AUTOMATING ADVANCED GEOPHYSICAL CLASSIFICATION COVERAGE GAP IDENTIFICATION USING POINT CLOUD DATA AND GEOGRAPHIC INFORMATION SYSTEMS

Dominique Jafar, TerranearPMC, Los Alamos, NM

Jon Miller, White River Technologies, Lebanon, NH

Eric Tow, TerranearPMC, Los Alamos, NM

Jeffrey Leberfinger, PIKA International, Inc., Hummelstown, PA

# Abstract

The use of terrestrial simultaneous localization and mapping (SLAM) LiDAR systems for positioning in Global Navigation Satellite System (GNSS)-denied areas of Munitions Response Sites (MRSs) has created new opportunities for advanced geospatial applications and data quality management on Military Munitions Response Program (MMRP) sites. One key application is leveraging base point cloud data to predict and identify site features that will result in geophysical coverage gaps. This approach may enhance quality control, streamline documentation, and reduce reliance on in-field annotations, which often delay grid completion and increase costs for contractors and clients. Our team recently evaluated base point cloud data collected using the Kaarta Stencil 2-16 SLAM Terrestrial LiDAR System at several MRSs. These data were used for positioning in GNSS-denied areas as part of advanced geophysical classification (AGC) surveys during MMRP projects. The point cloud data along with field annotations of survey gaps caused by obstructions were used to evaluate automated point cloud classification tools and develop an efficient workflow for gap prediction, identification, and analysis.

The study evaluated several automated point cloud classification methods, including Esri’s Classify LAS Ground tool, WhiteBox Tools' LidarGroundPointFilter, and the Cloth Simulation Filter (CSF) from CloudCompare. Esri’s Classify LAS Ground tool with aggressive settings produced gap predictions most consistent with field observations. Under varying test scenarios, the quality control (QC) measures integrated into the workflow successfully identified false negative gaps requiring further review and highlighted areas in need of additional geophysical coverage. Best practices for point cloud collection and automated gap prediction, QC assessments, and insights for refining the workflow across diverse site conditions will be discussed.