed herein. For example, the system and methods described herein may usefully employ a holographic display, an autostereoscopic display, a display viewed with anaglyph glasses, a head-mounted stereo display, or any other two-dimensional and/or three-dimensional display. As such, rendering as described herein should be interpreted broadly unless a narrower meaning is explicitly provided or otherwise clear from the context.

[0046] The term “dental object”, as used herein, is intended to refer broadly to subject matter specific to dentistry. This may include intraoral structures such as dentition, and more typically human dentition, such as individual teeth, quadrants, full arches, pairs of arches which may be separate or in occlusion of various types, soft tissue, and the like, as well bones and any other supporting or surrounding structures. As used herein, the term “intraoral

structures” refers to both natural structures within a mouth as described above and artificial structures such as any of the dental objects described below that might be present in the mouth. Dental objects may include “restorations”, which may be generally understood to include components that restore the structure or function of existing dentition, such as crowns, bridges, veneers, inlays, onlays, amalgams, composites, and various substructures such as copings and the like, as well as temporary restorations for use while a permanent restoration is being fabricated. Dental objects may also include a “prosthesis” that replaces dentition with removable or permanent structures, such as dentures, partial dentures, implants, retained dentures, and the like. Dental objects may also include “appliances” used to correct, align, or otherwise temporarily or permanently adjust dentition, such as removable orthodontic appliances, surgical stents, bruxism appliances, snore guards, indirect bracket placement appliances, and the like. Dental objects may also include “hardware” affixed to dentition for an extended period, such as implant fixtures, implant abutments, orthodontic brackets, and other orthodontic components. Dental objects may also include “interim components” of dental manufacture such as dental models (full and/or partial), wax-ups, investment molds, and the like, as well as trays, bases, dies, and other components employed in the fabrication of restorations, prostheses, and the like. Dental objects may also be categorized as natural dental objects such as the teeth, bone, and other intraoral structures described above or as artificial dental objects such as the restorations, prostheses, appliances, hardware, and interim components of dental manufacture as described above.

[0047] Terms such as “digital dental model”, “digital dental impression” and the like, are intended to refer to three-dimensional representations of dental objects that may be used in various aspects of acquisition, analysis, prescription, and manufacture, unless a different meaning is otherwise provided or clear from the context. Terms such as “dental model” or “dental impression” are intended to refer to a physical model, such as a cast, printed, or otherwise fabricated physical instance of a dental object. Unless specified, the term “model”, when used alone, may refer to either or both of a physical model and a digital model.

[0048] It will further be understood that terms such as “tool” or “control”, when used to describe aspects of a user interface, are intended to refer generally to a variety of

techniques that may be employed within a graphical user interface or other user interface to receive user input that stimulates or controls processing including without limitation drop-down lists, radio buttons, cursor and/or mouse actions (selections by point, selections by area, drag-and-drop operations, and so forth), check boxes, command lines, text input fields, messages and alerts, progress bars, and so forth. Thus in the following description the terms “tool”, “control” and the like should be broadly construed unless a more specific meaning is otherwise provided or clear from the context.

[0049] Fig. 1 shows an image capture system. In general, the system 100 may include a scanner 102 that captures images from a surface 106 of a subject 104, such as a dental patient, and forwards the images to a computer 108, which may include a display 110 and one or more user input devices such as a mouse 112 or a keyboard 114. The scanner 102 may also include an input or output device 116 such as a control input (e.g., button, touchpad, thumbwheel, etc.) or a display (e.g., LCD or LED display) to provide status information.

[0050] The scanner 102 may include any camera or camera system suitable for capturing images from which a three-dimensional point cloud may be recovered. For example, the scanner 102 may employ a multi-aperture system as disclosed, for example, in U.S. Pat. App. No. 11/530,413 to Rohály et al., the entire content of which is incorporated herein by reference. While Rohály discloses one multi-aperture system, it will be appreciated that any multi-aperture system suitable for reconstructing a three-dimensional point cloud from a number of two-dimensional images may similarly be employed. In one multi-aperture embodiment, the scanner 102 may include a plurality of apertures including a center aperture positioned along a center optical axis of a lens that provides a center channel for the scanner 102, along with any associated imaging hardware. In such embodiments, the center channel may provide a conventional video image of the scanned subject matter. In other embodiments, a separate video camera and/or channel may be provided to achieve the same result, i.e., a video of an object corresponding temporally to a scan of the object, preferably from the same perspective, or from a perspective having a fixed, known relationship to the perspective of the scanner 102. The scanner 102 may also, or instead, include a stereoscopic, triscopic or other multi-camera or other configuration in which a number of cameras or optical paths are maintained in fixed relation to one another to obtain two-dimensional images

of an object from a number of slightly different perspectives. The scanner 102 may include suitable processing for deriving a three-dimensional point cloud from an image set or a number of image sets, or each two-dimensional image set may be transmitted to an external processor such as contained in the computer 108 described below. In other embodiments, the scanner 102 may employ structured light, laser scanning, direct ranging, or any other technology suitable for acquiring three-dimensional data, or two-dimensional data that can be resolved into three-dimensional data. While the techniques described below can usefully employ video data acquired by a video-based three-dimensional scanning system, it will be understood that any other three-dimensional scanning system may be supplemented with a video acquisition system that captures suitable video data contemporaneously with, or otherwise synchronized with, the acquisition of three-dimensional data.

[0051] In one embodiment, the scanner 102 is a handheld, freely positionable probe having at least one user input device 116, such as a button, lever, dial, thumb wheel, switch, or the like, for user control of the image capture system 100 such as starting and stopping scans. In an embodiment, the scanner 102 may be shaped and sized for dental scanning. More particularly, the scanner may be shaped and sized for intraoral scanning and data capture, such as by insertion into a mouth of an imaging subject and passing over an intraoral surface 106 at a suitable distance to acquire surface data from teeth, gums, and so forth. The scanner 102 may, through such a continuous acquisition process, capture a point cloud of surface data having sufficient spatial resolution and accuracy to prepare dental objects such as prosthetics, hardware, appliances, and the like therefrom, either directly or through a variety of intermediate processing steps. In other embodiments, surface data may be acquired from a dental model such as a dental prosthetic, to ensure proper fitting using a previous scan of corresponding dentition, such as a tooth surface prepared for the prosthetic.

[0052] Although not shown in Fig. 1, it will be appreciated that a number of supplemental lighting systems may be usefully employed during image capture. For example, environmental illumination may be enhanced with one or more spotlights illuminating the subject 104 to speed image acquisition and improve depth of field (or spatial resolution depth). The scanner 102 may also, or instead, include a strobe, flash, or other light source to supplement illumination of the subject 104 during image acquisition.

[0053] The subject 104 may be any object, collection of objects, portion of an object, or other subject matter. More particularly with respect to the dental techniques discussed herein, the object 104 may include human dentition captured intraorally from a dental patient's mouth. A scan may capture a three-dimensional representation of some or all of the dentition according to particular purpose of the scan. Thus the scan may capture a digital model of a tooth, a quadrant of teeth, or a full collection of teeth including two opposing arches, as well as soft tissue or any other relevant intraoral structures. The scan may capture multiple representations, such as a tooth surface before and after preparation for a restoration. As will be noted below, this data may be employed for subsequent modeling such as designing a restoration or determining a margin line for same. During the scan, a center channel of the scanner 102 or a separate video system may capture video of the dentition from the point of view of the scanner 102. In other embodiments where, for example, a completed fabrication is being virtually test fitted to a surface preparation, the scan may include a dental prosthesis such as an inlay, a crown, or any other dental prosthesis, dental hardware, dental appliance, or the like. The subject 104 may also, or instead, include a dental model, such as a plaster cast, wax-up, impression, or negative impression of a tooth, teeth, soft tissue, or some combination of these.

[0054] The computer 108 may be, for example, a personal computer or other processing device. In one embodiment, the computer 108 includes a personal computer with a dual 2.8GHz Opteron central processing unit, 2 gigabytes of random access memory, a TYAN Thunder K8WE motherboard, and a 250 gigabyte, 10,000 rpm hard drive. In one current embodiment, the system can be operated to capture more than five thousand points per image set in real time using the techniques described herein, and store an aggregated point cloud of several million points. Of course, this point cloud may further processed to accommodate subsequent data handling, such as by decimating the point cloud data or generating a corresponding mesh of surface data. As used herein, the term "real time" means generally with no observable latency between processing and display. In a video-based scanning system, real time more specifically refers to processing within the time between frames of video data, which may vary according to specific video technologies between about fifteen frames per second and about thirty frames per second. More generally, processing

capabilities of the computer 108 may vary according to the size of the subject 104, the speed of image acquisition, and the desired spatial resolution of three-dimensional points. The computer 108 may also include peripheral devices such as a keyboard 114, display 110, and mouse 112 for user interaction with the camera system 100. The display 110 may be a touch screen display capable of receiving user input through direct, physical interaction with the display 110. In another aspect, the display may include an autostereoscopic display capable of displaying stereo images.

[0055] Communications between the computer 108 and the scanner 102 may use any suitable communications link including, for example, a wired connection or a wireless connection based upon, for example, IEEE 802.11 (also known as wireless Ethernet), BlueTooth, or any other suitable wireless standard using, e.g., a radio frequency, infrared, or other wireless communication medium. In medical imaging or other sensitive applications, wireless image transmission from the scanner 102 to the computer 108 may be secured. The computer 108 may generate control signals to the scanner 102 which, in addition to image acquisition commands, may include conventional camera controls such as focus or zoom.

[0056] In an example of general operation of a three-dimensional image capture system 100, the scanner 102 may acquire two-dimensional image sets at a video rate while the scanner 102 is passed over a surface of the subject. The two-dimensional image sets may be forwarded to the computer 108 for derivation of three-dimensional point clouds. The three-dimensional data for each newly acquired two-dimensional image set may be derived and fitted or “stitched” to existing three-dimensional data using a number of different techniques. Such a system employs camera motion estimation to avoid the need for independent tracking of the position of the scanner 102. One useful example of such a technique is described in commonly-owned U.S. App. No. 11/270,135, filed on November 9, 2005, the entire content of which is incorporated herein by reference. However, it will be appreciated that this example is not limiting, and that the principles described herein may be applied to a wide range of three-dimensional image capture systems.

[0057] The display 110 may include any display suitable for video or other rate rendering at a level of detail corresponding to the acquired data. Suitable displays include cathode ray tube displays, liquid crystal displays, light emitting diode displays and the like.

In some embodiments, the display may include a touch screen interface using, for example capacitive, resistive, or surface acoustic wave (also referred to as dispersive signal) touch screen technologies, or any other suitable technology for sensing physical interaction with the display 110.

