H_2-Mapping: Real-time Dense Mapping Using Hierarchical Hybrid Representation.

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Co-first author. Orded Determined by coin flip.
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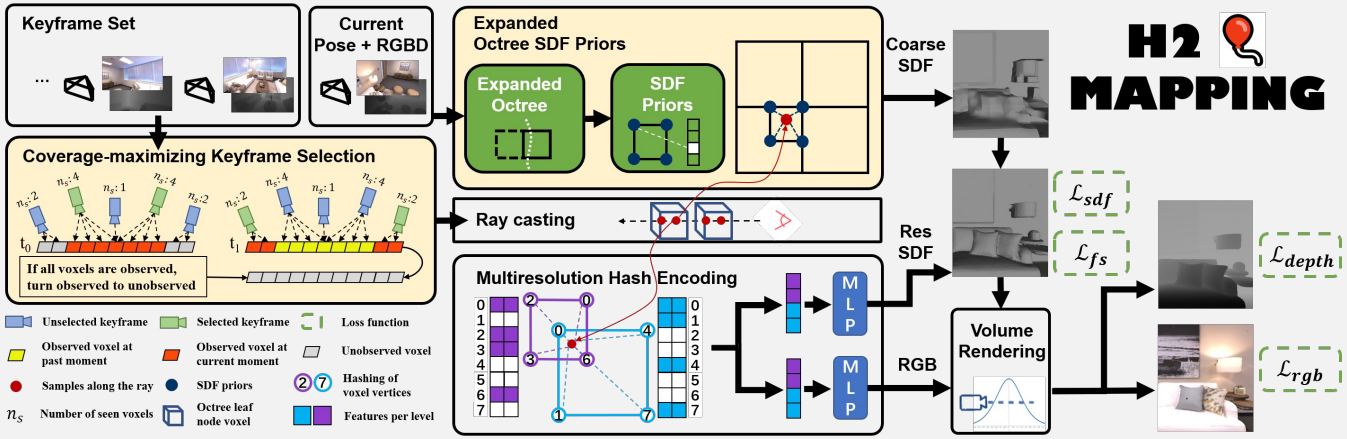


Pipeline of H_2-Mapping

Abstract-We propose a NeRF-based mapping method that enables higher-quality reconstruction and real-time capability even on edge computers. To the best of our knowledge, our method is the first to achieve high-quality NeRF-based mapping on edge computers of handheld devices and quadrotors in real-time.

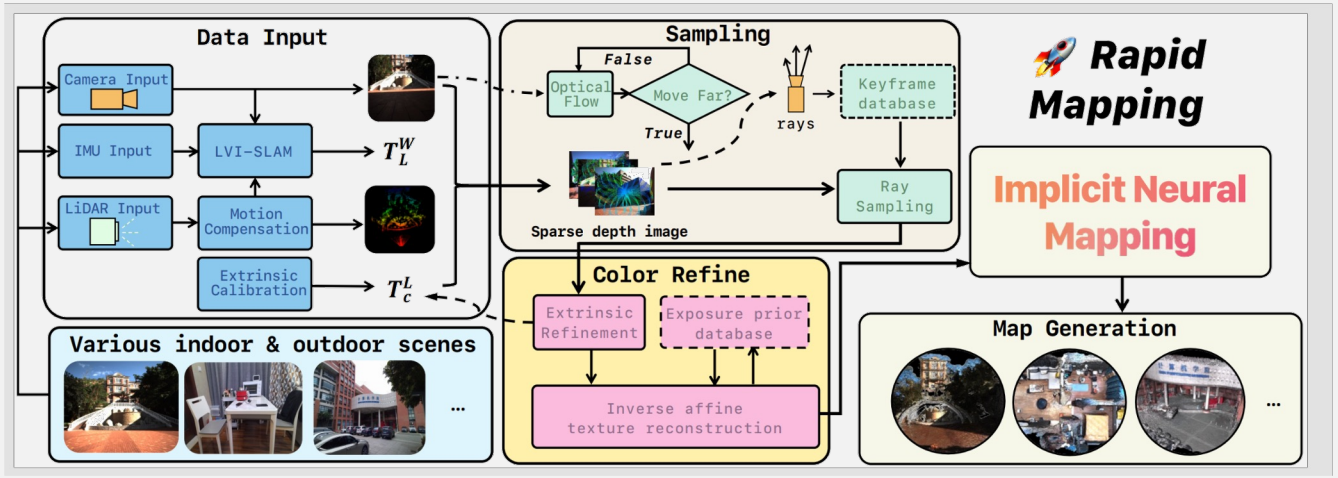
UAV Real-World Experiment

Handheld Device Real-World Experiment

Rapid-Mapping:LiDAR-Visual Implicit Neural Representations for Real-Time Dense Mapping

