Towards Optimal 3D Reconstruction of Caves Using RGB-D Cameras

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https://ucmerced.zoom.us/my/yangquan.chen

Faculty Host: Prof. YangQuan Chen

Abstract

It has long been recognized that cave sites often contain the best-preserved material in the archaeological record. Cave archaeology has developed its own methodologies for mapping and recording sites, yet few sites are mapped to both 3D models and semantic maps, which are important for analyses, data sharing, and spatial visualization. When building an affordable solution for scanning caves with RGB-D cameras, there are challenges. Large caves usually contain complex geometric structures and objects, which must be scanned with a long overlapped camera trajectories for good coverage. Due to the error in camera tracking, reconstruction results often contain flaws and mismatches. In this talk, we address this problem by extensive loop detection and optimization. We show a novel framework for dense surface loop closure, where loops are detected with a CUDA accelerated point cloud registration algorithm. For robust loop optimization, we introduce loop proposal generation and filtering modules for computational efficiency and a higher precision rate. Experiments show the proposed method can produce state-of-the-art results.

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Biography

Guoxiang Zhang is a Computer Science PhD candidate at UC Merced, working with Professor YangQuan Chen. He received MS and BS in EE from Xidian University. His research centers around 3D computer vision and scene understanding. His current research interests are visual simultaneous localization and mapping, fractional order calculus, multiview geometry.