Innovations in Tourism Industry & Development Using Augmented Reality (AR), Virtual Reality (VR)

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***Abstract*— over recent times, the evolution of digital technology has become a necessity to stay competitive in tourism and to attract the modern tourist. A new form of digital technology that is used in the public space is Virtual and Augmented Reality. This paper emphasizes on the analysis of scientific & technical aspects of developing mobile AR applications in smart tourism, which provides the necessary information about the destinations and their attractions. We address how the requirements of a user are essential to developing an AR application to attract tourists. We aim to present the technologies for tourism concerning AR and VR. This paper also acknowledges the technological limitations concerning end-user adaption.**

Keywords-

Augmented Reality, mobile applications, tourist experience, experience quality, Location awareness.

I. INTRODUCTION

Though the concept of Augmented Reality exists since the 2nd millennium of the 20th century, the evolution of Virtual Reality (VR) and Augmented Reality (AR) has become the emerging technologies of 21st Century. In the recent years the research in VR/AR in various fields such as education, medicine, etc., can immerse our minds in the experience which temporarily accepts VR/AR as another real version of Reality [6, 7, 8, 9, 10]. Augmented Reality is a technique that is stimulating our senses with computer-generated data such as graphics, video, text and GPS which is captured from the camera, mobile phone or any other devices and enhances the user with visualization.

Augmented Reality (AR) is a digital technology that enhances the person's perception of their physical surroundings when viewed through a particular device [1]. In an AR-enhanced platform, the user can find the information as very interactive and can be manipulated easily in the digital view [11].

Virtual Reality is considered to be an emerging technology for the Hospitality and Tourism industry which has the powerful effect of making one believing that he/she present in a virtual world, by providing interactive 3D surroundings simulated by a computer. The simulations can produce the 3D imagery of any tourist location as attractive and create a complete virtual Environment which can be entirely controlled by the supercomputers and VR devices. VR &AR used to create compelling 3D interactive visual experiences for all kinds of purposes and serves as the interface between the real world user and the VE.

The competition in the tourism industry for marketing the destinations has become challenging for many researchers. To survive from race, the use of modern technology like AR has become difficult for many destination organizations. The increased research in AR applications has identified the virtual experience for the tourism industry using smartphone to enhance the user's pre and post-experience [4]. AR has been the buzzword of modern technology and is experiencing rapid development and implementation in many industries, especially with the launch of the Google Glass project scheduled in 2014 [5].

The increased research of AR in the tourism sector is aiming to improve the tourist experience by helping tourists in accessing valuable information and improving their knowledge regarding a touristic attraction or a destination while enhancing the tourist experience and offering increased levels of entertainment [3].

AR technology is also capable of enhancing the tourist experience from planning, previewing and accessing location-based information of the holiday trip and destinations, directly and interactively, from various places. Users can preview the hotel before they actually book, access information while they are at home, navigate around their destination, know about the multi-language environment, and also can locate the entertainment and food options through a simple on a mobile device [14].

In 2009 the first AR smartphone apps came out, using AR technology for guiding to the physical locations from the user's smartphone camera. Tuscany+ was the first app built specifically for tourism - an "interactive, real-time guide" - intending to enhance the visitor experience [12].

Fig. 1: Tuscany+ the first app built specifically for tourism

This paper emphasizes on the use of VR/AR mobile applications, specifically to the needs of tourists and tourism professionals. The enormous growth of this technology motivated us to discuss in detail the current systems and the mobile applications that use VR/AR for tourism purposes, to highlight the benefits offered to tourists. In the process of developing smart tourism, various tourist organizations have introduced Self- Service Technologies (SST).As part of this they have identified Augmented Reality (AR) as the breakthrough technology, the mobile applications developed using Augmented Reality (AR) can give valuable experience to the tourist without using the tourist guide. If a tourist guide can be wholly replaced by providing the complete facts about the places, unique attractions, this change by the technology can bring huge impact and profits to the tourism professional and for the ministry of the tourism department. Finally, the paper proposes an archetypal framework for the development of mobile AR applications for the field of tourism, aiming to release the technology's full potential within this particular field.

