MOBILE AUGMENTED REALITY IN IMPROVING THE EXPERIENCE OF TOURISM

[1]Kriti Chopra, [2]Bhoomi Gupta

[1]UG Student, [2]Assistant Professor
[1,2]Department of Information Technology,
[1,2]Maharaja Agrasen Institute of Technology, Rohini, Delhi-110086, India.

Abstract : A lot of new technologies have arisen and there has been a huge change in the tourism industry. These have become a means of attraction for modern tourists and a way of maintaining the rivalry of business workers. In this sense, wireless augmented reality is viewed as a system capable of improving through a handheld device the way humans communicate with the environment. This paper addresses the challenges and opportunities for the implementation of AR technology in the tourism sector and presents a framework for a successful application of AR Travel.

IndexTerms – **Augmented Reality, Mobile applications, Travel and Tourism, Interactive experience.**

I. INTRODUCTION

Technological advances and man's growing dependence on mobile phone technology have turned out to be a push factor in the use of Augmented and Virtual Reality applications in almost all domains. While Augmented Reality(AR) has long existed as a tool and has also been used in many industries, its full potential in the travel industry remains to be fully determined. AR is a visualization technique that superimposes computer-generated data, such as text, video, graphics, GPS data, and other multimedia formats, on top of the real‑world view, as captured from the camera of a computer, a mobile phone or other devices. In other words, AR can augment one's view and transform it with the help of a computer or a mobile device, thereby enhancing the user's perception of reality and the environment around it. [30, 8].

Many researchers believe that augmented reality is an excellent user interface for mobile computing applications because it allows intuitive information browsing of location referenced information [14]. At places powered by AR-based applications, stories and exhibits help tourists explore independently thus lowering the dependence on the human tour guide. Augmented experiences extended to travelers with innovative mobile apps, facilitate their travel quest and building trust. Seeing that AR's popularity is expected to rise exponentially due to technological advances and studies into usability, adoption, and usefulness, it is important to identify what are the basic requirements for users to embrace AR. Sha Liang [25] stated that to ensure the acceptance and success of future AR systems, it is vital to understand the end-users' experience and requirements.

This paper addresses the opportunities for AR technology in the tourism sector and presents a framework for a successful application of AR Travel. The later section in the paper deals with the limitations of the application and the technology in the field.

II. LITERATURE SURVEY

The findings from a review of existing works of literature illustrated that the development of mobile technology has highly evolved the tourism industry particularly in four sectors - transport, accommodation, catering, and tourist attraction. The increasing dependency of humans towards mobile phones and the complexity of the formation of tourism experience have somehow created a demand for a more interactive encounter of tourism destinations through the use of technological applications. [10].

A visitor is a person who usually has "little or no awareness of the environment," according to McKercher and du Cros [23]. In this context, AR application can bring together the rapidly evolving digital world by using interactivity, efficiency, and responsiveness to bring together the IT industry and the tourism industry. Leue [3] identified that four potential external variables influence AR user acceptance including enjoyment, personal innovativeness, perceived benefits, costs, and information quality. Information is provided through the use of different interactive technologies within an AR framework. Such formats range from sound and image to video clips, 3D models and hyperlinks that may lead the user outside of the application. [8]. Past will be replicated and maintained for many years by way of Image Processing techniques such as Augmented Reality and now-a-days of mixed reality integrated with the different handheld devices.[6]. According to Dai-In Hana [7], AR has been tried in various ways for tourism purposes, but a clear application template has not been provided. Besides, the end-user point of view has been largely neglected in the development process of AR in tourism. Kounavis [8] suggests that the absence of interoperability of AR systems across mobile platforms often accounts for the lower demand and use of these technologies. Therefore, to clarify, smartphones with camera apps, high-performance CPUs, large-capacity storage and wireless network connectivity must be the mobile phone that is extremely appropriate for use as a portable AR handheld device to ensure compatibility and adequately capable of maximizing AR features [8, 13].

Findings demonstrated AR's potential to combine digital data with the real-world environment through the mobile device system and create a more immersive connection between visitors and the atmosphere around them. There is also enormous potential for using smartphone AR as a tool for active tourism understanding and tourism experience enhancement to provide more interactive communication between visitors and their surroundings.

III. RESEARCH METHOLOGY

3.1 Analysing the present literature

The analysis conducted in this paper was based on the study and review of the current literature relevant to this research area. The data was gathered from article newspapers, articles, books, sessions, conferences, and events. Mobile technology, mobile

augmented reality, tourism technology, geographic information system, indoor maps are the main areas that have been studied and reviewed. Even researched were the latest technologies utilizing augmented reality. The conclusions drawn from the existing literature have been contrasted with the present software research.

