

Comparative Evaluation of LiDAR and UAV Photogrammetry for Urban Inventory Mapping through an Automated Scan-to-BIM Framework

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INTRODUCTION & AIM

Rapid urbanization has accelerated the expansion of cities into hazard-prone areas, increasing the demand for accurate and up-to-date urban cadastral information for disaster risk management and urban planning [1]. However, many urban environments still lack detailed digital documentation and reliable base maps required for effective urban governance. Recent advances in unmanned aerial vehicle (UAV) technologies and automated Scan-to-BIM workflows have enabled efficient 3D reconstruction of urban environments using photogrammetric and LiDAR point clouds [2]. Furthermore, the integration of Building Information Modeling (BIM) and geospatial information supports the development of interoperable digital urban models and City Information Modeling applications [3]. Nevertheless, comparative evaluations of UAV photogrammetry and LiDAR for automated urban building extraction and BIM generation remain limited. Therefore, this study compares the performance of UAV photogrammetry and LiDAR technologies within an automated Scan-to-BIM workflow for generating georeferenced LOD 100 BIM models and 3D urban cadastral representations.

METHOD

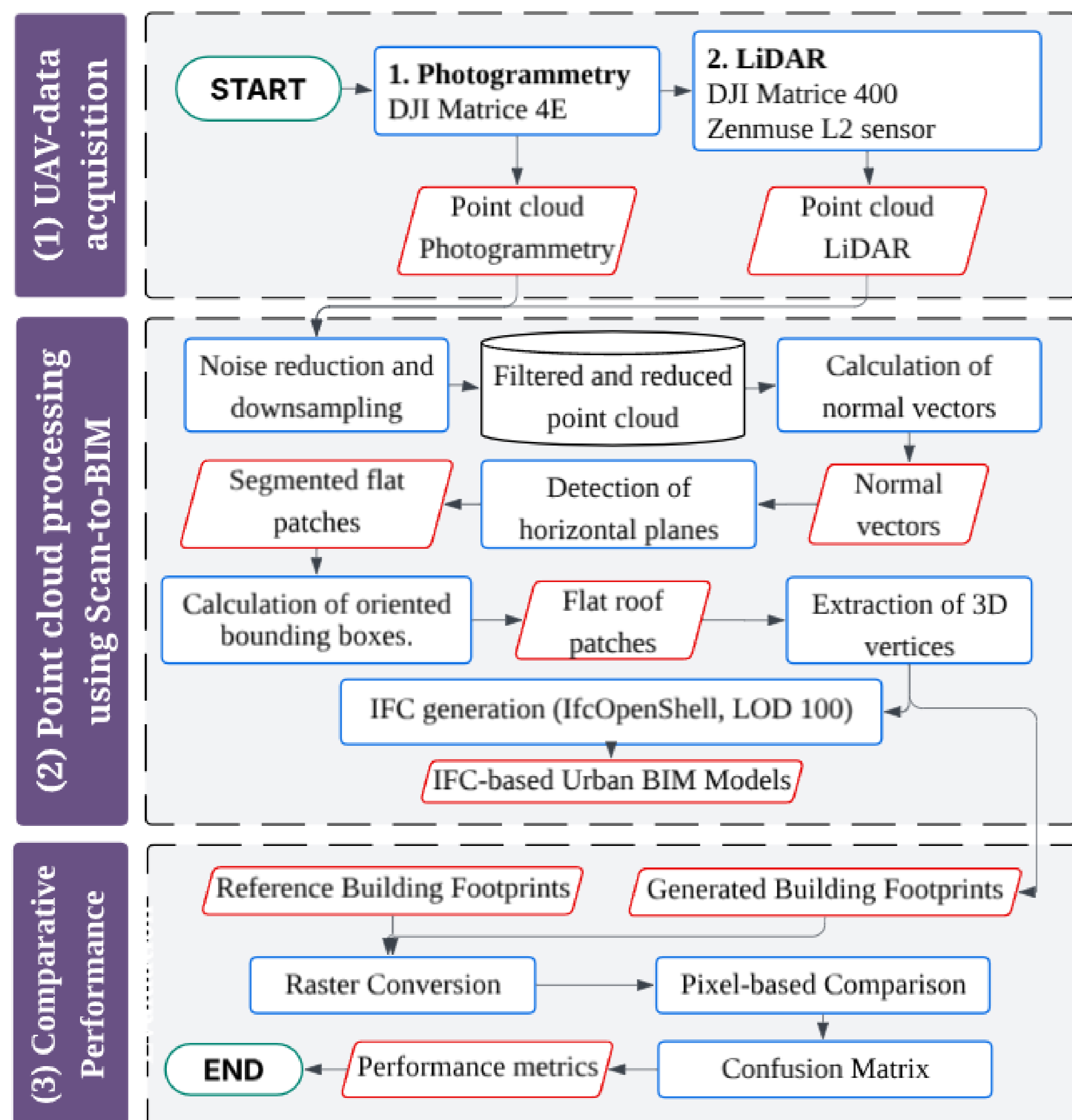


Fig. 1. Overview of the proposed workflow.

