



International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Virtual Visit to Indian Pilgrimages

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ABSTRACT

As the world is rapidly moving with physical travel at times not being possible, virtual tourism presents a novel solution to spiritual discovery. The following paper addresses the creation of a mobile application entitled “Virtual Visit to Indian Pilgrimages,” which focuses on giving users 360-degree panoramic experiences of major religious destinations in India. Developed with Unity Engine, the app is compatible with both normal and VR modes, enabling users to navigate temples like Ambadevi in Amravati with interactive gaze-based navigation [1][2]. Sound effects, information guides, and future inclusion of QR code-based guided tours are some of the features that enrich the user experience [3][5]. The app is performance-optimized and culturally sensitive, with the aim of benefiting devotees, students, and tourists [6][7]. To achieve scalability and handle great media assets economically, methods of asset bundling and image compression were adopted. The interface for the application has been made very user-friendly to suit users from all ages while providing multi-language support in coming updates. Modular design has been employed in creating the project so that other pilgrimage points would be easy to incorporate in later updates. Doing this, we aim to bridge the gap between past devotion and present technology while preserving history and presenting it to the world in an interesting, meaningful way [4].

Keywords: Virtual Reality, Indian Pilgrimage, 360-degree tour, Unity, VR Application

1. Introduction

Pilgrimage has been an Indian tradition, bringing people together spiritually with sacred sites across India. But not everyone can go there because of physical, economic, or time limitations. Technology can step in during such situations and bridge the gap. In this paper, a mobile application, Virtual Visit to Indian Pilgrimages, is proposed that will provide users with a virtual tour of religious sites in India through 360-degree panoramic images and easy, intuitive controls [2][3][5]. The app was developed with Unity Engine and can be played in VR mode as well as normal mode. Gaze-based interaction is one of the major features of the app, through which users can visit temples such as Ambadevi in Amravati without the use of buttons or touch input [4]. Background sound effects, short info guides, and future plans for QR-based guided tours add to the experience.

To make the app accessible to all age groups, the interface has been kept minimal and simple. Multi-language support will also be added in future releases. The application is developed in modular style and thus it is simple to extend to include other temples and pilgrimage centers in the future. For ensuring smooth operation even when there is abundant amount of media content, methods such as asset bundling and image compression have been adopted while developing the application [1]. Virtual tourism is becoming increasingly relevant to the world today, and this project is trying to bring spiritual experiences within reach of people who cannot physically travel at all times [5]. It can also be used in schools, tourism centers, and by anyone who is interested in experiencing the religious heritage of India in an experiential and interactive way [2][3]. This application is not just a technological application but also a cultural heritage platform, enabling the younger generation to remain connected to India’s rich religious heritage. Its integration potential with VR features, digital narratives, and temple databases makes it a promising platform for development. It can be redeveloped to present festivals, rituals, and traditional arts, further enhancing the user’s knowledge of Indian spiritual life and making it a multi-dimensional tool for education and devotional purposes.

1.1 Background and Motivation

India possesses a rich pilgrim tradition of millions of people along with their religious and cultural heritage. Pilgrim centers and temples are not only religious icons but also great social, historic, and emotional milestones. Pilgrimages—long and exhausting at times—have been made by people for centuries to these sacred sites and prayed for peace, blessings, or fulfillment. But in the fast life today, no one can take leave or spend money to travel long distances within the country for spiritual reasons. Physical limitations like age, sickness, or financial problems discourage people to travel to these sacred sites. In such a case, technology comes in to bridge the time, space, and access gaps. With growing development in immersive media and virtual reality, it is now feasible to reproduce real-life experience virtually, and individuals can see places that they cannot physically travel to. In this paper, a

mobile application named Virtual Visit to Indian Pilgrimages is proposed with the aim of bringing Indian temples to users' fingertips in the form of an immersive virtual experience. Utilizing 360-degree panoramic images and simple, easy-to-use interfaces, the application seeks to make spiritual and cultural discovery more accessible independent of geographical location or physical mobility [2][3][5].

