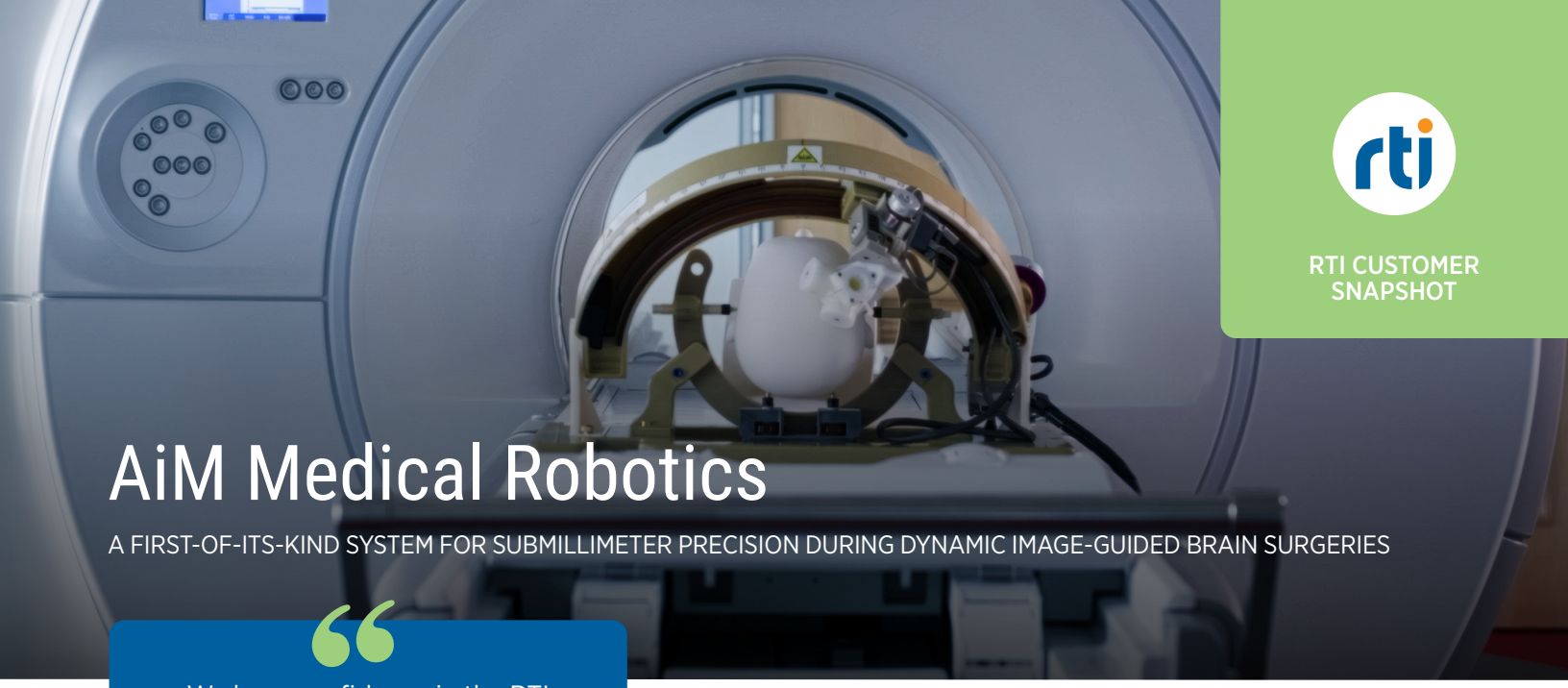


RTI CUSTOMER SNAPSHOT

AiM Medical Robotics

A FIRST-OF-ITS-KIND SYSTEM FOR SUBMILLIMETER PRECISION DURING DYNAMIC IMAGE-GUIDED BRAIN SURGERIES

> We have confidence in the RTI Connext® platform. Having something with incredibly high levels of reliability that has really been used and validated and tested is so mission-critical. Connext provides an ideal way to go about bringing our solution from prototype to production."
>
> **— Dr. Gregory Fischer —**
> Founder, AiM Medical Robtics

HIGHLIGHTS

- AiM is developing a compact, fully MRI-compatible robotic stereotactic system that safely operates inside MRI scanners
- AiM's system is a first-of-its-kind design, enabling neurosurgeons to track instrument advancement in real time and dynamically make intraoperative adjustments based on real-time MRI to account for brain motion/shifting during the procedure.
- RTI Connext provides AiM with a secure, and industry-compliant framework to synchronize high-volume data streams and provide the ultra-low latency required to transmit a surgeon's inputs to a robotic system located across a hospital room or thousands of miles away.