5 **[0058]** Fig. 2 is a conceptual block diagram of participants in a generalized manufacturing process for dental objects. The system 200 may begin with a patient 202 being scanned by a scanner 204, such as the scanner 102 and image capture system 100 described above, to obtain a digital surface representation 206 of one or more intraoral structures. This may include scans before and/or after a surface has been prepared to receive a dental
10 restoration or other dental object. So, for example, a pre-preparation scan may be taken to capture a shape of the original anatomy and any occlusion information useful in creating a restoration, and a prepared surface scan may be taken to use as a basis for creating the restoration, and in particular for shaping the restoration to the prepared surface. Articulation data relating to the orientation and/or relative motion of an upper and lower arch may also be
15 obtained through one or more scans of the arches in occlusion, or through other techniques such as still images or video of the arches in various orientations, or various dimensional measurements captured directly from the arches, or a physical bite registration captured on a thin sheet of material.

[0059] The digital surface representation 206 may be processed with one or more
20 post-processing steps 208. This may include a variety of data enhancement processes, quality control processes, visual inspection, conversion to a format suitable for rapid prototyping (or other manufacturing), and so forth. Post-processing steps may be performed at a remote post-processing center or other computer facility capable of post-processing the image file, which may be, for example a dental laboratory or a rapid fabrication facility. In some cases, this
25 post-processing may be done by the image capture system 100 itself. Post-processing may involve any number of clean-up steps, including the filling of holes, removing of outliers, etc.

[0060] Data enhancement may include, for example, smoothing, truncation, extrapolation, interpolation, filling (e.g. surface to volume) and any other suitable processes for improving the quality of the digital surface representation 206 or improving its suitability
30 for an intended purpose. In addition, spatial resolution may be enhanced using various post-

processing techniques. Other enhancements may include modifications to the data, such as forming the digital surface representation 206 into a closed surface by virtually providing a base for each arch, or otherwise preparing the digital surface representation for subsequent fabrication steps.

5 **[0061]** In a quality control process, the digital surface representation 206 may be analyzed for the presence of holes or regions of incomplete or inadequate scan data. The digital surface representation 206 may also be automatically examined for unexpected curvature or asymmetry to a scanned arch, or other apparent defects in the acquired data. Other quality control processes may incorporate additional data. For example, a current scan
10 may be compared to previous scans for the same patient. As another example, a selection of a dental restoration may be analyzed along with a scan of a tooth surface prepared for the restoration in order to evaluate the suitability of the surface preparation and any surrounding dentition for receiving the restoration. More generally, any process for evaluating data in the digital surface representation 206 with respect to its quality, internal consistency, or intended
15 use, may be used in a post-processing quality control process.

[0062] The digital surface representation 206 may also be displayed for human inspection, such as by providing a perspective rendering of a point cloud or mesh of acquired surface data on a display. For example, a dentist or other individual acquiring a scan may select a portion of a dental model such as an arch, or particular teeth, for use in subsequent
20 processing steps. A manual selection of portions of a model and/or scan may significantly reduce the amount of data required for a particular treatment. In addition, a manual identification of either model sections or video data may be followed by automated filtering of data. For example, once a dentist selects a particular tooth for subsequent processing, video data that is not associated with that tooth or one or more neighboring teeth may be
25 excluded from further processing, and may, for example, not be transmitted to downstream processes such as the margin marking systems described below. At this time, or at other times in the post-scan processing, a user may review the digital surface representation 206 to mark a margin for a restoration. Details of this specific process will be described below in greater detail.

[0063] Following any manual or automated post-processing, the resulting digital model may be transmitted to a rapid fabrication facility 216, as indicated by an arrow 209. In addition, articulation data 218 in any suitable form may be transmitted for use in subsequent processing steps, as well as a prescription or other specification for manufacture of a restoration, appliance, hardware, and the like. The rapid fabrication facility 216 may be a dental laboratory, an in-house dental laboratory at a dentist's office, or any other facility with machinery to fabricate physical models from digital models. The rapid fabrication facility 216 may, for example, include a milling system 210, a stereo lithography system 212, or a three-dimensional printer 214, or some combination of these. The milling system 210 may include, for example, a CNC milling machine. Milling systems may be used to take a block of material and create a variety of outputs, including full-arch models, dies, wax-ups, investment chambers or a final restoration or appliance. Such blocks may include ceramic-based, particle-board, wax, metals or a variety of other materials. Dental milling systems such as Procera from Nobel Biocare Inc., or Cerec from Sirona Inc. may also be used to create a final dental hardware component. The stereo lithography system 212 may include, for example, a Viper System by 3D Systems, Inc. The three-dimensional printer 214 may include, for example, an InVision HR printer from 3D Systems. Each of these fabrication techniques will be described in greater detail below.

[0064] The rapid fabrication facility 216 may use the articulation data 218 and the digital model to generate one or more dental objects, such as one or more full arch models 220, one or more dies 222, one or more waxups 224, one or more investment chambers 226, and/or one or more final restorations or appliances 228. Some components, such as the dies 222 and arches 220, may be inserted into an articulated model 234 such as an articulator with a standard base 230 or a custom base 232. A dental laboratory may employ these various components to complete a restoration 236, which may be returned to a dentist for placement into/onto the dentition of the dental patient.

[0065] A number of suitable rapid fabrication facilities are known in the art and may be usefully employed with the systems and methods described herein. A number of such techniques are described below by way of illustration and not limitation.

[0066] One suitable technique is milling. Milling is generally a subtractive technology in that material is subtracted from a block rather than added. Thus pre-cut workpieces approximating commonly milled shapes may advantageously be employed to reduce the amount of material that must be removed during a milling job, which may reduce material costs and/or save time in a milling process. Computerized Numerically Controlled (“CNC”) milling is one suitable technique. Another useful milling technique for the dental fabrication processes is a copy milling system that permits manual or automated transfer of a three-dimensional form from a physical object to a milled target. CNC milling and other milling technologies can be employed for manufacturing dental models, dental model components, wax-ups, investment chambers, and other dental objects. In addition specialty dental milling equipment exists, such as the Cerec system from Sirona Dental. All milling systems that may be adapted to use in the dental applications described herein are intended to fall within the scope of rapid fabrication facilities as described herein.

[0067] Another suitable technique is stereo lithography using a stereo lithography apparatus (“SLA”). In general, an SLA employs a laser to sequentially cure layers of a polymer, typically a photocurable liquid resin, with a pattern that defines a three-dimensional object. One useful commercial embodiment of an SLA is the SCS-1000HD available from Sony Corporation. Stereo lithography is well-suited for the high volume production of dental models and dies, because parts may be batched on machines for rapid production. When optimized, these parts may be used in lieu of plaster dental models and other dental objects. A similar technology employs digital light processing (“DLP”) to concurrently cure planar cross-sections of a polymer, and may also be usefully employed with the systems described herein.

[0068] Another suitable technique is three-dimensional printing. In general, a three-dimensional printer employs a print head to apply material such as curable photopolymers or powders in a layer-by-layer additive process. Three-dimensional printers are well suited to rapid fabrication of small parts such as wax patterns or wax-ups, as well as dies and other relatively small dental objects. One commercial system suitable for three-dimensional dental printing applications is the InVision HR printer from 3D Systems.

[0069] It will be appreciated that other rapid prototyping systems are known in the art. Thus, the terms fabricate, fabricating, and fabrication, as used herein, will be understood to refer to the fabrication technologies above, as well as any other rapid prototyping or other manufacturing technology that might be adapted to manufacture of custom dental objects, including, without limitation, selective laser sintering (“SLS”), fused deposition modeling (“FDM”), laminated object manufacturing (“LOM”), and so forth. Similarly, any of the above technologies, either alone or in combination, may operate as a means for fabricating, printing, manufacturing, or otherwise creating the dental objects described herein. It will be appreciated that the fabrication steps described above with reference to particular technologies may be followed by additional steps such as curing, cleaning, and so forth to provide a final product. The manufacturing techniques described above may be combined in various ways to provide a multimodal fabrication process. Thus, for example, a CNC milling machine may be used to create a die for a tooth requiring greater detail than an SLA can provide, while the SLA may be employed for a model of a dental arch that contains the die. This multimodal approach may deploy the advantages of various technologies in different aspects of the fabrication process, such as using stereo lithography for speed, milling for accuracy, and three-dimensional printing for high-speed fabrication of small parts.

[0070] Fig. 3 is a high-level flow chart of a dental object fabrication process. This process 300 employs a three-dimensional representation of dentition acquired directly from an intraoral scan, and may advantageously bypasses a number of processing steps used in conventional dentistry.

[0071] In general the process 300 may begin with data acquisition, as shown in step 302. Data acquisition may include any acquisition of a digital surface representation, or other three-dimensional or other representation of dentition suitable for use in a dental object fabrication process. The data acquisition may be performed using, for example, the scanner 102 and image capture system described above with reference to Fig. 1. In certain embodiments, a number of different scans may be acquired, such as scans to establish articulation and occlusion of arches, or scans before and after a surface preparation, which may be used jointly to create a prosthetic or the like. In certain embodiments scans may be

obtained at different resolutions, such as a relatively low-resolution scan for an opposing arch and a relatively high-resolution scan for the margin of a prepared tooth surface.

[0072] It will be understood that while the following description generally relates to operations performed outside a dentist's office, such as at a central processing location or a dental lab where margins are marked onto digital models, the user interfaces, tools, and techniques described herein may be usefully employed in a number of ways at the time of a scan, or before transmitting the scan data to a remote processing center.

[0073] For example, a dentist may employ the video review tools, either alone or in combination with synchronized views of a digital model, to qualitatively assess the suitability of a particular scan. Stereoscopic rendering of either the video image(s) and/or digital model may provide useful insights that the clinician can apply to determine whether a supplemental scan or an entirely new scan are appropriate.

[0074] In other embodiments, a dentist may perform some or all of the margin marking before transmitting data to a dental laboratory or other remote site.

[0075] In other embodiments, a dentist may tag frames of video data or points on a model surface with information that can be transmitted with the scan data to a remote site. This capability may be embodied in a tool for annotations provided within a graphical user interface such as the user interface described below. The annotations may include, for example, a prescription, margin information, margin marking instructions, or any other information relevant to margin marking or other steps in the dental restoration process. The information may be entered by selecting a point on a video image or digital model surface and entering any desired text, attachments, or other data or information. These annotations may be visually displayed as flags or other visual landmarks. In one aspect, the annotations may be provided on the video image. In another aspect, the annotations may be provided on the model. In another aspect, the annotations may be provided in one view, and displayed on both views.