3.2 Analysing existing AR applications and SDKs:

Wikitude was released on Android in 2008, later on, iPhone and Symbian platforms. It has been voted best AR browser of 2010 by readers of Augmented Planet. This extracts details from Wikipedia and Qype and overlays the geo-located data onto the screen. It comes with a lot of worlds that can be overlayed onto the real world which can be seen through the mobile device's camera. POIs can be created by the users themselves and location-based digital content that can be accessed through the Wikitude software framework. [33]

Layar is an Android and iPhone-focused mobile AR device launched in 2009. Users can discover their physical environment, gather geotagged data from the internet, and superimpose it on the video captured by the camera of the app. The architecture has an application programming interface that allows programmers to link across different layers to the user. There is an AR-view perspective map within the 3D layer and a walkable pedestrian path can be viewed within the designated community for each mentioned piece of architecture. [34]

MobiAR is a mobile, tourism-oriented service platform for Augmented Reality. It enables consumers to explore destinations through an enhanced interface mixing fact with digital data and tourism tool information. The Android-based platform chooses the material to view based on location and consumer expectations. Once the data has been screened properly, it can be displayed in both 2D and 3D formats [19].

Originally released in 2018, ARCore is a software development kit developed by Google that allows for the development of applications for augmented reality. ARCore uses three key technologies to integrate virtual content with the real environment, motion tracking, environmental comprehension, and light estimation, which allows the phone to understand its position on the world, detect the size and location of all surface types. ARCore SDK is available for Android, Unity for Android, Unity for iOS, Android NDK, iOS and Unreal. [11]

ARKit is Apple's augmented reality development platform for iOS mobile devices. ARKit allows developers to build high-detail AR experiences for iPad and iPhone. Environments captured by the device may have added virtual 3D text, objects, and characters to them. AR scenes created by one user are permanent and can be seen later by others who visit the site. Motion co-processors such as the iPhone 7 Plus's M10 can track data from the gyroscope, accelerometer, and magnetometer efficiently. Pokémon Go uses ARKit for creating an augmented experience. [31]

The Vuforia platform uses superior, stable, and efficient computer-based image recognition technology and provides multiple features that enable mobile app capabilities. A Vuforia SDK-based AR application consists of a camera capturing frame and passing content to the tracker, a camera-based image converter to a format suitable for OpenGL ES rendering and internal tracking, a tracker capable of loading and activating multiple datasets at the same time that contains computer vision algorithms that detect and track real-world objects. It also provides faster local detection of targets with the capacity of tracking 5 targets simultaneously. The SDK supports both native developments for iOS and Android, while also enabling the development of AR applications in Unity that are easily portable to both platforms. [32]

IV. RESULTS AND DISCUSSION

4.1 Augmented Reality in tourism

Based on the literature survey and the analysis of the available SDKs for the development of the Augmented Reality Applications, it can be said that AR can add interactive and engaging information to the search experiences. These expanded experiences can be extended to travelers by simplifying their travel search and building reliance with pioneering mobile apps. For travel, the potential of augmented reality is huge and vivid. People can take a short tour of that place before going to the actual place so they can decide where to go. Improved realism presents both tourists and the tourism industry with long-term ideals.

The analysis of the current work in this area clearly shows that understanding the requirements and experience of the user is of utmost importance for the application's success. The app should enhance the user's overall experience while traveling within a destination and increase the value for tourists. The model should be efficient and user-friendly.
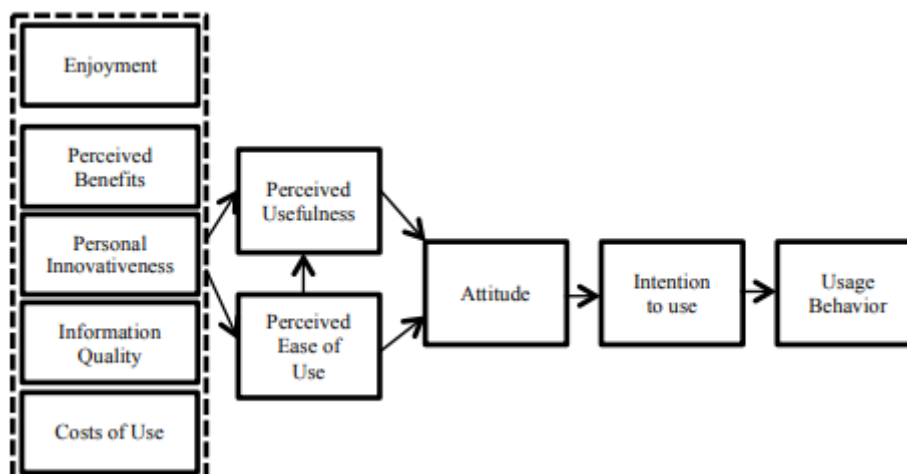

Figure 1 Leue's Proposed AR Acceptance Model [3]

4.2 Mobile AR Tourism Model Application

Any existing AR travel applications are developed based on the user's needs. The user's requirements and the potential of the organization to fulfil them will determine the market's acceptance of the application. In the development process of any software product, the user and the developer reflexively and mutually influence each other. The development is split into five steps, namely the selection, design, execution, testing and management of specifications.

