A
Seminar report on

Augmented Reality

Submitted in partial fulfillment of the requirement for the award of degree
Of   Electronics

SUBMITTED   TO: **SUBMITTED   BY:**

www.studymafia.org   www.studymafia.org

Preface

I have made this report file on the topic **augmented reality;** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to …………..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Index

Introduction

Augmented Reality (AR) is a growing area in virtual reality research. The world environment around us provides a wealth of information that is difficult to duplicate in a computer. This is evidenced by the worlds used in virtual environments. Either these worlds are very simplistic such as the environments created for immersive entertainment and games, or the system that can create a more realistic environment has a million dollar price tag such as flight simulators. An augmented reality system 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. In all those applications the augmented reality presented to the user enhances that person's performance in and perception of the world. The ultimate goal is to create a system such that the user cannot tell the difference between the real world and the virtual augmentation of it. It depicts the merging and correct registration of data from a pre-operative imaging study onto the patient's head. Providing this view to a surgeon in the operating theater would enhance their performance and possibly eliminate the need for any other calibration fixtures during the procedure.

What is AR?

The process of superimposing digitally rendered images onto our real-world surroundings, giving a sense of an illusion or virtual reality. Recent developments have made this technology accessible using a Smartphone.

How is it used?

Augmented reality is hidden content, most commonly hidden behind marker images, that can be included in printed and film media, as long as the marker is displayed for a suitable length of time, in a steady position for an application to identify and analyze it. Depending on the content, the marker may have to remain visible.

It is used more recently by advertisers where it popular to create a 3D render of a product, such as a car, or football boot, and trigger this as an overlay to a marker. This allows the consumer to see a 360 degree image (more or less, sometimes the base of the item can be tricky to view) of the product. Depending on the quality of the augmentation, this can go as far as indicating the approximate size of the item, and allow the consumer to 'wear' the item, as viewed through their phone.

Alternative setups include printing out a marker and holding it before a webcam attached to a computer. The image of the marker and the background as seen by the webcam is shown on screen, enabling the consumer to place the marker on places such as the forehead (to create a mask) or move the marker to control a character in a game.

How does it work?

Using a mobile application, a mobile phone's camera identifies and interprets a marker, often a black and white barcode image. The software analyses the marker and creates a virtual image overlay on the mobile phone's screen, tied to the position of the camera. This means the app works with the camera to interpret the angles and distance the mobile phone is away from the marker.

Due to the number of calculations a phone must do to render the image or model over the marker, often only smart phones are capable of supporting augmented reality with any success. Phones need a camera, and if the data for the AR is not stored within the app, a good 3G Internet connection.

HISTORY

The beginnings of AR, as we define it, date back to Sutherland's work in the 1960s, which used a see-through HMD to present 3D graphics. However, only over the past decade has there been enough work to refer to AR as a research field. In 1997, Azuma published a survey that defined the field, described many problems, and summarized the developments up to that point. Since then, AR's growth and progress have been remarkable.

In the late 1990s, several conferences on AR began, including the international Workshop and Symposium on Augmented Reality, the International Symposium on Mixed Reality, and the Designing Augmented Reality Environments workshop. Some well-funded organizations formed that focused on AR, notably the Mixed Reality Systems Lab in Japan and the Arvika consortium in Germany.

Applications

Main classes of applications:

1. Medical
2. Manufacturing and repair
3. Annotation and visualization
4. Robot path planning
5. Entertainment
6. Military aircraft

Augmented Reality vs. Virtual Reality

Augmented Reality

- System augments the real world scene
- User maintains a sense of presence in real world
- Needs a mechanism to combine virtual and real worlds
- Hard to register real and virtual

Virtual Reality

- Totally immersive environment
- Senses are under control of system
- Need a mechanism to feed virtual world to user
- Hard to make VR world interesting

Implementation Framework

Hardware

The main components of our system are a computer (with 3D graphics acceleration), a GPS system originally differential GPS, and now real-time kinematic GPS+GLONASS, a see-through head-worn display with orientation tracker, and a wireless network all attached to the backpack. The user also holds a small stylus-operated computer that can talk to the backpack computer via the spread spectrum radio channel. Thus we can control the material presented on the head worn display from the handheld screen.

