

AUGMENTED REALITY IN MOBILE DEVICES

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Abstract – In a world of new technologies, Augmented Reality (AR) came up with a felicitated position. The Mobile devices Company admired the popularity of Augmented Reality, in recent development in smart phone technology that granted power to the popularity of Augmented Reality in mobile devices. How augmented reality is different from virtual reality, and additionally we completely concentrate on the technology that is used for developing Augmented Reality application that is used to improve user experience. The secondary purpose of this technology is to help people to understand the practical usage, applications of Augmented Reality in different areas furthermore, discussing the existing problems and a generic framework required for its development.

Keywords—Augmented Reality (AR), Virtual Reality, Application, Advantages, Mobile devices

I. INTRODUCTION

In this contemporary era, Augmented Reality (AR) applications are starting to appear for average users. The main reason for this way of new applications is the development in mobile computing device. The base function of Augmented Reality is to bring physical components from world to persons mobile device screen.

Augmented Reality

“Augmented Reality is a technology that brings virtual objects into the real world. It has gained popularity because of its wide application uses in various fields such as gaming, entertainment, advertising, education, promotion and medical.” [1]



Fig. 1

Mobile Augmented Reality

It is a new technology based on Augmented Reality and can be used on mobile devices such as smartphones, iPads, iPods, gaming console and military Head-Up Display (HUD). It extends and enhances the user experience of the mobile device. [3]

II. APPLICATIONS IN 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.
- **Military:** The military uses a Heads-Up Display (HUD). This HUD display has an AR application embedded into it. For example, fighter pilots can see details such as the plane's altitude, airspeed, the horizon line and other critical data on the display. So, this way the pilot does not need to look down at the aircraft's machinery to get the required data.[2]
- **Medical:** AR also helps in the medical field also; The Medical students use an Augmented Reality application to practice very difficult surgery. The AR visual view can be provided to patients while explaining extremely complex medical conditions.
- **Maintenance and Repair:** A mechanic uses an Augmented Reality headset during repairing an engine or machine. This AR headset display provides important steps for the repairing process with necessary tools and the precise movements the mechanic needs to perform. [2]
- **Gaming:** Gaming in Augmented Reality is the combination of game graphics, visual and sound data with the user's environment in real time. It is an upcoming market with people investing a lot of money in this area. One of the first AR games was *The Eye of Judgment*; it is an interactive card game for the Sony PlayStation 3. There are few Augmented Reality popular games available for mobile devices: Pokémon GO, Zombie ShootAR.[2]
- **Entertainment:** There are many Augmented Reality applications developed for an entertainment purpose only. For an example, Jurassic Park at Universal Studios where people can interact with Augmented dinosaurs.

III. AUGMENTED REALITY VS. VIRTUAL REALITY

Augmented Reality (AR) and Virtual Reality (VR) both technologies have the extraordinary ability to change people's perception of the world. VR is the technology that has the power to send the user to another world. There are many tech giant companies making VR headsets like Google Cardboard, Samsung Gear VR, HTC Vive, Oculus Rift, etc. [3]

Putting a VR headset on your head will make you blind to the real world, but will expand your senses with experiences within. While in Augmented Reality it takes our current world (Reality) and adds something to it and it does not move us elsewhere. It simply "augments" our current state of presence with clear visions. As seen in below Figure 2 and Figure 3, Samsung is near ready to introduce its monitor-less AR glasses, which would connect to phones or PCs via WiFi and replace the screen on those devices. [3]

If we take the example of scuba diving vs. going to the aquarium, with virtual reality, you can swim with whales and with Augmented Reality, you can watch a whale pop out of your business card. While Virtual Reality is more immersive, Augmented Reality provides more freedom for the user and more possibilities for marketers because it does not need to be a head-mounted display. [3]



