Survey Enhancement of Projection and Recognition in Augmented Reality System

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Abstract - *The enormous technological improvements around the world have created momentous challenging competition among companies where each of the companies tries to attract the customers using different techniques. One of the most popular techniques is Augmented Reality. The field of augmented reality grows and improves remarkably in some areas. The AR is a new technological trend which is capable of presenting possibilities that are difficult for other technologies to offer and meet. Augmented reality is a live direct or indirect view of physical and real word environment whose essentials are augmented by computer generated sensors. Augmented Reality can be defined as demonstration of computer generated virtual characters on a live view of the real world. This paper describes the difference between augmented and virtual realities, types of augmented reality, current mobile applications available in market using AR.*

Key Words: Augmented Reality, Virtual Reality, Sensors, Virtual Characters, Application.

1. INTRODUCTION

First of all, just clarify the concept-what is meaning of reality? Reality means actual appearance of the thing physically rather than they might be imagined. Reality includes all thing that has existed, exits or will exist in the surroundings. There are mainly two types of reality -

1. **Augmented reality**
2. **Virtual reality.**

Virtual Reality used for describing the environment which can be interacted by a person. Virtual reality replicates an environment that simulates a physical presence in the real or imagined world.

In contrast of Virtual Reality, Augmented reality is an outlook of a physical, real-world environment whose essentials are augmented by computer-generated sensor input such as sound, video and graphics. It aims to replace the world's environment in a computer. Milgram [1] defined a continuum of Real to Virtual environments, where Augmented Reality is one part of the general area of Mixed Reality (Figure 1).
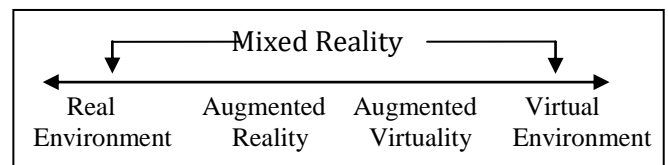

Fig 1: **Milgram's Reality-Virtuality Continuum [1]**

1.1 key characteristics of Augmented Reality

There are following key characteristics of Augmented Reality stated by Azuma [Azu97]:

1. **Combination of virtual images and real world:**

In the traditional display system, it can show only computer –generated images to the user. But the display technology in Augmented Reality permits user to see combined view of virtual images with real world. Thus it is more efficient than the traditional computer system.

2. **3-D registration of digital data**

Augmented Reality depends upon close coupling of virtual and real world. This coupling is based on the geometrical relationship between these two worlds. This makes it possible to provide 3-D view with respect to real world.

3. **Real Time Interaction**

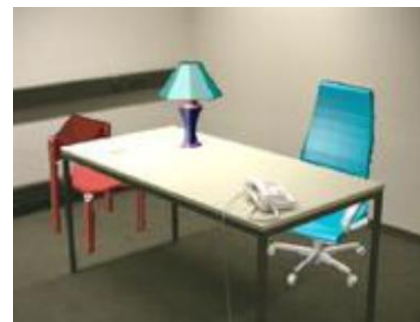The Augmented Reality System must allow user interaction [2]

Fig 2. Real desk with virtual lamp and two virtual chairs [3].

1.2 Common Types of Augmented Reality:

Common types of Augmented Reality include: [4]
1. Location
2. Projection
3. Recognition
4. Outline

1. Location :

Geographic Position System (GPS) mechanism is used to provide the location of particular things to the user. e.g. user can use a smart phone with GPS facility to know his location and have arrows on phones with live images to direct him towards the place where he need to go.

2. Projection :

The most common type of Augmented Reality is "Projection". It uses virtual imagery to augment what user see live. E.g. virtual keyboards. One can project it on any flat surface and can handle it easily.

3. Recognition :

Recognition uses the information of shapes, size or other matrices to give the additional virtual information to the user in real-time.

4. Outline :

Outline combines the outline of the human body or some part of body with virtual elements. It allows user to elect or otherwise use the objects that do not exist in real world. In this type of augmented reality, user can provide images of object with front, back, left side, right side, top, bottom views. This views will placed onto the 3-D cube which will make the complete view of virtual object.

2. ARCHITECTURE OF AUGMENTED REALITY SYSTEM:

Following tasks are carried out by the Augmented Reality Systems:
1. Scene Capture
2. Identification of Scene
3. Processing of Scene
4. Visualization of augmented Scene

Detail descriptions of these tasks are as follows:

1. Scene Capture:

Generally, scene is captured by the physical component devices. There are following two types of devices:

A. Video-through Devices:
Video-through devices capture the reality in a different way than the other devices used for visualizing the augmented reality for e.g. video cameras, and smart phones.

