

Notice and Invitation

Oral Defense of Master's Thesis
The Volgenau School of Engineering, George Mason University

Marie Talbott

Bachelor of Science, George Mason University, Fairfax, Virginia

Metrics and Performance Analysis of Next Generation Handheld Mine Detectors

Wednesday, April 26th, 2017 1:30pm

Room 3507 Engineering Building

All are invited to attend.

Committee

Dr. Gerald Cook, Earle C. Williams Professor, Thesis Director

Dr. Lloyd Griffiths, Dean Emeritus

Dr. Dimitris Ioannou

Abstract

Soldiers in theater face the threat of mines and improvised explosive devices (IEDs) which grow more sophisticated and more dangerous each year. In current conflicts, insurgents regularly use IEDs along well-traveled roads or even in urban environments to disrupt and delay soldiers during missions, as soldiers must first clear a safe path forward before proceeding. Mine and IED detection systems in theater can be integrated onto a vehicle, robotic platform, or a handheld system and use a variety of sensors to detect potential threats.

This thesis presents analysis of data collected by three handheld mine detectors that utilize Ground Penetrating Radar (GPR) to detect mines and IEDs. These detectors are prototypes intended to improve upon the handheld detector currently fielded by the US Army. A signal over background metric will be applied to the data collected with each system to calculate detections of targets (GPR response at a target location) and false alarms (GPR response not due to a target). Several methods for selecting the background for the signal over background metric will be investigated as there are varying levels of position information available for each detector. Data used in this thesis is from a collection that occurred in April and May 2016 at a US Army test site over relevant targets and threats. Data was collected with all three prototype systems and the currently fielded handheld detector over a short time period so that any environmental or weather issues that may impact system performance would be experienced by all systems.

Once the signal over background metric is calculated for the data collected with each system, the GPR system's capabilities for detecting targets will be assessed as well as the system's limitations, particularly against targets with little or no metal content. The methodology used in this thesis is identical to the analysis the author performs at her place of employment (The Institute for Defense Analyses) in support of the Countermine Division of Night Vision and Electronic Sensors Directorate (NVESD), based in Fort Belvoir, to assess a variety of mine and IED detection systems.