US 20050143651A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0143651 A1**

Verard et al. (43) **Pub. Date: Jun. 30, 2005**

(54) **METHOD AND APPARATUS FOR VIRTUAL ENDOSCOPY**

(76) Inventors: **Laurent Verard**, Superior, CO (US); **Paul Kessman**, Broomfield, CO (US); **Mark Hunter**, Broomfield, CO (US)

Correspondence Address:
HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 828
BLOOMFIELD HILLS, MI 48303 (US)

(21) Appl. No.: **11/068,342**

(22) Filed: **Feb. 28, 2005**

Related U.S. Application Data

(63) Continuation of application No. 10/223,847, filed on Aug. 19, 2002, now Pat. No. 6,892,090.

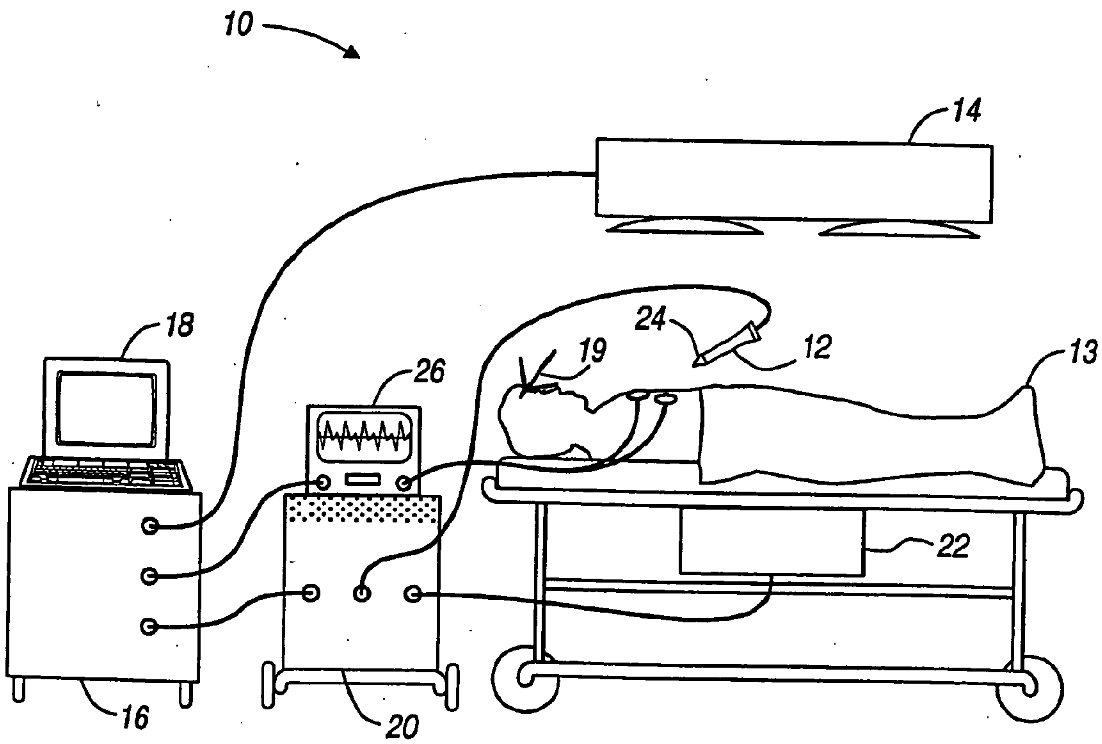
Publication Classification

(51) **Int. Cl.**[7] **A61B 5/05**

(52) **U.S. Cl.** **600/424**

(57) **ABSTRACT**

A surgical instrument navigation system is provided that visually simulates a virtual volumetric scene of a body cavity of a patient from a point of view of a surgical instrument residing in the cavity of the patient. The surgical instrument navigation system includes: a surgical instrument; an imaging device which is operable to capture scan data representative of an internal region of interest within a given patient; a tracking subsystem that employs electromagnetic sensing to capture in real-time position data indicative of the position of the surgical instrument; a data processor which is operable to render a volumetric perspective image of the internal region of interest from a point of view of the surgical instrument; and a display which is operable to display the volumetric perspective image of the patient.



