Faculty of Cognitive Sciences and Human Development

AUGMENTED REALITY GAME: 3D AEROPLANE SHOOTING GAME

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AUGMENTED REALITY GAME: 3D AEROPLANE SHOOTING GAME

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This project is submitted in partial fulfilment of the requirements
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The work described in this Final Year Project, entitled
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ABSTRACT

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Currently, advances in computer graphics and interactive techniques have increased the visual quality and field of Augmented Reality (AR) applications. A lot of research on this area has been carried out and it has appeared as a topic of research interest. This project describes an AR 3D aeroplane game. Target cursor is set at the current mouse position. Then, keyboard, mouse, or joystick is used as the input device to control the shooting bullet function. Marker and without marker tracking technique is applied to place the virtual aeroplanes in the real environment.

ABSTRAK

AUGMENTED REALITY 3D AEROPLANE SHOOTING GAME

Chew Chee Young

Kini, kemajuan dalam bidang grafik komputer dan teknik interaksi telah meningkatkan kualiti visual dan meluaskan aplikasi teknologi 'Augmented Reality' dalam bidang yang berlainan. Dalam bidang ini, banyak kajian telah dijalankan dan ia muncul sebagai topik kajian yang menarik perhatian. Projek ini membentangkan AR '3D aeroplane game'. Sasaran kursor adalah diset pada kedudukan tetikus masa itu. Papan kekunci, tetikus atau 'joystick' digunakan sebagai alat input bagi mengawal fungsi penembakan peluru. Teknik pengesanan 'marker' dan tanpa 'marker' telah diaplikasikan untuk menempatkan kapal terbang maya dalam keadan dunia sebenar.

Chapter 1

INTRODUCTION

1.0 Introduction

This chapter discusses about the introduction of the research based on the background of the research, problem statements, objectives of research, value of the study, scope of the project, significant of the study, and delimitation and limitation of the study.

1.1 Background

Nowadays, computer games industry turns into a mass market due to the rapid development in computer technology (Margerkurth, 2004). A lot of research on this

area has been carried out and it has appeared as a topic of research interest. However, there is still a big gap in achieving the desirable requirement in this computer entertainment area. The limitation of currently computer playing techniques would not be able to give the users to conduct an interactive playing environment.

Though, there are virtual reality games that allowed the players to immerse into the virtual game world, but, the effect of the game actions were only limited by the imagination of the programmers who create the game (Margerkurth, 2004). Since users are only placed into the gaming environment that created by the programmers, there is no direct experience or real world interaction among the users with the game.

Currently, people enjoy playing games which they can control or direct experience with the gaming environment (Zhang and Shan, 2001). So, the interactivity is the mainstream in designing recent computer game. Due to this issue that mention above, this project is to propose a development of a simple 3D aeroplane shooting game that implements augmented reality (AR) technology.

In this game, keyboard, mouse or joystick will be used as controlling or shooting the bullet and the mouse cursor will be set as the target cursor in this shooting game. Although the traditional input devices (mouse, keyboard or joystick) are used. However, this 3D aeroplane shooting game allows users to step into the gaming environment, which is the real world. This is because; the virtual objects (aeroplanes) will be augmented in the real world without using marker as the position. In this simple game several techniques will make use for instance 3D modeling, image processing, computer graphic, objects recognition and tracking.

Moreover, this 3D aeroplane shooting game is aims to give the users more realistic, and enjoyable playing experience compare to traditional games because in this game the real environment is additionally enhance by virtual game items. Thus, there are no more killing feeble aliens or shooting the enemy's space shutter on the tiny screen. In this game, we must handle with the hostile creatures or aeroplanes that floating around us in the real world (Deligiannidis & Urbanski, 2007)

1.2 Background of Literature

Augmented reality can be defined as a three dimensional virtual images appear superimposed or augmented over the real objects. It generates a composite view for the user. It is a combination of the real scene viewed by the user and a virtual scene generated by the computer that augments the scene with additional information. It allows a level of immersion by mixing virtual with the real world in different proportions that no virtual equipment can provide (Dipl, 2002). The goal and purpose of the augmented reality is to enhance the users' real environment with providing some information and assistance.

According to Dipl (2002), AR is one of the variations of virtual reality (VR). However, if compare to VR, they are very similar and yet quite different. The term VR was defined as "a computer generated, interactive, three-dimensional environment in which a person is immersed". In VR, the users do not see the real world around them since they are immersing into the virtual environment that generate by the computer system.

On the other hand, AR is the generation of virtual objects in the real world environment which the users view the image that is the combination of the real scene and a computer-generated virtual scene. Besides, it does not block the users' surrounding real environment in order to maintain the users' sense and feel of existing in a real world.

