



BETTER IMAGING FOR LANDMINE DETECTION

TakeAIM Winner 2013:
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It will take over 1,000 years to clear the 110 million active landmines in the world with current technology. Detection methods have barely changed since World War II, and are largely based on metal detection. However, using just a metal detector means almost every piece of metal must be removed from the ground to declare it free from landmines.

Our aim is to develop detection equipment which incorporates ground-penetrating radar (GPR) with advanced imaging methods alongside metal detection. Our imaging methods are based on 'Full-Waveform Inversion' (FWI), a state of the art in seismic imaging. We find the material parameters describing the subsurface which would most closely reproduce the recorded GPR data, giving us quantitative information about detected objects. FWI is able to cope with the large amounts of clutter in the ground, reducing the false positive detections of our equipment.

Until the last few years FWI has had very little development, and there is no GPR system for landmine detection which uses the method. Developing the imaging procedure alongside new detection equipment means we are able to guide what form the equipment should take for best results, unlike many other studies which perform FWI on data from pre-existing equipment.

The social benefits of the research are clear: speeding the de-mining process will bring forward the day when communities are able to live free from landmines. Our developments can also be used to improve the diagnostic capability of many other imaging applications, such as medical ultrasound.

Competition sponsors:



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ARTICULATING THE INFLUENCE OF
MATHEMATICS

The use of mathematics has profound consequences in all walks of life, but the opportunities that it opens up often go unrecognised or underexploited. The Industrial Mathematics KTN, enabled by the generous sponsorship of six leading corporate partners, ran the third annual TakeAIM competition in 2013 to make visible the crucial role that mathematics will increasingly play in all aspects of our lives. The competition was open to all undergraduate and postgraduate students working in the mathematical sciences. Authors of the best two entries each received a MacBook Air as their prize, with additional prizes being awarded to two runners-up.