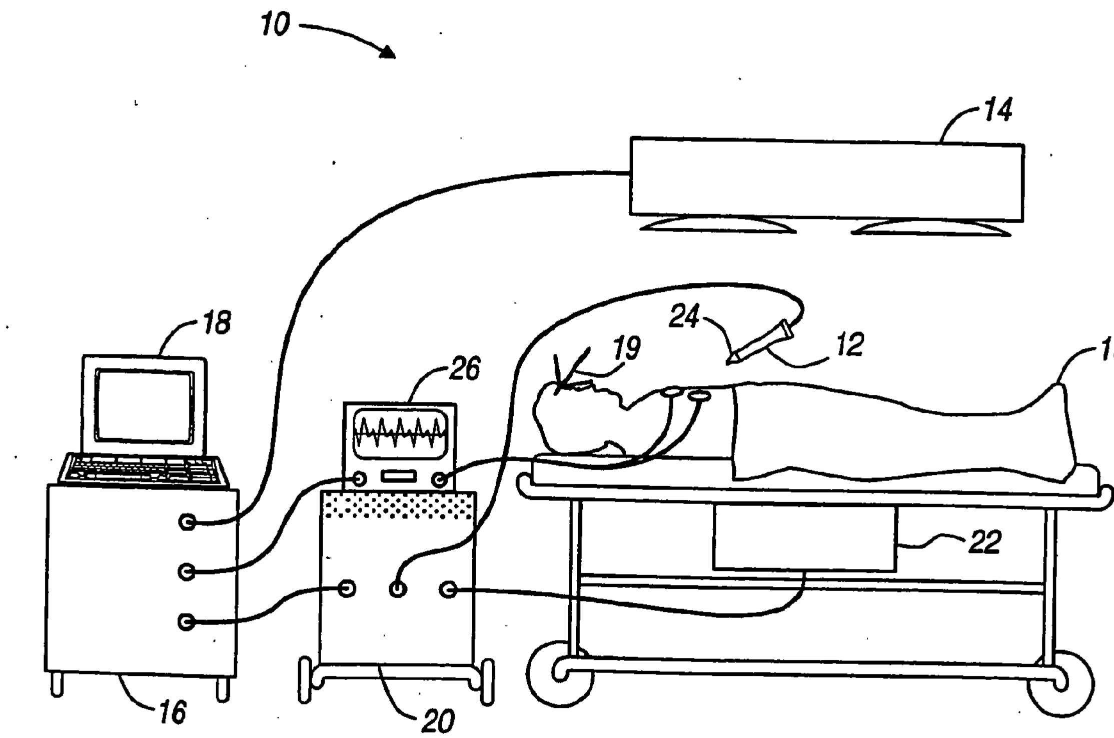


FIGURE- 1

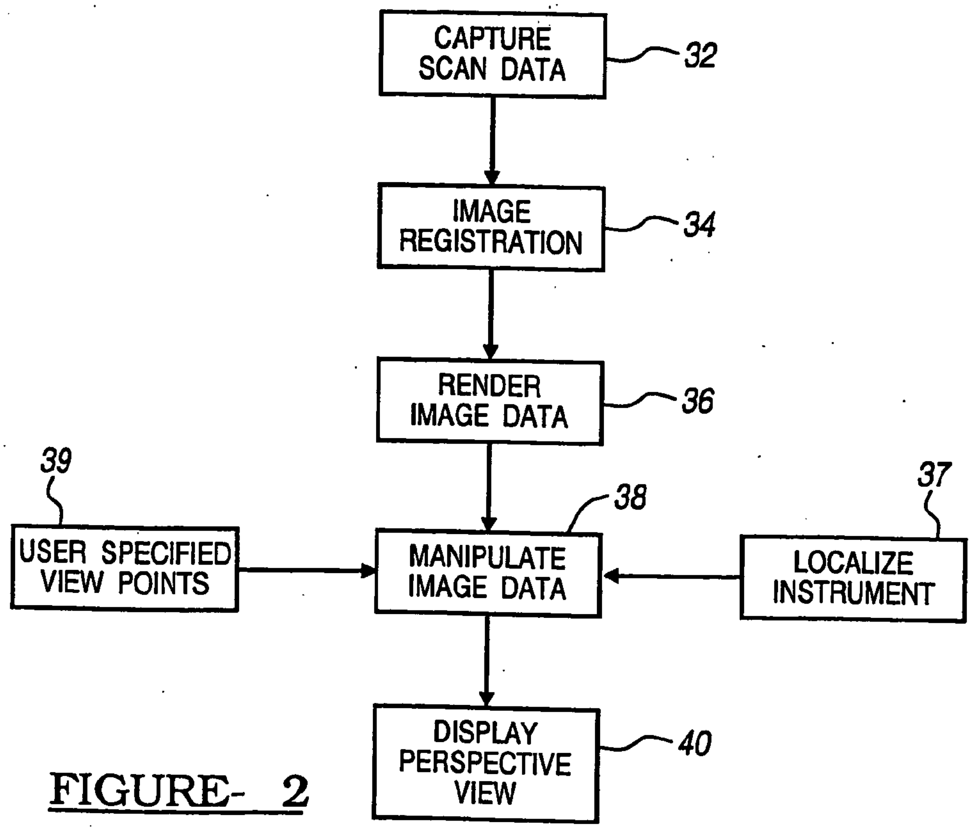


FIGURE- 2

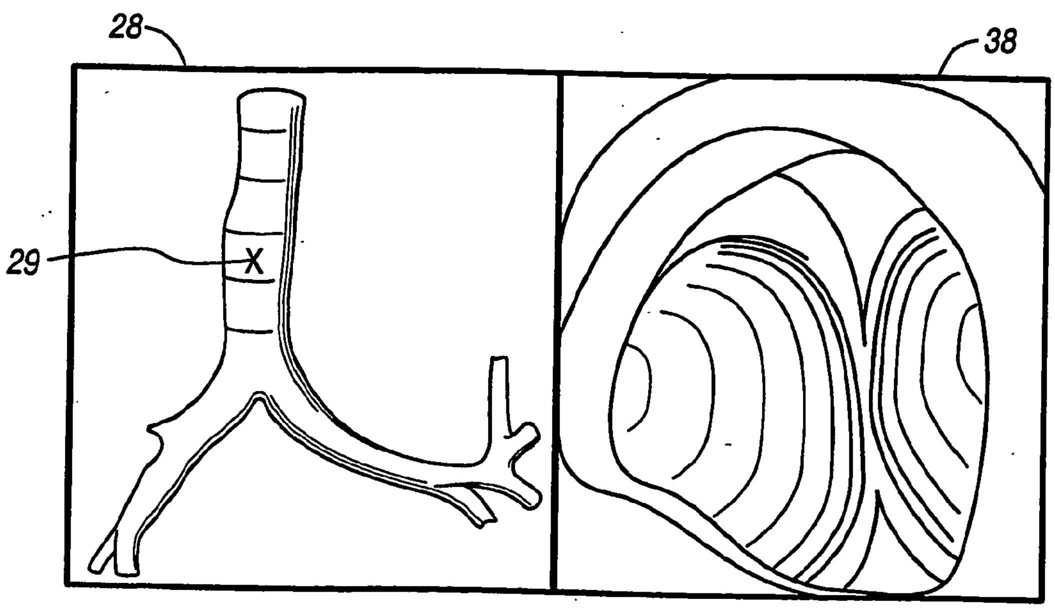


FIGURE- 3

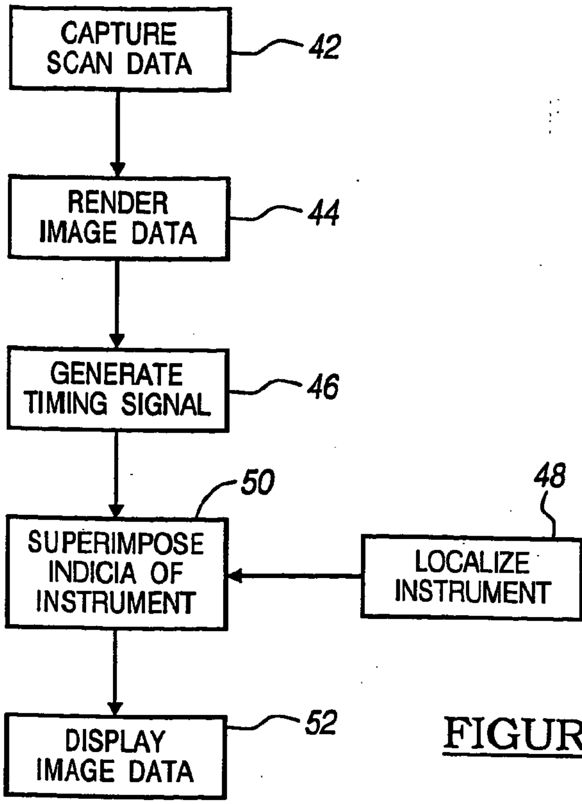


FIGURE- 4

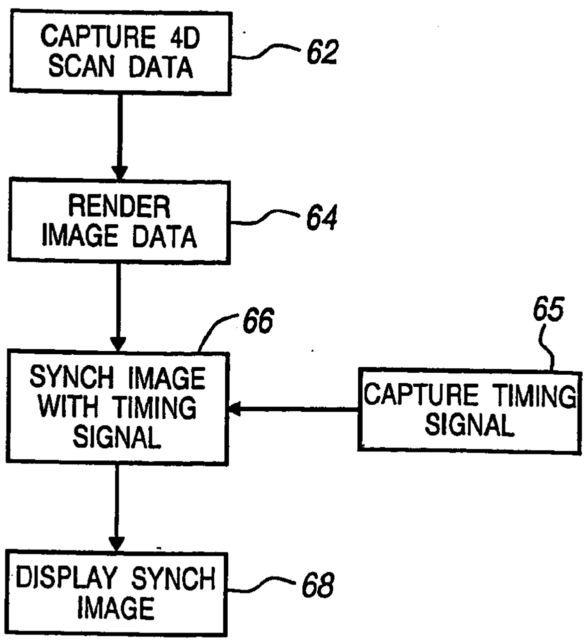


FIGURE- 5

METHOD AND APPARATUS FOR VIRTUAL ENDOSCOPY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. patent application Ser. No. 10/223,847 filed on Aug. 19, 2002. The disclosure of the above application is incorporated herein by reference.

FIELD

[0002] The present teachings relates generally to surgical instrument navigation systems and, more particularly, to a system that visually simulates a virtual volumetric scene of a body cavity from a point of view of a surgical instrument residing in a patient.

BACKGROUND

[0003] Precise imaging of portions of the anatomy is an increasingly important technique in the medical and surgical fields. In order to lessen the trauma to a patient caused by invasive surgery, techniques have been developed for performing surgical procedures within the body through small incisions with minimal invasion. These procedures generally require the surgeon to operate on portions of the anatomy that are not directly visible, or can be seen only with difficulty. Furthermore, some parts of the body contain extremely complex or small structures and it is necessary to enhance the visibility of these structures to enable the surgeon to perform more delicate procedures. In addition, planning such procedures required the evaluation of the location and orientation of these structures within the body in order to determine the optimal surgical trajectory.

[0004] Endoscopy is one commonly employed technique for visualizing internal regions of interest within a patient. Flexible endoscopes enable surgeons to visually inspect a region prior to or during surgery. However, flexible endoscopes are relatively expensive, limited in flexibility due to construction and obscured by blood and other biological materials.

[0005] Therefore, it is desirable to provide a cost effective alternative technique for visualizing an internal regions of interest within a patient.