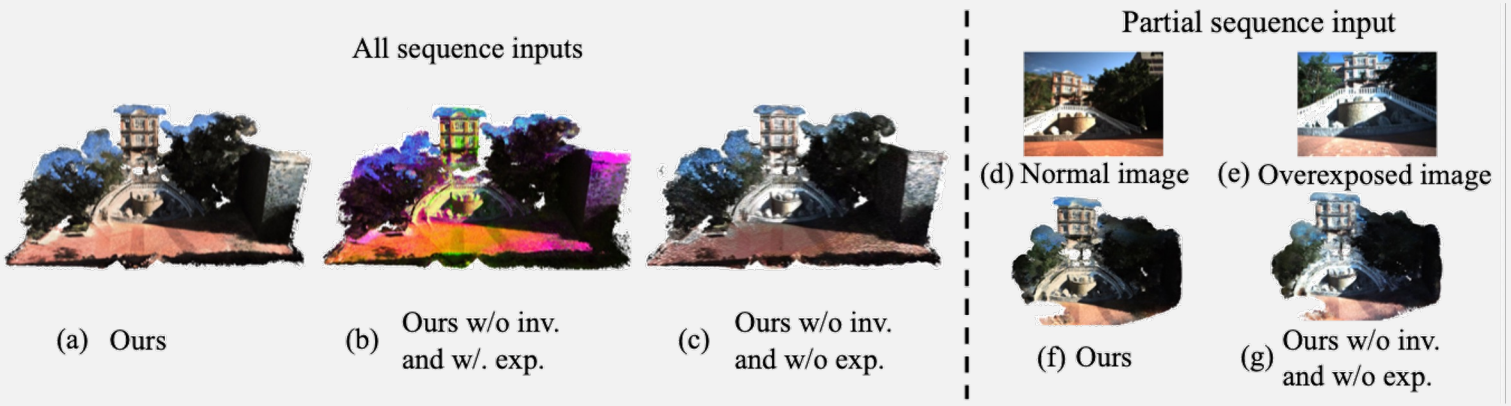
Hanwen Zhang, Yujie Zou, Zhewen Yan, Hui Cheng
Sun Yat-sen University

IEEE Robotics and Automation Letters, 2024



Pipeline of Rapid-Mapping

Abstract- We propose the first real-time LiDAR-Visual mapping method in large-scale indoor and outdoor environments, named Rapid-Mapping, that utilizes implicit neural representations and preserves high-fidelity textures. Extensive experiments validate that Rapid-Mapping enables real-time dense mapping in large-scale complex indoor and outdoor scenes, exhibiting more detailed re- alistic textures and more accurate geometry compared to existing methods.



