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Error-aware Construction and Rendering of Multi-scan Panoramas from Massive Point Clouds

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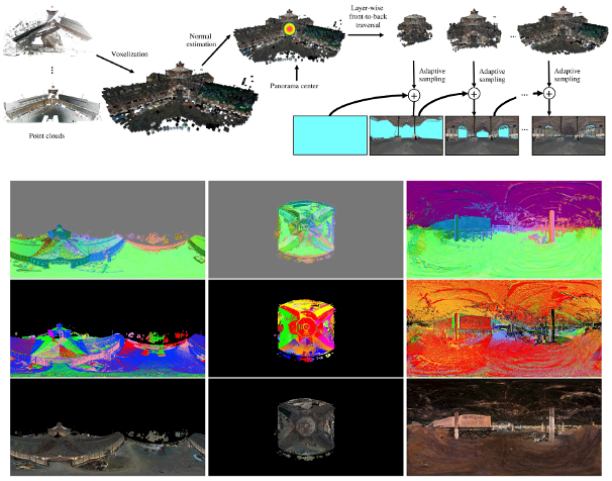

Obtaining 3D realistic models of urban scenes from accurate range data is nowadays an important research topic, with applications in a variety of fields ranging from Cultural Heritage and digital 3D archiving to monitoring of public works. Processing massive point clouds acquired from laser scanners involves a number of challenges, from data management to noise removal, model compression and interactive visualization and inspection. In this paper, we present a new methodology for the reconstruction of 3D scenes from massive point clouds coming from range lidar sensors. Our proposal includes a panorama-based compact reconstruction where colors and normals are estimated robustly through an error-aware algorithm that takes into account the variance of expected errors in depth measurements. Our representation supports efficient, GPU-based visualization with advanced lighting effects. We discuss the proposed algorithms in a practical application on urban and historical preservation, described by a massive point cloud of 3.5 billion points. We show that we can achieve compression rates higher than 97% with good visual quality during interactive inspections.

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