Fig. 2

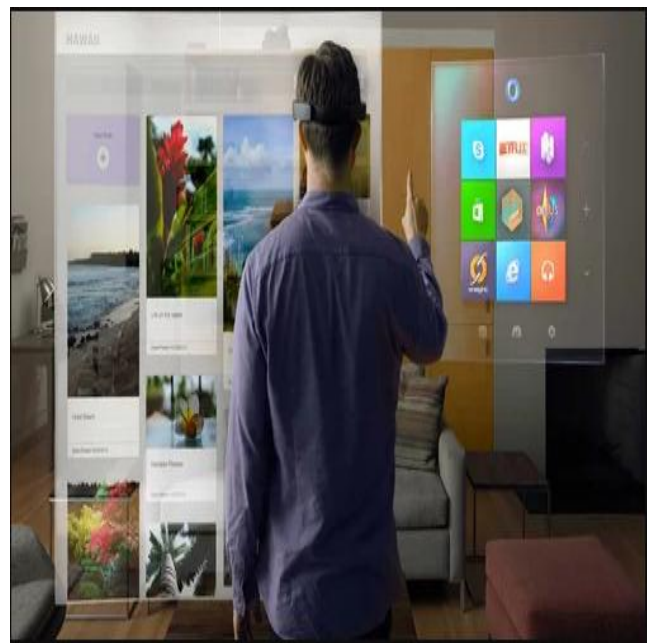


Fig. 3

IV. PROBLEMS AND CURRENT ISSUES EXISTING IN MOBILE AUGMENTED REALITY

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

- **Navigation and Tracking:** Augmented Reality(AR) system utilizes GPS for navigation because of its accuracy and high availability however, in urban environment GPS reception as well as accuracy can get worse, where the GPS signal can be reflected and shadowed by the surrounding buildings additionally, in mobile devices magnetometers available they are used for navigation and tracking but, this Magnetometers can be affected by the local magnetic fields.[6]

- **Content Management:** Many AR applications are limited in the way new content is be added to them. Programming skills are needed for linking knowledge sources to an existing system. Regular users should be able to add their own content with minimal technical effort. [6]

- **Usability:** A user's position and orientation is very important for an Augmented Reality application to behave as expected as well as Based on the location of the user, the digital 3D object is rendered into the real world. The modern GPS sensors are about 18 to 20 meters accurate while the magnetometer compass is about 20 degree accurate. This difference here might result in inaccurate calculation of the field of view and can trigger real world objects and 3D digital models to off-balance each other. Even though existing smartphones incorporates high resolution camera, their field of view is restricted. Consequently, only a small portion of the user's mobile field of view can be augmented. Identifying the Point of Interest to view the AR objects is a challenge the user must face. The user might have to rotate around while holding the device to locate the Point of Interest. [6]

- **Visualization:** Mobile devices small size display, brightness, resolution and field of view post as a major challenge in Augmented Reality applications furthermore, the view finder of the device is an important aspect for a realistic rendering of the Augmented Reality application since a small display device may not be able to fit the entire 3D digital objects. [6]

- **Interaction Design:** The Graphical User Interface (GUI) and interaction of the user with an Augmented Reality application is still a problem, due to the small size display of the mobile device. [6]

- **Hardware problems:** The hardware used should be light weight and small so that it is easily portable. The problem with having a small mobile device is its processing power. The device should have a medium or large battery with decent capacity also must have good camera in order to display the Augmented objects. [6]

- **Environmental issues:** The environment needs to be set up with markings to identify the locations for an AR application. [6]

V. MOBILE AUGMENTED REALITY FRAMEWORK

There are 4 most popular tools for building and testing amazing Augmented Reality app. Those are well explaining below.

- **ARToolKit:** This is the first as well as most popular framework in order to create very powerful and testing Augmented Reality app on both mobile operating system android and iOS. It is open-source library. This library provides video tracking functionality which is used to calculate the real camera position and orientation relative to square physical markers or natural feature markers in real time. Once the real camera position is known then a virtual camera is positioned at the same point and after that 3D computer graphics models are to be drawn, exactly on the marker. ARToolKit provide two of the main key feature in Augmented Reality: viewpoint tracking and virtual object interaction.[6]

- **ARKit:** ARKit (Apple ARKit) is Apple's augmented reality (AR) development platform for iOS mobile devices. ARKit allows developers to build high-detail AR experiences for iPad and iPhone. AR scenes made by one individual are persistent and can be seen by others visiting the location later.[6]

- **ARCore:** Google has also developed a platform for building augmented reality experiences for Android and iOS The ARCore provides a bunch of APIs which facilitates your phone to measure depth information and understand and interact with the surrounding. The ARCore also enables cross-platform AR experience by providing APIs to both iOS and Android. ARCore uses your phone's camera for motion tracking, allowing it to understand and track its position relative to the world. After that, it uses plan detection technique to detect the size and location of all type of surfaces like vertical, horizontal and angled surfaces like the ground, a coffee table. Finally, it performs light estimation to estimate the environment's current lighting conditions. [6]

- **Vuforia:** Vuforia is an Augmented Reality (AR) Software Development Kit (SDK) for mobile computing devices that is used to creation of AR applications. Vuforia uses computer vision technology to recognize and track images as well as 3D models in real time. The developers can establish the exact positioning and orientation of the 3D virtual objects relative to other real world entities with the help of image registration capabilities when they are viewed through the camera of a mobile device. The virtual object then tracks the position and orientation of the image in real-time so that the viewer's perspective on the object corresponds with the perspective on the Image Target. It thus appears that the virtual object is a part of the real-world scene. [6]

VI. CONCLUSION

Augmented Reality makes a significant move in era of technological world. This paper attempts to complete the vision within the constraints of today's Smartphone, But it raises many moral, ethical and technological questions that range from affects a better future. So, our approach provides a ready-to use platform for enabling in military, medical, engineering and other broad fields that is currently deployed in our life and being geared up for a worldwide roll-out.

VII. REFERENCES

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