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SMARAN- AR App for Time Travel to Visit Semi Existing Monuments of India and Easy Communication

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Abstract: Augmented Reality (AR) is an essential area of research in the technological sector due to its distinct benefits and applicability. AR helps us to see graphics rendered as the real-world objects. AR in smartphone application adds some elements to the camera of the smartphones, creating an effect of bringing a hologram content to your surroundings as an illusion. The sound sensor of your smartphone enables the input and output of sound. Various voice assistants, translation apps, alarms, etc. use it. This research paper discusses the functioning of AR, the Sound Sensor in an application which intends to take the user to a journey where he could see the semi existing monuments in their original form and state by reconstructing it using AR, when the user visits the place. In a country like India, where many different languages are spoken, the app would also focus on helping the user with any communication issues that he might face during his travel. The paper also highlights the entire design process carried out for this application. It discusses about the ideation, identification of the problem, anticipated solution, competitor analysis, user survey, empathy and affinity mapping, user flow, information architecture, design systemization, design iteration and explorations, final deliverable results.

Practical Implications: This research work is an absolute contender for the multimodal system which provides the keen and willing user to imbibe the originality, value, and culture of place and helping them to communicate at new places in the most Efficient and Minimal way.

Keywords: Augmented Reality; Communication; Design; Travel, User Experience, User Interface

1. Introduction

India is a country of diversity and great architectural importance. However, some of these prestigious architectural monuments got damaged during various invasions and wars. Their beauty was lost back then, and this generation would never get a chance to acknowledge their charm. Human sense can augment any physical environment (Höllerer and Feiner 2004) How strange is it to see a broken monument? Are our expectations from that place matched? Don't we get a lot of questions related to it? Augmented Reality is a perfect example of modern technology and a great area of research (Sirakaya and Sirakaya 2018). The wide field of Augmented reality ranges from architecture (Webster et al 1996; Thomas et al. 1999), medicine (Ploder et al. 1995; Tang et al. 1998; Birkfellner et al. 2002; Marescaux et al. 2004) , industry and robotics

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(Chong et al. 2009; Caudel and Mizell 1992), military, education (Pasareti et al. 2011; Shelton 2002; Billinghurst 2002), and many others. Keeping in mind the problems that users have been facing or might face in the future, Smaran has been designed to allow the user to envision the original Indian Monument through AR (augmented reality) and imbibe its charm in a better way. The users also face communication issues as Many different languages are spoken in the country, often become a barrier in smooth conversations between two people from different regions, to overcome that a Live Translator has been included within the app, that would add on to improve the overall travel experience for the user. Travelling is a necessity that cannot be separated from human life. The monuments are required by tourists in order to learn in detail about the culture of a place. Cultural diversity and monuments make India, a country that has so many tourist destinations. Smaran is based on a Minimalistic concept. Access to seeing the original monuments is still inadequate and not available with tourism Guides or pectoral references, especially for the monuments in India. Also, communication issues prominently add to the problems faced by the users. Tourists get difficult to imbibe the true virtue of the monument. They are not able to get detailed view or information about the monuments they want to visit. So, they feel that their time gets wasted at the location of the monument. They can't find good and trusted places to stay and places to visit nearby. The tech-based expression "augmented reality" has been in use since the late 1960's (Sutherland 1965) and Smaran includes such features to save users time and provide them the best user experience they've ever had with inbuilt system for these services. Based on all the problems listed by the users, Smaran would be an application that consists AR view, information about the monument they visit such as Creator, Era, Destroyer, Reason etc. This would be their one stop solution for all the user. This research paper mainly focusses on providing details about Smaran, the entire design process involved, right from the discovery phase including ideation, user screening- selection- interview, competitor and market analysis, technological review. Moving on to the define phase having all the collected data user personas, empathy and affinity mapping. The next stop was Ideation that incorporates Brainstorming, task flows and the information architecture. This was followed by the design and exploration phase where multiple designs, design systems were explored and final one was selected. The final phase was User testing and improvement, which was done on the basis of Cognitive Walkthrough. Ultimately delivering the best possible results for the target users.

