Point2Building: Reconstructing Buildings from Airborne LiDAR Point Clouds


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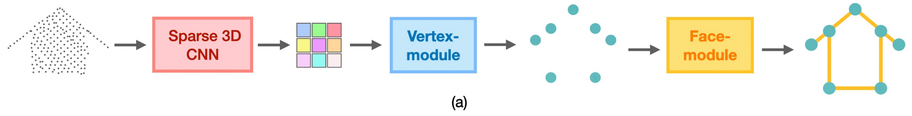
Introduction

We present a learning-based approach, **Point2Building**, to reconstruct buildings as 3D polygonal meshes from airborne LiDAR point clouds. Addressing challenges like diverse roof shapes, varying point density, and incompleteness, our autoregressive model Point2Building iteratively builds up meshes by generating sequences of vertices and faces, avoiding common preprocessing errors and enhancing reconstruction fidelity.

Proposed Method

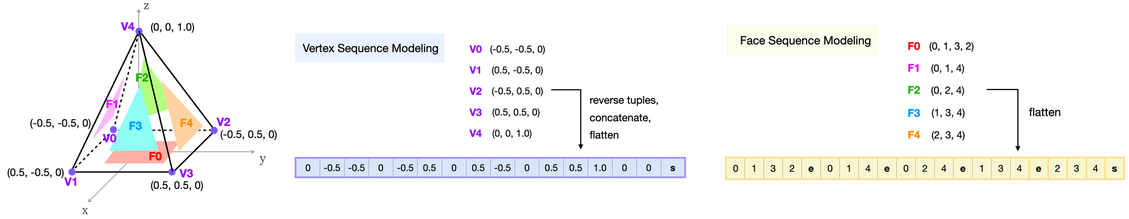


(a) Overview of the pipeline visualized with cartoon 2D data.

(b) **Vertex module** (SparseCNN + Transformer decoder) : Stages of generating vertices.

(c) **Face module** (Transformer encoder-decoder): Stages of assembling vertices into surfaces.

Mapping corners and faces into token sequences for training transformer-based models:



Experimental results

Tab. Evaluation on vertex prediction quality.

	precision ↑	recall ↑	F1-score ↑	Chamfer distance ↓
City3D	0.6717	0.7364	0.6804	0.9387
2.5D Dual Contour	0.2899	0.5060	0.3553	1.4006
Our Vertex-module	**0.8928**	**0.8617**	**0.8677**	**0.5816**

Tab. Errors (m) of reconstruction with different methods.

	MDE ↓	Hausdorff distance ↓	Chamfer distance ↓
City3D	0.3046	1.4723	0.3708
2.5D DualContour	0.3646	1.9157	0.4368
Ours	**0.2542**	**1.1200**	**0.3060**

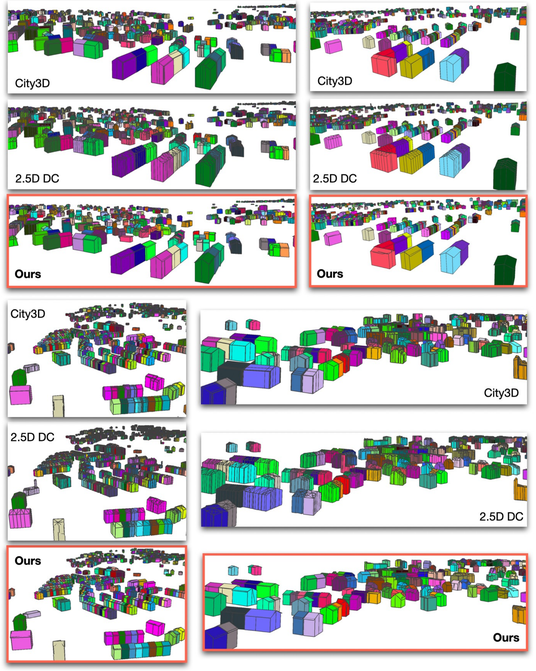


Fig. Comparison of reconstructed building blocks

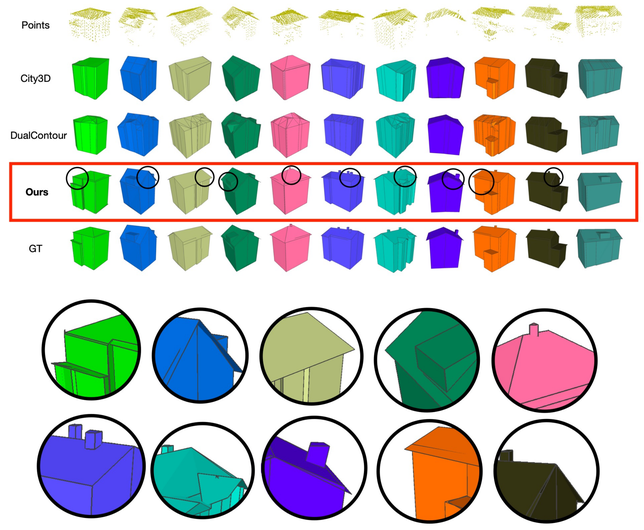


Fig. Gallery of building reconstructions using different methods.

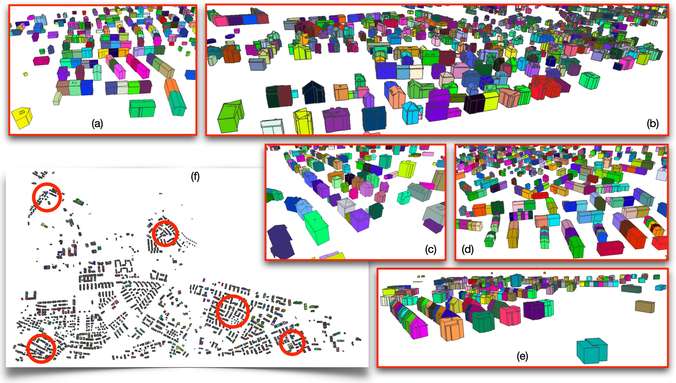


Fig. Reconstructed building blocks in Zurich.