June 2000

The Human Touch

Russell Gasser  
School of Engineering, University of Warwick

Terry Thomas  
School of Engineering, University of Warwick

Follow this and additional works at: http://commons.lib.jmu.edu/cisr-journal

Part of the Defense and Security Studies Commons, Emergency and Disaster Management Commons, Other Public Affairs, Public Policy and Public Administration Commons, and the Peace and Conflict Studies Commons

Recommended Citation  

This Article is brought to you for free and open access by the Center for International Stabilization and Recovery at JMU Scholarly Commons. It has been accepted for inclusion in Journal of Conventional Weapons Destruction by an authorized editor of JMU Scholarly Commons. For more information, please contact dc_admin@jmu.edu.
**Military-driven technology is useless for clearing mines in villages and rice fields.**

by Russell Gasser and Terry Thomas, Development Technology Unit, University of Warwick

Biting insects, inaccessible terrain, impenetrable bamboo thickets and thorn bushes. Mine clearance in Cambodia is a hot, sweaty business at the best of times. Because tripwires hidden in the undergrowth could trigger explosions, the vegetation has to be cleared by hand before mine detection can start. It is a tedious matter and can occupy two-thirds of a mine clearer’s working day.

The next step, finding and digging out every piece of buried metal, is not any easier. In the dry season, the ground can be rock-hard and the mines can remain active for many years. Something should be done, but what?

At first glance, the answer seems obvious: bring in super-fast robots, hook them up to remote sensors and control them from afar with computers. In countries such as Britain and the United States, that is pretty much what most scientists and engineers working on mine clearance technology have been doing.

In a typical advanced research lab, you will see mine-like targets planted in giant sandboxes below computer-controlled positioning equipment. The researchers will be hunched over computers analyzing mine “signatures,” detected remotely by ground-penetrating radar and polarimetric infrared cameras. By combining information from these sensors, the labs can obtain stunning images of buried objects.

Cambodia is not alone. Current estimates suggest there could be 25 million landmines buried worldwide. That is far fewer than was previously feared but still enough to contaminate one country in three and to kill or injure two thousand people every month, many of them children. Present methods of clearing land are slow, and mines can remain active for many years.Something should be done, but what?

The problem is that research into such approaches has been aimed at making them as fast as possible for military use, almost regardless of cost. Humanitarian deminers require cheap and highly dependable tools, even if they are slow. And the notion that techniques such as NQR will be vital to clearing “plastic” mines has been overstated.

For example, the ability to detect explosives without laboriously having to excavate scrap metal could be a boon. One promising method uses neutron bombardment to detect the nitrogen in explosives.

When nitrogen captures neutrons, gamma rays of a known energy are produced and can be detected. Another technique is “nuclear quadrupole resonance (NQR),” a form of nuclear magnetic resonance (NMR) that can detect chemical bonds specific to an explosive by the way atomic nuclei absorb radio waves. Unlike NMR, NQR uses the Earth’s magnetic field instead of powerful magnets.

In a typical advanced research lab, you will see mine-like targets planted in giant sandboxes below computer-controlled positioning equipment. The researchers will be hunched over computers analyzing mine “signatures,” detected remotely by ground-penetrating radar and polarimetric infrared cameras. By combining information from these sensors, the labs can obtain stunning images of buried objects.

Cambodia is not alone. Current estimates suggest there could be 25 million landmines buried worldwide. That is far fewer than was previously feared but still enough to contaminate one country in three and to kill or injure two thousand people every month, many of them children. Present methods of clearing land are slow, and mines can remain active for many years. Something should be done, but what?

The problem is that research into such approaches has been aimed at making them as fast as possible for military use, almost regardless of cost. Humanitarian deminers require cheap and highly dependable tools, even if they are slow. And the notion that techniques such as NQR will be vital to clearing “plastic” mines has been overstated.

For example, the ability to detect explosives without laboriously having to excavate scrap metal could be a boon. One promising method uses neutron bombardment to detect the nitrogen in explosives.

When nitrogen captures neutrons, gamma rays of a known energy are produced and can be detected. Another technique is “nuclear quadrupole resonance (NQR),” a form of nuclear magnetic resonance (NMR) that can detect chemical bonds specific to an explosive by the way atomic nuclei absorb radio waves. Unlike NMR, NQR uses the Earth’s magnetic field instead of powerful magnets.

The problem is that research into such approaches has been aimed at making them as fast as possible for military use, almost regardless of cost. Humanitarian deminers require cheap and highly dependable tools, even if they are slow. And the notion that techniques such as NQR will be vital to clearing “plastic” mines has been overstated.

For example, the ability to detect explosives without laboriously having to excavate scrap metal could be a boon. One promising method uses neutron bombardment to detect the nitrogen in explosives.

When nitrogen captures neutrons, gamma rays of a known energy are produced and can be detected. Another technique is “nuclear quadrupole resonance (NQR),” a form of nuclear magnetic resonance (NMR) that can detect chemical bonds specific to an explosive by the way atomic nuclei absorb radio waves. Unlike NMR, NQR uses the Earth’s magnetic field instead of powerful magnets.