[0076] It will be understood that other information, such as a camera model, distortion model, calibration data, and the like may be usefully transmitted along with or as a part of the prescription data for a particular patient and/or restoration. In addition, information such as header information inserted into frames of video data by a scanner may

be transmitted. This header information, which may include details on a particular scanner (e.g., a serial number), lighting conditions for a scan, the region of dentition scanned, and so forth, may also be usefully transmitted, and may be employed for a variety of downstream uses such as automated determination of video metadata such as a view (e.g., buccal, lingual, distal, medial, occlusal, etc.) or an identification of teeth within a current image. By way of example and not limitation, this information may be employed to label thumbnail views used in the navigation techniques described below. In other embodiments, the camera model (camera parameters, calibration data, distortion data, and the like) may be stored at a remote location, with the selection of a camera model for a particular scan based on the identification of the scanner in the video metadata. This approach advantageously reduces the amount of data that must be transmitted with each scan, while providing full information to characterize the relationship between video data and a three-dimensional model at a remote location where the model is being viewed and/or manipulated.

[0077] In addition to supplementing model information as described above, a dentist or other scan creator may prepare a more compact data transmission by removing unneeded material from the video and/or model data. In general, this selection process applies the general principle that the video data required for a three-dimensional model reconstruction may be different (and typically greater) than the video data required for human video-assisted review of the model or modeling operations such as margin marking. For example, after identifying a specific tooth or teeth for a restoration or the like, the operator may delete unneeded video frames or model data, or may initiate an automated removal of unneeded data based upon the identification of what video data is relevant to the region(s) of interest. Regions of interest may include a prepared tooth surface, one or more adjacent teeth, one or more opposing teeth, a number of prepared teeth (such as for a bridge), and so forth. Video images and/or a corresponding model may be stereoscopically rendered within a user interface at the site of the scan to assist with this pre-transmission selection of regions of interest. The user interface may incorporate some or all of the features described below with respect to a user interface for margin marking. In general, a number of criteria may be employed for selecting regions of interest or relevant image frames for a dental procedure such as margin marking. For example, frames of video data may be selected for coverage of

the image data, such as complete coverage of the regions of interest or optimal (e.g., non-overlapping or overlapping a predetermined amount) coverage of the regions of interest. Similarly, frames may be selected based upon orientation of the image data such as the best viewing angle, either for visual inspection or accuracy of calculated three-dimensional data (or both). Selection based upon orientation may further include selection of multiple frames with substantially different perspectives on each surface point or surface area in order to ensure or improve the chances of a number of unique perspectives on each surface feature. It will also be appreciated that, even within a region of interest, the video image capture rate of the scanner may be such that only a small number of video images are required for meaningful human review. Thus for example, a data reduction process may automatically eliminate every other frame, four out of five frames, nine out of ten frames, or any other number of frames selected to preserve adequate video data for video-assisted review as described herein. In a manual technique, a user may explicitly select the relevant video images. In an semi-automatic technique, a user may graphically identify points or regions of interest and the video data may be processed to select video images satisfying one or more selection criteria such as those described above. In a fully automated procedure, a user may simply identify the relevant teeth or provide a prescription, and a computer program may process the video images to determine regions of interest and select frames of video data accordingly.

[0078] Thus in one aspect there is disclosed herein a technique for reducing the size of a digital dental model by removing video frames and/or model data that are not relevant to a restoration. In another aspect, there is disclosed herein a technique for reducing the size of a digital dental model by removing video frames and/or model data that are not required for marking a margin. In addition to detailed video and or model data for the selected regions, a lower quality model of additional dentition may be transmitted with the selected regions, such as a low quality full arch model for use in a physical or virtual dental articulator. In another aspect, a similar subset of video images may be selected when displaying thumbnail views in a user interface as described below. Thus images of significance in a dental restoration procedure such as margin marking may be selected for display in a video navigation user interface such as the interface described below. These images may be further labeled with

orientation information for a user such as a view (buccal, lingual, distal, mesial, etc.), which may be displayed textually or through an illustrative icon, diagram, three-dimensional compass, or any other suitable visualization technique.

5 **[0079]** Once suitable data has been acquired, one or more modeling operations may be performed, as shown in step 304. This may include modeling steps such as ditching a virtual die of a digital dental model, specifying a tooth for treatment, filling holes or otherwise correcting data, bite registration, and/or fully designing a restoration, prosthetic, hardware or other dental object(s), as well as any other modeling or digital model manipulation useful in a dental context. Modeling may be performed using a variety of commercially available
10 Computer Automated Design (“CAD”) or other three-dimensional modeling tools, as well as tools incorporating the additional features described below in greater detail.

[0080] For example, modeling may include bounding the surface representation to form a solid, and then creating a void space, or collection of void spaces within the solid that do not affect dentally significant surfaces such as the dentition or surrounding soft tissue.

15 This may advantageously result in significant reductions in material required to fabricate a dental model from the voided digital model, thus reducing material costs as well as time to manufacture dental models. Modeling may also include creating or manipulating a margin on a prepared tooth surface. A number of other modeling steps are described with reference to specific fabrication processes below. It will be appreciated that the term “modeling” as used
20 herein may refer to any processing of a digital dental model including fully automated, semi-automated, and/or manual processes such as those noted throughout this description.

[0081] As shown in step 306, a prescription may be prepared. This specifies a type of restoration, prosthetic, or the like, and may include a variety of additional information related to a manufacturer, color, finish, die spacing, and so forth. It will be appreciated that
25 the prescription step 306 may be performed before the modeling step 304, such as in a process where a dentist transmits the initial digital surface representation from a patient to a dental laboratory along with a prescription, leaving some or all of the modeling to the dental laboratory.

[0082] As shown in step 308, one or more dental objects may be fabricated.
30 Fabrication may be performed using any of the fabrication technologies described above,

either alone or in various combinations, using data from one of the modeling systems described above, which may be reformatted or otherwise adapted as necessary for a particular printing, milling, or other fabrication technology. Also, as will be clear from some of the examples below, fabrication may include a combination of different fabrication technologies.

5 For example, dental model may be three-dimensionally printed with a space for a die, and the die may be milled of a different material for use in subsequent processing steps. Thus, the term “fabrication” as used herein is intended to refer to any suitable fabrication technology unless a specific fabrication technology is explicitly identified, or otherwise clear from the context. A number of specific fabrication examples are discussed below in greater detail.

10 **[0083]** As shown in step 310, a prosthetic or other dental object may be returned to a dentist for placement into a patient’s dentition.

[0084] It will be appreciated that the above processes, as well as the methods and systems described below, may be realized in hardware, software, or any combination of these suitable for the data acquisition, modeling, and fabrication technologies described herein.

15 This includes realization in one or more microprocessors, microcontrollers, embedded microcontrollers, programmable digital signal processors or other programmable devices, along with internal and/or external memory. The may also, or instead, include one or more application specific integrated circuits, programmable gate arrays, programmable array logic components, or any other device or devices that may be configured to process electronic

20 signals. It will further be appreciated that a realization may include computer executable code created using a structured programming language such as C, an object oriented programming language such as C++, or any other high-level or low-level programming language (including assembly languages, hardware description languages, and database programming languages and technologies) that may be stored, compiled or interpreted to run on one of the above

25 devices, as well as heterogeneous combinations of processors, processor architectures, or combinations of different hardware and software. At the same time, processing may be distributed across devices such as a camera and/or computer and/or fabrication facility and/or dental laboratory in a number of ways or all of the functionality may be integrated into a dedicated, standalone device. All such permutations and combinations are intended to fall

30 within the scope of the present disclosure.

[0085] It will also be appreciated that means for performing the steps associated with the processes described above may include any suitable components of the image capture system 100 described above with reference to Fig. 1, along with any software and/or hardware suitable for controlling operation of same. All such realizations and means for performing the processes disclosed herein are intended to fall within the scope of this disclosure.

[0086] Fig. 4 shows a generalized process for working with digital dental models using the tools described herein, and more particularly for preparing a model for use in fabrication of a dental restoration such as a crown.

[0087] In a user interface, command line interface, or the like, a user such as a dental technician may select a model from a work queue of digital models, as shown in step 402. This may be, for example, a queue stored on a local system, or a queue stored at a remote location accessible through a web-based portal for dental laboratories or other dental professionals. It will be understood that while a queue generally includes any system for distributing modeling projects to one or more users on a systematic bases such as a file server, content management system, or the like, the digital dental models and accompanying data may also be represented simply as a file (or group of files) located in a local computer directory or a file (or group of files) received over a network. The model may include, for example, relevant scans such as a digital dental impression acquired before and after a dentist's preparation of a tooth surface for a restoration. Other information may also be usefully included, such as dental prescription information to guide the user and video data acquired during the scan(s) used to obtain the digital dental impression. This latter data may be used, for example, as an aid to margin marking as described in greater detail below.

[0088] After selection of a particular model, a user may mark dies within the model, as shown in step 404. In general, separation into dies permits easier handling of the operative tooth or teeth during subsequent physical (and digital) processing, and the individual dies will be manufactured as separate pieces for use in a dental laboratory. Cutting into dies may include presenting the model to a user along with tools for the user to control display (e.g., rotational orientation, zoom, pan, etc.) of the model and tools for the user to define one or more dies within the model. In one embodiment, a die cutting tool may permit the user to

define vertical planes through a model at locations that separate teeth of an arch. An example of this operation is depicted in Figs. 5-6 below.

[0089] After a model has been separated into dies, a user may mark margins for restorations as shown in step 406. A user may be prompted to identify one or more dies that require margin marking. Once one or more dies have been specified, a user interface may present a three-dimensional rendering of one of the specified dies, and may provide a graphical tool for marking points along an intended margin within the user interface. Again, the interface may include tools for controlling display of the model, such as rotational orientation, zoom, pan, and so forth, so that a user can conveniently navigate around the model during marking. A margin marking tool in the interface may permit selection of points along a surface of the model, and may form a margin line through any suitable algorithm for joining the points into a continuous, closed loop on the tooth surface. The tool may permit an addition of points, a deletion of points, and/or a movement of points. The tool may also permit selection and/or de-selection of points for group operations such as joining into a margin line, deleting, moving, and so forth. A number of useful interface features to assist with margin marking are described in greater detail below.

[0090] Once the margins have been marked, the dies may be ditched as shown in step 408. In general, this operation entails removal of portions of the die(s) below the margin line to permit easier identification of the margin line during subsequent handling steps.

Ditching may be automated by processing the model to remove material below the margin line (or reshape the surface where a surface-only representation of the model is used). Manual ditching may also be supported through user interface tools that permit removal of model material. A combination of automated and manual techniques may also be employed.