2. Literature Review

AR has always been very prominent in the market, its presence being noticeably noticeable in the tourism industry. Using AR to re-create the Indian monument for users to enjoy its heritage is a great way to develop a deeper knowledge of the user. Yovcheva et al. (2013) cited the unpopular real-time taxpayer travel experience that we see as "a complex structure that includes emotions, feelings, skills and information from understanding, concentration and interaction with visual information integrated with the real user environment.", Arguing that the subject tourism has not been adequately researched.

A variety of technology-based solutions are offered in the same previous studies to bring about better relationships between the monument, their knowledge and users. The purpose of the technical methods may vary from preserving and consolidating architectural values, to the support of artistic creativity, to facilitating access and participation in architecture, protection of the masses, freedom of speech, and diversity.

2.1. AR in the Travel Industry

Augmented Reality has the potential to enhance user experience and help visitors view the monument, and improve their overall knowledge of the monument they are visiting, while increasing user entertainment levels throughout the process. Information provided to users about the unpopular taxpayer technology we see will be displayed depending on the monument the user can visit.

The introduction of AR on cultural and tourism heritage began in the late 1990s with the MRS project and the ARCHEOGUIDE Project, which was considered a mobile AR despite the large number of heavy equipment needed to carry this test. AR has been employed in readily portable devices such as smartphones and tablets in recent years. Other research initiatives including mobile AR applied to cultural heritage sites aimed for exhibition improvement, reconstruction, and exploration followed these pioneering studies.

The travel and tourism industry are a well-studied field. Customers in the travel business anticipate their expectations from a location with a significant monument to be met. This is where augmented reality (AR) may help the travel sector transform. AR has the power to provide people with amazing interactive and engaging information. Travelers can benefit from augmented experiences by elevating their trip experience and digitally erecting the original landmark in front of them. Travel experts have projected that adopting the potential of AR may provide a variety of user experiences, which might be beneficial to tourism.

Table 1. The table down below gives a comparative analysis between functions of various different AR based applications present for the travel industry. (Yovcheva et al. 2012)

Function	Explanation
Search and browse	Category search method that provides access to relevant information (rasinger et al., 2009)
Context- aware push	Users may miss important information, especially in the city's rich information settings. (rasinger et al., 2009)
M- Commerce	Transaction / booking options. (rasinger et al., 2009)
Feedback	Option to send and receive feedback from one user to another. (rasinger et al., 2009)
Routing and Navigation	To navigate to the area of interest shown in the AR view and select. (Umlauft et al., 2003)
Tour navigation	To select a location before the trip, so that the app can create a trip plan and the user can enjoy the trip in a better way. (Umlauft et al., 2003)
Map services	Allows the user to get the best view of the universe. (Suh et al., 2010)
Communication	Option to get specific information from accommodation providers or people who offer the same service.
Exploration of visible surroundings	In addition to looking at information about an item, location, object, and category, users may want to "check" available information about their surroundings without the conditions previously described. (U-Ajanki et al. 2010)
Interactive AR view	The AR "click" AR view can serve as a visual link for additional information, with more details about your preferred location (Wither et al., 2009)

2.2. AR and Time Travel

In the case of Smaran, AR is literally making Time Travel possible by reconstructing a monument in front of the user and virtually taking him to the roots of the architectural heritage. It not only improves the overall user experience but also enhances the users' interest towards the past eras. Travelers are obliged when they get to use an engaging, helpful, minimal and easy to use applications during travel. There are several other apps that lets you view monuments in an easy way through AR, from the comfort of your home. Researchers suggest that AR is the future of virtual time travel and will be highly beneficial for the upcoming generations. The main reasons for creating Smaran by digitalizing the monuments through AR are-

(1) to create a virtual replica of a damaged monument
(2) to create a database with information related to the architecture, design and importance of a monument
(3) to promote AR technology in terms of user interface and mobile applications to enhance the users' experience (Gomes et al. 2014).

2.3. Communication during Travel

Effective and Efficient communication is still a major problem that the users face during travel. This leads to distress and causes disturbance in the trip. India has a diverse culture and many different languages are being spoken here. As a result of which, people from different regions find it very difficult to communicate with each other. Over the last two decades a considerable number of theoretical and research studies have been carried out on strategies of effective language communication. Many studies were done in this regard. Communication remains imperfect when it is concerned with the regional difference and gap faced by users in a real-world scenario. Researchers also remind us of another important point which may lead to communication inefficiency in the target language situation saying "even among users with a high proficiency in English, rules for communicating intentions and for structuring discourse are largely determined by cultural background of the place they are going to visit".

