Large Scale Augmented and Virtual Reality in Structured Environments

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OpenARK

Features:

- 3D Hand Tracking
- Building Scale SLAM
- Building Interior 3D Reconstruction
- Articulated Avatar Tracking

OpenARK is an open-source platform includes fundamental tools such as AR-based camera calibration and SLAM, and it also includes higher-level functions to aid human-computer interaction, such as 3D gesture recognition and multi-user collaboration.
Hand Tracking
Simultaneous Localization and Mapping

S. Leutenegger et al “Keyframe-based visual–inertial odometry using nonlinear optimization” 2015
3D Reconstruction
Avatar Tracking
Where do we go from here?
One Type Of Structure
Detecting Structure

- **Big Data:**

- **Cheap Stereo and Depth Cameras:**

K. Huang, Y. Wang, Z. Zhou, T. Ding, S. Gao, Y. Ma, “Learning to Parse Wireframes in Images of Man-Made Environments”, CVPR 2018
Learning to Detect Wireframes

K. Huang, Y. Wang, Z. Zhou, T. Ding, S. Gao, Y. Ma, “Learning to Parse Wireframes in Images of Man-Made Environments”, CVPR 2018
Heuristics
Learned Wireframes
Think Bigger
Berkeley Dataset Generation
Mapping Interiors

- PX-80 Commercial 3D Reconstruction System provides ground truth information for the dataset.

- Intel Realsense d435i commercial depth camera allows for evaluation against a practical system.

- PointGrey wide baseline stereo camera setup enables testing new deep learning algorithms with stereo constraints.
How to Label?
Semiautomatic Labeling

Geometric Primitives

Semantic Labels

Specific Object Label

Desk

Tabletop

Opens

Used to Open
Summary

- Through Open-Source projects such as OpenARK we are working to advance the state of AR/VR by bringing more features available to researchers, hobbyists, and companies.

- We are working to tackle fundamental challenges in computer vision to allow for better and more useful 3D reconstruction.

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Thank You!