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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 March 2013 (14.03.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/036831 A1

(51) International Patent Classification:
A61B 5/06 (2006.01)

(21) International Application Number:
PCT/US2012/054256

(22) International Filing Date:
7 September 2012 (07.09.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/573,557 8 September 2011 (08.09.2011) US
61/627,728 17 October 2011 (17.10.2011) US

(71) Applicant *(for all designated States except US)*: **APN HEALTH, LLC** [US/US]; W305 N2963 Red Oak Court, Pewaukee, Wisconsin 53072 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **SRA, Jasbir** [US/US]; W305 N2963 Red Oak Court, Pewaukee, Wisconsin 53072 (US). **BELANGER, Barry** [US/US]; N6101 Oakland Hills, Chenequa, Wisconsin 53058 (US). **PAULMA, Mark** [US/US]; 2911 Ivanhoe Glen, Fitchburg, Wisconsin 53711 (US). **BRODNICK, Donald** [US/US]; N75 W7115 Linden St., Cedarburg, Wisconsin 53012 (US). **LANGENBACH, Bruce** [US/US]; 4141 N. Hawthorn Trace Rd., #207, Milwaukee, Wisconsin 53209 (US). **JANSSON, David G.** [US/US]; 5131 Park Place, Racine, Wisconsin 53402 (US).

(74) Agents: **JANSSON, Peter N.** et al.; 245 Main Street, Racine, Wisconsin 53403 (US).

(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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, 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, 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.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH,

[Continued on next page]

(54) Title: AUTOMATICALLY DETERMINING 3D CATHETER LOCATION AND ORIENTATION USING 2D FLUOROSCOPY ONLY

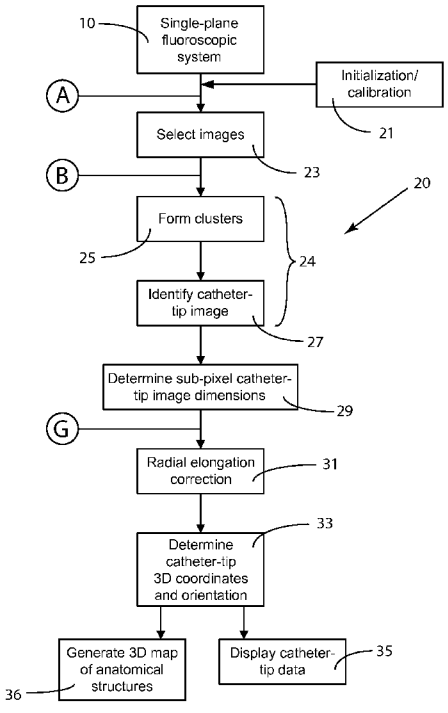


FIG. 4

(57) Abstract: A method for automatically determining the 3D position and orientation of a radio-opaque medical object in a living body using single-plane fluoroscopy comprising capturing a stream of digitized 2D images from a single-plane fluoroscope (10), detecting the image of the medical object in a subset of the digital 2D images, applying pixel-level geometric calculations to measure the medical-object image, applying conical projection and radial elongation corrections (31) to the image measurements, and calculating the 3D position and orientation of the medical object from the corrected 2D image measurements.

WO 2013/036831 A1

GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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