STUDY ON AUGMENTED REALITY

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Abstract— Augmented Reality is a breakthrough technology that could considerably ease execution of complex operations. Augmented Reality mixes virtual and actual reality, making available to the user new tools to ensure efficiency in the transfer of knowledge for several processes and in several environments.

Keywords— Augumented reality

1. INTRODUCTION

Augmented Reality (AR): Augmented Reality is a technology that composites virtual objects into the real world. It has gained popularity because of its wide application uses in various fields such as gaming, entertainment, advertising and promotion and medical .Mobile Augmented Reality(MAR) , Glass Augmented Reality (GAR):

It is a new technology based on Augmented Reality and can be used on mobile devices such as smart phones, smart glasses, I pads ,hallo gaming devices, gaming console and military Head-Up Display (HUD). It extends and enhances the user experience of the device

2. AUGMENTED REALITY

There are vast applications in Augmented Reality in various fields like navigation, sightseeing, military, medical, maintenance and repair, gaming, advertising and promotion and entertainment . Navigation: Many applications are using enhanced GPS and Augmented Reality to navigate from point A to point B. Through the phone camera, users see the selected route over the live view

This augmented reality working based on the MAR and GAR this two types of techniques are very use full for visualizing the object into the real world like a hallogram it will help for analizing the object ,destination ,navigations etc

Mobile augmented reality(MAR)

Glass augmented reality(GAR)

3. VARIOUS APPLICATIONS OF AUGMENTED REALITY

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Maintenance and Repair: A mechanic repairing an engine can see superimposed imagery and information about the engine by wearing an Augmented Reality headset. The AR headset can display important steps for the repair procedure along with displaying the tools and the exact motion the mechanic needs to perform. Training expenses can be reduced by using simulations to train technicians

Gaming: Gaming in Augmented Reality is an upcoming market with peopleinvesting a lot of money in this area. Few of the popular mobile AR games are Zombie shootAR, the zombies are superimposed on your mobile phone. The players can shoot the zombies using their mobile phones. Pokémon go is another popular Augmented Reality game

Advertising and Promotion: Details about a popular place near you can be Augmented on your mobile device, thereby promoting their brand. Coupons, 3D animations and offers can also be Augmented for advertising

Entertainment: Many Augmented Reality applications are developed for an entertainment purpose. For example, Lego's Augmented Reality application allows you to interact with 3D Lego products

Concerns in Augmented Reality applications: Social acceptance is one of the concerns of AR. Getting people to use AR is challenging, as people are concerned about their privacy. Users private data can be easily accessed and hackers can get to know the location of the user. The display screen is too small for the user to interact which might hinder the user experience of the user . External devices might have to be worn to have an Augmented reality effect. For example, a headset might have to be worn which might spoil the users fashion style

Scope of Paper: The remainder of the paper is organized as follows: consists of problems existing in mobile Augmented Reality. In we discuss the generic framework of Mobile Augmented Reality. we describe the key technology. we describe the existing Augmented Reality Software Frameworks. Finally, concludes the paper.

4. PROBLEMS AND CURRENT ISSUES IN EXISTING HARDWARE

There are quite a few challenges in the implementation of Augmented Reality despite the advances in research and development area. The challenges are due to problems related to context-awareness, usability, navigation, visualization and interaction design

Navigation and Tracking:

AR system utilize GPS for outdoor navigation because Of its accuracy and high availability. But in urban environments the GPS reception and accuracy can deteriorate, where the GPS signal can be reflected and shadowed by the surrounding buildings.

Magnetometers available in mobile devices can be used for the purpose of navigation and tracking, however, they can be affected by the local magnetic fields

AR indoor navigation systems cannot use the GPS solution, as the GPS signal are unavailable or too weak indoors. High Sensitivity GPS (HSGPS) or Ultra-Wide Band (UWB) location sensors can be used to detect indoor navigation, but currently no sensor technology is capable of providing precise navigation tracking indoor

Content Management: Many AR applications are limited in the way new content is be added to them. Programming skills are required for linking data sources to an existing system. Regular users should be able to add their own content with minimal technical effort

Usability: A user's position and orientation is very important for an Augmented Reality application to behave as expected.

Based on the location of the user, the digital 3D object is rendered into the real world. GPS sensors on smart phones have an accuracy of only 20 meters and the magnetometer compass orientation is only about 20 degrees. This will affect while calculating the field of view for the application, which will lead to digital objects and the real world not aligning with each other

Although existing smart phones have high resolution camera they provide a limited field of view. Consequently, only a small portion of the user's mobile field of view can be augmented. Identifying the Point of Interest to view the Augmented reality objects is a challenge

the must face. The user might have to rotate around while holding the device to locate the Point of Interest

Visualization: The small display, brightness, resolution, contrast and field of view post as a challenge in Augmented Reality applications.

The entire Augmented Reality application might not fit in the small display. The correct handling of the device is important for a realistic view if the virtual object is to rendered into the real world

Interaction Design: The user interface and interaction of the user with an Augmented Reality application is still a problem, due to the small display of the mobile device. There are many challenges in achieving interaction of the user with the digital object

Hardware problems: The hardware used should light weight and small so that it is easily portable. The problem with having a small device is its computational power. The battery life will be low and camera quality might not be good in most devices to display the augmented reality objects

Vision-based tracking and registration method: The data generated in the tracking phase, compares with stored data. Then it calculates the current orientation and position. It is fast simpler and has greater scalability

The comparison of the three kinds of tracking and registration methods along with Its advantage and disadvantages is as shown in the below table.

Comparison of the three tracking and registration methods

Object Detection and Recognition Technology: The main purpose of an Object detection and recognition technology is to discover the scene and find the target. It is divided into two parts. The first part is to emphasize on enhanced supplementary information to get a better perspective on the detection and classification. For example, in an Augmented Reality application after detecting the face, gender, name and age is displayed.