Effective communication is the process of sending the right message to the right receiver through the right channel at the right time and place with the right feedback. An inbuilt and minimal translator within the app, eases this scenario for the users. Instead of wandering at different sources for translation and easier communication, Smaran uses an inbuilt translator to help the users and ease the accessibility. Along with improving the trip experience for the user, it also uplifts the overall user experience.

3. Aims and Objectives of the paper:

- Identification of Problem using User Study (User interview and User survey) in the context of museum memory.
- Designing a user-based interface for rebuilding actual monument and delivering desired interface.
- Validation of developed prototype through Cognitive Walkthrough.

4. Methods

4.1. User Survey

User Surveys provide the basic foundation for design strategy. It helps to create an appropriate application for users by understanding the user requirements in a much better and easier way. Most importantly, it provides the data to back your strategy and make good design decisions.

To initiate the process of creating the application, a user survey was conducted through interviews, google forms, virtual conversations etc. From these surveys, empathy and affinity maps were plotted and personas were created.

4.2. Target Audience

These days, people like exploring new and different places with friends, family or people they find at the location (Nishad and Chowdhury 2021), so it majorly suits the age group between 16 and 70. Since the application is based on Indian monuments, its understood that the target audience majorly becomes the Indian people. To be more precise, the people who like to Travel, know about a place and explore everything. The application has an inbuilt translator that eases any communication issues. However, users world-wide can easily use the application. Its easy usage could also attract children and elderly people as well. In short, the application could be handled and used by all Age Groups.

4.3. Design of the AR based App

Smaran- The AR based application is designed on a very minimal themes for both the interfaces with vibrant and different colour themes selected on the basis of Mood Board, created on the basis of the user Survey. It has very clear icons, from 2007, the focus of the studies has been on two primary topics: symbol usability and the effects of cultural diversity (based on countries). The study of icon usability looked at different icon attributes and how they affected system usability. The recognition and determination of an icon's usability are typically decided by its simplicity of recognition and determination (Harley 2016). Round buttons make the design user friendly. Poppins was the typeface of choice. Poppins is a sans serif typeface that has become a popular design tool for web development. Each letterform is almost nonlinear, with optical adjustments added to stroke joints as needed to keep the typographic colour consistent. The illustrations used in the application are based on an Indian Theme, making it even more user friendly. The overall optimal ratio of an interface is related to a screen dimension; smaller the creen, higher becomes the figure-background ratio (Lou and Zhou 2015). To ease the usase, especially for the elderly, instructions are kept minimal as complexity would incraese their difficulty while interacting with the system. (Chowdhury and Karkun 2021)

