Stealth radar system sees through trees, walls -- undetected

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Ohio State University engineers have invented a radar system that is virtually undetectable, because its signal resembles random noise. The radar could have applications in law enforcement, the military, and disaster rescue.

Eric K. Walton, senior research scientist in Ohio State's ElectroScience Laboratory, said that with further development the technology could even be used for medical imaging.

He explained why using random noise makes the radar system invisible.

"Almost all radio receivers in the world are designed to eliminate random noise, so that they can clearly receive the signal they're looking for," Walton said. "Radio receivers could search for this radar signal and they wouldn't find it. It also won't interfere with TV, radio, or other communication signals."

The radar scatters a very low-intensity signal across a wide range of frequencies, so a TV or radio tuned to any one frequency would interpret the radar signal as a very weak form of static.

"It doesn't interfere because it has a bandwidth that is thousands of times broader than the signals it might otherwise interfere with," Walton said.

Like traditional radar, the "noise" radar detects objects by bouncing a radio signal off them and detecting the rebound. The hardware isn't

expensive, either; altogether, the components cost less than $100.

The difference is that the noise radar generates a signal that resembles random noise, and a computer calculates very small differences in the return signal. The calculations happen billions of times every second, and the pattern of the signal changes constantly. A receiver couldn't detect the signal unless it knew exactly what random pattern to look for.

The radar can be tuned to penetrate solid walls -- just like the waves that transmit radio and TV signals -- so the military could spot enemy soldiers inside a building without the radar signal being detected, Walton said. Traffic police could measure vehicle speed without setting off drivers' radar detectors. Autonomous vehicles could tell whether a bush conceals a more dangerous obstacle, like a tree stump or a gulley.

The radar is inherently able to distinguish between many types of targets because of its ultra-wide-band characteristics. "Unfortunately, there are thousands of everyday objects that look like humans on radar -- even chairs and filing cabinets," he said. So the shape of a radar image alone can't be used to identify a human. "What tends to give a human away is that he moves. He breathes, his heart beats, his body makes unintended motions."

These tiny motions could be used to locate disaster survivors who were pinned under rubble. Other radar systems can't do that, because they are too far-sighted -- they can't see people who are buried only a few yards away. Walton said that the noise radar is inherently able to see objects that are nearby.

"It can see things that are only a couple of inches away with as much clarity as it can see things on the surface of Mars," he added.

That means that with further development, the radar might image

tumors, blood clots, and foreign objects in the body. It could even measure bone density. As with all forms of medical imaging, studies would first have to determine the radar's effect on the body.

The university is expected to license the patented radar system.

Source: Ohio State University