1.2 Implementation and Features

The mobile application has been developed on the Unity Engine, which is a powerful and feature-rich development platform that supports both 2D as well as 3D content. The USP of the application is the app compatibility in two modes—standard screen mode and Virtual Reality (VR) mode—that provides flexibility according to the choice of the user and the devices available. One of the strongest features of the application is the feature of gaze-based interaction, regardless of the input devices of buttons or touchscreens. This is extremely helpful for elderly users or users who are not accustomed to touchscreen smartphones of the current era. Gaze control provides freedom to the users to simply look at certain objects or hotspots of the virtual world to trigger action or transition to new scenes. This gesture-based free approach to interaction contributes to the immersive and user-friendly nature. In the present version of the app, the user is able to virtually travel to Ambadevi Temple in Amravati and enjoy the spiritual atmosphere through realistic graphics and realistic sound effects. Background sound effects are used to imitate the on-location spiritual atmosphere, and short information guides are presented at relevant moments to inform users regarding the significance and history of the temple. In the future, the app is also set to be utilized for QR-guided pilgrimages, wherein the users scan codes at the pilgrim spots or printed guides and go straight to specific locations of pilgrimage within the virtual landscape [4].

1.3 User Accessibility and Scalability

So that the users of all age groups and backgrounds can use the app easily, its design has been made intentionally to be clean, simple, and uncluttered. The whole of the app, including menus and navigation cues, has been made simple. This makes it suitable for elderly users, students, and those who may not be familiar with mobile technology. Furthermore, multi-language support is part of the application's future road-map, so that users from different linguistic backgrounds can access information in their preferred language, making the spiritual experience more personal and inclusive. Developmentally, the app has been structured in a modular way such that new temples or pilgrimage centers can be easily inserted in subsequent versions without having to reform the entire thing. This allows for the app to grow over time and expand on its spiritual site database. To optimize performance and ensure smooth operation even when dealing with rich media content such as high-resolution images and audio files, efficient techniques like asset bundling and image compression have been used. These methods help keep the app lightweight and responsive, even on devices with lower hardware capabilities [1].

1.4 Applications and Future Potential

In the modern, digitally interconnected world, virtual tourism is becoming a compelling substitute for physical travel. As people become increasingly aware of the environmental footprint, cost, and time required for travel, digital means of visiting the world are becoming increasingly popular. The Virtual Visit to Indian Pilgrimages app takes this phenomenon to the domain of spiritual and cultural tourism. It allows users to delve into the spiritual heritage of India in a fun and meaningful manner without having to step out of their home. People with disabilities or medical conditions can benefit from this type of digital solution for making spiritual connections. The application's potential use-cases go beyond individual exploration. It can be implemented in schools, where it can be utilized to educate students on Indian temples, mythology, and cultural history using interactive narratives. Tourism offices and pilgrimage offices can also utilize the app to provide a glimpse of what tourists will experience or to act as an alternative during off-season or limited access periods. The app can even be used by the Indian diaspora abroad who want to connect with their religious heritage. Ultimately, this project is about bridging tradition and innovation—conserving cultural values while bringing them within reach through contemporary digital mediums [2][3][5].

2. Methodology

Development of Virtual Visit to Indian Pilgrimages application followed a user-focused and module-based development approach. On a deeper level, the objective was to ensure usability, engagement, and extensibility without sacrificing the lighthearted nature of experience on devices. The approach involved thorough planning, world creation, coding, optimization, and the addition of VR-compatible features. User needs, particularly concerning spiritual experiences, availability of technology for the elderly age groups, and linguistic inclusion, were determined through research. The method was to combine the visual and auditory elements of temples to recreate a complete pilgrimage setting.

2.1 Requirement Analysis and Conceptual Design

The problem statement was the starting step that entailed defining the scope of the project. The essential objective was to provide a new way for people to feel and experience spiritual and cultural destinations in a virtual mode, specifically to those individuals facing mobility, expense, or time constraints. A comparative study of user expectations, prevalent technologies, and existing virtual tourism experiences in the Indian scenario was done. This contributed to the development of the overall concept of the app and led to the incorporation of 360-degree panoramic views and VR support. Research on simplicity of UI, religious site relevance, and age-friendliness was also part of conceptualization. User flow and appearance visual planning was achieved via wireframing and mood boards.

