



3D Sensing with Single-Photon Cameras for Resource-Constrained Applications

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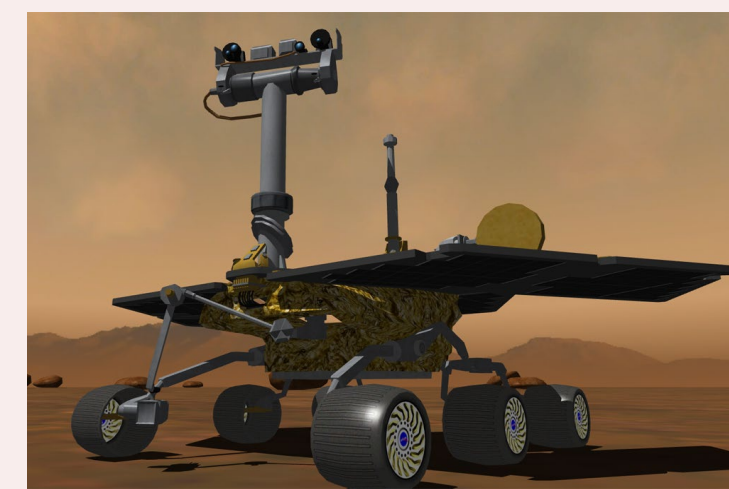
Resource Constrained 3D Vision Applications



