

A Survey of ARToolkitBased Augmented Reality Applications

Ashok kumar M

Department of Computer Science and Engineering
Kamban Engineering College
Tiruvannamalai-606603, Tamilnadu.
E-mail : m.ashokme002@gmail.com

SahityaPriyadharshini K

Department of Computer Science and
Engineering
Kamban Engineering College
Tiruvannamalai-606603, Tamilnadu.
E-mail : sairoses@gmail.com

Abstract - Augmented Reality is a budding area in virtual reality research , which tends to present a combination of real and virtual image to the user. This paper briefs a short survey on Augmented Reality applications that uses ARToolkit . Augmented Reality is one of the research hotspots of many renowned foreign universities and research institutions in recent years. AR technology has a wide range of applications like Advertisement, Navigation, Medical, Military, Architecture and Games. Libraries are needed for developing Augmented Reality applications. ARToolKit is one among the pioneer software libraries for building Augmented Reality (AR) applications. One of the key difficulties in developing Augmented Reality applications is the problem of tracking the user's viewpoint. ARToolKit is resilient to the above described problem by the use of computer vision algorithms. The ARToolKit video tracking libraries calculate the real camera position and orientation relative to physical markers in real time. This enables an easy development of wide range of Augmented Reality applications.

Keywords: *Augmented Reality, ARToolkit, MusicAR, ASM, ARoom, Phobias, Games*

I. INTRODUCTION

Augmented Reality (Augmented Reality) is also called Mixed Reality. It has virtual information applied in the real world through computer technology, thus making the real environment and virtual objects overlay in real time in the same screen or space then coexist. Augmented reality provides information different from which human can sense in general condition. It not only demonstrates the information of real world but also displays virtual information at the same time, thus having two types of information complementing and superimposing each other. In visualized augmented reality, the user uses the helmet display to manage the multiple synthesis of the real world and computer graphics, thus making us can see the real world around it.

ARToolKit is a C and C++ language software library that lets programmers easily develop Augmented Reality applications. One of the key difficulties in developing Augmented Reality applications is the problem of tracking the user's viewpoint. In order to know from what viewpoint to draw the virtual imagery, the application needs to know where the user is looking in the real world. ARToolKit uses computer vision algorithms to solve this problem. The ARToolKit video tracking libraries calculate the real camera position and orientation relative to physical markers in real time. This enables the easy development of a wide range of Augmented Reality applications.

II. STUDENT PROJECTS USING ARTOOLKIT

In this paper the authors like to describe three student projects developed at the University of Applied Science at Hagenberg using ARToolkit. All projects were implemented by students during their semester projects. Those projects are MusicAR, ASR and ARoom[2].

A. Music AR

The Music AR was the development of an AR based game for children[3]. The goal was to enhance the attraction of a kid application by using a webcam. By using ARToolkit markers, children can activate or deactivate the different musicians (trumpeter, guitarist, etc.) or play/stop them playing their instruments. The application uses simple 3D characters which are animated. Therefore, the Quake II loader of [4] has been integrated in the ARToolkit environment. The sound output is implemented by using OpenAL.

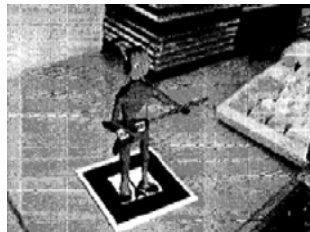


Figure 1 :Music AR

B. ASR

The second application, ASR (Augmented Sound Reality), combines Augmented Reality with a 3D sound environment. Current AR based applications suffer from missing audio integration. And even if they have audio support, they do not play real 3D sound. In this installation the users can place different sound sources not only virtually in the real 3D space, but they can also hear the results in 3D[3].

C. ARoom

A combination of ASR with ARoom makes sense. Who doesn't want to know how the sound changes, if the speakers of the brand new stereo systems are moved from the left to the right angle in the living room. Another very interesting extension of ARoom could be the virtual assembly description of furniture, which in reality sometimes becomes a little bit too difficult[3].

III. AN AUGMENTED REALITY SYSTEM FOR TREATING PSYCHOLOGICAL DISORDERS: APPLICATION TO PHOBIA TO COCKROACHES

Augmented Reality has been used in many fields, but it has not been used to treat psychological disorders. Augmented Reality presents several advantages respect to: the traditional treatment of psychological disorders and Virtual Reality treatments. In this paper we present the first Augmented Reality System for the treatment of phobia to cockroaches. Our system has been developed using ARToolkit software[1]. It has been tested with one

patient and the results have been very satisfactory. At first of the exposure session the patient was not able to approach to a real cockroach and after the exposure session using our Augmented Reality system, the patient was able to approach to a real cockroach, to interact with it and to kill it by herself. This first result is very encouraging and it demonstrates that Augmented Reality exposure is effective for the treatment of this kind of phobias[5].



Figure 2 : An image of the Exposure Session

IV. SYSTEM FOR CREATING GAMES IN AUGMENTED ENVIRONMENTS

This paper describes internal structure and potential applications of newly constructed system for rapid game development in augmented environments. The system is script driven, separating marker recognition and display engine from behavior description. First experiences show that the system works efficiently and enables augmented games preparation even for not experienced programmers. This system utilizes the ARToolkit library, which allows determining relative position of the observer to special 'markers'. The library analyses input image for that purpose, which can be streamed even from a cheap web camera. The library is extremely efficient - it allows multiple markers tracking in real time on a personal computer[6]. Figure 3 shows a sample marker recognized by the library, which is composed of a square frame, and a distinctive pattern inside of it.



Figure 3 :Sample Marker

Augmented reality allows creation of original and interesting computer games, which can interact with the user in various, alternative ways. Games allow us to create a non-real world, with its special rules. In the game “Monkeybridge” [7] virtual and real objects are placed on a table (such as stones, wooden ramps, etc.). Virtual characters controlled by players, are trying to use them to make a bridge and cross a virtual river. Also some efforts are made to use AR in open environments – “Human Pacman” players equipped with head

Mounted displays are collecting virtual objects and running away from ghosts in a labyrinth placed on the university parking [8].

V. CONCLUSION

With this survey, one can utilize the ARToolkit to develop augmented reality applications. The ARToolkit library significantly reduces the development time and cost to a minimum. The learning of the tools is a valuable education experience for a developer. The skill can be reused again to develop different types of applications. Relying on this tool enables students to affordably undertake development of augmented reality environment and other related multimedia projects for profit, which can fuel their interest and hope even if the profit is insignificantly small.

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