SUMMARY

[0006] A surgical instrument navigation system is provided that visually simulates a virtual volumetric scene of a body cavity of a patient from a point of view of a surgical instrument residing in the patient. The surgical instrument navigation system generally includes: a surgical instrument, such as a guide wire or catheter; a tracking subsystem that captures real-time position data indicative of the position (location and/or orientation) of the surgical instrument; a data processor which is operable to render a volumetric image of the internal region of interest from a point of view of the surgical instrument; and a display which is operable to display the volumetric image of the patient. The surgical instrument navigation system may also include an imaging device which is operable to capture 2D and/or 3D volumetric scan data representative of an internal region of interest within a given patient.

[0007] For a more complete understanding of the present teachings, reference may be made to the following specification and to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] **FIG. 1** is a diagram of an exemplary surgical instrument navigation system according to various embodiments;

[0009] **FIG. 2** is a flowchart that depicts a technique for simulating a virtual volumetric scene of a body cavity from a point of view of a surgical instrument positioned within the patient according to various embodiments;

[0010] **FIG. 3** is an exemplary display from the surgical instrument navigation system according to various embodiments;

[0011] **FIG. 4** is a flowchart that depicts a technique for synchronizing the display of an indicia or graphical representation of the surgical instrument with cardiac or respiratory cycle of the patient according to various embodiments; and

[0012] **FIG. 5** is a flowchart that depicts a technique for generating four-dimensional image data that is synchronized with the patient according to various embodiments.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS

[0013] **FIG. 1** is a diagram of an exemplary surgical instrument navigation system **10**. According to various embodiments, the surgical instrument navigation system **10** is operable to visually simulate a virtual volumetric scene within the body of a patient, such as an internal body cavity, from a point of view of a surgical instrument **12** residing in the cavity of a patient **13**. To do so, the surgical instrument navigation system **10** is primarily comprised of a surgical instrument **12**, a data processor **16** having a display **18**, and a tracking subsystem **20**. The surgical instrument navigation system **10** may further include (or accompanied by) an imaging device **14** that is operable to provide image data to the system.

[0014] The surgical instrument **12** is preferably a relatively inexpensive, flexible and/or steerable catheter that may be of a disposable type. The surgical instrument **12** is modified to include one or more tracking sensors that are detectable by the tracking subsystem **20**. It is readily understood that other types of surgical instruments (e.g., a guide wire, a pointer probe, a stent, a seed, an implant, an endoscope, etc.) are also within the scope of the present teachings. It is also envisioned that at least some of these surgical instruments may be wireless or have wireless communications links. It is also envisioned that the surgical instruments may encompass medical devices which are used for exploratory purposes, testing purposes or other types of medical procedures.

[0015] Referring to **FIG. 2**, the imaging device **14** is used to capture volumetric scan data **32** representative of an internal region of interest within the patient **13**. The three-dimensional scan data is preferably obtained prior to surgery on the patient **13**. In this case, the captured volumetric scan data may be stored in a data store associated with the data processor **16** for subsequent processing. However, one skilled in the art will readily recognize that the principles of the present teachings may also extend to scan data acquired during surgery. It is readily understood that volumetric scan data may be acquired using various known medical imaging devices **14**, including but not limited to a magnetic resonance imaging (MRI) device, a computed tomography (CT) imaging device, a positron emission tomography (PET) imaging device, a 2D or 3D fluoroscopic imaging device, and 2D, 3D or 4D ultrasound imaging devices. In the case of a two-dimensional ultrasound imaging device or other two-dimensional image acquisition device, a series of two-dimensional data sets may be acquired and then assembled into volumetric data as is well known in the art using a two-dimensional to three-dimensional conversion.

[0016] A dynamic reference frame **19** is attached to the patient proximate to the region of interest within the patient **13**. To the extent that the region of interest is a vessel or a cavity within the patient, it is readily understood that the dynamic reference frame **19** may be placed within the patient **13**. To determine its location, the dynamic reference frame **19** is also modified to include tracking sensors detectable by the tracking subsystem **20**. The tracking subsystem **20** is operable to determine position data for the dynamic reference frame **19** as further described below.

[0017] The volumetric scan data is then registered as shown at **34**. Registration of the dynamic reference frame **19** generally relates information in the volumetric scan data to the region of interest associated with the patient. This process is referred to as registering image space to patient space. Often, the image space must also be registered to another image space. Registration is accomplished through knowledge of the coordinate vectors of at least three non-collinear points in the image space and the patient space.

[0018] Registration for image guided surgery can be completed by different known techniques. First, point-to-point registration is accomplished by identifying points in an image space and then touching the same points in patient space. These points are generally anatomical landmarks that are easily identifiable on the patient. Second, surface registration involves the user's generation of a surface in patient space by either selecting multiple points or scanning, and then accepting the best fit to that surface in image space by iteratively calculating with the data processor until a surface match is identified. Third, repeat fixation devices entail the user repeatedly removing and replacing a device (i.e., dynamic reference frame, etc.) in known relation to the patient or image fiducials of the patient. Fourth, automatic registration by first attaching the dynamic reference frame to the patient prior to acquiring image data. It is envisioned that other known registration procedures are also within the scope of the present teachings, such as that disclosed in U.S. Ser. No. 09/274,972, filed on Mar. 23, 1999, entitled "NAVIGATIONAL GUIDANCE VIA COMPUTER-ASSISTED FLUOROSCOPIC IMAGING", which is hereby incorporated by reference.