[0091] Once the die has been cut, the margin has been marked, and the model has been ditched, the model may be saved for further processing as shown in step 410. The user may then return to the work queue to select another model as shown in step 402. More generally, the model and its various parts (e.g., the dies) may be stored at any stage of processing so that a user may save any current work and return to the saved project at a later time. While not specifically depicted, it will be appreciated that a user may select a new model from the work queue (step 402) before completing a previously selected model, so that

the user can maintain any number of models at various stages of completion according to scheduling demands, personal preferences, or any other criteria.

[0092] It will be understood that the operations described above may be distributed among a number of locations involved in a digital dental workflow. For example, models may be originally created by a dentist using a digital scanner such as any of the scanners described above. The scanned model may be transmitted over a data network (along with prescription information and any other useful data) to a central repository that stores scan data and provides a secure interface for downstream users. Models may be selected from the repository in work queue fashion as described above by a dental technician at a dental lab or other facility, and the dental technician may cut and mark the models as appropriate. The technician may then apply any suitable ditching, or the cut and marked model may be returned to the central repository or some other post-processing location for automated ditching. Once returned to the central repository, the dies, prescription, and other data may be provided (again through a secure interface) to a rapid fabrication facility which may manufacture corresponding dental objects and forward them to a dental laboratory for finishing. While this is one example of a workflow that usefully distributes processing steps according to competence and capabilities, it will be understood that numerous other arrangements are possible, and may usefully be employed within the scope of the systems and methods described herein.

[0093] In one aspect, the methods described above may be employed to prepare models for rapid fabrication or the like, resulting in the fabrication of a physical model from a digital model of a die that has been cut, marked (on the margin), and ditched as generally described above. This in one aspect, a method described herein includes selecting a digital dental model; cutting at least one die from the digital dental model to provide a die model; marking a margin on the die model to provide a marked model; ditching the marked model to provide a ditched model; and fabricating a physical model from the ditched model. The method may include transmitting the ditched model to a remote data repository, to a dentist for review, or to a rapid fabrication facility for creation of the physical model.

[0094] Figs. 5 and 6 depict a graphical die cutting operation that may be employed in a user interface for handling digital dental models. As shown in Fig. 5, a model 502 such

as a scan of a dental arch may be graphically depicted in a user interface 500 by rendering the model 502 from a desired perspective. It will be understood that while a single arch is depicted, the model 502 may include multiple arches, including opposing arches, or may include a portion of an arch such as one or more teeth of interest. As shown in Fig. 6, a graphical tool may permit a user to specify one or more cuts 602 within the model 502 to segment the model into one or more sections 604, including one or more dies or individual teeth, also known as operative teeth (for a restoration such as a bridge, a die may include more than one tooth). Each section 604 may then be individually processed as appropriate. While the cuts 602 are depicted as lines through an appropriately oriented model, the graphical cutting tool may employ a number of different techniques for segmenting the model 502 including lines (which might define vertical planes), planes, or the like. Where planes are used to define sections 604 of the model 502, a tool may provide any suitable graphical representation of the planes within the user interface, and may permit a user to add, remove, or reposition the planes. The tool may also, where appropriate, permit a user to skew the planes off vertical to achieve a desired segmentation of the model 502. It will be understood that cutting a digital dental model into segments such as dies may be performed using a number of user interface tools, and may be digitally represented using a number of techniques. For example, the model may be separated into a number of separate surface models for each segment of the original model, or the cut planes used to define the segments may be associated with the original model to represent various sections thereof. Any techniques suitable for digitally representing the segmentation of the original model into a number of segments such as dies may be used with the systems and methods described herein.

[0095] Fig. 7 depicts a graphical margin marking operation that may be employed in a user interface for handling digital dental models. As shown in Fig. 7, a model 702 such as a die from one of the digital dental models described above may be graphically depicted in a user interface 700 by rendering the model 702 from a desired perspective. A margin line 704 may be created within the model 702 by selecting one or more points 706 on a surface of the model 702 (where a restoration is to meet the prepared tooth surface) and joining the points 706 in a continuous closed loop of the margin 704. The user interface 700 may provide tools for controlling a perspective or point of view for rendering the model 702, such as for

rotating, panning, zooming, and the like. In the following description, terms such as perspective and point of view are used interchangeably to refer to data describing a position and orientation from which a subject is being viewed. In three dimension space, this typically includes x, y, and z coordinates as well as rotational orientation on three axes. The user interface 700 may also provide tools for manipulating the points 706, such as for creating, deleting, or moving points, as well as for selecting and/or de-selecting points for group operations such as a move or delete. The tool(s) may include an undo feature for undoing one or more previous operations. The points 706 may be jointed automatically or manually, or some combination of these, such as through a tool in the interface 700 that automatically interconnects all points not joined manually, or a tool that suggests a next point based upon extrapolation or interpolation of existing points. The margin line 704 may be represented as a line, a set of line segments, a set of points, or any other suitable data set, which may be defined in a coordinate system of the model 702 (and by extension, in a coordinate system of the model of Figs. 5 and 6, or any other digital model from which the operative tooth model was obtained). In general, while two-dimensional user interfaces are depicted in these drawings, the user interface 700 of the systems and methods described herein may employ any suitable two-dimensional or three-dimensional rendering techniques, including the various stereoscopic three-dimensional interfaces described herein.

[0096] Fig. 8 depicts a graphical ditching operation that may be employed in a user interface 800 for handling digital models. Once a margin line 802 has been defined for a die 804, ditching the die may be manually or automatically performed to provide a tooth base 806 for convenient handling of the resulting physical model used by a dental laboratory to create a restoration, and to make the margin line more readily visible in digital and physical models. With a properly specified margin line 802, ditching of the die is amenable to a high degree of automation. The user interface 800 may nonetheless provide tools for specifying various ditching parameters (depth, amount of material removal, etc.) and for inspecting the resulting ditched die. The user interface 800 may also provide tools for manually ditching, and/or for refining an automatically ditched die. Where highly detailed dental models are used, processes such as automated ditching may be advantageously performed at a digital data center such as the remote data repository described above.

[0097] Fig. 9 illustrates an automated margin marking technique. One useful technique for automated margin marking employs a direct comparison of a tooth surface before and after preparation for a restoration. As depicted in Fig. 9 in a cross-sectional view, a model of a tooth surface before preparation for a restoration 902 may be registered with a model of a tooth surface after preparation for the restoration 904, where the pre-prep model 902 includes the volume of the post-prep model 904, as well as additional tooth structure. A line 906 formed on an exterior edge of the registered models (only two points on this line are visible in Fig. 9 at the left and right edges of the cross section) defines the margin line for the prepared tooth surface. The line 906 may be algorithmically identified using a Boolean XOR of the surfaces or volumes of the registered models, or using any of a number of other suitable edge finding techniques.

[0098] For example, contour evaluation may be applied to algorithmically identify the margin on the post-prep model 904 (or an associated pre-prep model) in three-dimensions. Similarly, edge finding techniques may be applied to still video images, with the results mapped to the three-dimensional model using, for example, the techniques described herein. In another embodiment, two-dimensional and three-dimensional techniques may be used in conjunction with results averaged or otherwise combined to derive a single margin line. In a semi-automated embodiment, image-based and model-based techniques may be separately applied, and a user may be permitted to select which result is used for a margin line, or the user may be permitted to select portions of the margin line from each result.

[0099] Fig. 10 shows a user interface for visually-assisted margin marking. A number of the processes described above are relatively straightforward and amenable to automated or computer-assisted modeling techniques. However, margin marking presents particular difficulties due to the likely presence of gross errors in a digital surface scan of dentition resulting from blood, saliva, or displaced soft tissue around the critical scan areas for a margin. The following interface addresses these difficulties by supplementing a display of a three-dimensional model with video images obtained during a scan. This interface is particularly suited to video-based scanning techniques such as a multi-aperture camera that includes a center channel for capturing video, as described generally above.

[00100] The user interface 1000 may include, for example, a video image window 1010, a cross-sectional view window 1020, a model view window 1030, and a video control window 1040. One or more of these windows 1010-1040 may be stereoscopically rendered, or otherwise displayed in three-dimensions using available data such as the three-dimensional model, video image pairs, and/or sequences of images that can be warped to provide suitable stereo image pairs. The model view window 1030 and the cross-sectional view window 1020 employ two-dimensional rendering based upon a three-dimensional model, so stereoscopic rendering in these windows is a relatively straightforward application of known stereoscopic techniques. Where a multi-aperture or multi-camera image sequence is provided, the still image in the video image window 1010 may also be stereoscopically rendered based upon depth information encoded in stereo image pairs or the like. In one aspect, this stereoscopic image may be synthesized based upon a center channel image (where available), the reconstructed 3D model, and a camera model that provides mappings between image and object space. In one aspect, a user may switch between an originally acquired stereo image pair and the synthesized stereoscopic image to permit qualitative evaluation and/or validation of the three-dimensional digital model.

[00101] The video image window 1010 may display a still image from a video of a subject. The video may have been acquired during a three-dimensional scan, such as from a center channel of a multi-aperture camera, or from a video camera in a nearby, fixed, and known location relative to a scanning device. In general, a variety of handheld scanners are known that employ a variety of techniques for obtaining three-dimensional images including structured light or laser techniques, time-of-flight techniques, single-camera video techniques, multi-camera, multi-aperture, or split-pupil video techniques, and so forth. Although there are exceptions, these techniques largely rely on three-dimensional reconstruction algorithms that either require camera path data as an input or derive camera path data during processing of scan data. In other words, for each video image obtained during a scan, there is a substantially corresponding, known, concurrent camera position that includes camera position and rotational orientation relative to a subject being scanned. Thus for a still image displayed in the video image window 1010, a perspective or point of view of the scanner on the image content -- in this case, the subject is a prepared tooth surface -- can be determined. This

information is useful for synchronizing views with the perspective view window, as will be described in greater detail below. Where non-video scanning techniques are employed, data may be supplemented with concurrent two-dimensional video that provides still images to supplement margin marking and other procedures as generally described herein.

5 **[00102]** Orientation information may be usefully displayed within (or otherwise in association with) the video image window 1010. For example, to assist a user with orientation of the image within the context of dentition, the video image window 1010 may display a viewpoint (e.g., buccal, lingual, distal, mesial, etc.) and/or distance of the current image, any of which may, as noted above, be determined from the scanner position data
10 obtained during a scan. Further, a user control may be provided for direct selection of orientation. For example, a user may textually or graphically select an orientation for which a view of the current tooth or tooth surface is desired. The user interface may responsively select an image that contains an orientation of the subject matter that most closely
15 corresponds to the selected orientation and display this image in the video image window 1010. In addition, the video control window 1040 described below may be responsively updated, such as by selecting a group of thumbnail images 1042 having a variety of different perspectives on the tooth surface selected, or a number of predetermined closely adjacent orientations.

