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CWRU researchers to develop methods for improving MRI guidance in robotically controlled biopsies

Published on September 14, 2016 at 2:01 AM

Researchers at Case Western Reserve University are developing methods for more effectively using a magnetic resonance imager (MRI) to guide a robotically controlled biopsy needle or heart catheter around organs, muscles and bones to their target tissue.

The team of engineers, led by M. Cenk Cavusoglu, professor of electrical engineering and computer science, has received a four-year, $1 million National Science Foundation grant to support the project.

The researchers say improvements to MRI guidance will allow physicians to perform biopsies and ablations and other procedures done through the skin with more precision. Ultimately, by making procedures easier, more efficient and repeatable, their work would raise the standard of care.

Biopsies typically employ long, flexible needles to sample tissues, such as the liver, that can't be felt through the skin. Heart catheters are fed through a vein in the thigh up to a beating heart to ablate tissues causing an irregular beat.

The challenge for these through-the-skin procedures is guiding flexible instruments through the body to flexible and sometimes-moving organs or tissues, Cavusoglu said.

For that, the standard MRI is too vast.

"It's like when you're driving and want to change lanes," he said. "You don't want to continuously look everywhere; you want be aware of where your car is and the traffic around you and to look at the target--the next lane. After you change lanes, your task then changes to something else."

To enable the MRI to focus on the tasks at hand and coordinate seamlessly with the robotics, the researchers are developing two sets of algorithms that quantify and reduce uncertainties.

The first set will locate and track the surgical instruments, such as the needles or catheters, used in the procedure.

The second set, active-sensing algorithms, is aimed at controlling the MRI to continuously identify and track the target tissues as well as obstacles and anatomical structures to avoid.

Source:
Case Western Reserve University