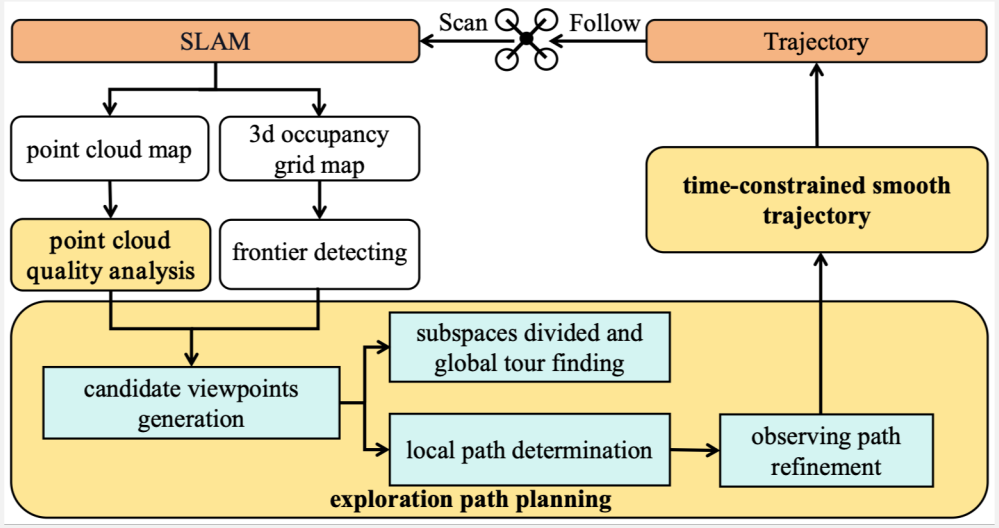
Inverse Affine Texture Reconstruction

Real-World Experiment

ECOS:Efficient UAV Exploration with Dense-aware Online Scanning Using a LiDAR Sensor

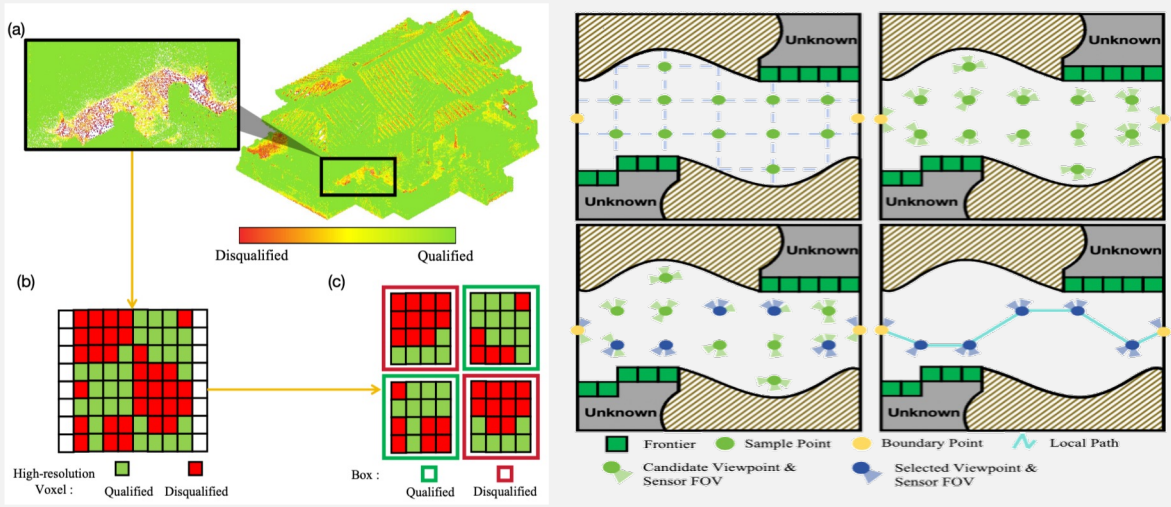
Zhewen Yan, Junlong Huang, Yujie Zou, **Hanwen Zhang**, Hui Cheng
Sun Yat-sen University

IEEE Robotics and Automation Letters (Under Review)

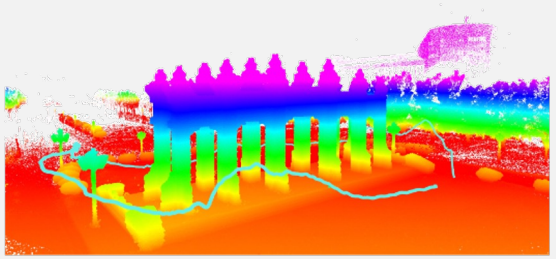


Pipeline of ECOS

Abstract- We propose a framework that supports efficient UAV exploration with dense-aware online scanning using a LiDAR sensor. Extensive simulations and real-world experiment demonstrating that our method completes exploration tasks with unparalleled point cloud density and efficiency compared to state-of-the-art approaches



