Augmented Reality Live-Action Compositing

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Abstract

We shall demonstrate a system that performs live-action compositing of physical and virtual objects against a panoramic background image in real-time at interactive rates.

A static camera is directed towards a 40 cm³ miniature stage, whose backdrop has been colored in chromatic green. Users can add virtual objects and manipulate their parameters within the scene by using a proxy device that consists of a small rod attached to a fiducial marker. Our system runs on commodity hardware such as a notebook equipped with a firewire video camera. The necessary chroma-keying and adaptive difference-matting algorithms have been implemented on a GPU using fragment shading.

Keywords: Augmented Reality, Live-Action Compositing, Programmable Shading

1. Introduction

We propose a system that utilizes Augmented Reality techniques for performing live-action compositing of physical and virtual objects in real-time on widely-available standard multimedia workstations. With the advent of programmable shading on commodity hardware, it has become possible to cheaply implement a variety of video-processing algorithms that were formerly confined to the domain of dedicated broadcast systems. By using marker-based visual tracking, we enable users to adjust parameters relating to virtual augmentations (such as object positions or light placement) directly and intuitively in physical scene-space.

2. System description

A static video camera is directed towards a 40 cm³ miniature stage, whose backdrop has been colored in chromatic green. In order to separate the physical models from the stage background, we have implemented the chroma-keying algorithm described by Vlahos and summarized in [1] as a fragment-shader program.

Users will be able to place virtual objects inside the scene and match them to the physical models by adjusting their properties (position, orientation, lighting, animation cycle) through an interaction proxy device, consisting of a small rod attached to a fiducial marker, which can be tracked by the ARToolKit software library, as described in [2].

Optionally, a statistical background model can be computed from the input video stream in real-time (again using fragment shading) in order to eliminate any manipulators from the final composite, whereby operating in HSV color space, as proposed by François et al. [3], significantly reduces the matting errors induced from a noisy video signal. This method will result in fiducials being keyed out, even if they are partially occluded by physical models.

Figure 1: Proposed demo setup.

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4. References

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