**APPLICATION OF VARIOGRAM TO DETECT BURIED OBJECTS USING A LASER DOPPLER VIBROMETER**

*Md Ilias Mahmud, Geology and Geological Engineering, University of Mississippi, USA*

*Robert M Holt, Geology and Geological Engineering, University of Mississippi, USA*

*Craig J Hickey, National Center for Physical Acoustics, University of Mississippi, USA*

*Vyacheslav Aranchuk, National Center for Physical Acoustics, University of Mississippi, USA*

The remote detection and identification of the buried objects such as landmines is very complex and covers a wide range in applications. One area of research includes the detection of buried objects using vibration sensors like Laser Doppler Vibrometer (LDV). The LDV measures ground vibration generated from the acoustic-to-seismic (A/S) coupling of airborne sound into the ground. A spatial anomaly in vibrational energy is indicative of a landmine. Most LDV-based studies, depend upon visual detection by observing processed images at various frequencies of excitation. In this study, we used variogram, a geostatistical tool, to analyze the spatial variation in ground vibration recorded by an LDV for buried object detection. Here, the magnitude of the vibrational velocity is considered as a regional variable to compute and model the variogram. LDV measurements were carried out in a sand box in natural state (background) and with an object buried a few centimeters below the ground surface. The result shows that the shapes of the variogram, higher variance of the with-object data than the background, can distinctively identify an object from the background. We develop a two-dimensional Gaussian function to simulate the signature of a buried object which allows generation of a series synthetic data to verify to what extent a variogram can successfully detect a buried object. The difference in variograms narrows as the vibration of the object approaches the background vibrational velocity. The variogram models demonstrate that the buried object is detectable when the variance in data with a target is considerably higher than the background. Further research is needed to establish the variogram as an independent tool to detect buried object using a mechanical excitation.