[0019] During surgery, the surgical instrument **12** is directed by the surgeon to the region of interest within the patient **13**. The tracking subsystem **20** preferably employs electromagnetic sensing to capture position data **37** indicative of the location and/or orientation of the surgical instrument **12** within the patient. The tracking subsystem **20** may be defined as a localizing device **22** and one or more electromagnetic sensors **24** may be integrated into the items of interest, such as the surgical instrument **12**. In one embodiment, the localizing device **22** is comprised of three or more field generators (transmitters) mounted at known locations on a plane surface and the electro-magnetic sensor (receivers) **24** is further defined as a single coil of wire. The positioning of the field generators (transmitter), and the sensors (receivers) may also be reversed, such that the generators are associated with the surgical instrument **12** and the receivers are positioned elsewhere. Although not limited thereto, the localizing device **22** may be affixed to an underneath side of the operating table that supports the patient.

[0020] In operation, the field generators generate magnetic fields which are detected by the sensor. By measuring the magnetic fields generated by each field generator at the sensor, the location and orientation of the sensor may be computed, thereby determining position data for the surgical instrument **12**. Although not limited thereto, exemplary electromagnetic tracking subsystems are further described in U.S. Pat. Nos. 5,913,820; 5,592,939; and 6,374,134 which are incorporated herein by reference. In addition, it is envisioned that other types of position tracking devices are also within the scope of the present teachings. For instance, non line-of-sight tracking subsystem **20** may be based on sonic emissions or radio frequency emissions. In another instance, a rigid surgical instrument, such as a rigid endoscope may be tracked using a line-of-sight optical-based tracking subsystem (i.e., LED's, passive markers, reflective markers, etc).

[0021] Position data such as location and/or orientation data from the tracking subsystem **20** is in turn relayed to the data processor **16**. The data processor **16** is adapted to receive position/orientation data from the tracking subsystem **20** and operable to render a volumetric perspective image and/or a surface rendered image of the region of interest. The volumetric perspective and/or surface image is rendered **36** from the scan data **32** using rendering techniques well known in the art. The image data may be further manipulated **38** based on the position/orientation data for the surgical instrument **12** received from tracking subsystem **20**. Specifically, the volumetric perspective or surface rendered image is rendered from a point of view which relates to position of the surgical instrument **12**. For instance, at least one electromagnetic sensor **24** may be positioned at the tip of the surgical instrument **12**, such that the image is rendered from a leading point on the surgical instrument. In this way, the surgical instrument navigation system **10** according to various embodiments is able, for example, to visually simulate a virtual volumetric scene of an internal cavity from the point of view of the surgical instrument **12** residing in the cavity without the use of an endoscope. It is readily understood that tracking two or more electromagnetic sensors **24** which are embedded in the surgical instrument **12** enables orientation of the surgical instrument **12** to be determined by the system **10**.

[0022] As the surgical instrument **12** is moved by the surgeon within the region of interest, its position and orientation are tracked and reported on a real-time basis by the tracking subsystem **20**. The volumetric perspective image may then be updated by manipulating **38** the rendered image data **36** based on the position of the surgical instrument **12**. The manipulated volumetric perspective image is displayed

40 on a display device **18** associated with the data processor **16**. The display **18** is preferably located such that it can be easily viewed by the surgeon during the medical procedure. In one embodiment, the display **18** may be further defined as a heads-up display or any other appropriate display. The image may also be stored by data processor **16** for later playback, should this be desired.

[**0023**] It is envisioned that the primary perspective image **38** of the region of interest may be supplemented by other secondary images. For instance, known image processing techniques may be employed to generate various multi-planar images of the region of interest. Alternatively, images may be generated from different view points as specified by a user **39**, including views from outside of the vessel or cavity or views that enable the user to see through the walls of the vessel using different shading or opacity. In another instance, the location data of the surgical instrument may be saved and played back in a movie format. It is envisioned that these various secondary images may be displayed simultaneously with or in place of the primary perspective image.

[**0024**] In addition, the surgical instrument **12** may be used to generate real-time maps corresponding to an internal path traveled by the surgical instrument or an external boundary of an internal cavity. Real-time maps are generated by continuously recording the position of the instrument's localized tip and its full extent. A real-time map is generated by the outermost extent of the instrument's position and minimum extrapolated curvature as is known in the art. The map may be continuously updated as the instrument is moved within the patient, thereby creating a path or a volume representing the internal boundary of the cavity. It is envisioned that the map may be displayed in a wire frame form, as a shaded surface or other three-dimensional computer display modality independent from or superimposed on the volumetric perspective image **38** of the region of interest. It is further envisioned that the map may include data collected from a sensor embedded into the surgical instrument, such as pressure data, temperature data or electro-physiological data. In this case, the map may be color coded to represent the collected data.

[**0025**] **FIG. 3** illustrates another type of secondary image **28** which may be displayed in conjunction with the primary perspective image **38**. In this instance, the primary perspective image is an interior view of an air passage within the patient **13**. The secondary image **28** is an exterior view of the air passage which includes an indicia or graphical representation **29** that corresponds to the location of the surgical instrument **12** within the air passage. In **FIG. 3**, the indicia **29** is shown as a crosshairs. It is envisioned that other indicia may be used to signify the location of the surgical instrument in the secondary image. As further described below, the secondary image **28** is constructed by superimposing the indicia **29** of the surgical instrument **12** onto the manipulated image data **38**.

