

## **Surface and Buried Landmine Scene Generation and Validation using the Digital Imaging and Remote Sensing Image Generation (DIRSIG) Model**

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### **Abstract:**

Over the years, detection and neutralization of surface-laid and buried landmines has been a slow and dangerous endeavor for military forces and humanitarian organizations throughout the world. In an effort to make the process faster and safer, scientists have begun to exploit the ever-evolving passive electro-optical realm, both from a broadband perspective and a multi or hyperspectral perspective. Carried with this exploitation is the development of mine detection algorithms that take advantage of the spectral features exhibited by mine targets, only available in a multi or hyperspectral data set. Difficulty in algorithm development comes from a lack of robust data, which is needed to

appropriately test the validity of an algorithm's results. This work deals with the creation of synthetic data using the Digital Imaging and Remote Sensing Image Generation (DIRSIG) model. A synthetic surface and buried landmine scene has been modeled after a data collect on the US Army's Yuma Proving Grounds by the Airborne Hyperspectral Imager (AHI), operated by the University of Hawaii. The synthetic data has been created to represent the surrogate minefield thermally, spatially, spectrally, and temporally in the 7.9 to 11.5 micron region, using 70 bands of data. Validation and verification of the scene has been accomplished by direct comparison to the AHI truth data using Rank Order Correlation comparison, Gray Level Co-occurrence Matrix analysis, Spectral Co-occurrence Matrix analysis, and an evaluation of the R(x) algorithm's performance. This paper describes the work done to build the scene and compares the results to truth data.

**Bio:**

Captain Erin Peterson received a Bachelor's degree in Mathematics from Clarkson University and is currently finishing his Master's degree in Imaging Science from Rochester Institute of Technology. He has worked as an ICBM Maintenance Officer in Wyoming and a Weapon System Survivability Analyst in New Mexico for the United States Air Force.

**Keywords:**

DIRSIG, reststrahlen, thermal signature, validation, anomaly detection