We also provide a more direct control mechanism of a cursor in the head worn display by mounting a track pad on the back of the handheld display where it can easily be manipulated (we inverted the horizontal axis) while holding the display upright.

To make the system to be as lightweight and comfortable as possible, off-the-shelf hardware can be used to avoid the expense, effort, and time involved in building our own. Over the years, lighter and faster battery-powered computers with 3D graphics cards, and finally graduated to laptops with 3D graphics processors.

Software

Software infrastructure Coterie, a prototyping environment that provided language-level support for distributed virtual environments. The main mobile AR application ran on the backpack computer and received continuous input from the GPS system, the orientation head tracker, and the track pad (mounted on the back of the handheld computer). It generated and displayed at an interactive frame rate the overlaid 3D graphics and user interface components on the head worn display.

In the handheld computer we ran arbitrary applications that talked to the main backpack application via Coterie/Repo object communications. In our first prototype, we simply ran a custom HTTP server and a web browser on the handheld computer, intercepted all URL requests and link selections, and thus established a two-way communication channel between the backpack and the handheld.

Advantages

Augmented reality (AR) is a view provided by virtual computer-generated imagery of a mixed reality in which real and virtual worlds interact in real-time. Advantages and disadvantages of the technology are listed below. Please comment based on your experience with augmented reality.

Advantages of AR

- Can increase knowledge and information
- People can share experiences with each other in real time over long distances
- Games that provide an even more "real" experience
- Things come to life on people's mobile
- Form of escapism

Disadvantages of AR

- Spam and Security
- Social and Real-Time vs. Solitary and Cached
- UX (User Experience): Using AR can be inappropriate in social situations.
- Interoperability: The lack of data portability between AR environments (such as Wikitude AR and Layar AR browser).
- Openness: Other people can develop their own layers of content to display

Issues in Augmented Reality

- **Performance Issues**

    Real time processing of images can be a challenge and often can slow down augmented reality systems.

    - **Interaction Issues**

    Users within a mixed environment because of augmented reality have difficulties interacting with the environment as normal.

    - **Alignment Issues**

    People working in an augmented reality are more sensitive to alignment errors. Proper calibration and alignment with the reference frame of the world is crucial.

CHALLANGES

Technological limitations

Although there is much progress in the basic enabling technologies, they still primarily prevent the deployment of many AR applications. Displays, trackers, and AR systems in general need to become more accurate, lighter, cheaper, and less power consuming. Since the user must wear the PC, sensors, display, batteries, and everything else required, the end result is a heavy backpack. Laptops today have only one CPU, limiting the amount of visual and hybrid tracking that we can do.

User interface limitation

We need a better understanding of how to display data to a user and how the user should interact with the data. AR introduces many high-level tasks, such as the need to identify what information should be provided, what's the appropriate representation for that data, and how the user should make queries and reports. Recent work suggests that the creation and presentation of narrative performances and structures may lead to more realistic and richer AR experience.

Social acceptance

The final challenge is social acceptance. Given a system with ideal hardware and an intuitive interface, how AR can become an accepted part of a user's everyday life, just like a mobile phone or a personal digital assistant. Through films and television, many people are familiar with images of simulated AR. However, persuading a user to wear a system means addressing a number of issues. These range from fashion to privacy concerns. To date, little attention has been placed on these fundamental issues. However, these must be addressed before AR becomes widely accepted.

CONCLUSION

Augmented reality is another step further into the digital age as we will soon see our environments change dynamically either through a Smartphone, glasses, car windshields and even windows in the near future to display enhanced content and media right in front of us. This has amazing applications that can very well allow us to live our lives more productively, more safely, and more informatively.

Maybe in the future, we will see our environments become augmented to display information based on our own interests through built-in RFID tags and augmentations being implemented through holographic projections surrounding the environments without a use of an enabling technology. It would be incredible to no longer wonder where to eat, where to go, or what to do; our environment will facilitate our interactions seamlessly. We will no longer be able to discern what is real and what is virtual, our world will become a convergence of digital and physical media.