ROBOTIC SURGERY SYSTEMS AND SURGICAL GUIDANCE METHODS

IITM Technology Available for Licensing

Problem Statement

- Robotic surgery relies on precise registration between preoperative images and the surgical robot's coordinate system, but challenges arise from resolution differences and intra-operative disturbances.
- **Intra-operative factors like manual handling and patient positioning changes disrupt accurate navigation of surgical tools.**
- Different imaging modalities and potential occlusions complicate mapping 2D intra-operative data to 3D preoperative images.
- The present invention relates to System and methods that provides surgical guidance and targeting in robotic surgery systems.

Intellectual Property

- IITM IDF Ref. **1813**
- **IN 201841048137**
- **PCT/IB2019/061459 - Published**
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Technology Category/ Market

Category - Healthcare Robotics
Applications-Robotic surgery systems, Orthopaedic surgery
Industry- Medical Imaging and Diagnostics, Healthcare Robotics

Market - Global surgical robotics market size was valued at $78 billion in 2022, and is projected to reach $188 billion by 2032, growing at a CAGR of 9.1% from 2023 - 2032.

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

Research Lab

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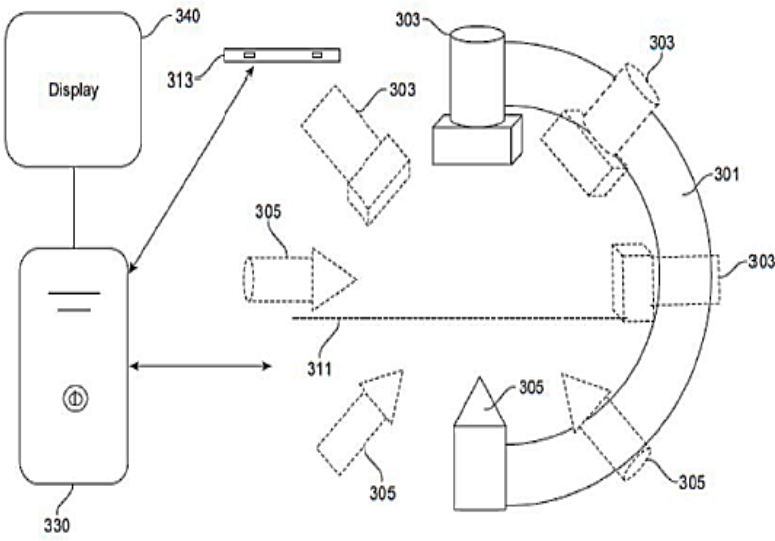

FIG. 1. illustrates the robotic surgery system.

Technology

- The present invention relates to **a method of providing surgical guidance and targeting in robotic surgery systems.**

The method utilizes data from a navigation system in tandem with 2-dimensional (2D) intra-operative imaging data. 2D intra-operative image data is superimposed with a pre-operative 3-dimensional (3D) image and surgery plans made in the pre-operative image coordinate system.

The superimposition augments real-time intraoperative navigation for achieving image guided surgery in robotic surgery systems.

The advantages include minimizing radiation exposure to a patient by avoiding intraoperative volumetric imaging, mobility of tools, imager and robot in and out of the operating space without the need for re-calibration, and relaxing the need for repeating precise imaging positions. (FIG. 1)

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Key Features / Value Proposition

Enhanced Surgical Guidance
- The method and system enable precise surgical guidance by seamlessly integrating pre-operative and intra-operative image data, improving accuracy during robotic surgeries.

Real-time Registration
- Real-time registration of intra-operative images and navigation system data allows for continuous tracking of surgical tools, enhancing the surgeon's ability to navigate within the patient's body.

Non-Invasive Calibration
- The system's calibration process does not require physical markers on the patient, reducing invasiveness and improving patient comfort during surgery.

Multimodal Imaging
- The system supports various imaging modalities, including X-ray, ultrasound, CT scans, and MRI scans, providing flexibility and versatility for different surgical procedures

Augmented Visualization
- Surgeons benefit from augmented intra-operative images that align with pre-operative data, improving their ability to make informed decisions and enhancing overall surgical outcomes

3D Visualization
- The system augments the 2D intra-operative image data with a rendering of the 3D pre-operative image data, providing surgeons with a 3D view that aids in better decision-making and navigation.

