

# Low-Cost MMS

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## SUMMARY

Mobile Mapping Systems (MMS) have become essential tools for acquiring high-resolution geospatial data in surveying, construction, and urban planning. However, traditional MMS platforms are expensive, complex, and often inaccessible for small- to medium-scale projects. This research focuses on evaluating low-cost MMS solutions by integrating portable laser scanners with Simultaneous Localization and Mapping (SLAM) algorithms and Micro-Electro-Mechanical Systems (MEMS) Inertial Measurement Units (IMUs).

The study employs the GeoSLAM ZEB Horizon 3D laser scanner as a case study to assess the feasibility of using low-cost MMS for both indoor and outdoor applications. LiDAR measurements (distances and angles) are fused with MEMS IMU data (angular rates and accelerations) to drive strapdown Inertial Navigation System (INS) computations. A methodology is developed to extract features, build point cloud maps, and model measurement errors, with compensation aided by IMU integration. Experimental tests evaluate efficiency in object identification, shape preservation, and dimensional accuracy for buildings, trees, and poles, while also analyzing accuracy variations with vehicle speed.

Results demonstrate that low-cost MMS can achieve reliable accuracy levels suitable for many professional surveying tasks, offering a cost-effective alternative to conventional MMS. This research highlights the potential of portable, low-cost systems to democratize access to 3D mapping technologies and support decision-makers seeking high accuracy with reduced costs.

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