New research brings 'invisible' into view (w/ Video)

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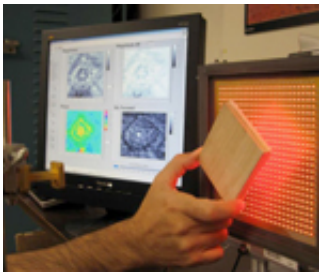

(PhysOrg.com) -- A group of researchers at Missouri University of Science and Technology has developed a handheld camera that uses microwave signals to non-destructively peek inside materials and structures in real time.

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, rendering it portable.

"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," says Dr. Reza Zoughi, the Schlumberger Distinguished Professor of Electrical Engineering at Missouri S&T, who is leading the research effort.

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

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 two years increasing its size and overall efficiency.

"Unlike X-rays, microwaves are non-ionizing and may 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."

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 3D or holographic images," Zoughi adds.

Zoughi's research group has received partial funding from NASA Marshall Space Flight Center to support this research. His team includes

M.T. Ghasr, post-doctoral fellow of electrical and computer engineering, and a number of other researchers and students.

Provided by Missouri University of Science and Technology (news : web)