20 **[00103]** In another aspect, a variety of image enhancement techniques may be applied to the working image(s) displayed in the video image window 1010 to enhance visual quality of the displayed image. For example, the display may employ locally adaptive contrast enhancement or contrast limited adaptive histogram equalization, or any other suitable techniques. The display may also, or instead, employ other information such as distance from a light source or information available from a corresponding three-dimensional model to
25 control color, intensity, and the like for improved visual display of the still video image(s). Pseudo-coloring may also be employed advantageously, such as by shading an area around a margin or accenting areas of high spatial contrast. It will be understood that the image enhancement techniques described herein may be employed to assist margin marking or other dental operations as well as during or immediately after a scan as an aid to video review by
30 the scan operator.

[00104] As described below, in one aspect the system operates to synchronize a viewpoint or perspective of a subject in the video image window 1010 and the model view window 1030. A number of techniques may be employed in order to maintain consistent visual information among the various windows of the user interface 1000. For example, the video image may be undistorted to more closely match depth information apparent in a stereoscopically rendered three-dimensional model. In one embodiment, the three-dimensional model accurately reflects the physical, three-dimensional counterpart and incorporates any calibration data, camera parameters, distortion models, and the like, so the preferred technique would be to undistort the video image accordingly for display. As a significant advantage, this approach permits a simple pinhole projection characterization of the mapping between the video image space and the digital model space, which can significantly reduce computation time for mappings between the two representations. However, it is possible and may be desirable in certain cases to distort the three-dimensional model to spatially correspond to the stereoscopically rendered video image. In either case, spatial correspondence may generally be achieved by mapping data across the camera model, calibration data, and the like used to create the three-dimensional model from the video data. This adjustment may include a distortion model for the camera system, which may account for x, y, and/or z dependent distortion in one or more channels of the camera system, as well as scene parameters such as viewing angle and the like.

[00105] Other techniques for conforming images in the various displays include adaptations of the still image display to a perspective selected in the model view, such as by texture mapping of video data onto the model, or warping, combining or otherwise processing existing image pairs to synthesize a perspective corresponding to the model view.

[00106] A number of points 1012, which may be user-positioned points or computer-positioned points, define some or all of a margin line 1014 (a partial margin line is illustrated by way of example and not limitation) within the video image window 1010. Points 1012 may be controlled with a user interface tool such as a cursor, along with any drop down menus, lists, scroll bars, keystrokes, or other controls suitable for adding, deleting, and moving points 1012. In addition, points 1012 may be selected or de-selected for group operations such as joining a group of points (to form some or all of a margin), moving a group

of points, deleting a group of points, or adjusting a group of points to create a smoother margin line, or to algorithmically move points to more likely margin positions based upon curvature analysis, data concerning an unprepared tooth surface, or any other available information in combination with various techniques known in the art. Other more processing-intensive functions may also be provided, such as recommending a point location within a region around a current cursor position, completing the closed loop of a margin line based on one or more user-selected points, or looking for possible outliers in a current point set that defines a margin line. Where the video image window 1010 is stereoscopically rendered, a three-dimensional cursor may also be provided to accommodate user navigation within the rendered three-dimensional space. The three-dimensional cursor may be similarly employed in any of the windows 1010, 1020, 1030, 1040 that employ stereoscopic or other three-dimensional rendering techniques.

[00107] A number of useful features may be incorporated into a three-dimensional cursor. For example, the three-dimensional cursor may effectively behave as if it were attached to the surface of the imaged model (or stereoscopic video image) so that user motions (such as with a mouse) in a two-dimensional plane are projected onto the corresponding image locations relevant to the surface of the stereoscopically rendered image in the stereoscopic coordinate system. This technique works well with the systems described above where the video and model displays contain projections with unique surface locations for each screen location (such as a pixel or the like). However, in certain embodiments, additional three-dimensional functions may be provided that are not attached to the projected surface. This may include, for example, validation of the model and/or stereo images, editing the model based upon the stereo video images, and so forth. In such instances, an additional control such as a mouse scroll wheel may be employed to provide an additional degree of freedom for user input.

[00108] While three-dimensional input may permit unconstrained cursor movement within the stereoscopically rendered three-dimensional space, the third user input (e.g., scroll wheel) may also be further adapted for use with the margin marking operations described herein. For example, using the interface, tools, and three-dimensional cursor described herein, a user may directly edit the digital model in the model view window 1030, such as to

create better agreement between video images and the three-dimensional model. There may be numerous reasons for such an edit. For example, with reference to the video, a user may identify artificial objects in a field of view such as cord, saliva, blood, and so forth. As another example, the video-based stereoscopic rendering and the model-based stereoscopic rendering may appear different. This may occur where, for example, the stereoscopic video is derived directly from image pairs obtained during a scan, while the model is derived using a camera model (e.g., camera parameters, calibration data, distortion data, and the like). A user may address these variations by selecting a point on the stereoscopically rendered surface of the model (or the video image) and moving the point freely in three dimensions. For example, the scroll wheel may control movement of the surface point in the z-axis of the screen, or in a direction normal to the surface. Further a user may control the extent to which surrounding points follow the movement. This technique may also be employed to sharpen the margin where the margin on the model appears overly rounded, or otherwise deviates from the margin depicted in the video image (or temporally adjacent images that provide clearer visual content). In one aspect, these tools permit direct manipulation of the digital model and/or stereoscopically rendered video image. In another aspect, these tools enable validation of the digital model by direct comparison to the source image data. In either case, the user-provided model revisions may be used to revise the mapping of the model to the video image so that the user's changes are retained throughout any subsequent model operations. Another useful application is to segment individual teeth where the model appears to physically couple or bridge adjacent teeth across an interproximal gap.

[00109] The cross-sectional view window 1020 may be included within the user interface 1000 to assist a user in identifying contours of a tooth surface, and in particular for more accurate manual location of a margin. Cross-section view: this view shows the cross-section of the currently selected edit area point to help identify high curvature areas. The window 1020 may display one or more of a cross-section 1022 of a subject, such as at a current edit point 1024 (which may be any of the points 1012 displayed in the video image window 1010), or a perspective of the digital model 1026 beginning at a planar cross-section that includes the current edit point 1024, or some combination of these. The orientation of the planar cross-section through a subject may vary, although for purposes of discriminating

contours, an orientation having the steepest or most varied slope may suitably be selected. A plane normal to the margin line may also be usefully employed. Points such as the current edit point 1024 or other points of the margin line, and changes thereto, may be synchronized with points displayed in the video image window 1010 and/or the model view window 103 as generally described above.

[00110] The model view window 1030 may be included within the user interface 1000 to provide a margin marking environment based more closely on three-dimensional data in the digital model 1032 of a subject. The model view window 1030 may provide a two-dimensional or three-dimensional rendering of the digital model, along with tools and/or controls such as those described above for adding, deleting, or otherwise manipulating points 1034 and/or groups of points to mark a margin line 1036 on a tooth surface. As noted above, each change to a point 1034, along with resulting changes to the margin line 1036 may be used to update display of the points and/or margin line in other windows 1010, 1020, 1040 of the user interface 1000.

[00111] The video control window 1040 may be included within the user interface 1000 to provide for user selection of a still image for display in the video image window 1010, or more generally for navigating within a video stream captured by the camera system. Using the video control window 1040, a user may navigate within the video sequence as appropriate to create, inspect, and validate a margin line. The video sequence may be a video sequence from a camera system used to obtain three-dimensional data for a scan subject, or from a related camera having a substantially known relationship relative to the camera system and/or scan subject.

[00112] In one embodiment, the controls may include a number of thumbnail images 1042 showing images from various camera locations during a scan. Other visual cues may be provided with the thumbnail images 1042. For example, an arrow 1044 or other highlighting feature may be provided to illustrate which of the thumbnail images 1042 contain surface area visible in the model view window 1030, or which of the thumbnail images 1042 contain visible portions of the margin line. Thumbnail images 1042 may also or instead be displayed with orientation information. For example, the thumbnail images 1042 may provide orientation details (e.g., buccal, lingual, distal, mesial) or distance by providing annotations

using text, icons, or other visual cues contained with or displayed adjacent to each thumbnail. A current video image displayed in the video image window 1010 may also be identified using highlighting 1046 or other visible indicia. While the current image is depicted at a left-hand side of the window 1040, the current image may instead be positioned at the center of the thumbnail images 1042 or any other suitable location. It will be appreciated that thumbnail images 1042 may in general be selected and/or grouped according to relevance in order to assist a user. For example, thumbnail images 1042 may be selected to provide a variety of views of a current tooth, or of a portion of a margin line currently being edited. Where a dentist (or other scanner) has identified a number of teeth, grouping the thumbnails so that only images of the current tooth may be particularly helpful to a downstream technician.

[00113] While a one-dimensional thumbnail array is depicted in Fig. 10, it will be understood that numerous other techniques are known in the art for video timeline control and may be suitably employed with the systems described herein. By way of example and not of limitation, the video control window 1040 may display a two-dimensional array (i.e., 2 x 5, 3 x 5, or any other suitable dimensions). The window 1040 may also, or instead, include a slider or other control for user navigation along an entire video sequence. In another aspect, the thumbnail images 1042 may be temporally adjacent frames of video data, or may be spaced apart at suitable intervals such as every fifth frame of data, tenth frame of data, or the like. The thumbnail images 1042 may also, or instead, include synthesized images from a variety of viewpoints useful for margin marking. These and other variations may be usefully employed within the video control window 1040 described herein.

[00114] In one aspect a perspective or point of view may be synchronized between the video image window 1010 and the model view window 1030. For example, a user may operate controls within the video control window 1040 to select a video image for display in the video image window 1010. In response to selection of a video image of a subject, the model view window 1030 may render the subject (based upon a digital model of the subject) from the same point of view or perspective. To this end, position data for the scanner/camera, such as x, y, and z position (in any coordinate system referenced to the subject) and rotational

orientation, may be obtained from data acquired during the scan. This position data may then be employed to render the digital model appropriately.

[00115] A user may also or instead control the perspective of the digital model in the model view window 1030 as generally described above. In this case, the video image window 1010 may be updated to provide a video image more closely corresponding to the user-selected perspective in the model view window 1030. A number of techniques may be suitable employed for synchronization from the model view window 1030 to the video image window 1010. For example, user controls for altering perspective in the model view window 1030 may be constrained so that a user can only move perspective along the camera path that was used to obtain the three-dimensional data. In this example, a limited ability to pan or zoom may be provided for variations in point of view that stay within the context of the current video image. In addition, the video image may be warped, re-sized, or otherwise manipulated to accommodate minor variations in rotational orientation or the like. As another example, a new video image may be selected for display in the video image window 1010 by finding a video image within the full video sequence (or a portion of the full video sequence) that most closely corresponds to the user-selected viewpoint. This may be determined, for example based upon any suitable distance or other quantitative comparison between position and/or rotational orientation of a new user-select viewpoint and viewpoints associated with images within the video sequence. As another example, a new video image may be synthesized that nearly or exactly corresponds to the user-selected perspective using various combinations of video data, camera system distortion models, three-dimensional digital model data, and any other available data. This may include, for example, mapping video texture data onto the three-dimensional model, or combining video data from a number of different video images, along with suitable warping, scaling, registration, and the like.

