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Augmented and Virtual Reality in Tourism

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ABSTRACT- Augmented reality is relatively new technology that allows mixing of virtual and real worlds to achieve a level of immersion that gives an amazing experience to viewer. In recent years, the fleeting development of augmented reality technology has fascinated people towards this highly dynamic area. This chapter focusses on the research and progress of augmented reality in recent years. Also, this chapter will throw light on the key technologies, development tools and application of augmented reality in some fields especially in the area of Social Media marketing of tourism. In this chapter the applications of Augmented and virtual reality for interactive virtual tours will be focused upon.

KEYWORDS- Virtual Reality, Tourism, Augmented Reality

I. INTRODUCTION

Augmented reality allows intermingling of real and virtual worlds, in technical means it uses include Multimedia, 3D-Modelling, Real-time Tracking Sensing and more to give its viewer a great experience with guided intelligence to roam around.[1] The information conveyed by the virtual objects helps a user perform real-world tasks. ARs principle is to apply computer-generated virtual information, such as text, images, 3D models etc., to the real world after simulation. AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. In this way, real world and superimposition of virtual information works in achieving the enhancement of the experiences. Therefore, AR supplements reality, rather than completely replacing it. Ideally, it would appear to the user that the virtual and real objects coexisted in the same space. Graphic overlays might also be used to remove or hide parts of the real environment from a user gives a new dimension to entertainment industry. AR gives user an authentic experience in the area of interior decoration as well for example, to remove a desk in the real environment, draw a representation of the real walls and floors behind the desk and "paint" that over the real desk, effectively removing it from the user's sight. [2]. With the improvement of computing power of computer software and hardware, AR has gradually shifted from research stage of the laboratory to the stage of mass and industry application, and as a bridge between the digital world and the real world, it provides people with a new way to recognize and experience the things around them. Some researchers suggest the AR should be seen as a concept rather than taking it as a technology as it's a new technology giving room to new revelations and discoveries. [3] Some of the fields where AR/VR are being used are:

- Sciences: Educational institutions are harnessing the visual and sensory power of VR to teach students subjects such as human and animal anatomy, molecular biology, chemistry and atomic physics. Astronaut and pilot training makes extensive use of the extended reality technology.
- Tourism: Virtual tours to historical monuments and archaeological sites in far off places are enriching the learning experience of history, archaeology and political science students. Furthermore, students of arts get first-hand experiences of the world's top museums and the artworks housed therein through VR.
- Business Studies: Different business and economic models can be better explained to students through the use of AR/VR. In business education, the real buying-selling, the in-store experiences, production line, supply chain etc. could be made visibly understandable and experiential with the use of AR/VR. The technology comes in very handy in making students corporate-ready.
- Architecture & Engineering: The most widespread use of AR/VR is witnessed in the fields of architecture and engineering. Using VR technology, the designers are able to not just better implement their vision by creating to-scale 3-D models, they are pushing the boundaries of physics and mechanics by creating the most imaginative and innovative designs.
- Communication Skills: Across the disciplines, VR tech is being used by students to enhance their communication skills, particularly public speaking abilities. There are VR e-learning virtual speech courses that allow students to choose the size of the crowd being addressed and then practise public speaking and presentation skills.
- Social Media Marketing: Social media is all about engagement and interaction, and AR/VR in social media will boost the client's engagement as they can experience a virtual version of what the brand is offering.

  The coexistence of virtual objects and real environments allows the viewers to visualize complex geopositioned relationships and abstract concepts experience phenomena that creates an amazing real world. To achieve the purpose of this chapter empirical and review studies are observed and examined to know how AR could be incorporated into educational settings.
- Gaming: Audio visual effects in gaming are now the bygones of gaming and entertainment industry. The

users are evolving and so as the gaming experiences for them. As per Ericsson ConsumerLab insight report March,2019 out of total surveyed data (66 percent) are interested in AR gaming. Almost 4 out of 10 AR gamers agree that AR gaming will be more interesting with better and more immersive games, access to lower-cost AR glasses and better batteries.

- Medical simulation:- Augmented reality can be used to realistically display how the procedures take place during various kinds of operations. They can be practicing tools for the learners to learn the medical processes instead of the traditional cadaver-based practice. Throughout the process, they can be guided on their next step so as to inculcate the learning process by doing it on their own. Although since human life can not be left on experiments so AR/VR can be applied for training purposes only.

