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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Continued on next page]

(54) Title: METHOD FOR USING A PHYSICAL OBJECT TO MANIPULATE A CORRESPONDING VIRTUAL OBJECT IN A VIRTUAL ENVIRONMENT, AND ASSOCIATED APPARATUS AND COMPUTER PROGRAM PRODUCT

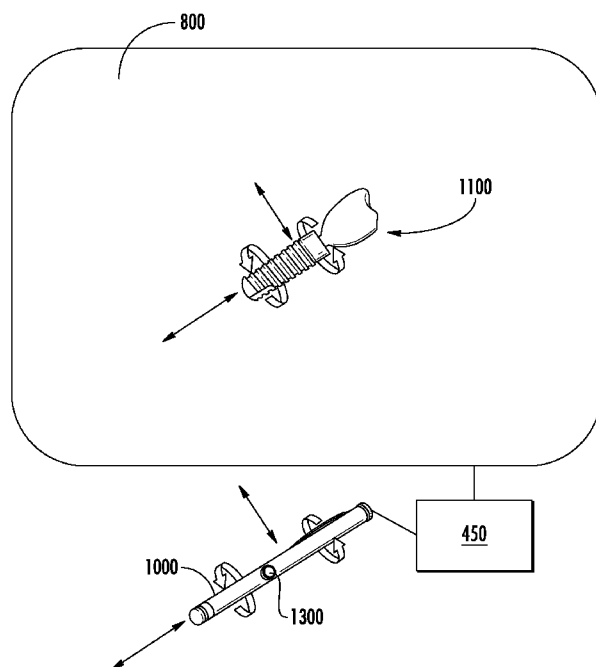


FIG. 6

(57) Abstract: Systems and methods are provided for planning a procedure. A display device is configured to display a first virtual element. A controller device having a processor is configured to be in communication with the display device, and the controller device is further configured to direct the display device to display the first virtual element. A physical control element is in communication with the controller device, and is configured to correspond to the first virtual element such that an actual manipulation of the control element is displayed, via the processor of the controller device and on the display device, as a corresponding response of the first virtual element to the actual manipulation of the control element. Associated systems, methods, and computer program products are also provided.



SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

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19 October 2017

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/021192

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B34/10 A61B34/00
ADD. A61C8/00 A61B34/32

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)

A61B A61C

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Anonymous: "Computer mouse - Wikipedia, the free encyclopedia", 5 March 2015 (2015-03-05), XP055272627, Retrieved from the Internet: URL:https://en.wikipedia.org/w/index.php?title=Computer_mouse&oldid=650002099 [retrieved on 2016-05-13] page 1 ----- -/--	1,8,15, 22,29



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/021192

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	3shape: "Dental System(TM) 2013 - Implant Planning and Guided Surgery", YouTube, 12 March 2013 (2013-03-12), pages 1-1, XP054976528, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=zg8gf3Vtp0w [retrieved on 2016-05-17] time stamps 2:10-2:33 -----	1,2,4,5, 8,9,12, 15,16, 19,22, 23,26, 29,30, 32,33
X	Kanal von voxelmansimulators: "Cavity Preparation with VOXEL-MAN Dental", YouTube, 7 February 2012 (2012-02-07), pages 1-1, XP054976530, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=CB_vdW6K42o [retrieved on 2016-05-17] timestamps 0:33, 1:22, 1:49, 1:31-1:33 -----	1,2,5,8, 9,12,15, 16,19, 22,23, 26,29, 30,33
X	hapTELproject: "hapTEL demo video", 24 August 2009 (2009-08-24), XP054977718, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=dH94oeEla6E [retrieved on 2017-09-11] 0:17-0:22 description text of video -----	1,7, 11-14, 16, 18-21, 27,28, 34,35
X	Anonymous: "Drag and drop - Wikipedia, the free encyclopedia", 24 January 2014 (2014-01-24), XP055186807, Retrieved from the Internet: URL:http://en.wikipedia.org/w/index.php?title=Drag_and_drop&oldid=592127371 [retrieved on 2015-04-29] the whole document -----	1,3,6,8, 10,15, 17,22, 24,25, 29,31
X	phattanapon: "Better Dentists through Virtual Reality", YouTube, 1 January 2011 (2011-01-01), pages 1-1, XP054976529, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=XiTP9Q8JUSs [retrieved on 2016-05-17] the whole document ----- -/--	1,2,5,8, 9,11,12, 15,16, 19,22, 23,26, 29,30,33

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/021192

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	tlrptel: "Hi-tech tools for dental students", 13 September 2010 (2010-09-13), XP054977720, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=WTBJTgTlywE [retrieved on 2017-09-11] the whole document -----	1,7, 11-14, 16, 18-21, 27,28, 34,35

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/021192

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.:

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, 2, 5, 8, 9, 12, 15, 16, 19, 22, 23, 26, 29, 30, 33

Systems and methods for planning procedures with physical control elements and virtual display elements, directed at the use of such systems in dental planning procedures.

2. claims: 3, 4, 6, 7, 10, 11, 13, 14, 17, 18, 20, 21, 24, 25, 27, 28, 31, 32, 34, 35

Systems and methods for planning procedures with physical control elements and virtual display elements, directed at specific interaction features of the human-machine interface.
