Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M20-072L
Published: 4/18/2023

Inventors

Hamidreza Marvi

Mahdi Ilami

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

Magnetic Medical Device Steering with Nonvisual Tracking

Steering and positioning medical devices, such as needles, is a promising technique for use in minimally invasive surgeries. However, positioning the device is often complicated by obstacles such as bones, blood vessels and other sensitive tissues. Current methods for steering medical devices have limitations such as restricted radii of curvature, deflection when moving from one tissue type to another, excessive modeling complexity and unnecessary tissue damage. Further, systems for tracking and providing location information about medical devices require MRI, CT or ultrasound visualization system which have their own limitations.

Researchers at Arizona State University have developed a novel system for medical device steering and tracking. With the use of magnets, this system is able to precisely steer and track/localize the position and orientation of the medical device inside the body. Because of the mechanism for steering the medical device, smaller radii of curvature can be achieved and buckling issues are eliminated. Besides, the tracking components provide real-time visual feedback for the control system as well as the user without requiring an MRI, CT or ultrasound. Hence, this real-time steering and tracking system overcomes many limitations in current systems, increases target placement accuracy, minimizes tissue damage and improves clinical outcomes.

Potential Applications

- Medical device steering and tracking
  - Targeted drug delivery
  - Neural stimulation, recording, mapping, etc.
  - Biopsies
  - Imaging
  - Thermal ablation
  - Internal radiotherapy

Benefits and Advantages

- Does not require the use of MRI, CT or ultrasound to provide the location of the medical devices
- No radiation exposure to the patient
- For steerable needles – enables the use of soft and non-load-bearing materials for shaft fabrication
- Does not confine the space around the patient enabling use of robotic elements
- Achieves smaller radii of curvature than state-of-the-art needle steering techniques
- No buckling at the entry point
- Eliminates excessive tissue damage
- No control complexity due to torsion of a needle shaft
- Cost-effective

For more information about this opportunity, please see

Ilami et al - Scientific Reports - 2020

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

Dr. Marvi's departmental webpage

Dr. Marvi's laboratory webpage