II. HISTORY OF AUGMENTED REALITY

Although the technology appears to be relatively new but the footprints of AR/VR take us back to 1960s the concept of VR was formulated in the 1960s and the first commercial VR tools appeared in the late 1980s. The Diagram below shows the History and evolution of Augmented Reality in detail: -

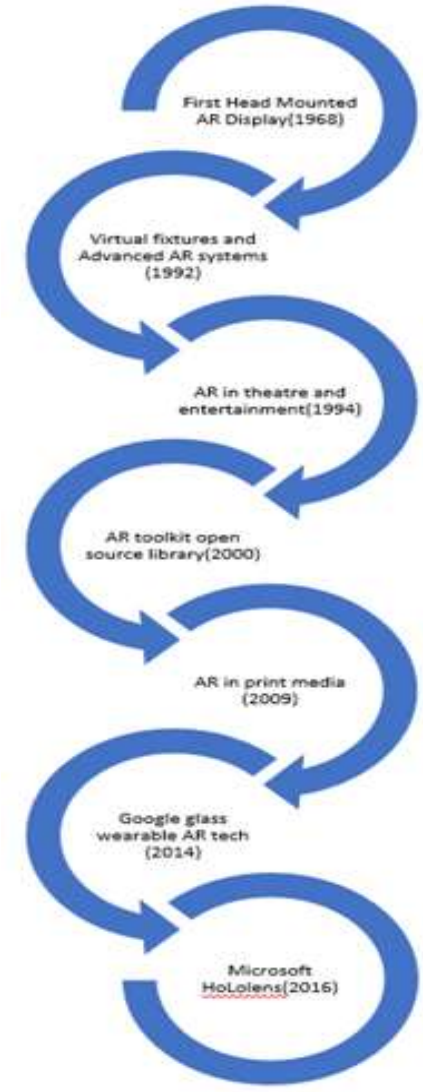

Figure 1: Brief representation of evolution of AR

American engineer Ivan Sutherland is recognized as one of the pioneers in the history of Augmented Reality. In year 1960s he designed 3D modeling and visual simulation software, the Sketchpad. In 1968, the device "A head-mounted three dimensional display" was deployed at the University of Salt Lake City as a pair of glasses to see images in 3D which are called the ancestors Google Glass. Due to its bulkiness and weight it needed to be suspended from the ceiling and users had to be strapped to the device in order to create better immersion, which made the experience quite uncomfortable. In 1980, Steve Mann developed first functional model of AR headset named the EyeTap, a headgear that displayed virtual information to the viewer. The Electronic Visualization Laboratory, University of Illinois in 1992 created the CAVE Automatic Virtual Environment, an immersive VR system projected on three or more walls of a room.

More recently, technology has been improved and more sophisticated VR devices, like Oculus Rift, or HTC Vive that provide a wider field of view and lower latency are developed. In addition, the head mounted devices are combined with other tracker system as eye-tracking systems, motion and orientation to give close to real experience to the user. [W2] In the beginning of 1990 Rosenberg and Feiner developed an AR fixture for maintenance assistance, showing operator performance with added virtual information on the fixture to repair enhanced the operators performance. In 1993 Loomis and colleagues produced an AR GPS-based system for helping the blind in the assisted navigation through adding spatial audio information. In the 1993 Julie Martin developed "Dancing in Cyberspace," an AR theater in which actors interacted with virtual object in real time. Few years later, Feiner et al. (1997) developed the first Mobile AR System (MARS) able to add virtual information about touristic buildings (Feiner et al., 1997). Since then, several applications have been developed: in Thomas et al. (2000), created ARQuake, a mobile AR video game; in 2008 was created Wikitude that through the mobile camera, internet, and GPS could add information about the user's environments. In 2009 others AR applications, like AR Toolkit and SiteLens have been developed in order to add virtual information to the physical user's surroundings. In 2011, Total Immersion developed D'Fusion, and AR system for designing projects. Finally, in 2013 and 2015, Google developed Google Glass and Google HoloLens, and their usability have begun to test in several field of application.

In 2014, Snapchat brought AR model to all common users, by introducing "geofilters". Actually, these were more "frames" or objects that users could place on their screen in order to indicate to their subscribers where they were. With the advent of Lenses in 2015, and filters later the entertainment experience has reached to the palm tops of every user. Released in 2016, the mobile app placed Augmented Reality at the core of its gameplay. The players wander in their real environment, with their phone, in order to catch Pokemon or to defeat other players during fights. Uptill today Augmented reality has added a real world experience to the virtually created scenes. Reviewing the available research this chapter focusses on the use of Augmented Reality in the areas of virtual tours which has in turn increased the tourism of many countries. In paper [4], authors have shown through their analysis that

in many areas of Indonesia their tool Exploresia (designed using AR) help to promote tourism destinations in Indonesia so that tourists are interested in coming to the selected location and Exploresia become the new interactive media tourism. Use of modern information technologies that allow to make virtual trips to different institutions and places, become indispensable in many areas of human activity. The most dynamically developing industry in Ukraine is tourism; during the selection of the trip, each tourist wants to be acquainted with all the conditions and seeks to obtain comprehensive information about the place of visit. The technology of "virtual tour" allows to provide information visualization.[5] Also, Bollywood has become intelligent in this area, in one of the recent movies the lead actor was a VR expert who gave the users of his VR device fully immersive experience of his loved ones being around. Authors list several other examples of using the augmented reality technology in tourism, namely, augmented walks, where tourists are placed within the real environment, but with the possibility to view additional artificial information in the form of 3D reconstructions of monuments, either via digital screens, or head-mounted displays. Within the "Ename 974" project, the system superimposes the real-world scenes with virtual 3D reconstructions of archaeological monuments; the results are displayed on a visualization device [10]. According to [9], several national parks in the US have also "added augmented reality stations to view archaeological sites on far distant cliffs and other inaccessible locations". The devices enabling the augmented reality experience are telescope-like and are superimposing animations on the real-world scenes, providing virtual recreations and information on real fossil remains. To run, an AR system must also include a camera able to track the user movement for merging the virtual objects, and a visual display, like glasses through that the user can see the virtual objects overlaying to the physical world. To date, two-display systems exist, a video see-through (VST) and an optical see-though (OST) AR systems (Botella et al., 2005; Juan et al., 2005, 2007). The first one, disclosures virtual objects to the user by capturing the real objects/scenes with a camera and overlaying virtual objects, projecting them on a video or a monitor, while the second one, merges the virtual object on a transparent surface, like glasses, through the user see the added elements. [10]

