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Radiation-Free Tracking and 3D Visualization of Medical Devices

Interventional procedures are typically minimally invasive, using flexible medical devices such as catheters, guide wires and needles, to perform ablations, embolizations, stent placements and more. Imaging, particularly X-ray imaging, is used to track the flexible medical device inside a patient's body and allow for proper guidance, placement and minimization of tissue damage. However, when x-ray imaging is used, this exposes the patient, surgeons and other medical professionals to excessive levels of radiation.

Researchers at Arizona State University have developed a novel system to track steerable medical devices inside a patient without using x-ray imaging. Utilizing Fiber Bragg Gratings (FBG) sensors and a novel program to combat issues with sensor origin and coordinates, this system tracks flexible medical devices without limiting the motion of the fiber or the device. It also updates the visualization of the flexible medical device even as the patient's body moves. This system can be used as a stand-alone system or along with surgical robotic systems.

This system provides surgeons with real-time 3D visualization of the medical device inside the patient's body, without x-ray imaging and without limiting the maneuverability of the medical device.

Potential Applications

- Flexible medical device tracking/visualization during interventional surgeries
  - Catheters, guide wires, needles, etc.

Benefits and Advantages

- Radiation-free tracking
- Real-time, 3D visualization
- Eliminates the need for x-ray imaging to track medical devices
  - Reduced radiation exposure to patient and medical professionals
- Because this doesn’t require x-ray imaging, it opens up additional rooms for surgical procedures, increasing patient capacity at hospitals
- Can be used as a stand-alone system or along with surgical robotic systems
- Body movements, such as from heartbeats or breathing can be captured and implemented in the system to update the visualization images
- Doesn’t require the first sensing point to be fixed, or additional sensors to be added to the fiber
  - Reduced complexity of the system
- Medical devices can be used freely without significant limitations to maneuverability

For more information about the inventor(s) and their research, please see

Dr. Marvi's departmental webpage