AR/VR Headsets
Limited Power



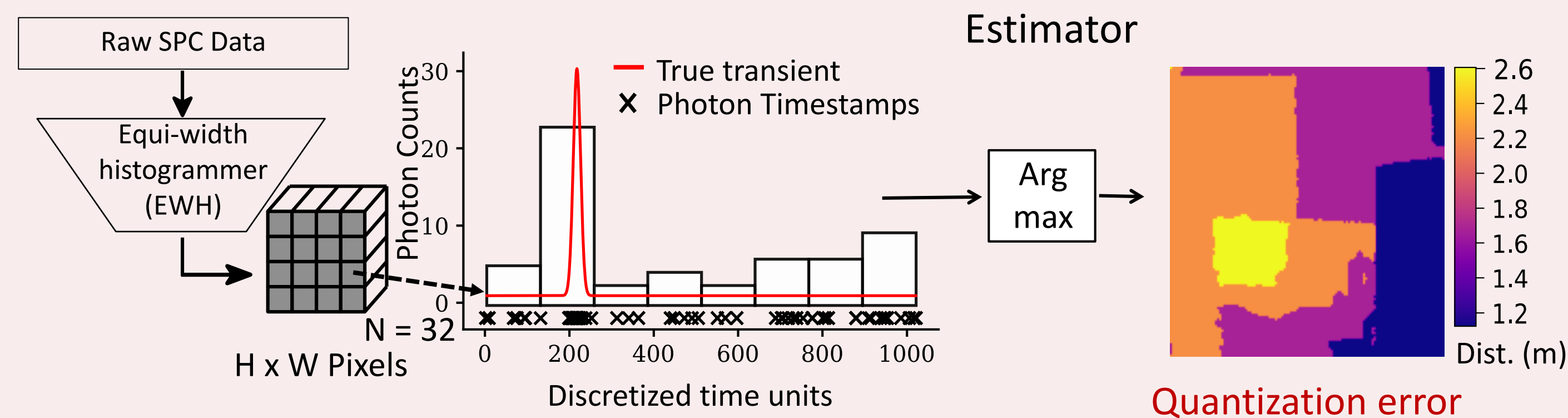
Autonomous Drones
Limited Bandwidth



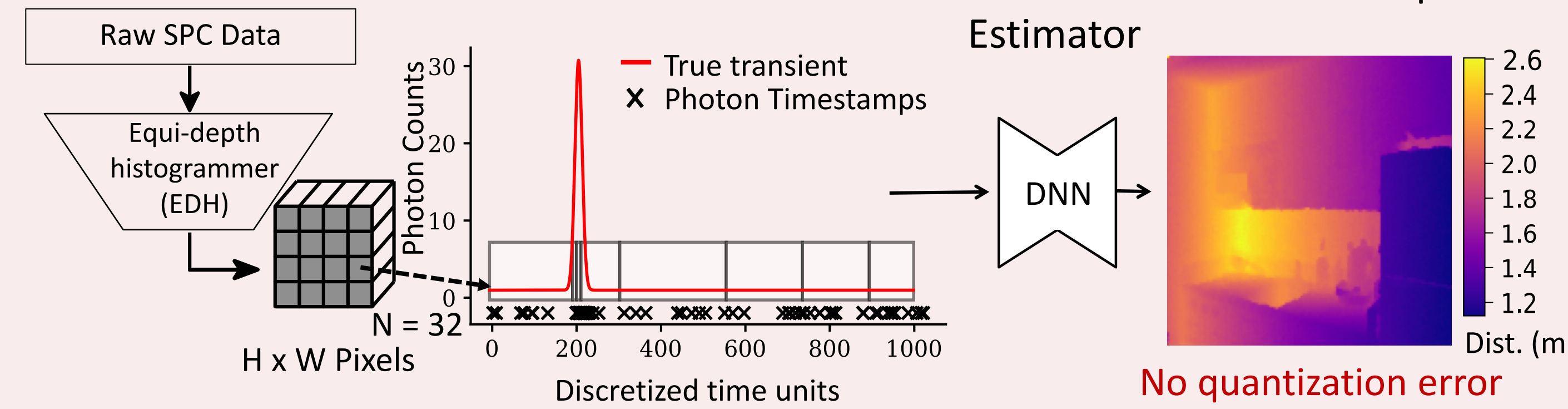
Space Robots
Limited Memory

Conventional vs. Equi-Depth Single-Photon Cameras

Conventional 3D SPC

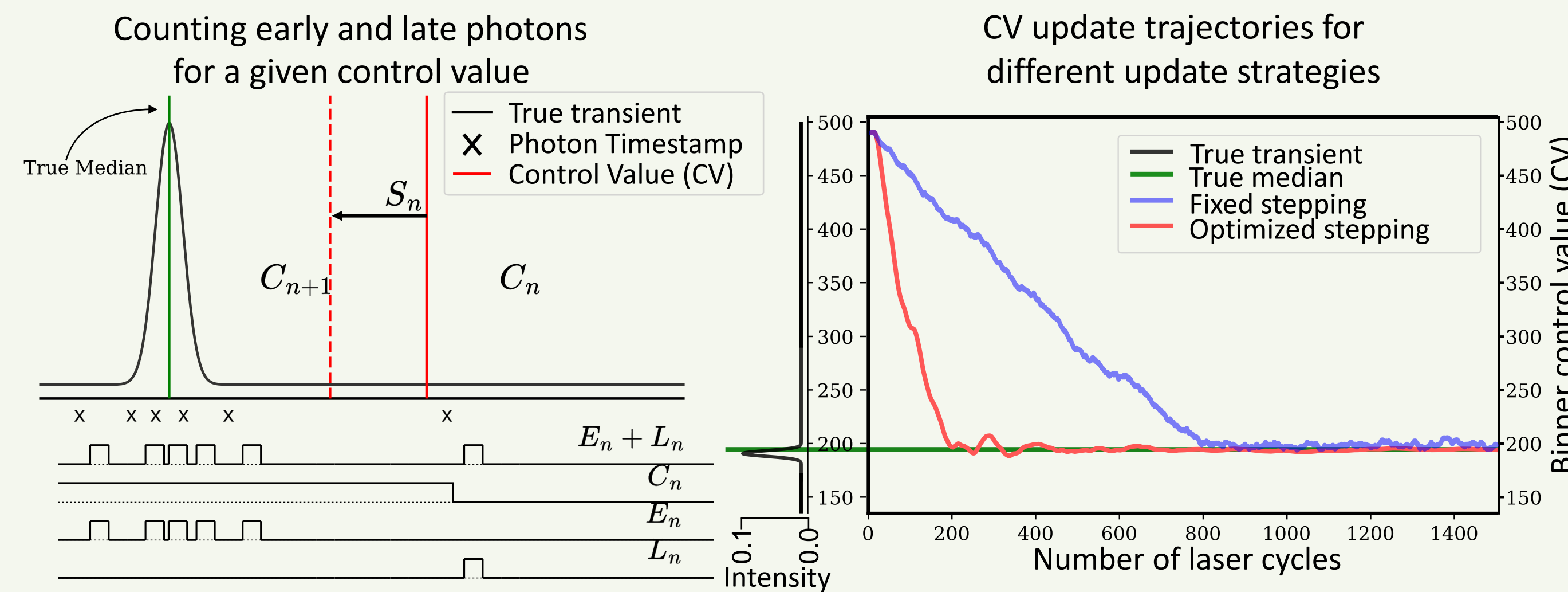


EDH 3D SPC [Ours]