III. INCORPORATING AUGMENTED REALITY IN TOURISM

In the field of tourism, the application of augmented reality technology to tourist attractions can restore historical sites by using mobile phone cameras, screen software and other technological means to integrate the real scenes. In addition to viewing scenes, additional information can be obtained. AR technology is often used in archaeological studies to zoom in on relics in real landscapes to ensure that archaeologists can more accurately pinpoint their location.[1] The unique characteristics of mobile technologies, for example ubiquity, flexibility, personalisation and dissemination make it a useful tool for both tourism suppliers and consumers (Kim, Park, & Morrison, 2008). Thus, the number of tourism organisations exploring the potential application of technologies to enhance tourist experiences has risen [6]. The introduction and increased proliferation of technologies has had a significant impact on many industries, especially the tourism sector[7].

- Technological advancements, such as AR, have impacted and disrupted all tourism organisations [8]. The increased awareness and use of these technologies, have changed travel behaviours by revolutionising the way in which tourists search for information, make decisions (Wang et al., 2014), purchase tourism products and services, find and explore reviews [7] As the use of technologies in tourism has increased, the distinction between tourist experiences and daily life has become increasingly blurred. This blending has been defined as spill-overs (Wang et al., 2016), and much research explores the impact of AR & spill overs upon travel experiences. For instance, Cranmer et al. [6] took an internal stakeholder perspective to examine the use of AR within the cultural heritage tourism context.
- With regards to the visitor experience, their study revealed AR adds value, by modernising the existing offering. This in turn is expected to make it more attractive for new markets, as well as, retain existing ones. Further, Han et al. (2019) explored how meaningful tourism applications can be developed by including tourists as part of the development and implementation stage. Tourists are happy to escape into known simulated experiences like Disneyland, totally absorbed into staged alternate realities (Cohen, 1979). It can be argued that the application of VR/AR into the tourism experiences merely pushes this alternate reality one step further.
- The studies explored how the increased interactivity and presence of Second Life affected awareness of tourism sites and trip-planning. In general, they found that participants developed positive feelings and increased awareness toward the destinations. The studies found that students showed increased motivation, with many participants describing the experiences as more interesting and interactive. Similar to the studies on destination marketing, technical difficulties, and uneasiness-of-use were a common concern, specifically for the educators. Nevertheless, the importance of future research into virtual tourism lies in the benefits that it could bring to those who have restrictions on travel, such as physical disabilities, financial difficulties, or social stigma.
- The advent of AR has also opened doors for several industries to enrich their customer experience. According to a Statista report, the Augmented Reality market is predicted to grow from 5.91 billion to 198 billion U.S. dollars by the year 2025. Like every industry that is leveraging the benefits of AR, the travel and tourism industry has also witnessed tremendous growth with this emerging technology. AR is playing a crucial role in transforming the tourism landscape and boosting travel experiences for tourists.[W4]

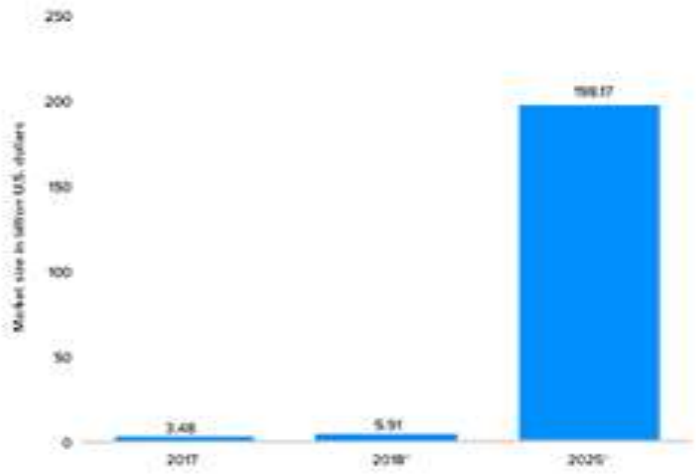

Figure 2: Market Size in Billon on U.S. Dollars

IV. CONCLUSION

AR/VR is the emerging field which will give its user amazing experience. Metaverse has been explored as a new technique of amalgamation of AR VR. While it is important to understand the ways in which metaverse tourism is helping to change the industry, business owners and other decision-makers also need to have an awareness of the tangible benefits The use of AR/VR in the area of tourism will not only give a great experience to its users but also will increase the turnover of tourism industry of that country.

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