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Development of 7 Tesla Magnetic Resonance Imaging Guided Robotic System

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Stereotaxy is a neurosurgical technique guided by preoperative imaging. Its procedure is typically performed through a small burr hole opening in the skull that prevents tissue visualization. The intervention is basically "blind" for the operator with limited means of intra-operative confirmation that may result in the reduced accuracy and safety. It may take several hours to reach a specific target. The magnetic resonance imaging (MRI)-guided robotic stereotactic neural intervention system offers the potential to reduce surgical duration while improving target accuracy and safety. Current studies show that the use of MRI for guiding robotic surgical devices has a great potential for performing precisely targeted and controlled interventions. However, the currently developed project of robotic system is limited to being compatible with clinical 1.5T-3.0T MRI scanners as well as expensive sales. The proposed project dedicates in developing and deploying MRI-compatible robotic systems, and enables the technologies for intra-operative MRI-guided based interventions. The preliminary work will be involved in the design of robotic mechanisms, the customization and development of motors as well as sensors. The developed robot will be used for MR safe and MR compatibility test, which is a new generation of 7.0T MRI developed by Sino Canada Health Engineering Research Institute. The follow-up work will be involved in the integration between the intervention robot and control system, network environment building, etc. Our aims are focus on developing stereotactic neurosurgical robotic assistant system with MR-compatible, high accuracy and low price, which could benefit both surgeons and patients.

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