(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 April 2002 (11.04.2002)

PCT

(10) International Publication Number
WO 02/029758 A3

(51) International Patent Classification[7]: G06F 19/00

(21) International Application Number: PCT/US01/30480

(22) International Filing Date:
28 September 2001 (28.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/679,725 4 October 2000 (04.10.2000) US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:
US 09/679,725 (CIP)
Filed on 4 October 2000 (04.10.2000)

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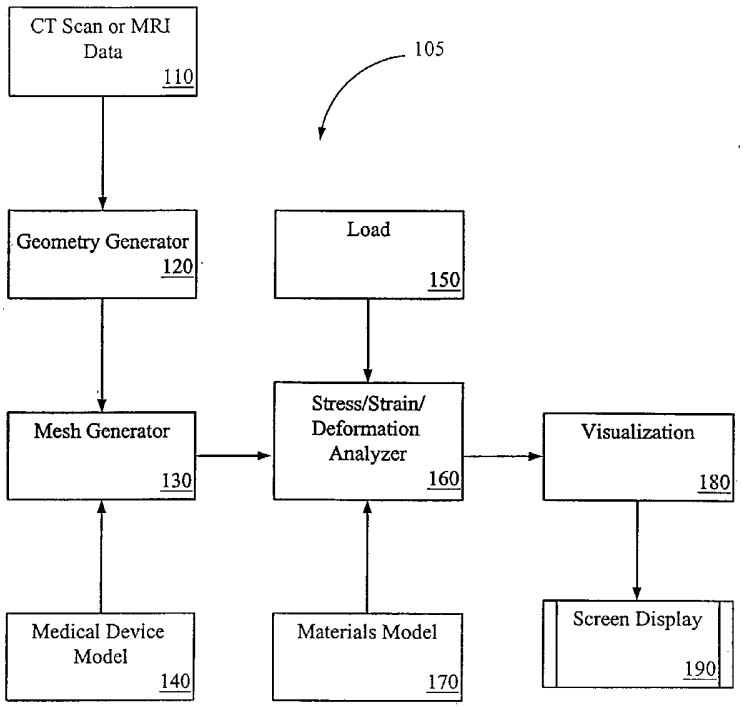
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,

[Continued on next page]

(54) Title: VIRTUAL PROTOTYPING AND TESTING FOR MEDICAL DEVICE DEVELOPMENT



(57) Abstract: A system and method of developing better-designed medical devices, particularly prosthesis and more particularly cardiovascular stents and endovascular grafts. The system comprises a geometry generator, a mesh generator, a stress/strain/deformation analyzer, and, optionally, a visualization tool. In one embodiment, the geometry generator receives three-dimensional volumetric data of an anatomical feature and generates a geometric model. The mesh generator then receives such geometric model of an anatomical feature or an in vitro model and a geometric model of a candidate medical device. In another embodiment, the mesh generator only receives a geometric model of the candidate medical device. Using the geometric model(s) received, the mesh generator creates or generates a mesh or a finite element model. The stress/strain/deformation analyzer then receives the mesh, and the material models and loads of that mesh. Using analysis, preferably non-linear analysis, the stress/strain/deformation analyzer determines the predicted stresses, strains, and deformations on the candidate medical device. Such stresses, strains, and deformations may optionally be simulated visually using a visualization tool.

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MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

Published:

— *with international search report*

(88) Date of publication of the international search report:
10 July 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

Int ›nal Application No
PCT/US 01/30480

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06F19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F A61F

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, BIOSIS, IBM-TDB, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BOZIC K J ET AL: "Three-dimensional finite element modeling of a cervical vertebra: an investigation of burst fracture mechanism." JOURNAL OF SPINAL DISORDERS. UNITED STATES APR 1994, vol. 7, no. 2, April 1994 (1994-04), pages 102-110, XP008014238 ISSN: 0895-0385	1-4, 8-11, 14-19, 23-26, 29-32, 36-38, 41-43, 47-49, 52-57, 61-64, 67-73, 77-80, 83-87, 91-93, 96-100, 104-106, 109-111
Y		5-7, 20-22,

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 March 2003	20/03/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340-2040, Tx. 31 651 epo nl, Fax: (+31–70) 340-3016	Godzina, P

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
		33-35, 44-46, 58-60, 74-76, 88-90, 101-103
	abstract page 103, left-hand column, line 52 -page 105, right-hand column, line 44 page 109, left-hand column, line 38 -right-hand column, line 2 figures 1,2,4,5 ---	
Y	CANERO C ET AL: "Optimal stent implantation: three-dimensional evaluation of the mutual position of stent and vessel via intracoronary echocardiography" COMPUTERS IN CARDIOLOGY, 1999 HANNOVER, GERMANY 26-29 SEPT. 1999, PISCATAWAY, NJ, USA,IEEE, US, 26 September 1999 (1999-09-26), pages 261-264, XP010367090 ISBN: 0-7803-5614-4	5-7, 20-22, 33-35, 44-46, 58-60, 74-76, 88-90, 101-103
A		1-4, 8-11, 14-19, 23-26, 29-32, 36-38, 41-43, 47-49, 52-57, 61-64, 67-73, 77-80, 83-87, 91-93, 96-100, 104-106, 109-111
	the whole document --- -/--	

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	TESTI D ET AL: "Risk of fracture in elderly patients: a new predictive index based on bone mineral density and finite element analysis" COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE, JULY 1999, ELSEVIER, IRELAND, vol. 60, no. 1, pages 23-33, XP002233879 ISSN: 0169-2607 the whole document ---	1-4, 8-11, 14-19, 23-26, 29-32, 36-38, 41-43, 47-49, 52-57, 61-64, 67-73, 77-80, 83-87, 91-93, 96-100, 104-106, 109-111
A	STERN CH ET AL: "INTERACTIVE DEFINITION OF ENDOLUMINAL AORTIC STENT SIZE AND MORPHOLOGY BASED ON VIRTUAL ANGIOSCOPIC RENDERING OF 3D MAGNETIC RESONANCE ANGIOGRAPHY (MRA)" CARS. COMPUTER ASSISTED RADIOLOGY AND SURGERY. PROCEEDINGS OF THE INTERNATIONAL CONGRESS AND EXHIBITION, PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON COMPUTER ASSISTED RADIOLOGY AND SURGERY, XX, XX, June 1999 (1999-06), pages 176-180, XP000949213 the whole document ---	1-111
A	EP 0 574 098 A (AMERICAN MED ELECTRONICS) 15 December 1993 (1993-12-15) abstract column 1, line 23 -column 2, line 22 column 3, line 37 -column 6, line 14 figures 3,4,6,11 -----	1-111

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int[illegible]nal Application No
PCT/US 01/30480

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