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RESULTS & DISCUSSION

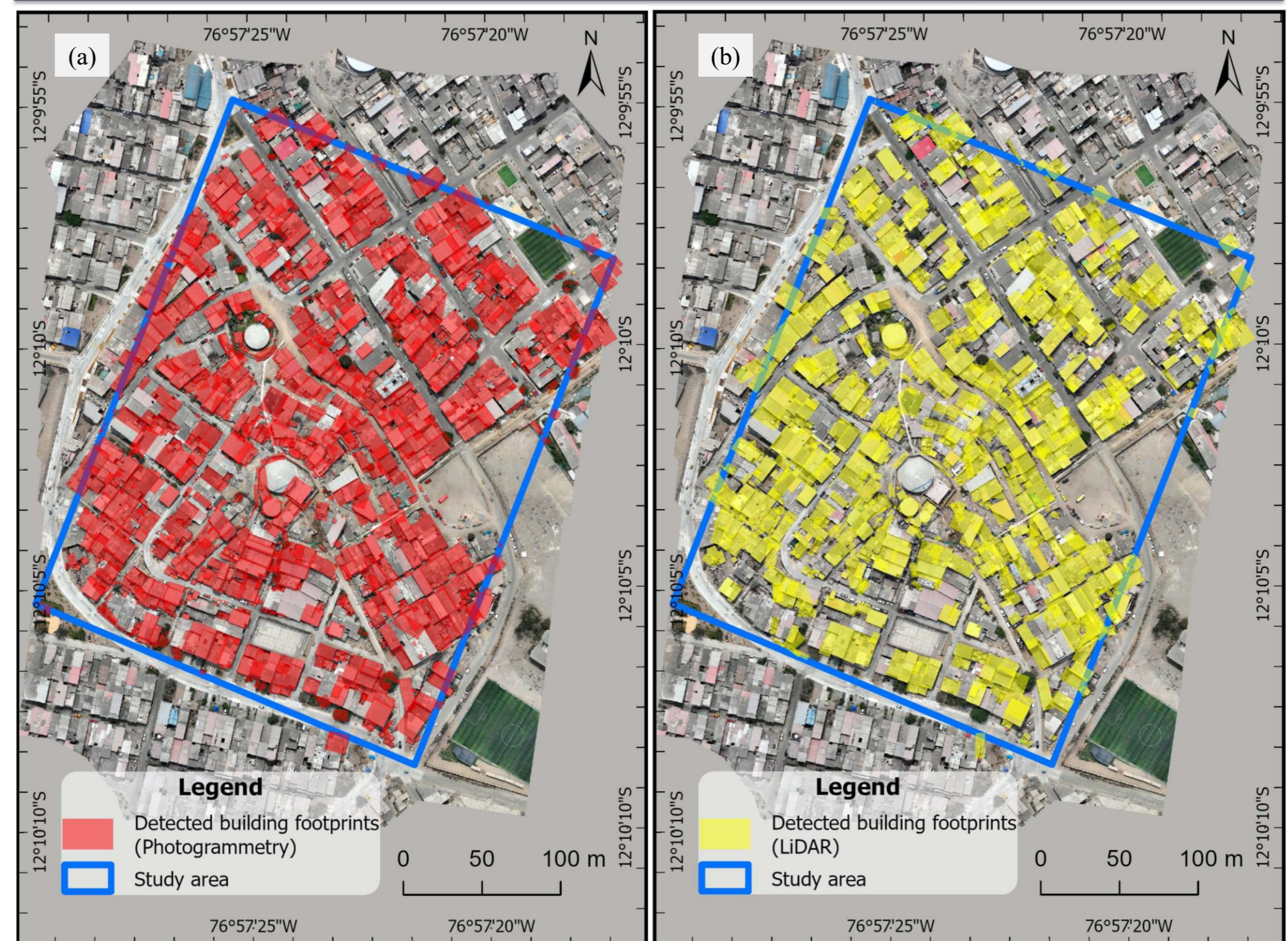


Fig 2. Building footprint extraction results from photogrammetry (a) and LiDAR (b).

Metric	Photogrammetry	LiDAR
Accuracy	0.8076	0.8145
Precision	0.6400	0.6759
Recall	0.7195	0.6523
F1-score	0.6774	0.6639

Comparative Analysis

LiDAR achieved higher accuracy and geometric consistency, while photogrammetry obtained the highest recall and F1-score, demonstrating competitive building footprint detection performance.

CONCLUSIONS

- Both UAV-based approaches successfully generated georeferenced LOD 100 BIM models through the automated Scan-to-BIM workflow.
- LiDAR achieved higher accuracy and precision, demonstrating improved geometric consistency and volumetric completeness in dense urban environments.
- UAV photogrammetry obtained the highest recall and F1-score, showing competitive building footprint extraction performance with reduced acquisition cost and processing time.
- The proposed workflow demonstrates the feasibility of integrating UAV photogrammetry and LiDAR for 3D urban cadastre generation and urban risk management applications.

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