2.2 Application Architecture and Module Planning

The application was created with a modular setup so that it could be flexible and scalable. Every religious site was implemented as a separate scene or module in Unity so that new content could easily be added or replaced in the future updates. The fundamental modules were the 360° viewer, gaze interaction handler, background audio manager, and language controller. The design adapted to an MVC-inspired structure in order to break away from logic, data handling, and UI presentation. The modular planning also allowed for the reuse of assets and scripts as well as reducing development time. The app uses both VR and non-VR navigation modes and used logic switching to support the different input devices without compromising on performance or usability.

2.3 Development Tools and Technologies

The game was developed mainly with Unity Engine because of its robust VR support, support for mobile deployment, and fast 3D rendering. C# was used to write the scripts controlling the gaze interaction, scene transition, and displaying dynamic content. Android was selected as the target platform because of its popularity in India. Asset bundling methods were utilized to handle and load the large media files effectively without burdening device memory. Furthermore, image compression tools were utilized to minimize APK size and ensure performance on devices. Audio editing tools were utilized to incorporate ambient temple sound effects to further immerse the player.

2.4 Gaze-Based Interaction and User Experience

One of the standout features of the app is using gaze-based interaction, with elements being able to be turned on or to move between different views by focusing only on pre-selected hotspots. This negates the necessity of physical touch or button inputs and makes the app more usable, particularly when it comes to using VR mode. A reticle-based approach provides gaze time tracking and also a visual confirmation to enhance precision. The UX design focused on minimalism in order to reduce cognitive load and to make the app accessible to all people regardless of age group. Specially selected colors, fonts, and placement of buttons were made for cultural aesthetics as well as legibility.

2.5 Testing, Optimization and Future Expansion

The final phase was thorough performance and user interface testing. Several Android devices were used to test for frame rate, loading time, and responsiveness. Bug tracking and unit testing ensured all the features were working fine. Optimization techniques such as occlusion culling, asset streaming, and memory management were used to reduce lag and prevent application crashes. Test-user feedback resulted in the addition of background guides and also proposed the addition of QR-based navigation for possible future releases. The app's modularity makes it an easy task to add additional temples, support multiple languages, and even real-time coverage of festivals, positioning it as a solid foundation for ongoing development.

3. System Architecture

The "Virtual Visit to Indian Pilgrimages" app has been specially designed to provide a cross-platform, interactive experience for both traditional mobile users and sophisticated VR players. The framework is built using modular modules so that it can easily transition between interaction modalities, touch and gaze, based on the capability of the device used by the user. This flexibility enables the application to function flawlessly on diverse Android platforms, from low-end smartphones to VR-enabled headsets, with homogeneous performance and user engagement. The usability-centric design prioritizes scalability and local immersion through the integration of natural navigation patterns, multimedia features, and area-based audio description. The following figure depicts the internal flow from application startup to user activity, showing how system elements communicate in an adaptive and dynamic manner. To ensure smooth user interaction, the architecture integrates both front-end and back-end elements that function cohesively. Core application features are encapsulated within Unity's scene management and XR plugin framework, which detects device capabilities in real time to determine whether VR mode should be enabled.

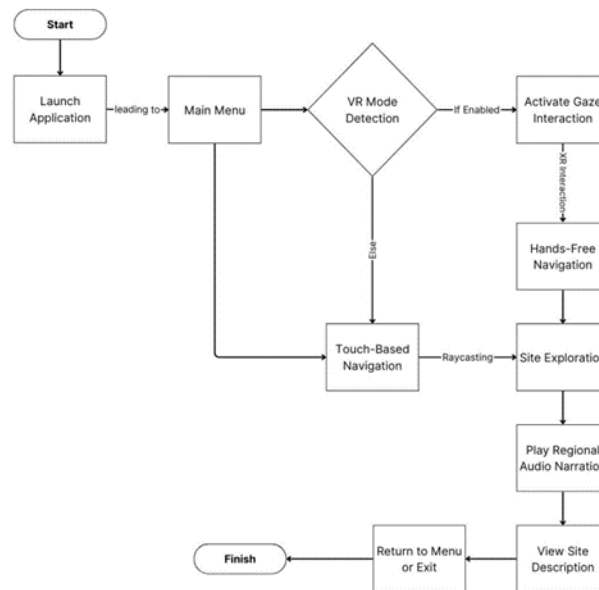


Fig 1: Working of Virtual Visit Application

As mentioned in Fig 1, the system begins with application startup and guides the user to the main menu. Depending on the device capabilities or user preference, the VR mode is enabled or skipped. When VR is enabled, gaze-based, hands-free interaction is initiated. Otherwise, a touch-based navigation system enables standard users to interact through raycasting. Irrespective of the interaction mode, users can navigate sites via an orientation-based experience involving local audio narration and text description. The sequence ends with a choice of returning to the menu or leaving the app, affirming a loop-friendly, user-orientated architecture.