B. See-through Devices:
See-through devices capture reality and give a picture of it with the augmented information for e.g. Head mounted displays.

2. Identification of Scene:

There are following two types techniques used for scene identification:

A. Marker- Based Scene Identification:

This technique uses markers. Different types of Augmented Reality (AR) markers are images that can be detected by a camera and used with software as the location for virtual assets placed in a scene. Most are black and white, though colors can be used as long as the contrast between them can be properly recognized by a camera. Simple augmented reality markers can consist of one or more basic shapes made up of black squares against a white background. More elaborate markers can be created using simple images that are still read properly by a camera, and these codes can even take the form of tattoos [5].
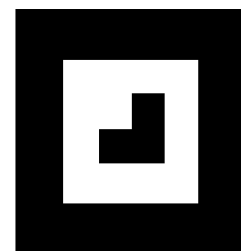
Fig 3: A Simple Marker

B. Non-Marker Based Scene Identification:

In Non- marker Based augmented reality the image is gathered through internet and displayed on any specific location (can be gathered using GPS). The application doesn't require a marker to display the content. It is more interactive than marker based augmentation.

3. Processing of Scene:

After calculation of the marker in real space with respect to different parameters of the camera, the system looks for the equivalent virtual model to each marker in the 3D.

4. Visualization of augmented Scene:

At the last, the system produces the image of the projected 3D object when user uses marker then it produces real space on the scene image that combines reality and virtuality. And when user uses non-marker technique then it presents digital information.

3. ADVANTAGES AND DISADVANTEGS OF AR:

Augmented reality is similar to virtual reality except it seeks to augment your insight of the real world and is not a dream place. Advantages and disadvantages of augmented reality are listed below[5].

3.1 Advantages of Augmented Reality:
- AR increases knowledge and Information
- Form of escapism
- People can share their views with each other in real world over long distance
- Games like application provides ,even more "real" experience

3.2 Disadvantage of Augmented Reality:

- Security and privacy
- UX(User Experience): Using AR can be unsuitable in social situations
- Interoperability: Lack of data portability between AR environments
- Openness: Other people can develop their own layers of content to display

4. APPLICATION OF AR:

Applications for augmented reality are broad. The military uses augmented realty to assist men and women making repairs in the field. The gaming industry is moving games outside like old days, equipped with wearable head gear of course

4.1 Navigation:

Navigation applications are possibly the most natural fit of augmented reality with our everyday lives. Enhanced GPS systems are using augmented reality A to B. Using the phones camera in combination with the GPS, the users see the selected route over the live view of what is in front of the car.

4.2 Medical:

4.2.1   Medical Learning :

AR has offered new ways of submitting information. Health related information can be submitted by AR in its intense illustration. The AR became pervasive by desirable quality of the smart phones that are supplied with sensors and camera. Such sensors allow the provision of precise context information to the environment aware situations and it permit doctors to collect information. Doctors can easily have managed over the sick persons needing care, e.g. measuring the temperature and heartbeats, etc. This information can be submitted through the AR. Following figure shows application using AR in medical institutes [6].

Fig3.Example of augmented reality medical school practical books from student view on phone display [12].

4.3 Advertising

Since smart phones contain multimedia devices like sensors, they are considered the ideal enablers for AR. They enable users to grasp sight of the real world through a magic lens. The "Image Space" application specify the approach through which users and AR view can be accessed immediately by any user who has the Image Space mobile client on his mobile. As presented in the screen capture of our mobile client as indicated in following figure, the live camera feed displays the real world when on the other hand the digital banner is overlapped on the upper part, making it appears as "standing" in front the store, even though the user switches the device [20].

Fig 4.Placing banner on a map

4.4 Shopping

E-commerce is one of the most favorable applications of the AR . Specifically online clothing shopping due to the users cannot calculate whether the clothes will fit them or not. AR helps user to find out the perfect match cloths as shown in following figure.
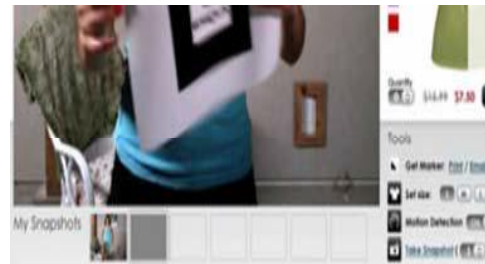

Fig 5. Online Shopping

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