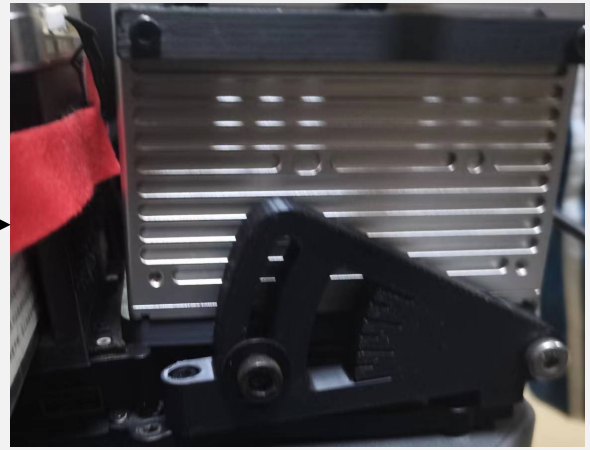
Point Cloud Dense-aware



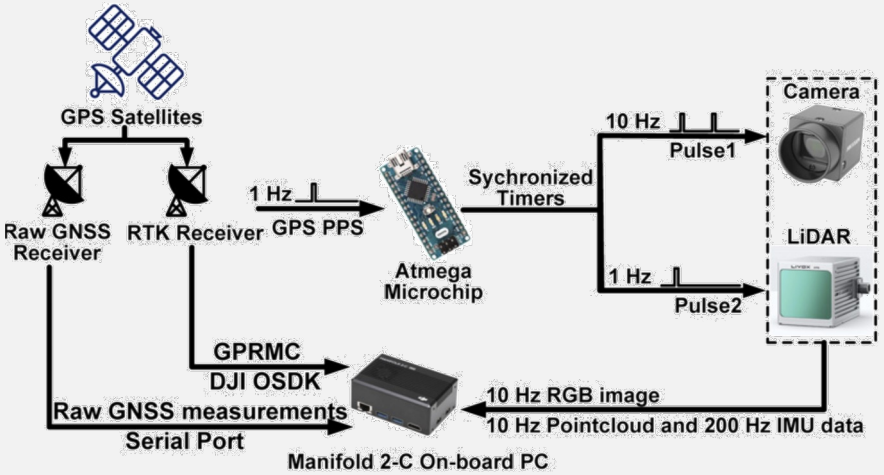
Real-Word Experiment

Engineering Efforts

Angle Adjustment



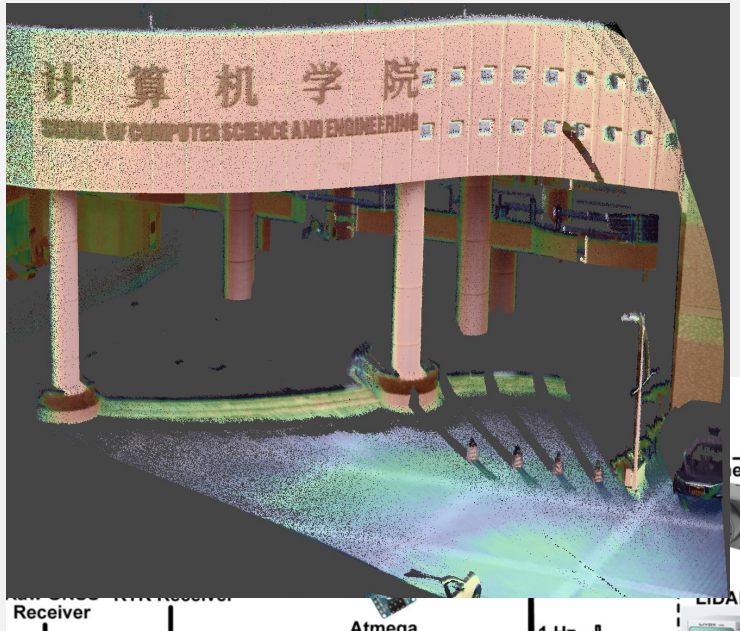
UAV Equipment



Time Synchronization

Sensor Calibration

IMU Intrinsic	Camera	Camera-IMU Extrinsic	Camera-LiDAR Extrinsic	RTK-LiDAR Extrinsic
imu_utils[1]	matlab tools[2]	Kalibr[3]	DVLC[4]	Manual



[1]. https://github.com/gaowenliang/imu_utils
[2]. https://www.mathworks.com/help/vision/camera-calibration.html
[3]. P. Furgale, “Unified temporal and spatial calibration for multi-sensor systems,” in Proc. IEEE/RSJ Int. Conf. Intell.Robots Syst.
[4]. Koide et al., General, Single-shot, Target-less, and Automatic LiDAR-Camera Extrinsic Calibration Toolbox, ICRA2023