About AiM

AiM Medical Robotics is a Massachusetts-based neurosurgical robotics company driving a new era of accessible, faster, safer and more precise neurosurgery. AiM is developing a compact surgical robot that uses continuous, real-time visualization for highly precise and efficient dynamic image-guided neurosurgical interventions.

The system's robotic frame is made of high-strength plastics and radiolucent materials, so it can operate seamlessly inside diagnostic and interventional MRIs without the risk of image artifacts. Additionally, it is designed to be used across most interventional or diagnostic MRI scanners and for OR-based use under intraoperative CT guidance, where it is also radiolucent.

Challenge

In deep brain stimulation (DBS) procedures, surgeons target structures in the brain with submillimeter precision, and there is no margin for error. Yet, working with robots inside a magnetic resonance imaging (MRI) scanner to achieve this level of precision is incredibly difficult. The MRI provides closed-loop feedback to ensure the robots are targeting the correct soft tissue anatomical target location, despite intraoperative motion and brain shift. Precision is the most important thing in medical robotics.

Typically, these types of procedures are performed using static images acquired days, hours, or even minutes earlier. However, brain tissue moves and targets shift during the procedure, so accuracy relative to the actual soft tissue targets within the brain is paramount – simply put, there are no second chances. If surgeons don't dynamically account for real-time motion, they could target the wrong part of the brain. For this reason, patients who undergo DBS procedures may require reoperation, largely due to inaccuracies, which is an industry-wide challenge when real-time targeting data is not available.

Modern medical devices require an uninterrupted flow of reliable, real-time data to maintain accuracy as a patient's physiological conditions evolve. Moreover, data needs to be synchronized and shared across devices in real time, so that all devices are smartly integrated and united in the common purpose of saving patients' lives.

Solution

AiM is bringing to market a unique, compact surgical robot that allows real-time MR imaging to be used during neurosurgery procedures. Working with robots inside the MRI is a highly complicated task, so this system was designed to pair robotics with intraoperative MRIs to help reduce surgical procedure times and improve accuracy. It doesn't require installation or facility customization and can be deployed in minutes across standard surgical and imaging suites.

Surgeons can use AiM's system to perform brain procedures inside an MRI scanner. They can visualize an instrument advancing toward a target in the brain in real time and compensate for brain motion or shifts as they occur. Plus, they can interactively update a surgical plan as a target in the brain moves during the course of the procedure, and confirm accuracy of delivery during procedures.

AiM required a rapid, scalable and highly reliable architecture to power its system's real-time data communication, which is why the company selected RTI Connext. Connext synchronizes real-time video, force feedback, live 3D visualization, and other high-volume data streams across the system. This helps ensure that a surgeon's perception and the robot's physical response remain perfectly aligned.

Benefits

With Connext serving as the foundation for distributed data flow, AiM established an architecture that can satisfy stringent FDA cybersecurity and operational regulations. Connext delivers a well-established, reliable platform that is already industry standard, delivering security features that enforce strict data encryption, mutual authentication, and granular access controls across local and wide-area networks.

Connext gives AiM the flexibility to support the integration of advanced edge AI, imaging devices, and multi-jointed surgical robots into a singular, highly resilient digital ecosystem optimized for patient safety. As a result, AiM has been able to build a system with the ability to scale for future offerings to help patients, surgeons, and hospitals and ultimately improve healthcare.

> "Our system is very complex. It has a number of unique components that all need to communicate with each other. We've found RTI's Connext platform to be ideal for interfacing between the different components, both within our robot controller, as well as other devices within the ecosystem."
>
> **— Dr. Gregory Fischer —**
> Founder, AiM Medical Robtics

ABOUT RTI

RTI is the real-time data streaming company for intelligent distributed systems. RTI Connext® software is the critical nervous system for over 2,000 designs across Aerospace and Defense, MedTech, Automotive, and Robotics.

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