Clemson University Research Foundation

Electromagnetic Catheter Tracking System to Reduce Radiation Exposure (2011-122)

Uses image-guided navigation, reducing radiation exposure to pediatric cardiology patients

Market Overview

This electromagnetic catheter tracking system improves surgical intervention while reducing radiation exposure to pediatric cardiology patients. As congenital heart disease (CHD) cases continue to rise in children, the pediatric interventional cardiology market is expected rise as well, reaching a value of $1,379.1 million by 2018. While many therapeutic interventions for CHD patients have transitioned from open surgical procedures to minimally invasive, catheter-based procedures requiring fluoroscopic guidance, this approach results in excessive cumulative radiation exposure for children. According to the FDA, radiation exposure from medical imaging has almost doubled in the past two decades alone, with children and teenagers being especially vulnerable to the effects of radiation exposure through procedures like interventional fluoroscopy. To combat this issue, researchers at Clemson University and Medical University of South Carolina (MUSC) have developed an image-guided navigation system capable of displaying catheter position and real-time 3D echocardiographic images, reducing fluoroscopy use in clinical intervention.

Application

Pediatric cardiology; medical imaging

Stage of Development

Preliminary Prototype

Advantages

- Requires fewer fluoroscopic acquisitions, reducing radiation exposure
- Provides feedback and guidance to clinician about the catheter location, enabling up-to-date information for optimum patient safety

Technical Summary

To date, radiation dose reduction in cardiac catheterization has been aimed at modifying the existing technology to limited dose delivery. However, this approach is inherently limited because fluoroscopy remains the principal imaging modality. Inventors from Clemson University and MUSC have developed an electromagnetic catheter navigation system capable of displaying catheter position and real-time 3D echocardiographic images, thereby reducing exposure to ionizing radiation via fluoroscopy. To facilitate guidance of the instrument during the surgery, the estimated position of an instrument relative to the plurality of projection images can be displayed. The position of the instrument can be tracked using an electromagnetic tracking system, which uses a low-strength magnetic field to follow miniaturized sensor coils embedded in the instrument. For use in interventional cardiology, the system integrates real-time catheter position into a dynamic, anatomical image of the heart.

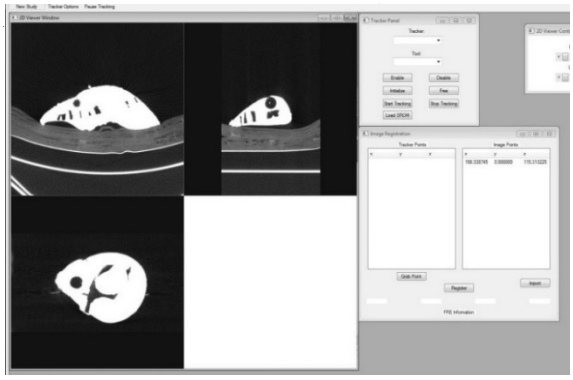

Figure 1: Example of the Catheter tracking system displaying medical images

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App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Utility	United States	13/967,881	9,183,354	2011-122	David Kwartowitz, Hamilton Baker, Fuad Mefleh

About the Inventors

David Kwartowitz, Ph.D., is a Professor of Bioengineering at Clemson University. He earned his Ph.D. in Biomedical Engineering at Vanderbilt University and completed a postdoctoral fellowship at Mayo Clinic. Dr. Kwartowitz is the Principal Investigator of the Clemson University Technology guided-Therapy for Endoscopic and Robotic Surgery (CUTTERS) lab. His research interests focus on both the creation of and application of medical images, analysis of biologically based signals, and medical robotics.

George Hamilton Baker, M.D., is an Associate Professor of Pediatrics at MUSC Health. He earned his M.D. from Albany Medical College and completed both his Residency and Fellowship at MUSC Health. His specialty is in Pediatric Cardiology.

For More Information

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