



(51) International Patent Classification:

A61N 5/10 (2006.01) G06T 7/00 (2006.01)
A61B 19/00 (2006.01)

(21) International Application Number:

PCT/US2013/039009

(22) International Filing Date:

1 May 2013 (01.05.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

13/462,750 2 May 2012 (02.05.2012) US

(71) Applicant: VIEWRAY INCORPORATED [US/US]; 2 Thermo Fisher Way, Oakwood Village, OH 44146 (US).

(72) Inventor: DEMPSEY, James, F.; 2 Thermo Fisher Way, Oakwood Village, OH 44146 (US).

(74) Agents: CONLEY, James, P. et al.; Mintz Levin Cohn Ferris Glovsky and Popeo, P.C., One Financial Center, Boston, MA 02111 (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, 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))
- with amended claims (Art. 19(1))

(88) Date of publication of the international search report: 27 February 2014

Date of publication of the amended claims: 1 May 2014

(54) Title: VIDEOGRAPHIC DISPLAY OF REAL-TIME MEDICAL TREATMENT

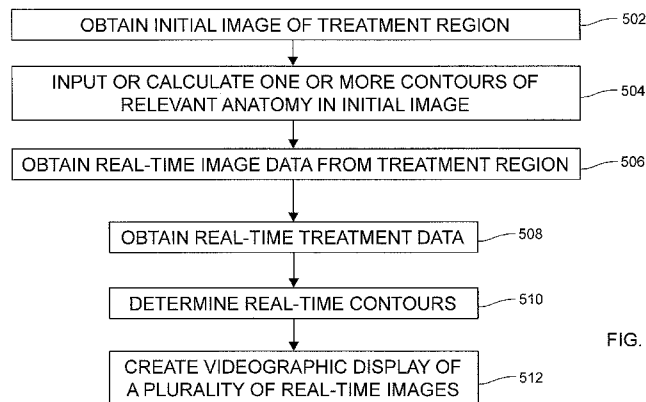


FIG. 5

500

(57) Abstract: Systems and methods for creation of a videographic representation of a real-time medical treatment by a processor operating in conjunction with a treatment device and an imaging device are described. The representation may include real-time imaging data, a representation of real-time treatment data and contours of relevant anatomy among other things. Related systems and techniques are also described.

WO 2013/166111 A4

received by the International Bureau on 14.03.2014

1. A method comprising:
 - delivering one or more radiation beams of ionizing radiation from one or more external radioisotope sources of an irradiating device controlled by a radiation treatment system to a treatment region according to a planned treatment regimen;
 - obtaining a plurality of real-time images of the treatment region using an imaging device controlled by the radiation treatment system while delivering of the one or more radiation beams;
 - obtaining real-time treatment data during the delivery of the one or more radiation beams, wherein the real time treatment data comprises one or more of: firing status of the one or more radiation beams, location of the one or more radiation beams, shape of the one or more radiation beams, intensity of radiation associated with the one or more radiation beams, and delivered radiation dose;
 - determining one or more real-time contours of relevant anatomy in the plurality of the real-time images using an image processing technique;
 - providing for a videographic display of one or more of the plurality of the real-time images, the videographic display including one or more corresponding real-time contours and a representation of the real-time treatment data.
2. The method of claim 1, wherein the imaging device is a magnetic resonance imaging system.
3. The method of claim 2, wherein the image processing technique is deformable image registration.
4. The method of claim 1, wherein the representation of the real-time treatment data in the videographic display includes one or more of: a graphical representation of a beam for the one or more radiation beams when the one or more radiation beams are on, an indication of accumulated dose deposition, and textual indications of the amount of accumulated deposited dose.

5. The method of claim 1, wherein initial images and the plurality of real-time images are obtained from one or more of: a magnetic resonance imaging system, a positron emission tomography scanner, a computed tomography scanner and an X-ray machine.
6. The method of claim 5, wherein the image processing technique is deformable image registration.
7. The method of claim 1, wherein the real-time treatment data further comprises at least one of surgical instrument location information and surgical incision location information.
8. The method of claim 1, wherein the real-time treatment data further comprises at least one of a graphical representation of an instrument and a portion of a medical professional that is captured in the real-time images.
9. The method of claim 1, wherein the videographic display is provided on a remote device.
10. The method of claim 1, wherein the videographic display is three dimensional.
11. A system comprising:
 - an irradiating device configured to deliver to a treatment region one or more radiation beams of ionizing radiation from one or more external radioisotope sources of the irradiating device according to a planned treatment regimen, the irradiating device further configured to acquire real-time treatment data during the delivery of the one or more radiation beams,
 - wherein the real time treatment data comprises one or more of: firing status of the one or more radiation beams, location of the one or more radiation beams, shape of the one or more radiation beams, intensity of radiation associated with the one or more radiation beams, and delivered radiation dose;
 - an imaging device configured to acquire a plurality of real-time images of the treatment region during the delivery of the one or more radiation beams;
 - a display; and

a processor configured to determine one or more real-time contours of relevant anatomy in the plurality of the real-time images using an image processing technique and to output to the display a videographic display of the plurality of the real-time images, the videographic display including the one or more real-time contours and a representation of the real-time treatment data.

12. The system of claim 11, wherein the imaging device is a magnetic resonance imaging system.

13. The system of claim 12, wherein the image processing technique is deformable image registration.

14. The system of claim 11, wherein the representation of the real-time treatment data in the videographic display includes one or more of: a graphical representation of a beam for the one or more radiation beams when the radiation beam is on, an indication of accumulated dose deposition, and textual indications of the amount of accumulated deposited dose.

15. The system of claim 11, wherein the imaging device is selected from: a magnetic resonance imaging system, a positron emission tomography scanner, a computed tomography scanner and an X-ray machine

16. The system of claim 15, further comprising a second imaging device configured to acquire a portion of the images of the treatment region.

17. The system of claim 11, wherein the real-time treatment data further comprises at least one of surgical instrument location information and surgical incision location information.

18. The system of claim 11, wherein the real-time treatment data further comprises a graphical representation of at least one of an instrument that is captured in the real-time images and a portion of a medical professional that is captured in the real-time images.

19. The system of claim 11, wherein the display is on a remote device.

20. The system of claim 11, wherein the videographic display is provided over a web interface to a social media site.

21. The system of claim 11, wherein the videographic display is three dimensional.