A Photorealistic Compositing Tool for Mobile Augmented Reality

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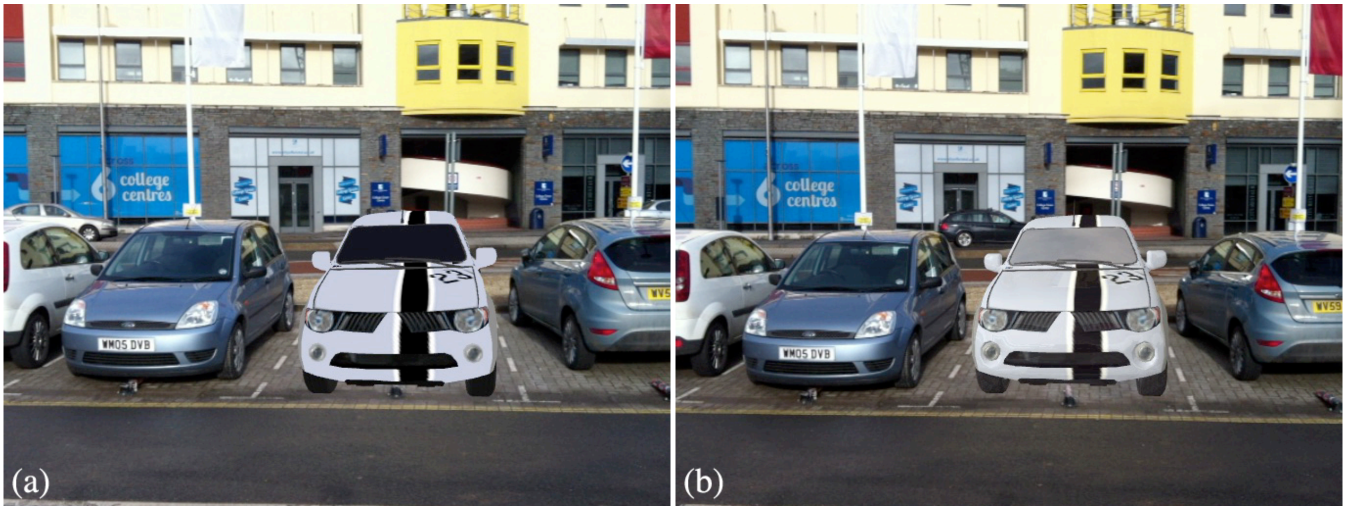

Figure 1: *A white pickup truck composited in its basic form (a) and enhanced form (b) with our tool. Notice the: improved lighting and shading, specially around the headlights and grill; reflected clouds on the windshield and surrounding buildings on the hood; appropriate colorization of the tires; and, improved tone matching (compare with white car, far left).*

Abstract

We present an interactive tool that enables photorealistic compositing for mobile augmented reality (AR), using integrated sensors to drive a real-time rendering rig. The system links existing technologies to new devices, resulting in a significantly enhanced experience compared to conventional compositing and AR applications.

Keywords: Application poster, photorealistic compositing, mobile, augmented reality, context-awareness, real-time.

1 Introduction

Photorealistic compositing attempts to convincingly combine separate visual elements into a single image. The task is often complicated by costly information gaps between a source and target scene, expertly counterbalanced by meticulous skill and intuition. In mobile AR, photorealistic compositing remains a largely unexplored area; even though the enabling device can easily and instantaneously gather valuable context-aware data to simplify the task. In this work, we detail the tool built to bridge the source (real environment) and target (virtual model) scenes.

2 Technical Approach

The system handles a continuous input of multi-sensor data used to drive a shader-based rendering rig, completed with constants pertaining to the virtual model. Location (GPS) and orientation (gyroscope, magnetometer) sensors are leveraged to calculate the position of the sun [Reda and Andreas 2003], simulated by a virtual directional light. The gyroscope is further used to obtain the polar angle between the viewer and the model, resulting in a convincing approximation of real-time ambient occlusion via hemisphere lighting [Taylor 2001]. The camera analyzes either a live image feed or user-captured cube map of the environment. Intensity correction is performed on the base lighting/shading, using an adjustable smoothstep function based on Perlin's work [Perlin 2002]. Color correction [Reinhard et al. 2004] is then performed on the model's texture, resulting in the final composite.

3 Implementation and Further Work

The work discussed has been fully implemented and is capable of running on most modern mobile devices in real-time (30 FPS). While the system is largely automated, controls are still available to manually adjust the lighting intensity and color correction. Furthermore, a touch-gesture interface is included to adjust the model's pose with ease. Currently, we are integrating the system with traditional AR marker-based tracking. A more complex implementation has been planned which will investigate image stitching and image-based lighting for compositing in artificially-lit scenes.

References

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