4. Results

The "Virtual Visit to Indian Pilgrimages" app has shown extremely effective performance on various parameters such as consistency of performance, ease of use, accessibility, and user engagement. In testing on a range of Android devices from low-end smartphones with minimal GPU support to high-end VR devices such as Google Cardboard-compatible viewers—the app showed consistent frame rate and quick scene changes, indicative of the efficiency of its modular design. The smooth switching between touch and gaze navigation guaranteed accessibility to users based on the device specifications. Low-end smartphones were supported by raycasting that used low texture resolution, enabling light use without compromising visual quality, while VR-capable devices enjoyed full panoramic experience and natural gaze control. Such flexibility not only strengthened cross device compatibility but also validated the effectiveness of app optimization approaches in reaching a larger user base.

User interaction analysis also underscored the system's intuitiveness and decreased learning curve. Learners without any previous experience with virtual reality learned to operate the application easily within minutes, aided by well-labelled hotspots, easy-to-use menus, and auto-sound triggers on entering key zones. The interaction of gaze, in specific, was smooth and responsive, and users were delighted over the hands-free experience mimicking a fully immersive tour. Feedback also confirmed that the integration of regional audio narrations significantly helped in affecting the emotional attachment of users. Through the presentation of historical and cultural background through a storytelling model, the app managed to span the gap between digital simulation and physical pilgrimage. Even without physical movement or haptic feedback, users were reported as feeling "present" at the location, with descriptions of the experience as calming, informative, and even spiritual.

From the perspective of system flow, real-time mode detection and dynamic UI adaptation remained consistent throughout sessions. The process from application launch to investigation and egress followed a smooth and unobstructed path, as illustrated in the system architecture. The VR mode started the gaze triggers immediately to be activated, whereas the touch mode provided accuracy through raycast-based input with visual feedback. In long-term usage environments, memory management within the Unity platform was still effective, avoiding crashes and ensuring application stability. As a whole, results confirm that the app is not just a prototype but indeed an extensible solution whose ability to add more pilgrimage destinations and augmented capabilities can be enhanced without degrading performance or usability. Synthesis of technology and culture within this virtual experience has immense potential for enhancing digital heritage tourism in India.

5. Conclusion

The "Virtual Visit to Indian Pilgrimages" app is a gigantic leap in integration of virtual technology and cultural preservation. With the offering of both VR and non-VR touch modes, the app is accessible across all Android devices with a very broad range of low-end phones to high-end headsets, making the religious experience accessible to everyone. This flexibility not only opens up access to sacred Indian heritage to everyone but also caters to those

who cannot travel because of physical, geographical, or economic limitations. The intuitive controls, local audio guides, and natural patterns of interaction make the application engaging and enlightening and leave a deep feeling of connection to the visited locations.

Essentially, the application is not a technology product alone—but a cultural bridge transferring customary traditions into the virtual sphere. The positive feedback witnessed during the testing underscores the success of its intuitive design and multimedia-fostered immersion. The modular design also allows the system to be highly scalable and upgradable so that new features could be incorporated without affecting the fundamental user experience. By being supportive of initiatives such as "Azadi ka Amrit Mahotsav" and the government initiatives towards digital tourism, the application ensures real-time usage and wide acceptance.

Lastly, this project provides a vision-based solution for the issues of cultural tourism in the present. It maintains heritage, provides spiritual consciousness, and enhances transmission of education through a future-proof, interactive, and open interface. With continuous development, incorporation of AI elements, support for multiple languages, and potential integration with national portals, this app can become a pillar of India's digital pilgrimage program, making its spiritual heritage and keeping it accessible for decades to come.

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