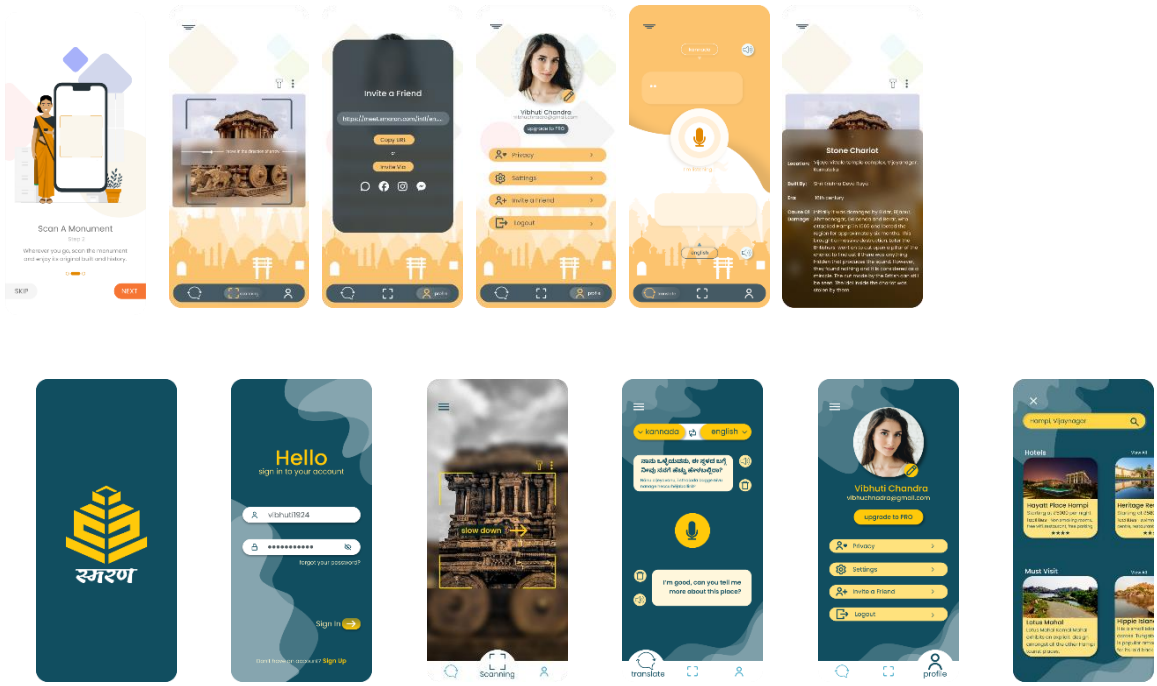

Figure 1. Interface and Screens of AR app for experiencing partially destroyed Indian heritages

4.4. Cognitive Walkthrough

Cognitive walkthroughs are used to examine the usability of an application. Noting the expert user's first experience on his first interaction with the system is an important concept in User Experience design (Interaction Design Foundation 2022). It is designed to see whether or not an Expert user can easily carry out tasks within a given system. It is the most cost- effective method to test an application. Fifteen users, 10 males and 5 females aged between 12-65 were given a set of tasks, where their actions were tracked live and time was noted. After the completion of the cognitive walkthrough, changes were made in the wireframes and the prototype according to the what the user expected.

5. Results and Discussion

5.1.Users Pain and Gain points found through user Survey

Smaran solves many user problems in a modern way using augmented reality. The users who love travelling can now imbibe, Visualise and gain the essence of an old- damaged monument for which they had visited. They can now see the entire site recreated in front of them, read about its information. This augmented reality application piqued the user's interest in cultural heritage. Their overall impressions of the AR app were really good and inspiring. The interface design of such programmes should assure user happiness. (Chowdhury, 2020) There were a few problems marked by the users, which are highlighted in the figures given below. (see **Figure 2**).

Figure 2. Problems in current interfaces of AR app identified during cognitive walkthrough

5.2. Cognitive walkthrough and Design Modification

The cognitive tour revealed that the software is simple to use, intuitive, and contains useful information. As per the results, elder users performed accurately however slower by 1.5 times as compared to the younger users (Stobel 2009). The users were able to comprehend with the application system easily due to the systematic design and representation. The users enjoyed using the application. However, as stated by some of the users the menu icon looked inappropriate because a basic menu option is meant to deliver data and information (Kim 2011). It plays a vital role to understand a user's satisfaction after using the application (Ling, Hwang, and Salvendy 2007), they didn't like the illustrations (as they didn't match India's theme initially), they faced problems in reading the text displayed above glass morphism. According to their feedback, changes were made and new modified design was presented in front of them. This modified design was adapted in a much better way by the users and they enjoyed the overall experience of using the application.

6. Conclusion

Cultural heritage and Tourism aren't just an object, it's the actual representation of the way we used to live and could also be considered as our nation's true wealth. Finding innovative ways to conserve, document, and study them using current technology like augmented reality is a top priority, and archaeologists, scholars, and museum curators have conducted numerous experiments and excursions in the past. This paper showcases an overview of the research, methods and design used to create the augmented reality-based application Smaran, in context of culture, heritage and tourism. Identifying and classifying the application's most important critical elements, as well as their influence on its successful use. In order to satisfy user expectations, alleviate problems, and improve the overall user experience, apps based on augmented reality that are devoted to tourism are now in need of additional development and study. This application would also serve as a two-way interactive tool for the user, which means that the application will easily recommend interesting Hotels and nearby sites that would be selected by users.

Being able to see the real monument through augmented reality would develop a greater interest for the users, encourage them to visit more places and realize the monument's true attractiveness. Technologies like these would also lead in the growth of tourism in India in a long run.

The paper's introduction section outlines augmented reality technology, its benefits in culture and tourism in general, and provides a summary of the Smaran application. The section on Augmented Reality in Tourism gives a thorough review of research, technology, and design based on Smaran and augmented technology.

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