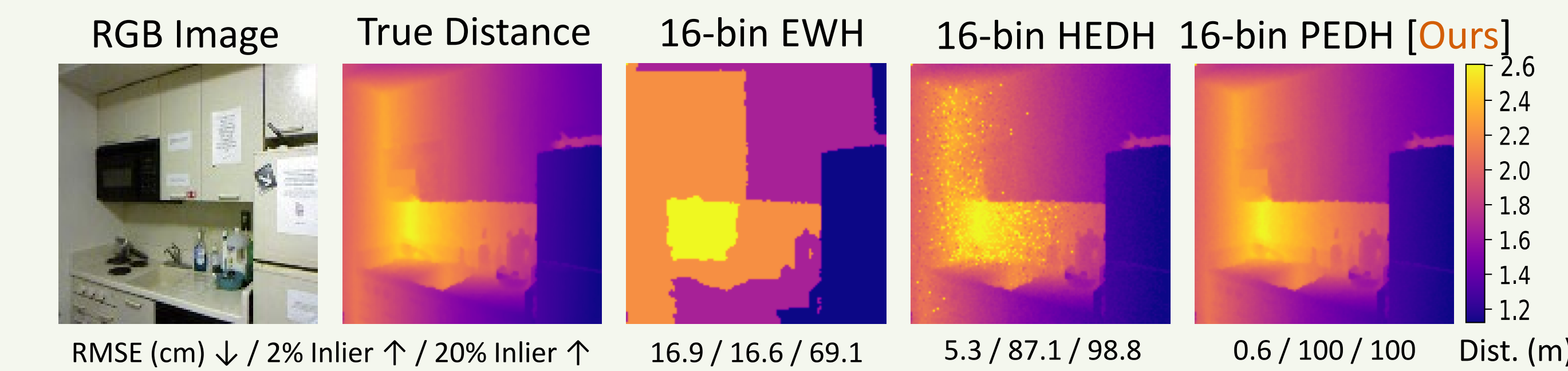
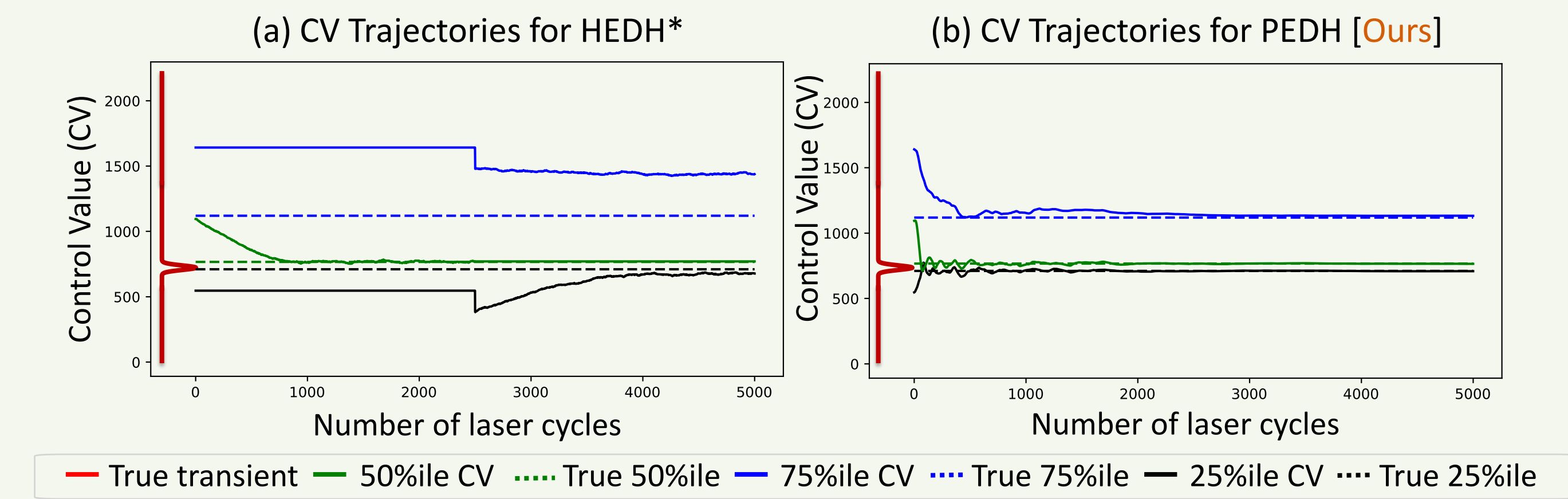
EDH SPCs maintain distance accuracy with far fewer bins, ideal for resource-constrained applications

