

ACOUSTICS2008/573 Nonlinear Seismo-Acoustic Landmine Detection

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The seismo-acoustic methods are among the most promising emerging techniques for the detection of landmines. Numerous field tests have demonstrated that buried landmines manifest themselves at the surface through resonance and nonlinear responses (or signatures) to acoustic/seismic excitation at the frequencies below 1000Hz. The resonance signatures are primarily due to mine's housing structural resonances. The nonlinear signatures explained by high contact nonlinearity at the mine-soil interface. These phenomena are utilized for landmine detection demonstrating high provability of detection and low false alarms. The paper provides overview of theoretical and experimental investigations conducted by the author and his colleagues at Stevens Institute of Technology. Among major accomplishments are discovery and explanation of mine's resonance behavior; soil/depth effect on buried mine's resonances; discovery and analysis of nonlinear acoustic interactions at the soil-mine interface; development of nonlinear quadratic and intermodulation detection algorithms based on dual-frequency excitation. Work supported by the U.S.Army NVESD, ARO and ONR.