[**0026**] Referring to **FIG. 4**, the display of an indicia of the surgical instrument **12** on the secondary image may be synchronized with an anatomical function, such as the cardiac or respiratory cycle, of the patient. In certain instances, the cardiac or respiratory cycle of the patient may cause the surgical instrument **12** to flutter or jitter within the patient. For instance, a surgical instrument **12** positioned in or near a chamber of the heart will move in relation to the patient's heart beat. In these instance, the indicia of the surgical instrument **12** will likewise flutter or jitter on the displayed image **40**. It is envisioned that other anatomical functions which may effect the position of the surgical instrument **12** within the patient are also within the scope of the present teachings.

[**0027**] To eliminate the flutter of the indicia on the displayed image **40**, position data for the surgical instrument **12** is acquired at a repetitive point within each cycle of either the cardiac cycle or the respiratory cycle of the patient. As described above, the imaging device **14** is used to capture volumetric scan data **42** representative of an internal region of interest within a given patient. A secondary image may then be rendered **44** from the volumetric scan data by the data processor **16**.

[**0028**] In order to synchronize the acquisition of position data for the surgical instrument **12**, the surgical instrument navigation system **10** may further include a timing signal generator **26**. The timing signal generator **26** is operable to generate and transmit a timing signal **46** that correlates to at least one of (or both) the cardiac cycle or the respiratory cycle of the patient **13**. For a patient having a consistent rhythmic cycle, the timing signal might be in the form of a periodic clock signal. Alternatively, the timing signal may be derived from an electrocardiogram signal from the patient **13**. One skilled in the art will readily recognize other techniques for deriving a timing signal that correlate to at least one of the cardiac or respiratory cycle or other anatomical cycle of the patient.

[**0029**] As described above, the indicia of the surgical instrument **12** tracks the movement of the surgical instrument **12** as it is moved by the surgeon within the patient **13**. Rather than display the indicia of the surgical instrument **12** on a real-time basis, the display of the indicia of the surgical instrument **12** is periodically updated **48** based on the timing signal from the timing signal generator **26**. In one exemplary embodiment, the timing generator **26** is electrically connected to the tracking subsystem **20**. The tracking subsystem **20** is in turn operable to report position data for the surgical instrument **12** in response to a timing signal received from the timing signal generator **26**. The position of the indicia of the surgical instrument **12** is then updated **50** on the display of the image data. It is readily understood that other techniques for synchronizing the display of an indicia of the surgical instrument **12** based on the timing signal are within the scope of the present teachings, thereby eliminating any flutter or jitter which may appear on the displayed image **52**. It is also envisioned that a path (or projected path) of the surgical instrument **12** may also be illustrated on the displayed image data **52**.

[**0030**] According to various embodiments the surgical instrument navigation system **10** may be further adapted to display four-dimensional image data for a region of interest as shown in **FIG. 5**. In this case, the imaging device **14** is operable to capture volumetric scan data **62** for an internal region of interest over a period of time, such that the region of interest includes motion that is caused by either the cardiac cycle or the respiratory cycle of the patient **13**. A volumetric perspective view of the region may be rendered **64** from the volumetric scan data **62** by the data processor **16** as described above. The four-dimensional image data may be further supplemented with other patient data, such as temperature or blood pressure, using coloring coding techniques.

[0031] In order to synchronize the display of the volumetric perspective view in real-time with the cardiac or respiratory cycle of the patient, the data processor **16** is adapted to receive a timing signal from the timing signal generator **26**. As described above, the timing signal generator **26** is operable to generate and transmit a timing signal that correlates to either the cardiac cycle or the respiratory cycle of the patient **13**. In this way, the volumetric perspective image may be synchronized **66** with the cardiac or respiratory cycle of the patient **13**. The synchronized image **66** is then displayed **68** on the display **18** of the system. The four-dimensional synchronized image may be either (or both of) the primary image rendered from the point of view of the surgical instrument or the secondary image depicting the indicia of the position of the surgical instrument **12** within the patient **13**. It is readily understood that the synchronization process is also applicable to two-dimensional image data acquire over time.

[0032] To enhance visualization and refine accuracy of the displayed image data, the surgical navigation system can use prior knowledge such as the segmented vessel structure to compensate for error in the tracking subsystem or for inaccuracies caused by an anatomical shift occurring since acquisition of scan data. For instance, it is known that the surgical instrument **12** being localized is located within a given vessel and, therefore should be displayed within the vessel. Statistical methods can be used to determine the most likely location within the vessel with respect to the reported location and then compensate so the display accurately represents the instrument **12** within the center of the vessel. The center of the vessel can be found by segmenting the vessels from the three-dimensional datasets and using commonly known imaging techniques to define the centerline of the vessel tree. Statistical methods may also be used to determine if the surgical instrument **12** has potentially punctured the vessel. This can be done by determining the reported location is too far from the centerline or the trajectory of the path traveled is greater than a certain angle (worse case 90 degrees) with respect to the vessel. Reporting this type of trajectory (error) is very important to the clinicians. The tracking along the center of the vessel may also be further refined by correcting for motion of the respiratory or cardiac cycle, as described above.

