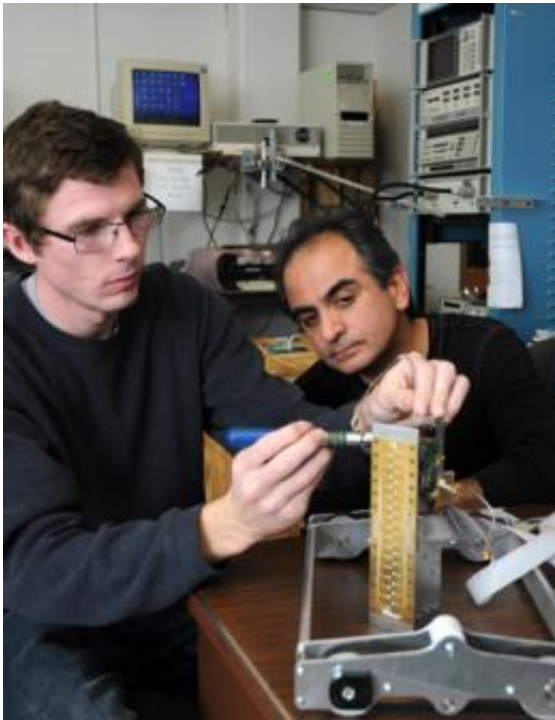


New camera makes seeing the 'invisible' possible

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(PhysOrg.com) -- The science similar to the type used in airport body scanners could soon be used to detect everything from defects in aerospace vehicles or concrete bridges to skin cancer, thanks to researchers at Missouri University of Science and Technology.

The research team, led by Dr. Reza Zoughi, the Schlumberger Distinguished Professor of [Electrical Engineering](#) at Missouri S&T, has developed a patented handheld camera that uses millimeter and microwave signals to non-intrusively peek inside materials and structures in real time. His contributions to this field, in part, have earned him the 2011 Joseph F. Keithley Award in Instrumentation and Measurement from the Institute of Electrical and Electronics Engineers (IEEE).

"In the not-so-distant future, the technology may be customized to address many critical inspection needs, including detecting defects in thermal insulating materials that are found in spacecraft heat insulating foam and tiles, space habitat structures, aircraft radomes and composite-strengthened concrete bridge members," Zoughi says.

The technology could help medical professionals detect and monitor a variety of skin conditions in humans, including cancer and burns. It also has the potential to help Homeland Security personnel detect concealed contraband (such as weapons) or reduce the number of passenger pat downs at airports. Even homeowners could see a direct benefit from the technology as it potentially could be used to detect termite damage.

How it works

The compact system can produce synthetically focused images of objects - at different planes in front of the camera - at speeds of up to 30 images per second. A laptop computer then collects the signal and displays the image in real-time for review. The entire system, powered by a battery similar to the size used in laptops, can run for several hours.

"Unlike X-rays, microwaves are non-ionizing and may only cause some heating effect," Zoughi says. "However, the high sensitivity and other characteristics of this camera enables it to operate at a low-power level."

The idea for developing a real-time, portable camera came to Zoughi in 1998 while he was on sabbatical in France. In 2007, Zoughi's research group completed the first prototype and has spent the past three years decreasing its size, while improving its overall efficiency.

Currently the camera operates in the transmission

mode, meaning objects must pass between a transmitting source and its collector to be reviewed. The team is working on designing and developing a one-sided version of it, which will make it operate in a similar fashion to a video camera.

"Further down the road, we plan to develop a wide-band [camera](#) capable of producing real-time 3-D or holographic images," Zoughi adds.

In 2010, a U.S. patent was issued for this technology.

Provided by Missouri University of Science and Technology

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