Count-Free Median Tracking Algorithm



Optimized stepping algorithm achieves faster convergence, lower variance and better accuracy than fixed stepping

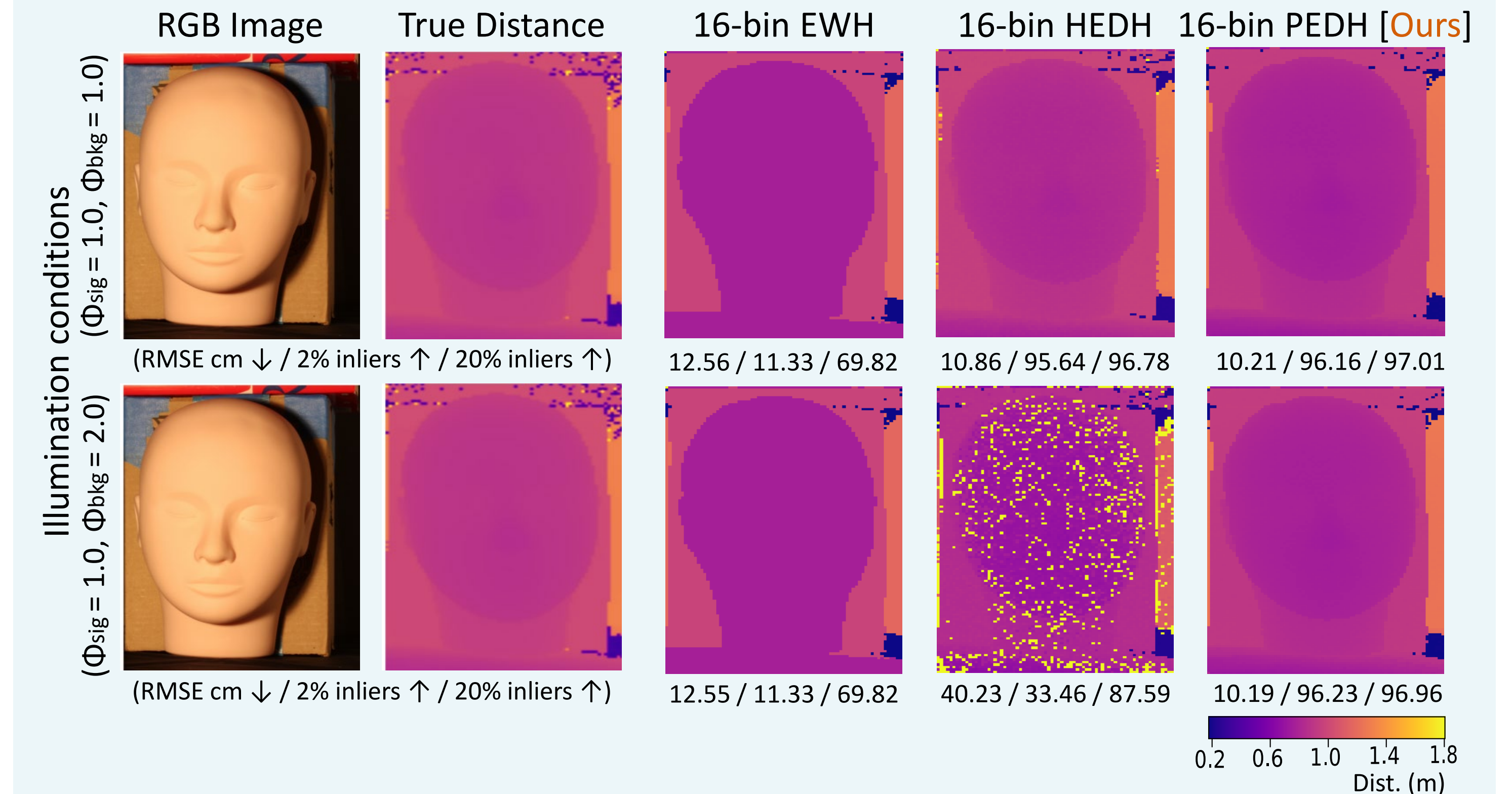
Simulation Results: EDH and Distance Estimates



PEDH tracks multiple quantiles simultaneously and provides faster convergence than prior methods