[0033] The surgical instrument navigation system according to various embodiments may also incorporate atlas maps. It is envisioned that three-dimensional or four-dimensional atlas maps may be registered with patient specific scan data or generic anatomical models. Atlas maps may contain kinematic information (e.g., heart models) that can be synchronized with four-dimensional image data, thereby supplementing the real-time information. In addition, the kinematic information may be combined with localization information from several instruments to provide a complete four-dimensional model of organ motion. The atlas maps may also be used to localize bones or soft tissue which can assist in determining placement and location of implants.

[0034] While the teachings has been described in its presently preferred form, it will be understood that the teachings is capable of modification without departing from the spirit of the teachings as set forth in the appended claims.

What is claimed is:

1. A navigation system to track a surgical instrument relative to a patient, comprising:

a tracking subsystem operable to capture in real-time position data indicative of the position of the surgical instrument;

a data processor adapted to receive scan data representative of a region of interest of a given patient and the position data from the tracking subsystem, the data processor being operable to render an image of the region of interest from a point of view which relates to position of the surgical instrument, the image being derived from the scan data; and

a display in data communication with the data processor, the display being operable to display the image of the patient.

2. The navigation system of claim 1, further comprising:

a timing signal generator operable to generate and transmit a timing signal that correlates to at least one anatomical function of the patient;

wherein the tracking subsystem is operable to receive the timing signal from the timing signal generator, the tracking subsystem operable to capture position data indicative of the position of the surgical instrument and to report the position data in response to the timing signal received from the timing signal generator;

wherein the data processor is adapted to receive scan image data representative of an internal region of interest within a given patient and the position data from the tracking subsystem, the data processor being operable to render a volumetric perspective image of the internal region of interest from the scan image data and to superimpose an indicia of the surgical instrument onto the volumetric perspective image based on the position data received from the tracking subsystem.

3. The navigation system of claim 2 wherein the timing signal is generated at a repetitive point within each cycle of either a cardiac cycle or a respiratory cycle of the patient, thereby minimizing any jitter of the surgical instrument in the volumetric perspective image which may be caused by the cardiac cycle or the respiratory cycle of the patient.

4. The navigation system of claim 2 wherein the data processor is further operable to the track position of the surgical instrument as it is moved within the region of interest and to update the corresponding position of the indicia of the surgical instrument in the volumetric perspective image of the patient.

5. The navigation system of claim 1 wherein the data processor is further operable to track in real-time the location and orientation of the surgical instrument as it is moved within the region of interest and the display is further operable to display the location and orientation of the surgical instrument.

6. The navigation system of claim 1, wherein the scan data includes two dimensional scan data, three dimensional scan data, four dimensional scan data, or combinations thereof.

7. The navigation system of claim 1, wherein the scan data can be obtained preoperatively, intra-operatively, from an atlas map, or combinations thereof.

8. The navigation system of claim 1, wherein the tracking subsystem is operable to capture real time position data indicative of a position of the surgical instrument in the patient, an orientation of the surgical instrument in the patient, or combinations thereof.

9. The navigation system of claim 1, wherein the tracking subsystem is an electromagnetic tracking subsystem including a tracking sensor interconnected with the surgical instrument to assist in determining a position and orientation of the surgical instrument relative to the patient.

10. The navigation system of claim 1, wherein the rendered image displayed on the display is operable to be from the point of view of the surgical instrument, a point of view at a angle relative to the surgical instrument, or combinations thereof.

11. The navigation system of claim 5, wherein the data processor is operable to create a map of the area through which the surgical instrument is moved by tracking the real time location and orientation of the surgical instrument over time.

12. The navigation system of claim 11, wherein the map is displayed on the display.

13. The navigation system of claim 1, wherein the data processor is operable to compensate for error in the tracking subsystem and/or inaccuracies caused by anatomical shift caused during acquisition of the scanned data.

14. The navigation system of claim 1, further comprising:

an imaging device operable to create the scanned data representative of a region of interest of a given patient.

15. The navigation system of claim 14, wherein said imaging device includes a magnetic resonance imaging scanner, a computed tomography scanner, an ultrasound system, a positron emission tomography, or combinations thereof.

16. The navigation system of claim 1, further comprising:

a disposable surgical instrument.

17. The navigation system of claim 1, further comprising:

a surgical instrument selected from a group consisting of a guide wire, a pointer probe, a stent, a seed, an implant, an endoscope, a catheter, or combinations thereof.

18. The navigation system of claim 1, wherein said tracking subsystem includes wireless communication with the surgical instrument.

19. The navigation system of claim 1, wherein said tracking subsystem is an electromagnetic tracking subsystem, an optical tracking subsystem, a sonic tracking subsystem, an infrared tracking subsystem, a radiation tracking subsystem, or combinations thereof.

20. The navigation system of claim 1, further comprising:

an accuracy enhancing subsystem operable to enhance visualization and/or refined accuracy of the displayed image data;

wherein the enhanced accuracy subsystem is operable to compensate for an error in the tracking subsystem when tracking the surgical instrument through a selected vessel.

21. A surgical instrument navigation system to display a virtual image from the point of view of a surgical instrument within a patient, comprising:

a tracking subsystem operable to capture position data indicative of the position of the surgical instrument;

a data processor adapted to receive scan image data representative of an internal region of interest within a given patient and the position data from the tracking subsystem, the data processor being operable to render an image of the internal region of interest from the scan image data and to superimpose an indicia of the surgical instrument onto the rendered image based on the position data received from the tracking subsystem; and

a display in data communication with the data processor, the display being operable to display the rendered image of the patient.