1.2 Problem Statement

Nowadays, computer games are very common and can be found in everywhere. However, no matter how good the graphic of a particular game, it still lacks of realistic because we cannot feel the sense of present and interact in the game environment. As stated before, though there are virtual reality games that allow the players to immerse into the virtual game world, but, the effect of the game actions were only limited by the imagination of the programmers who create the game (Margerkurth, 2004).

With the existence of AR technology, the virtual object can coexist with the real creatures in the real environment. Therefore, the users now can interact freely with the objects in game in the real time.

In this project, I want to place the moving virtual 3D aeroplane in the real scene in order for users to experience the shooting of enemy aeroplane floating around them. However, questions that arise are where and how to place the virtual object in the real scene and make it realistic by using the current tracking technology.

Thus, a simple 3D aeroplane shooting game is come out with using makerless tracking technique to track the real environment without adding any marker.

1.4 Objective of Study

The objective is divided into two categories which are the general objectives and specific objectives.

1.4.1 General objective

The purpose of the research is to create a simple AR 3D aeroplane shooting game that using keyboard, mouse or joystick to control shooting bullet or fire in the game. Beside, the coordinate x and y of mouse cursor will be found and set as the target cursor in this game. In addition, there are no special placed markers such as fiducials use in this game in order to reduce the registration problem while augmented the moving virtual aeroplanes into the real environment and increase the realistic of the game. Thus, in this game, markesrless tracking technique will be used to perform tracking and recognition of the real environment.

This game allowed users to control the target cursor in shooting the virtual aeroplanes that pop up in the real environment. It can make the gaming process an interesting and enjoyable real world experience for the users.

1.4.2 Specific objective

The specific objectives for the study are:

- To use keyboard as controller for bullet and fire in the AR games environment.
- To implement markerless technique in AR game.
- To find the current x-y coordinates of the mouse cursor and changes it into crosshairs in AR shooting games.

1.5 Values of the Study

Due to the real time interaction of the users with the virtual objects that augmented on the real world, AR makes the gaming environment an interactive, real and interesting medium.

Furthermore, with this characteristic, AR has increase the direct experience of the users when playing a game compares to the traditional computer games, it makes the game more efficient by enhanced the users' sense of presence while playing game (Vallino, 1998a)

Hence, development of this system will construct groundwork in developing a more interacting and real game environment and gives a new definition in entertainment environment with AR technology.

1.6 Project Scope

The scope of this project is to develop and design a simple 3D aeroplane shooting game with the implementation of Augmented Reality. In this game, users can shoot the virtual aeroplanes that pop up in the real world. The manipulation that can be done by the users are controlling the target cursor and shooting the virtual aeroplanes augmented in the real world without using marker.

This project will focus on the finding the mouse cursor x-y coordinates and set it as the target cursor, using keyboard, mouse, or joystick as the input device to control the shooting bullet function, and using markerless tracking technique to project the virtual object in the real environment.

1.7 Significance of the study

Currently, research and development in the area of augmented reality is still in a minimal scale. It is hoped that this project will create a center of attention and attract more interest of the new researchers in getting involved. Furthermore, if this system is successfully developed, it will create a groundwork and contribution in developing other games applications.

This project is focus on using input device (keyboard, mouse or joystick) in the augmented reality, setting target cursor by finding the x-y coordinates of mouse cursor, and augmented the virtual objects without using marker (markerles). If these techniques can achieve a satisfying level, the future gaming world will become more interactive and enjoyable.

Beside, with the combination with others techniques in this field, such as using fingertips as input device, the gaming world will become more interactive, realistic, attractive and enjoyable.

1.8 Limitation of the Study

One of the main limitations of AR is the high cost in built an AR system due to the expensive equipments. AR should be constrained in cost in order to achieve a broader usage where inexpensive gadgets can be used in the process of building an augmented reality system.

According to the previous research, another constrain of the AR is the registration problem (Vallino, 1998b). This problem caused the virtual objects that superimpose on the real world look distort. This is because time is taken in image

processing and time is also taken in placing the virtual objects in the real environment. So, in this shooting game which is not static, the virtual object may not place at the correct position and cause the image distorted.

1.9 Summary

This chapter introduces the research project, the background, problem statements, research objectives, significant and limitations of the study are also discussed in this chapter. The following chapter will discuss about literature review related in this study.

Chapter 2

RESEARCH BACKGROUND

2.0 Introduction

In this chapter, the overview of the literature related to AR will be discussed. Several applications that have been done in this area will also be included in this chapter as well.

2.1 Augmented Reality

Augmented Reality (AR) is a part of virtual reality which allows a person to view one or more virtual 3D objects in the real-world environment (Shelton, 2002). It