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OPERATIONAL EFFICIENCY OF SINGLE-SESSION HANDHELD SLAM FOR RAPID 3D DOCUMENTATION OF A UNIVERSITY BUILDING

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Abstract

This study quantifies the operational efficiency of a single-session handheld SLAM workflow for documenting a university building. A single operator scanned the ground floor, first floor and exterior in 33 minutes, producing 242.7 million points, at a documentation rate of ~45–60 m^2/min and sub-centimetre local accuracy. Handheld SLAM offers a time gain on the order of days over static terrestrial scanning, at an accepted trade-off in density and accuracy.

• Introduction

- 3D documentation of buildings is increasingly needed for management and renovation. Static terrestrial laser scanning (TLS) is accurate but slow, requiring many setups. Handheld SLAM lets a single operator scan interiors and exteriors in one pass. This work quantifies the productivity of a single handheld session on a real institutional building.

• Material and Methods

- A CHCNAV RS10 handheld SLAM scanner (32 LiDAR channels) with an Insta360 X4 camera was carried by one operator along a closed-loop trajectory, in a single 33-minute session, processed in CoPre. Accuracy was checked with a Leica DISTO D110. Indicators: time, point throughput, data rate, density and documentation rate (m^2/min).

• Results and Discussions

- The session produced 242,670,484 points (8.13 GB) at ~122,560 pts/s and ~252 MB/min, with a mean density of ~14,500 pts/m^3 and a documentation rate of ~45–60 m^2/min. The accuracy check gave 6 mm (length) and 2 mm (width) differences, below 1 cm. Compared with the literature, handheld SLAM documents a building in minutes versus ~2 days and 70 setups for static TLS (Conti et al., 2024), at lower density and accuracy.

• Conclusions

- A single 33-minute handheld session, with one operator, documented an entire building at a density adequate for architectural documentation. The method suits rapid, low-cost documentation of the built stock; the main limitations are partial coverage and trajectory-dependent colourisation.

33 min	242.7 M	1	45–60	< 1 cm
single session	3D points	operator	m²/min	local accuracy

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