Precision Pneumatic Robot for MRI-Guided Neurosurgery

Published date: Nov. 13, 2013

Technology description

Summary
At Vanderbilt University, a robotic steering mechanism for MRI-guided neurosurgical ablation has been developed. The small robot has submilimeter precision and is fully MRI compatible. It aims to replace current surgical practices with minimally invasive procedures in order to enhance the treatment of cancer and numerous neurological disorders such as epilepsy.
Addressed Need
· Provides a robotic presence for the surgeon in the confined space of a high-Tesla closed-bore scanner
· Epilepsy is the 3rd most common neurological disorder affecting 3 million Americans and over 50 million people worldwide
· Anti-seizure medications have adverse side effects and fail to provide adequate seizure control for 1 in 3 patients
· Current surgical procedures are invasive, carry a high level of risk, and require a lengthy recovery time and therapy for the patient
Technology Description
This multiple degree of freedom robot allows for precision manipulation of ablating instruments during MRI guided surgical interventions. The robot actively steers a snake-like cannula for percutaneous interventions and is computer controlled during the MRI scan to allow for real-time feedback of the cannula position, as well as real-time thermal dose monitoring using MR thermometry. Fully MRI-compatible, the robot is built of carefully selected materials, such that it does not introduce noise or image artifacts to the MRI image and it can actively move while the scanner is imaging. Additionally, the robot has fail-safe locking mechanisms for enhanced safety and easily integrates into existing compressed air facilities in hospitals.

Application area

· Minimally invasive ablation of the hippocampus as an alternative to a hippocampal lobectomy for the treatment of epilepsy
· Applicable for biopsy or electrode placement procedures for other neurological disorders and cancer

Advantages

· MRI-guided surgery enhances precision with minimal invasiveness, resulting in improved patient outcomes.
· Lobectomies are the most common surgical treatments for epilepsy and over 70% of epilieptics could benefit from the procedure. This robotic technology addresses the current widespread undertreatment.

· Compact, fully MRI compatible robot enables real-time MR guided submillibeter precision and thermometry for minimally invasive ablation.

Institution

Vanderbilt University

Inventors

David Comber
Grad Research Assistant
Mechanical Engineering
Eric Barth
Associate Professor
Mechanical Engineering

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com