An analysis of the existing literature and software led to the collection of the user requirement. The actions, decision making, motives, and happiness of the client have a significant impact on the application's design and features. During the design process, the first step is analyzing the location type for which the app is intended. For, a historic site, a monument, a heritage site, or a museum, history recreation and real-time navigation would be the main feature. Second, the budget and time constraints affect the design.
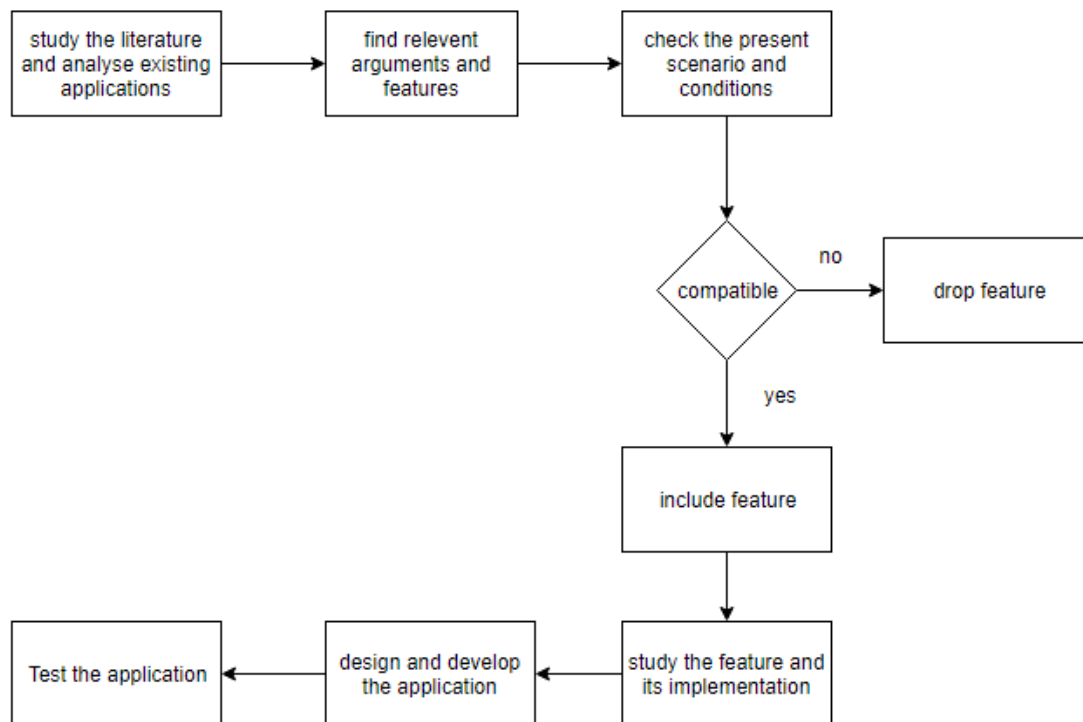

Figure 2 Process chart for development of AR travel app

V. CONCLUSIONS AND LIMITATIONS

The introduction of mobile technology has dramatically changed the way travelers interact and communicate with their world over the past few decades. Increasing human dependency on mobile phones and the nuances of developing tourism engagement have, through the use of software apps, created a demand for a more engaging tourist destination experience. Mobile Augmented Reality software is considered to be able to narrow the gap between the need for a better understanding and fulfilling the ideal experiences of the tourist. Integrating digital data through the mobile device app with the real-world environment makes for more direct interaction between travelers and their experience. Enhanced reality is aimed at affirming the four aspects of travel and tourism–transport, lodging, leisure, and tourist attraction. Therefore, there is huge potential to use smartphone AR as a tool for successful analysis of tourism and enhancement of tourism experience.

Given the wide range of AR technologies in the travel industry, the use of technology in this field is hampered by several reasons and influences. The existing AR technologies are not interoperable on various platforms. Although there are many frameworks to develop AR apps, it is still not feasible to use platform-wide applications. To use the app all the time, it also requires a good Wi-Fi or internet connection. Many communities do not have full internet coverage, nor are mobile roaming rates affordable. The meaningless material and the lack of functionality of apps are some of the other factors why software is less used in the city.

VI. SCOPE AND RELEVANCE

AR as a technology has a wide range in different domains. The applications developed in particular in the travel and tourism industry to provide the user with a virtual view of the rooms, easy flight bookings and also personalized real-time information. Interactive storytelling is used by the AR software for museums and other such sites. AR enables one to be taken through past, present and future time loops into a guided, multi-sensory experience. Not only for these locations, but also an office building, schools, and colleges, different software can be used to improve not only accessibility but also the user's overall experience. AR engineering can also be used in the field of education and other industries through the use of these applications.

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