II. ADVANCEMENT OF TECHNOLOGY (AR/VR) IN TOURISM:

A. AR/VR Frameworks

Years ago the application or projects developed for the department of tourism are considered to be as an only pilot project, but today due to the advancement in the technology increased the ease of developing many projects addressing the real-time problems. Many frameworks and toolkits were developed, which also increased the usage of technology; these frameworks work based locations, images and work efficiently on different devices and different operating systems. Projects developed using structures like layers can run on all kind of platforms like iOS, Android, Symbian and BlackBerry. These advancements in the technology have brought enormous scope for developing the projects and addressing the problems of all kind of mobile users.

B. AR/VR in Tourism

As per the research many application /Projects which were developed using this technology in the field of tourism, most of them were started as research projects only and very few are converted into commercials and are available in the market even today [13]. In this section we try to discuss about various AR applications developed for the field of tourism and in the latter part of section we share about the application "Tourist Guide" which can address the problem of tourist having high-class experiences and memories without tourist guide. Due to the enhancement in the immediate surroundings, Augmented Reality is considered to be one of the technologies with high potential to make a significant impact in the industry of tourism. Tourist is such kind of a person who has little or only gathered knowledge from friends or internet, thus accessing the information based on location, image or marker would greatly help the tourist and the tourism industry. So based on the user's area or location if the application can trace the interesting facts and places to visit could make a unique point to the user. There are several applications which are developed for the tourism industry, and few of the applications were also developed focusing on the idea of a tourist guide. Applications like Tuscany +, this belongs to the specific region Tuscany only which functions like a digital Tourist guide which only works on iOS. This application retrieves the information from the internet sources only and delivers the information solely in English and Italian languages.

Urban Sleth is another application which targets the users who love to solve mysteries and enjoy adventurous trips; even this was launched only on iOS. Street Museum, another AR application concentrating on the street museums of London which works on both iOS and Android platforms only. Thus the applications have several limitations, either focusing solely on the specific region or platform or displaying information only in specific languages.

C. Overview of applications Developed in the field of Tourism using AR/VR:

Table 1: Applications developed in the field of Tourism

Application	Specific to Region	Platform	True Data	History Behind Things	Notification of Special Attraction
Tuscany+	Yes	iOS	Draws from internet	partially	partially
Urban Sleth	Yes	iOS	-	No	Partially
Street Museum	Yes	iOS, Android			
Basel AR Tourist Guide	Yes	iOS, Android, Symbian Blackberry	Dedicated Database	Yes	Yes
India Tourist Guide		Not AR Application	Yes	Partial	Yes
Smart Tour Guide		Not AR Application	Yes	Partial	Yes
Guide Books		Available in the form book	Yes	Partial	NO

Above all applications have several limitations like most of the apps are developed only specific to the region or work alone on a particular platform like iOS, Android or few of them are not Developed using Augmented Reality or do not provide exact information. So still there is a need for an application which can work on all platforms, display information in many languages and provides suggestions to the users based on the location or the image.

Here we describe about an application which we started building by collecting true information behind the history. The compelling factor of the application is the visual experience. 3D models played the major role and are built using Blender. The application building is done using Unity, a game engine.

Table 2: Specifications of Tourist guide

Application	Specific to Region	Platform	True Data	History Behind Things	Notification of Special Attraction	Free of cost
Tourist Guide	No	iOS, Android, Symbian Blackberry	Dedicated Database	Yes	Yes	Yes

The application consists of a camera scanner and the special attractions are to be scanned using the application. The information related to that place will be popped out on the mobile screen which will be in the form of text, audio, video and 3D models which makes the tour more interesting.

III. RESOURCES

The resources used to build our application are as follows
1. Smartphone
2. Unity
3. Vuforia
4. Blender

A. Unity

Unity is a graphics and physics engine that is used to build scale-able applications that can be built for multiple platforms with the same codebase. Supported platforms include Linux-x86/x86-64, Mac-x86/x86-64, Windows-x86/x86-64, iOS, Android and WebGL . Unity also allows the user to select a graphics API of their choice (DirectX 9, Direct X11, Direct X12, Vulkan, OpenGL, Metal, OpenGL ES 2.0, OpenGL ES 3.0, WebGL 1.0, WebGL 2.0). Unity uses C# for internal scripts and logic.