[00116] In another embodiment, the system may provide unidirectional synchronization. That is, the model view may respond to a selection of a still image by rendering from the perspective of the selection. The model view may subsequently be manipulated to provide any suitable perspective for editing or validating a margin, while the still image in the video image window 1010 remains unchanged. The user may be provided with a reset control to return the model view to the perspective of the still image, and the

model view may continue to respond to a new image selection by re-rendering the model from the perspective of the new image. Thus views in the video image window 1010 may control rendering in the model view window 1030. However, altering perspective of the model view window 1030 has no effect on the still image displayed in the video image window 1010.

5 **[00117]** In another aspect, display of the points 1012 in the video image window 1010 may be synchronized with display of points 1032 in the model view window 1030. Thus a user manipulation of a point 1012 in the video image window 1010 may be used to update the same point 1032 in the model view window 1030, and a user manipulation of a point 1032 in the model view window 1030 may be used to update the same point 1012 in the
10 video image window 1010. It will be understood that in either case, a user may select a point in two dimensions (corresponding to the user interface), with a three-dimensional location of the point determined by projecting the x and y coordinate of the point on to a surface of the model or the still image. In either case, information about the camera system such as distortion models for camera channels may be employed to accurately transform spatial
15 information for a point between the two windows 1010, 1030. More generally, some or all of the windows 1010, 1020, 1030, 1040 may include tools for manipulating points and/or the margin line, with any changes updated throughout all of the windows. It will be appreciated that numerous other arrangements may be provided. For example, points and/or margin lines may optionally not be displayed in the video control window 1040 or cross-sectional view
20 window 1020. As another example, tools for controlling points may only be provided in one or two of the windows, such as the video image window 1010 and the model view window 1030.

[00118] Using the user interface 1000 and tools described above, a wide array of iterative and/or interactive margin marking processes may be employed. By way of example
25 and not of limitation, one such operation is now described. A user may initiate a margin marking process by selecting a thumbnail image 1042 in the video control window 1040 for display (as a “working image”) in a working area such as the video image window 1010. A user may then use a mouse to select points along a margin line in the video image window 1010. The margin marking system may receive these two-dimensional selections through the
30 user interface 1000 and correlate them to the three-dimensional space of the three-

dimensional model. Using location/rotation data for the selected image, the system may also render a corresponding view of the digital model in the model view window 1030, along with any corresponding points selected in the working area. A user may review point selections and a corresponding margin line in the model view window 1030. In addition, the user may
5 manipulate the model view to provide any number of useful perspectives on the model for visual validation of the selected margin or points thereof. A user may then select another thumbnail to obtain a new working image, and continue iteratively until adequate points have been identified to derive a complete, closed loop margin line.

[00119] In another aspect, tools may be provided for manipulating the digital model,
10 either through interaction with the model in the model view window 1030, the video image in the video image window 1010, or a combination of these. For example, the three-dimensional cursor techniques described above may be more generally applied to address possible variations between a video image (based upon a single image pair) and a model view (based upon a composite of image pairs). The variations may result from image-to-image variations
15 in subject matter clarity, or model-wide variations resulting from the synthesis of numerous different image pairs. In addition, the techniques described above may be used to correct errors originating with the person who originally operated the scanner. For example, where a flap of skin or the like obstructs a portion of a margin, or a particle or the like creates a discontinuity on the margin line, these deficiencies may be addressed by extrapolating,
20 interpolating, or otherwise synthesizing other available surface data either automatically, semi-automatically, or manually using the interactive model editing tools above.

[00120] While the invention has been described in connection with certain preferred embodiments, other embodiments may be understood by those of ordinary skill in the art and are encompassed herein.

CLAIMS

What is claimed is:

- 5 1. A method comprising:
 creating a three-dimensional model from a sequence of image sets, each image set
 including a plurality of images of a subject including dentition, each one of the plurality of
 images captured from a different optical axis, the plurality of images including at least one
 video image;
10 rendering the three-dimensional model in a user interface from a perspective;
 selecting a video image from the sequence of image sets that contains a view of the
 subject most closely corresponding to the perspective;
 displaying the video image in the user interface; and
 providing a tool for marking a margin of the dentition.
15
2. A system comprising:
 a memory storing a three-dimensional model of a subject and a sequence of image sets
 used to create the three-dimensional model, each image set including a plurality of images of
 a subject including dentition, each one of the plurality of images captured from a different
20 optical axis, the plurality of images including at least one video image;
 a display configured to provide a user interface presenting the sequence of image sets;
 and
 a processor configured to render the three-dimensional model in the user interface
 from a perspective, select a video image from the sequence of image sets that contains a view
25 of the subject most closely corresponding to the perspective, display the video image in the
 user interface, and provide a tool for marking a margin of the dentition.

3. A method comprising:
creating a three-dimensional model from a sequence of image sets, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis;

5 displaying one of the plurality of images in a first window;
rendering the three-dimensional model in a second window; and
synchronizing the first window and the second window to provide a common perspective on the subject.

10 4. The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and rotating the three-dimensional model to maintain the common perspective.

15 5. The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective.

20 6. The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective.

25 7. The method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective.

8. The method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and creating a composite video image from two or more of the plurality of images to provide a common perspective on the subject.

9. A system comprising:

a memory storing a three-dimensional model of a subject and a sequence of image sets used to create the three-dimensional model, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different
5 optical axis;

a display configured to provide a user interface displaying one of the plurality of images in a first window; and

a processor configured to render the three-dimensional model in a second window displayed in the user interface and synchronize the first window and the second window to
10 provide a common perspective on the subject.

10. The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and rotate the three-dimensional model to maintain the common perspective.

11. The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and translate the three-dimensional model to maintain the common perspective.

12. The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and scale the three-dimensional model to maintain the common perspective.

13. The system of claim 9 wherein the processor is configured to receive a user selection
25 of a different perspective of the three-dimensional model and select a new one of the plurality of images to maintain the common perspective.

14. The system of claim 9 wherein the processor is configured to receive a user selection of a different perspective of the three-dimensional model and create a composite video image
30 from two or more of the plurality of images to provide a common perspective on the subject.

15. A method comprising:

displaying a three-dimensional model of dentition from a perspective;

providing a plurality of video images of the dentition;

5 selecting one of the plurality of video images that shows the dentition from the perspective; and

displaying the one of the plurality of video images in a user interface with the three-dimensional model as an aid to visually determining a margin of the dentition.

10 16. The method of claim 15 further comprising displaying a margin on one or more of the three-dimensional model or the one of the plurality of video images.

17. The method of claim 16 further comprising receiving a user modification of the margin and updating the display with a modified margin.

15 18. A system comprising:

a display having a window for displaying a three-dimensional model of dentition from a perspective;

a camera providing a plurality of video images of the dentition; and

20 a processor configured to select one of the plurality of video images that shows the dentition from the perspective and display in a second window in the display the one of the plurality of video images as an aid to visually determining a margin of the dentition.

25 19. The system of claim 18 wherein the processor is configured to display a margin on one or more of the three-dimensional model or the one of the plurality of video images.

20. The system of claim 19 wherein the processor is configured to receive a user modification of the margin and update the display with a modified margin.

SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA

ABSTRACT

5 Tools are described for preparing digital dental models for use in dental restoration
production processes, along with associated systems and methods. Dental modeling is
improved by supplementing views of three-dimensional models with still images of the
modeled subject matter. Video data acquired during a scan of the model provides a source of
still images that can be displayed alongside a rendered three-dimensional model, and the two
10 views (model and still image) may be synchronized to provide a common perspective of the
model's subject matter. This approach provides useful visual information for disambiguating
surface features of the model during processing steps such as marking a margin of a prepared
tooth surface for a restoration. Interactive modeling tools may be similarly enhanced. For
example, tools for margin marking may synchronize display of margin lines between the still
15 image and the model so that a user can interact with either or both of the visual
representations, with changes to a margin reflected in both displays.

