Markerless Tracking Solutions for Augmented Reality on the Web

João Paulo S. do M. Lima, Pablo C. Pinheiro, Veronica Teichrieb, Judith Kelner
Virtual Reality and Multimedia Research Group (GRVM) – Informatics Center (CIn)
Federal University of Pernambuco (UFPE)
{jpsml, pcp, vt, jk}@cin.ufpe.br

Abstract

This paper presents tracking software infrastructure developed for allowing the creation of web targeted augmented reality applications based on natural features of the real scene. A texture based markerless tracking by detection technique for planar objects was used with descriptor based (SIFT and SURF) and classifier based (Ferns) feature matching methods. One server-side tracking infrastructure was implemented using the Mammoth open source Flash media server. In addition, two client-side tracking solutions were developed, each one based on a different browser plug-in (OSAKit and Silverlight). The implemented solutions were evaluated using real data regarding metrics such as performance and load time. Client-side tracking provided better results, with the OSAKit solution having higher frame rates, while the Silverlight solution showed to be more flexible and platform independent.

1. Introduction

The desktop platform is the target environment most commonly addressed when developing Augmented Reality (AR) systems. However, depending on the requirements of an AR application, the use of different execution platforms may be necessary. If the system has to be published to several users, the web platform shows to be more adequate, where the application is executed through the Internet in a web browser. In the last years, AR technology has been often used in web applications, most of the times for marketing purposes. For example, important results have been obtained by the advertising piece developed by the German company MetaIco for the launch of the new model from the British car manufacturer MINI [1]. An application was created where the user is capable of visualizing a virtual replica of the car over a print ad. The advertisement was cited in more than 100 magazine/blog articles and the making-of video was seen by more than 200,000 people on the Internet, which highlights the success of the initiative.

The use of markerless tracking, which is based on natural features of the scene, has also been gaining more space on web targeted AR applications for advertising. The media used in this kind of application needs to be as appealing as possible in order to catch consumers’ attention. Markerless tracking satisfies this requirement, since the idea of having a real scene augmented with virtual objects without any artificial elements such as markers added to the environment is very attractive. In addition, the own package of the product being advertised can be tracked and augmented with virtual elements.

In this context, this paper aims to present the implementation and evaluation of some solutions regarding markerless tracking for web targeted AR. The criteria used in the evaluation of the solution include performance, load time, platform independency and technology diffusion. The keypoint based technique described in [2] was adapted to work on the Internet. Different approaches for feature matching were utilized (descriptor based [3][4][5] and classifier based [6]). Three different technologies have been evaluated: Mammoth [7], OSAKit [8] and Silverlight [9]. When using Mammoth, tracking takes place at server-side, while the utilization of OSAKit and Silverlight allows tracking to occur at client-side.

This paper is organized as follows. Section 2 presents related work regarding web AR. Section 3 describes the keypoint based markerless tracking technique used in this work. Section 4 details the three markerless tracking solutions for the web developed in this work. A discussion about the results obtained is presented in Section 5. Section 6 draws some conclusions and future work.

2. Related work

The first more concrete initiatives towards marker based AR for the Internet occurred when the