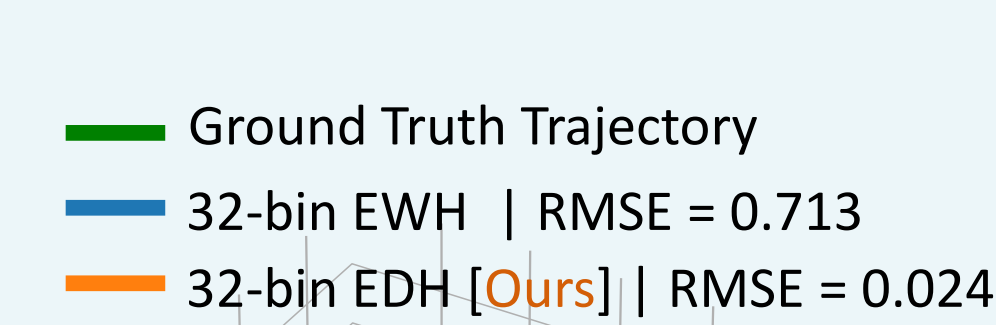
(*Ingle & Maier, ICCP 2023)

Hardware Results: Varying Illumination

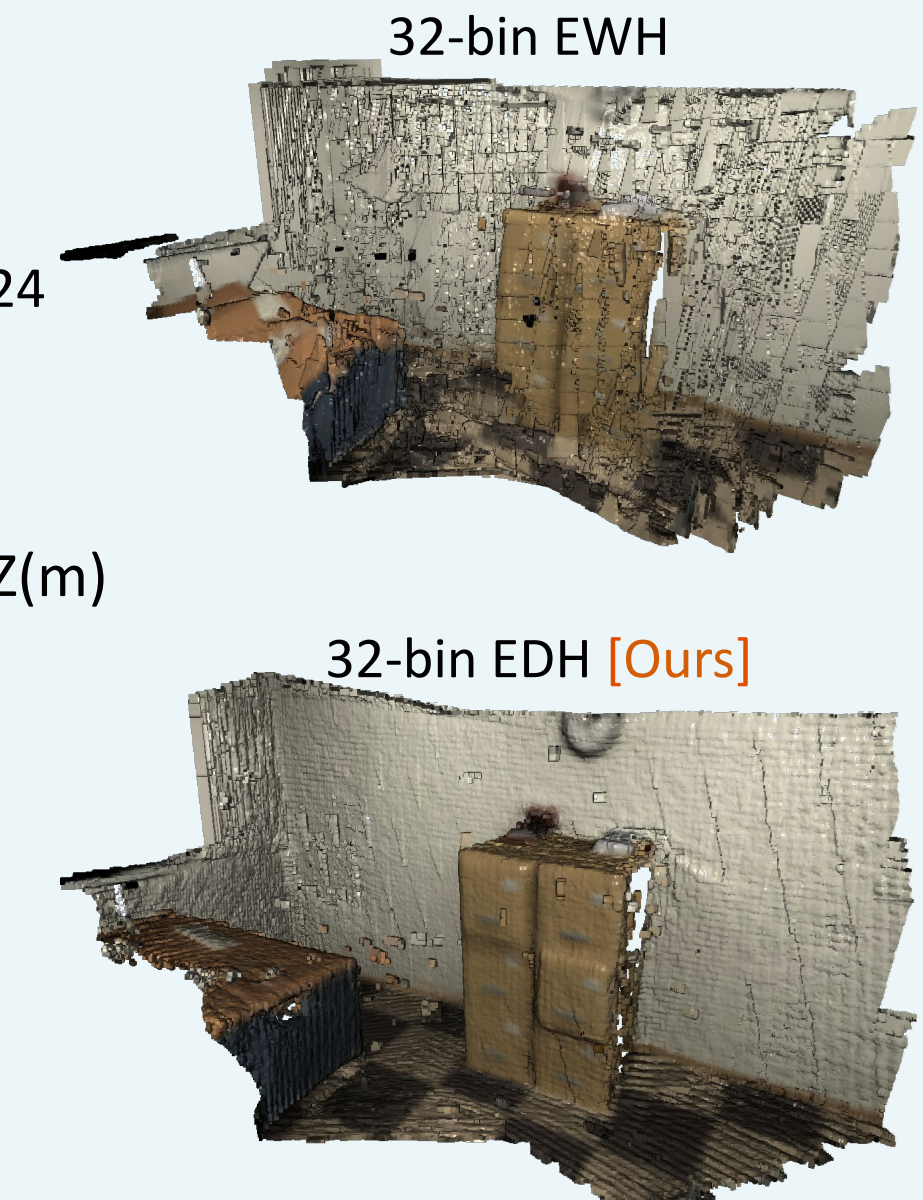


3D Vision Tasks Enabled by EDH SPCs

RGBD Visual Odometry



3D Reconstruction



RGBD Semantic Segmentation