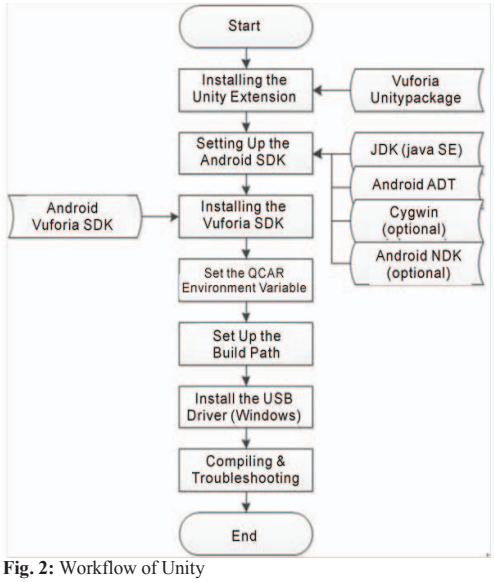

Fig. 2: Workflow of Unity

B. Vuforia

Vuforia is an SDK that provides detection and tracking of image targets by using feature detection. A feature is any point in an image that is on the edge of multiple colored sections. A colored cube has 4 feature points. It was available as a plug-in for Unity and has been integrated into the engine with the release of Unity version 2017.

Fig 3: Sample image target

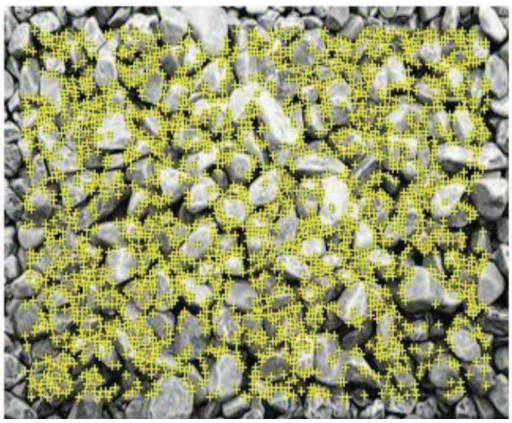

Fig 4: Features of sample image target

C. Blender

Blender is an open-source software toolset, used for creating animated films, visual effects, art, 3D printed models, interactive 3D applications and video games. Blender has unique characteristics like UV unwrapping, texturing, raster graphics editing, rigging and skinning, fluid and smoke simulation, particle simulation, soft body simulation, sculpting, animating, match moving, rendering, motion, video editing and compositing.

Blender Game Engine was a built-in real-time graphics and logic engine with features such including collision detection, a dynamics engine, and programmable logic. Blender can be used to create wide range of applications from stand-alone to real-time applications ranging from architectural visualization to video games. Last year (April 2018) it was removed from the upcoming Blender 2.8 release series, having long lagged behind other game engines such as the open-source Go dot, and Unity.

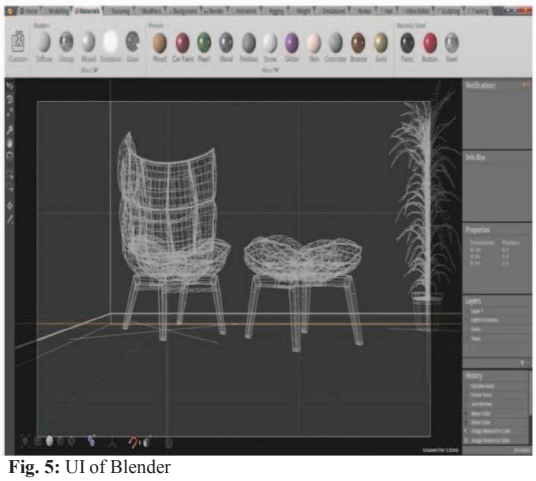

Fig. 5: UI of Blender

IV. CONCLUSIONS:

Tourist Guide is an application that uses Augmented Reality technology which helps tourists to enjoy the tourist places with visual treat. Our application will help increasing the revenue of the tourist department because many tourists will be attracted to our application for the visual treat it provides. It helps the history enthusiasts in gaining the information

behind the tourist places. Our system aims at giving the best visual experience and in delivering true data.

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