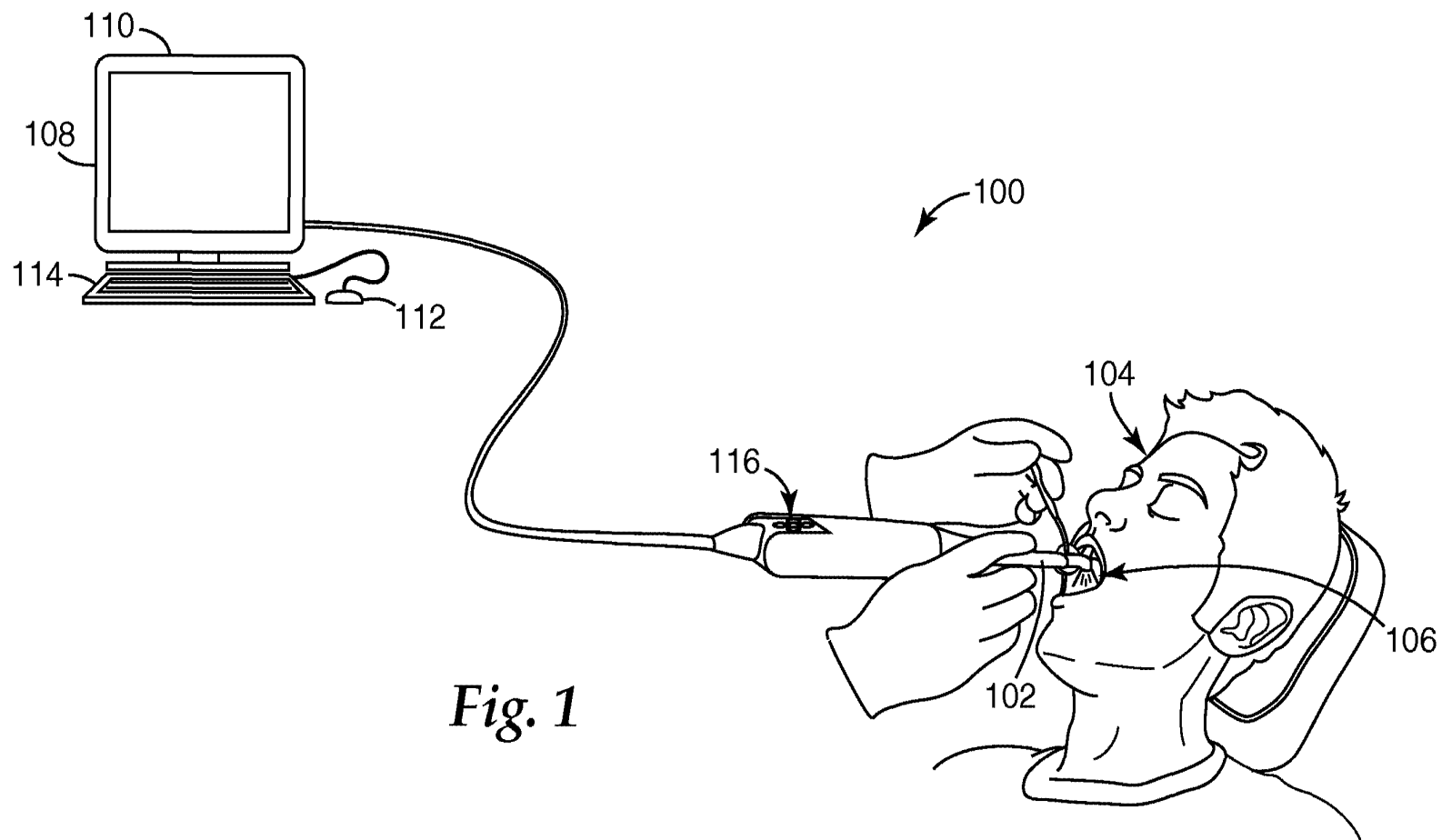


Fig. 1

1/6

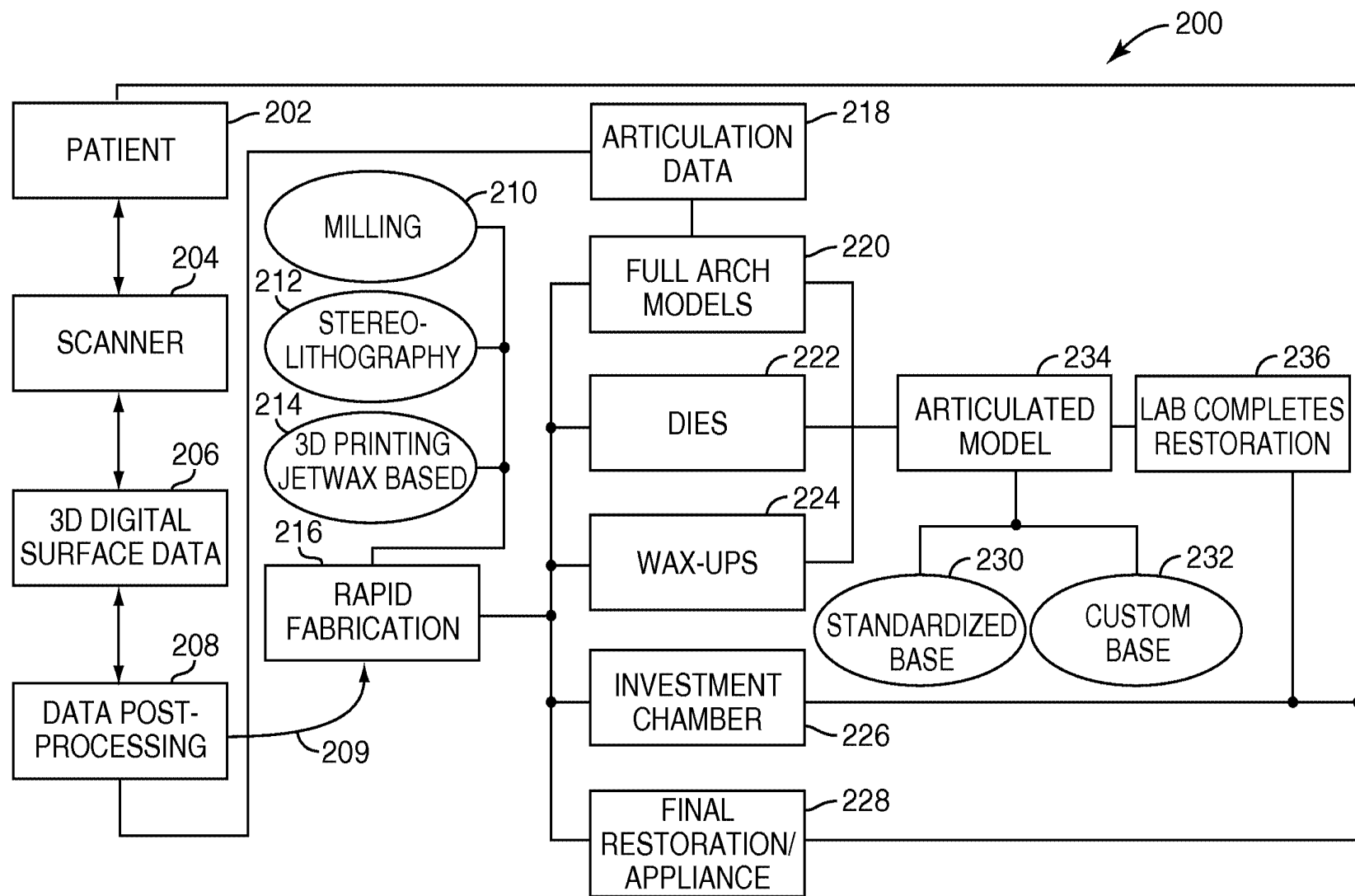


Fig. 2

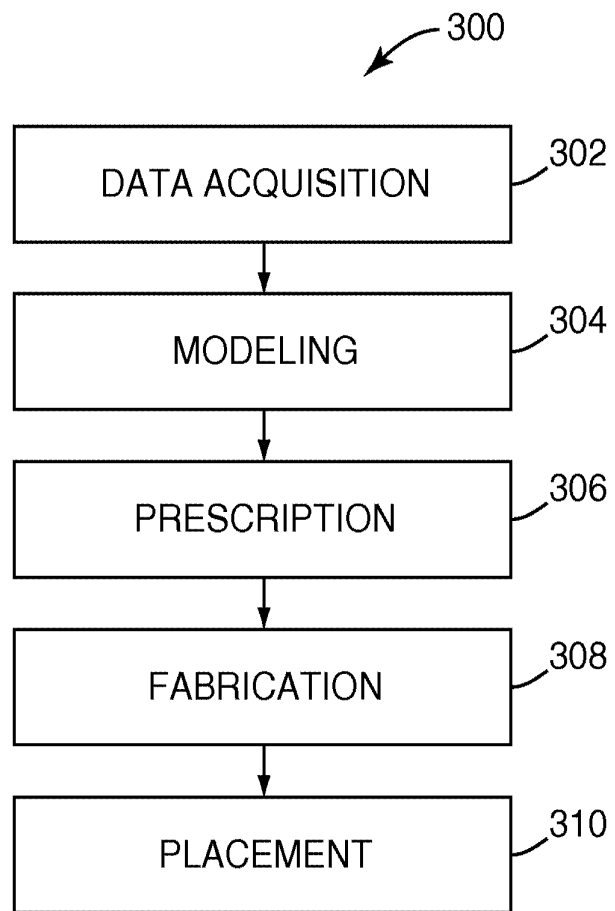


Fig. 3

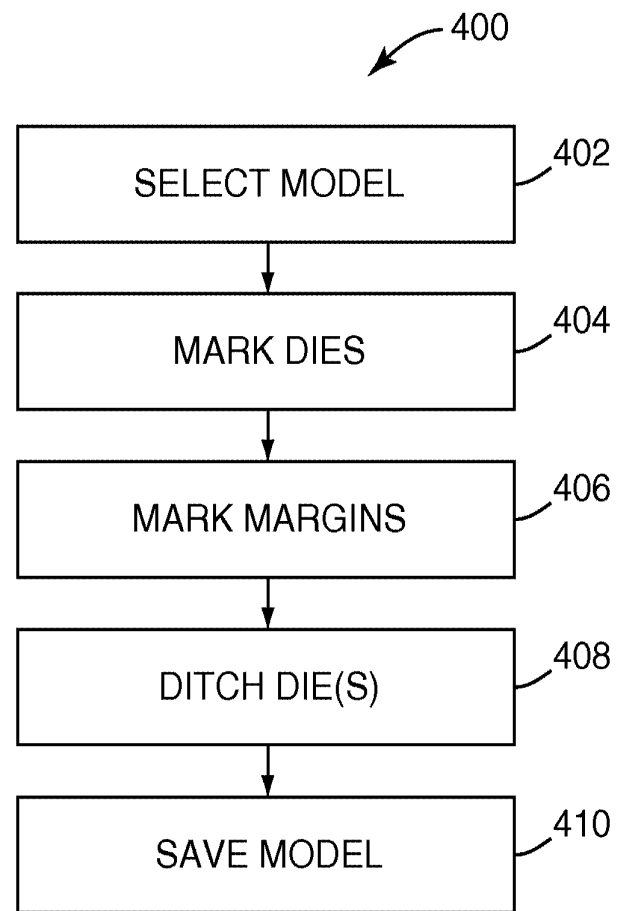


Fig. 4

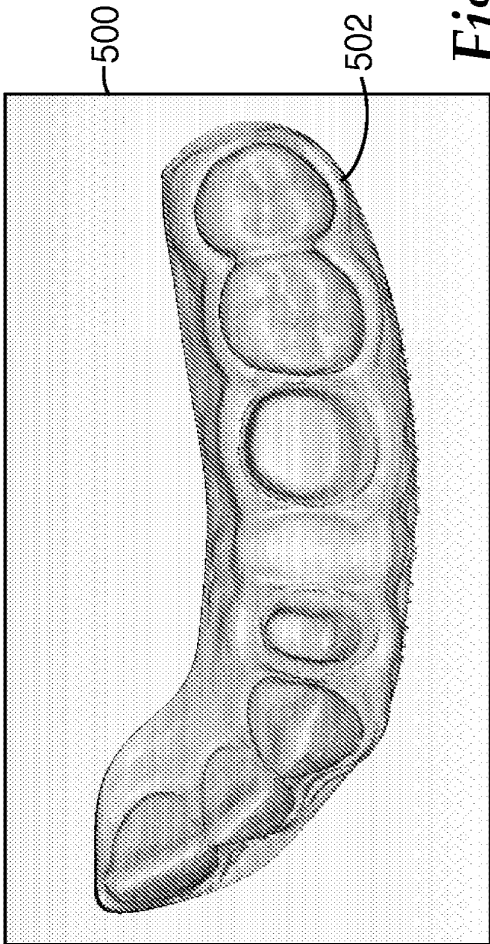


Fig. 5

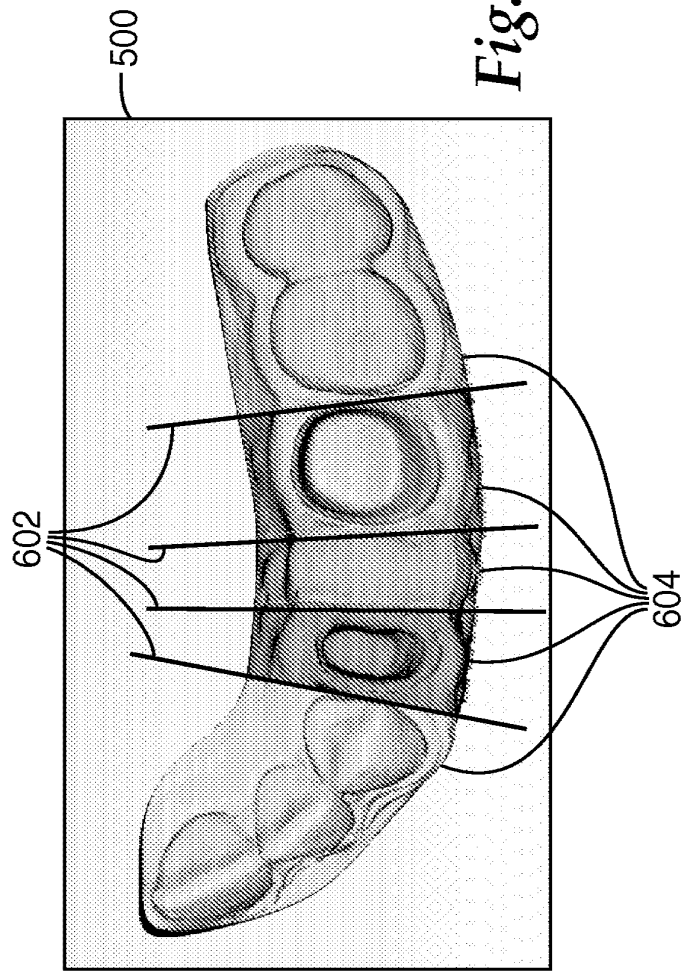


Fig. 6

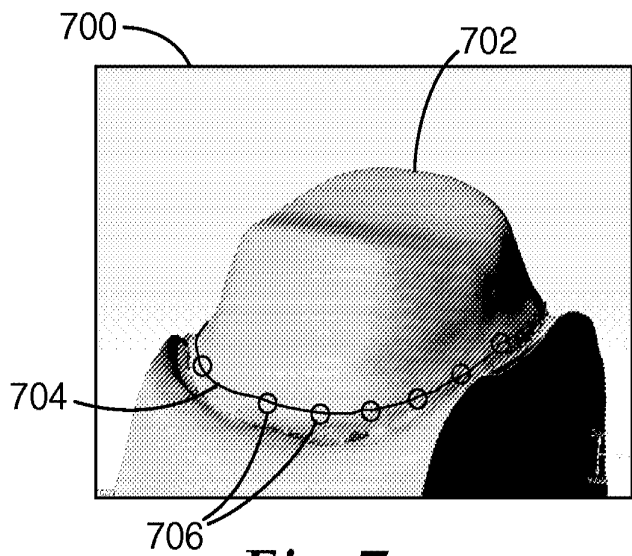


Fig. 7

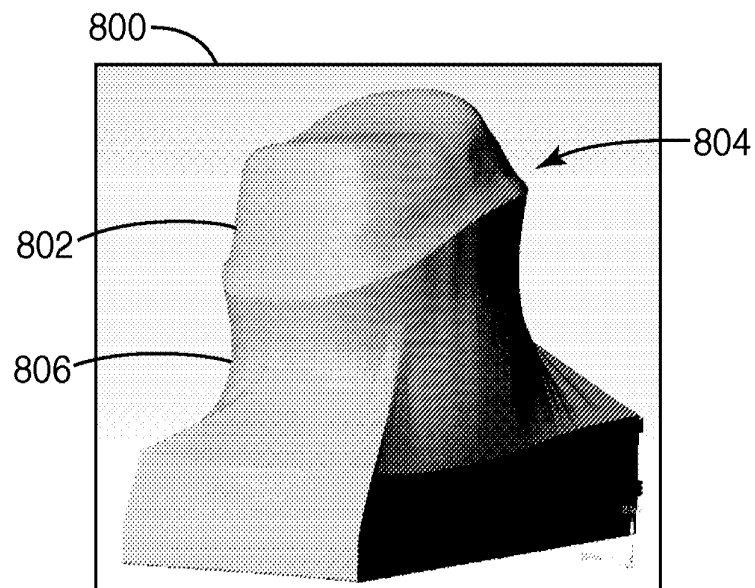


Fig. 8

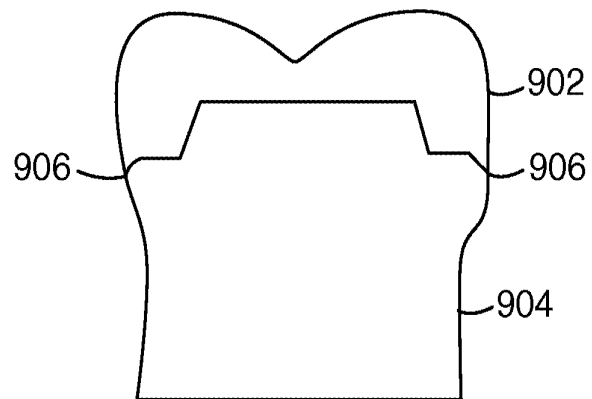


Fig. 9

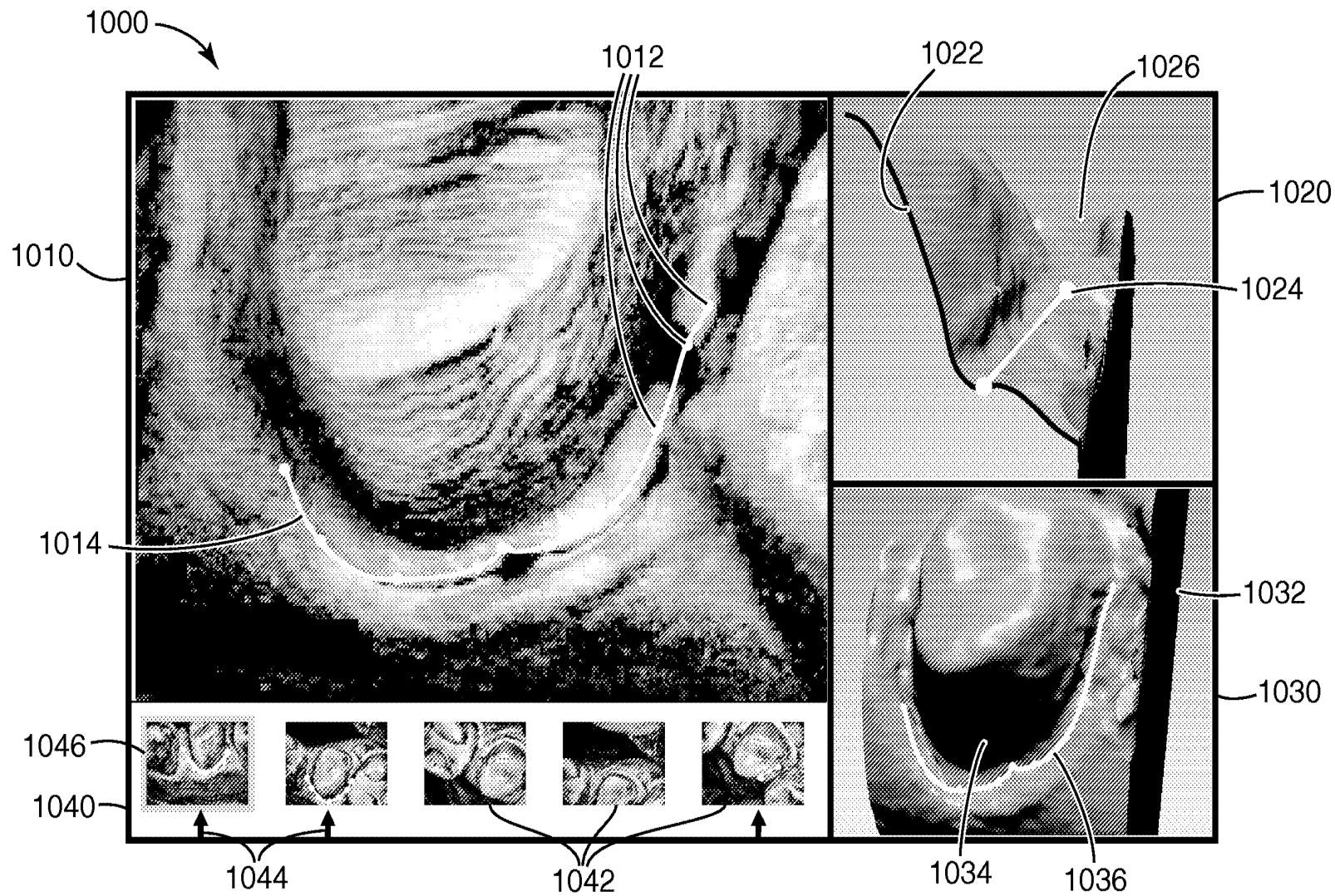


Fig. 10

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	SYNCHRONIZED VIEWS OF VIDEO DATA AND THREE-DIMENSIONAL MODEL DATA			
First Named Inventor/Applicant Name:	Janos Rohaly			
Filer:	Lance L. Vietzke/Paula Bick			
Attorney Docket Number:	63341US008			
Filed as Large Entity				
Utility under 35 USC 111(a) Filing Fees				
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:				
Independent claims in excess of 3	1201	3	420	1260
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2860

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First Named Inventor/Applicant Name:	Janos Rohaly
Customer Number:	32692
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Time Stamp:	13:23:54
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RAM confirmation Number	10826
Deposit Account	133723
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	Transmittal_63341US008.PDF	461873	no	2
			0435a8696361eb54fd0d34c5dc0fc765332510ed		
Warnings:					
Information:					
2	Application Data Sheet	ADS_63341US008.PDF	1235131	no	8
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Warnings:					
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3	Power of Attorney	POA.PDF	324436	no	1
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4		AppAsFiled_63341US008.PDF	208933	yes	47
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	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	42	
	Claims		43	46	
	Abstract		47	47	
Warnings:					
Information:					
5	Drawings-only black and white line drawings	63341US008_DWGS_9-16-14.PDF	915579	no	6
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6	Fee Worksheet (SB06)	fee-info.pdf	36976	no	2
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Application Number: 14487371

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- Drawings – Other than Black and White Line Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

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