ABSTRACT

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Title: **Target Types and Placement for Terrestrial and Mobile Mapping**
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The use of digital three-dimensional (3D) data has increased over the last two decades as private and public firms have begun to realize its utility. Mobile Terrestrial Laser Scanning (MTLS) or Mobile Mapping Systems (MMS), which utilizes LiDAR (Light Detection and Ranging) data collection from a moving platform along with advances in positioning systems—e.g., Global Navigation Satellite Systems (GNSS), Inertial Measurement Units (IMUs), and Distance Measurement Instruments (DMIs)—have paved the way for efficient, abundant, and accurate 3D data collection. Validation and control targets are vital to ensure relative and/or absolute accuracy for MTLS projects. The focus of this dissertation is to evaluate several types of targets and the positional spacing of said targets for MTLS.

A mostly planar two-dimensional (2D) targeting system (painted target on ground) is commonly used to constrain, register, and validate the 3D point clouds from MTLS. In this dissertation, 3D objects—a sphere and a cube—were evaluated with varied angles of incidence and point densities as more appropriate alternatives to constrain and validate the 3D MTLS point clouds. Next, a planar circular 2D target—with the use of the raw intensity of the LiDAR pulse as another measured dimension—was evaluated as a proof of concept to also constrain and validate 3D LiDAR data. A third and final component of this dissertation explored analyses of IMU to determine the positional spacing of control and validation targets in MTLS projects to provide maximum accuracy for all data points.