

Physicists build inexpensive land mine detection system using off-the-shelf components

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Anyone who is an online shopper and humanitarian might find this research project appealing. Physics professor John Scales is working on a low-cost, human-focused, high technology effort to stop the devastation of unexploded buried land mines with a novel acoustical/microwave detection system. The work is described in the *Journal of Applied Physics*.

In a project sponsored by the U.S. Army Research Laboratory's Army Research Office, Scales, his collaborator Martin Smith, and students at the Colorado School of Mines have built a new system using microwave-based sensors to detect vibrations the ground (or other structures) remotely.

Cost is key. Made from off-the-shelf parts -- including online auction deals -- the system costs about \$10,000. This compares to laser-based Doppler remote detection systems that sells for upwards of \$1 million. Microwaves have many other advantages including that they can see through foliage.

"Land mines are an enormous problem around the world for both military personnel and civilians," explains Scales. "We've developed an ultrasound technique to first shake the ground and then a microwave component to detect ground motion that indicates location of the land mine. We hope that the two components together enable us to detect the

land mines in a safe fashion, from a distance."

Many other applications exist for remote vibration sensing, including monitoring the structural integrity of buildings, bridges, and dams. Multiple approaches exist for land mine detection, from trained dogs and rats that detect chemicals used in the explosives to biosensor plants that change colors in response to [soil conditions](#) altered by mines.

But there's still a pressing need for innovation.

"The reason so many people are working on this problem from so many angles," says Scales, "is there is no one scheme that works well all the time. You need an arsenal of tools."

More information: The article, "A low-cost millimeter wave interferometer for remote vibration sensing" by John A. Scales et al will appear in the Journal of Applied Physics. jap.aip.org/

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