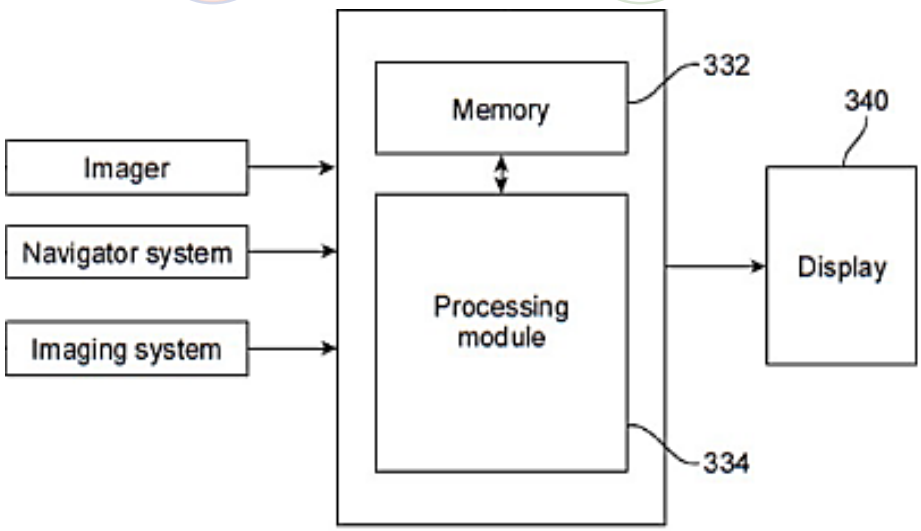

FIG. 2. illustrates the computing system in the robotic surgery system.

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Images

Capture pre-operative image data of a patient at predetermined positions and orientations using the C-arm apparatus

Reconstruct a 3d pre-operative image data from the captured pre-operative image data

Capture 2d intra-operative image data of the patient at the predetermined positions and orientations during a surgical procedure

Register the 2d intra-operative image data and the navigation system data in real time during the surgical procedure

Register the 3d pre-operative image data with the 2d intra-operative image data

Augment the intra-operative image data with a rendering of the 3d pre-operative image data that is in registration with the real time intra-operative image data

FIG. 3. illustrates a method of providing surgical guidance and targeting in robotic surgery systems.

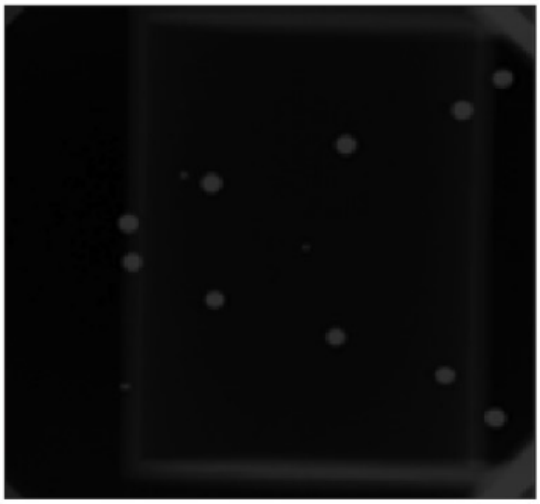

FIG.4A. illustrates shots appearing as 2D projections of the spiral object when taken at roughly equi-spaced poses with this object placed stationary under the c-arm.

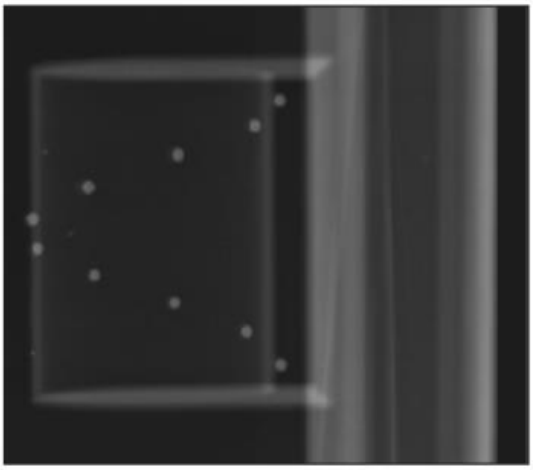

FIG.4B. illustrates registration between the intra-operative imaging and navigation system data.

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