

Fused AR Experience

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Figure 1: Spring Training 2009, Peoria, AZ.

Abstract

Traditionally Augmented Reality has taken three main forms each with its own drawbacks. Optical see-through gives us a good view of the real world but it is difficult to show virtual objects effectively as occlusion cannot be achieved. Spatial Augmented reality doesn't allow the user to view the virtual content at the correct depth. The closest to approach to ours is Video See through augmented reality however it suffers from mismatch between the location of eye and the camera center. In recent years there has been a lot of work on accurately reconstructing a 3D representation of the environment using RGBD sensors. We propose a system that combines such a realtime reconstruction method with a Head mounted display to create a wide field of view Augmneted Reality system.

Keywords: KinectFusion, RGBD, Augmented Reality

Concepts: •Computing methodologies → Image manipulation; Computational photography;

1 Introduction

Recent advances in reconstruction methods means that we can create a 3D representation of an environment in real time. The ability of these methods lead us to imagine an alternate form of Augmented Reality. By attaching an RGBD sensor to a VR HMD we can reconstruct the environment around the user as he moves around in his environment. As we have a 3D model of the environment we can render the view from each of the user's eyes. This enables us to accurately reproduce the real environment of the user in stereo. Virtual content can then be composited over the model of the real environment. By using the tracking from the reconstruction method we can align the virtual content with the reconstruction.

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2 Related Work

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Figure 2: Ferrari LaFerrari. Image courtesy Flickr user “gfreeman23.”

3 System Design

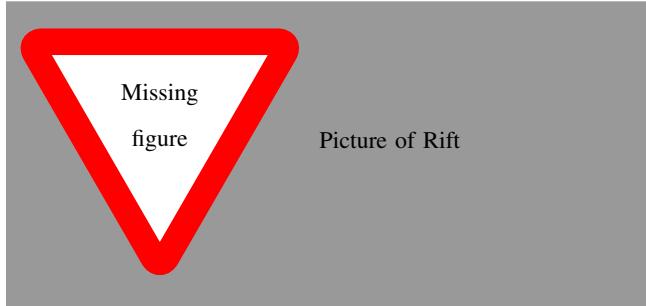
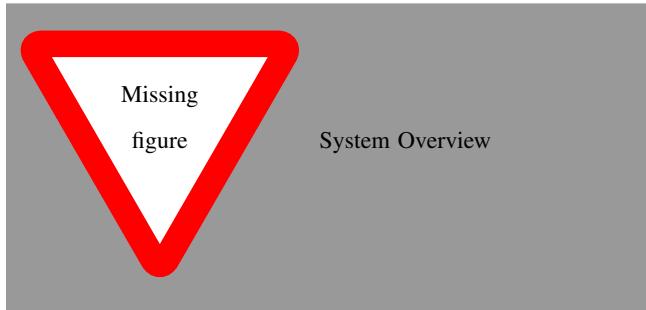
Our setup consists of a Kinect camera rigidly aligned to an Oculus Rift HMD (Figure

Add picture of rift and kinect

). The kinect acquires RGBD images which are used as input to the KinectFusion algorithm. Using the RGBD images, KinectFusion estimates the camera pose and uses this to integrate the current depthmap into the reconstruction. Virtual content is generated by animating a rigged model of a virtual character. The reconstruction is rendered from the viewpoint of the eyes. The virtual content is then composited onto this. If the virtual content is transformed using the same tracking as the reconstruction then it remains aligned to the environment. The combination of the reconstruction and virtual content is then rendered onto the HMD. Figure

Add system overview figure

shows the System Overview.



- 3.1 Environment Capture
- 3.2 Generate Virtual Content
- 3.3 Composit Real and Virtuals
- 3.4 Tracking
- 3.5 Display on HMD

Acknowledgements

To Robert, for all the bagels.