The second part is image matching, the image features and corresponding information are stored in the database on the MAR server. In an Augmented Reality system, the camera of the mobile device is used to capture the current image scene. Recognition technology is used to process the image, matches with respect to feature value. Finally displays the corresponding image in the camera field of view

Calibration: Calibration technology utilizes the pixels of the image by the camera and restores the objects in real space. It is responsible for detecting the position and orientation and reporting the result data to the system. The calibration measured values are: the scope of vision, camera parameters, sensor offset, deformation and object localization

Model rendering: The Model rendering technique is a process which utilizes 3D data to generate 2D images. The resulting image is usually stored in a frame buffer. OpenGL ES rendering technology is used in mobile devices to achieve rendering in Augmented Reality applications. It is a 2D/3D lightweight graphics library, specially designed for embedded and mobile devices OpenGL ES rendering process

Display interaction technology: This technology deals with how to display and interact with mobile AR effortlessly and efficiently on the mobile device. To achieve efficient user interface and interaction with MAR is still a challenge. The mobile devices have a small display screen, no mouse, no keyboard and poor data computing power. Interaction is just reduced to touch and swipe gestures

5. SOFTWARE FRAMEWORKS

To build a MAR application from scratch is complicated and time-consuming. There are many existing software frameworks which can be used by developers to focus on developing their high-level applications rather than worrying about the low-level implementations. In this section of the paper we discuss the different existing frameworks available and compare them in a tabular

Studierstube ES: It is one of the most successful MAR application framework developed by the Institute of computer graphics. It was rewritten from scratch to leverage new graphics API's and provide better rendering capability. The system uses Open-Tracker, a network module middleware and high-level description language. Studierstube ES is currently available for Android and Windows phones

Wikitude: It is a location based Augmented Reality SDK (Software Development Kit). Which provides augmentation on mobile phones, tablets and smart glasses. When the user points their mobile phone's devices to a specific geo- site, Wikitude overlays image and text information over the current view

Nexus: It is a software framework developed by the University of Stuttgart to support location-aware mobile applications. It supports both distributed and local data management to provide uniform access to virtual and real objects. Nexus proves to be more stable and portable than other platforms

UMAR: It is a conceptual software framework which is based on client –server architecture. Most of the processing in UMAR happens on the client side to reduce over –dependence on network infrastructure and data traffic. It imports ARToolkit, the camera calibration module for visual tracking and accuracy. It is only available on Symbian platforms and does not support collaborative MAR applications

Tinmith-evo5: It is an object-oriented software framework developed by the Wearable Computer Lab, University of South Australia. The data flow has sensor data as its input and display device as its output. The objects have a certain amount of memory allocated at the object repository to support persistent storage, distributed and runtime configuration. The Render system is based on OpenGL and supports hardware acceleration

DWARF: It is a reconfigurable distributed software framework, designed to manage the sequence of task flow operations.

KHARMA: It is an open architecture software developed by the GVU, Georgia Institute of technology. It is based on KML (Keyhole Markup Language), which is a type of XML notation for expressing geographic annotation and visualization. It consists of three major components, channel server, tracking server and infrastructure server. KHARMA is suitable for geospatial MAR applications

ALVAR: It is a client-server based software platform. Developed by VTT technical Research Center, Finland. In ALVAR, the rendering of virtual contents and calculations are outsourced to server to leverage its powerful rendering and computing capabilities. Images are sent from the server to the client side to render onto the real world. It supports both a marker and markerless tracking. ALVAR was used to develop several MAR applications in plant life management, retail and maintenance fields

CloudRid AR: It is a cloud-based architecture software platform. CloudRid AR provides a local rendering engine, for rendering AR content in cases of low requirements .The user's interaction is recorded on the local device and uploaded to the cloud .

ARTiFICe: It is a software platform used to develop distributed and collaborative
MAR applications. It allows multiple user collaboration, for example, multiple users can focus on the same physical area or the same AR content is rendered on different physical
scenarios. ARTiFICe is implemented in several desktop and mobile platforms . Open source frameworks: There are several other open source frameworks available from developer communities. Few are listed below .

AndAR – It is a framework to enable Augmented Reality on Android platforms .

DroidAR – It is a framework which supports both marker-based and location-based applications .

- GRATF- It is a framework which provides recognition, localization and pose an estimation of optical glyphs in video files and images.

6. CONCLUSION

This paper gives a brief introduction about Mobile Augmented Reality. It defines what Mobile Augmented Reality [MAR] is and what are its challenges and concerns. It describes the generic framework required to develop an Augmented Reality application.

We also discuss the existing Mobile Augmented Reality application available in different fields such as gaming, medical, military and advertisement and promotions. We have enlisted the different available Augmented Reality software platforms. Cloud computing will play an important role in the future development of Augmented Reality applications. It will become a new trend and become a key role in developing

MAR applications, since the cloud will undertake the heavy computational task, there by saving energy and extending the battery life of the mobile device . Cloud services can operate as caches, decreasing the computational cost for both cloud services as well MAR applications. Mobile cloud computing seems as a promising new technology for promoting the development of MAR applications .

There seems to be a lot of future scope for Mobile Augmented Reality applications provided we eliminate all concerns and challenges. Privacy is one of the major concern for Augmented Reality.
For example, pointing your phone to someone's face which automatically pulls up their Facebook page could make some people weary .
Even the user's data such as the location of the user and personal information about the user present on the mobile device can be compromised while using an AR application. Wehope more research on the topic will lead to the development of amazing Augmented Reality application without compromising user's privacy and comfort

7. References

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