22. The surgical instrument navigation system of claim 21, wherein the rendered volumetric perspective image of the internal region of interest of the patient is from a point of view of the surgical instrument and is displayed on the display.

23. The surgical instrument navigation system of claim 22, wherein the tracking subsystem is operable to track both a position and an orientation of the surgical instrument to allow said data processor to render a volumetric prospective image of the internal region of interest from a point of view of the surgical instrument.

24. The surgical instrument navigation system of claim 21, wherein the scan image data is at least one of two dimensional, three dimensional, four dimensional, or combinations thereof.

25. The surgical instrument navigation system of claim 24, wherein the data processor is operable to render a volumetric perspective image of the internal region of interest based upon at least one scanned image data set of the patient.

26. The surgical instrument navigation system of claim 21, wherein tracking the subsystem includes a tracking sensor interconnected with the surgical instrument and a localizing device operable to determine a position of the tracking sensor;

wherein said tracking subsystem is operable to determine at least a position, an orientation, or combinations thereof of the tracking sensor.

27. The surgical instrument navigation system of claim 21, wherein the data processor is operable to render at least one of a volumetric perspective image, a surface rendered image, or combinations thereof.

28. The surgical instrument navigation system of claim 21, wherein the rendered image includes an image from a point of view other than a point of view of the surgical instrument.

29. The surgical instrument navigation system of claim 21, further comprising:

a secondary image;

wherein the data processor is operable to render a secondary image of the area of interest; and

wherein the display is operable to display the rendered secondary image.

30. The surgical instrument navigation system of claim 21, wherein the data processor is operable to render a four dimensional image of the patient;

wherein a change of the patient over time is illustrated on the rendered image.

31. The surgical instrument navigation system of claim 21, further comprising:

a disposable surgical instrument.

32. The surgical instrument navigation system of claim 21, wherein said tracking subsystem is an electromagnetic tracking subsystem, an optical tracking subsystem, an infrared tracking subsystem, a sonic tracking subsystem, a radiation tracking subsystem, or combinations thereof.

33. The surgical instrument navigation system of claim 21, further comprising:

at least one surgical instrument selected from a group consisting of a guide wire, a pointer probe, a stent, a seed, an implant, an endoscope, a catheter, or combinations thereof.

34. The surgical instrument navigation system of claim 21, further comprising:

an imaging device operable to create the scan image data.

35. A method of creating image data representative of a point of view of a surgical instrument relative to a patient for display on a display, comprising:

obtaining image data of a patient;

tracking the surgical instrument;

determining a position of the surgical instrument;

determining an orientation of the surgical instrument;

creating image data relating to a point of view of the surgical instrument within the patient; and

displaying the created image data illustrating the point of view of the surgical instrument within the patient.

36. The method of claim 35, wherein obtaining image data of the patient includes obtaining two dimensional image data, three dimensional image data, four dimensional data, or combinations thereof.

37. The method of claim 36, wherein displaying the created image data includes displaying a changeover time of the image data from the four dimensional image data.

38. The method of claim 35, wherein tracking a surgical instrument, includes determining a position of a tracking sensor interconnected with the surgical instrument with a localizing device.

39. The method of claim 35, further comprising:

creating secondary image data relating to a point of view external to an area of interest of the patient and a surgical instrument.

40. The method of claim 35, wherein creating an image data relating to a point of view of the surgical instrument within the patient includes correcting for errors in at least one of determining the position of the surgical instrument, determining an orientation of the surgical instrument, a change in the position of the patient from a present time to the time of obtaining the image data of a patient, or combinations thereof.

41. The method of claim 40, wherein correcting for errors includes:

using statistical methods to determine if a surgical instrument has potentially punctured a vessel.

42. The method of claim 41, further comprising:

transmitting the indication error to a user.

43. The method of claim 40, wherein correcting for errors includes determining a likely position of the surgical instrument within a vessel based upon image data of the patient and a probable location of the surgical instrument.

44. The method of claim 35, wherein obtaining image data of a patient includes obtaining an atlas map image data.

45. The method of claim 35, further comprising:

displaying an indicia of the position of a portion of the surgical instrument relative to the obtained image data of the patient.

46. The method of claim 35, further comprising:

rendering a volumetric prospective image, rendering a surface rendered image of the region of interest, or combinations thereof.

47. The method of claim 35, further comprising:

displaying a secondary view relative to the displayed created image data illustrated in the point of the view of the surgical instrument within the patient.

48. The method of claim 35, further comprising:

interconnecting a timing signal generator with the patient to track a change in the patient over time;

wherein determining a position of the surgical instrument and determining orientation of the surgical instrument includes accounting for the change in the patient determined by the timing signal generator.

49. The method of claim 35, wherein the timing device measures a respirator cycle, a cardiac cycle, or combinations thereof to allow for a reduction of jitter and/or flutter in displaying the created image data.

50. The method of claim 35 further comprising:

obtaining the image data using at least one of a magnetic resonance imaging system, a computed tomography imaging system, a positron emission tomography imaging system, an ultrasound imaging system, or combinations thereof.

51. The method of claim 35, further comprising:

selecting a disposable surgical instrument.

* * * * *