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## A Geo-Intelligent Mobile App for Enhancing Tourism in Pandharpur

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#### ABSTRACT:

Pandharpur, a revered pilgrimage hub in Maharashtra, India, draws a vast number of visitors annually, primarily to the sacred Vithoba temple. Despite its spiritual appeal, tourists often face challenges such as navigating the town, handling dense crowds, and accessing timely and relevant information. To address these issues, this study presents a mobile application built with geo-location intelligence, aimed at improving the travel experience for pilgrims and visitors alike. The app combines GPS-enabled navigation, real-time updates on crowd density, multilingual content, and insights into local culture and heritage. Designed with ease of use in mind, the application encourages informed and responsible tourism while also fostering economic opportunities for the local community. This paper explores the app's architecture, implementation process, and anticipated impact on tourism management in Pandharpur.

Keywords: Crowd management, Cultural tourism, Geo-intelligent app, GPS navigation, Pandharpur, Religious tourism.

#### 1. Introduction

Efficient teacher record management plays a vital role in strengthening educational governance. Traditional approaches, which rely heavily on paperbased systems, often suffer from issues such as data inaccuracy, difficulty in updating records, and the risk of physical damage or loss. With the rise of digital technologies, institutions are now shifting toward more reliable and accessible systems that automate administrative workflows. The Intelligent Teacher Records and Rating Portal emerges as a forward-thinking solution to these persistent challenges. Designed as an all-in-one digital platform, the portal enables institutions to maintain detailed teacher profiles, implement real-time updates, and incorporate a feedback mechanism that empowers stakeholders to participate in performance reviews. Through its web-enabled framework, the system promotes transparency, streamlines operations, and facilitates evidence-based decisions to drive educational quality and accountability. Pandharpur, a historic town in Maharashtra, India, holds deep religious significance and is renowned for the Vithoba temple, which draws large crowds of devotees, particularly during the Ashadhi Ekadashi pilgrimage. As a focal point of spiritual tourism, the town welcomes millions of visitors each year. However, the influx of tourists presents logistical challenges such as poor wayfinding options, congested public spaces, and a lack of timely, reliable information for travelers. In response to these concerns, the development of digital tools, particularly those utilizing geographic technologies, presents an opportunity to improve the visitor experience. With the advent of smart tourism, mobile applications that integrate GIS functionality can offer tailored, real-time assistance to travelers.

The mobile application proposed in this study is designed to enhance the experience of pilgrims and tourists in Pandharpur. Key features include GPSbased route guidance, multilingual audio tours, real-time crowd notifications, and contextual cultural content. The app is built to accommodate a wide range of users by incorporating both live and offline modes to ensure functionality even in areas with limited connectivity. This paper details the conceptualization, structure, and implementation of the application, highlighting its potential to not only improve travel efficiency but also support cultural preservation and community engagement [1,2,5].

#### 2. Review of Literature

The conceptualization of a geo-intelligent mobile application for Pandharpur builds upon extensive research in religious tourism, GIS technologies, and mobile-based service delivery. This review summarizes eight relevant studies, offering insights into the design, purpose, and potential impact of digital tools tailored for pilgrimage destinations, with specific emphasis on navigation assistance, cultural immersion, sustainable crowd control, and information accessibility.

**S. Shinde et al. (2015)** introduced a basic Android application designed to aid visitors in navigating Pandharpur and locating key religious landmarks. While the app was instrumental in providing foundational location-based services, it lacked real-time functionalities such as live crowd updates and route optimization. This highlights the need for a more sophisticated system capable of addressing contemporary expectations, especially during peak pilgrimage seasons [1].

**K. Shinde (2020)** analyzed spatial behavior in Indian pilgrimage contexts, noting how unregulated visitor flows often lead to overcrowding. The study underscores the utility of GIS and digital tools in improving space utilization and managing foot traffic effectively—principles that directly inform the development goals of the proposed application for Pandharpur [2].

Nyaupane et al. (2015) investigated how religious tourists engage with cultural heritage sites. The research pointed out the role of context-sensitive content—such as historical background and multilingual support—in fostering a deeper connection between the visitor and the destination. These insights are reflected in the proposed app's inclusion of audio guides and multilingual features [3].

**V. Sati (2018)** explored how pilgrimage destinations in environmentally sensitive areas are affected by surges in tourist numbers. The study proposed the use of technology for real-time capacity tracking and intelligent routing to minimize ecological impact. The crowd-monitoring and route management capabilities of the proposed app are built on this very idea of environmentally conscious tourism planning [4].

Hassan et al. (2022) documented the successful implementation of the Eatmarna mobile application for Umrah pilgrims. Features like live density tracking, ritual guidance, and health notifications were found to significantly improve pilgrim safety and satisfaction. These functionalities inspired the inclusion of real-time alerts and spiritual navigation in the proposed app for Pandharpur [5].

Yadav et al. (2020) examined the ecological toll of mass pilgrimages on the Chandrabhaga River in Pandharpur. The findings emphasized the urgent need for digital solutions that support better people movement and environmental stewardship. The app's focus on optimized navigation and crowd distribution aligns well with such sustainability goals [6].

**Guldeokar & Sonule (2020)** reviewed tourism at Shegaon, another spiritual hub in Maharashtra. Their work noted gaps in tourist information delivery and infrastructure, recommending mobile technologies to bridge these divides. Similar recommendations have been adapted for Pandharpur's context, where the app will serve as a platform to not only guide pilgrims but also connect them with local businesses and services [7].

Kunwar & Adhikari (2022) evaluated pilgrimage tourism in rural Nepal and highlighted how mobile applications can significantly enhance visitor experience by delivering local insights and navigation support. Their emphasis on offline functionality and rich cultural content is especially relevant to Pandharpur, where internet access may be inconsistent and visitors span a broad demographic [8].

#### 3. Methodology

The geo-intelligent app for Pandharpur is built with a modular design to ensure scalability and accessibility. It includes the following key components: Front-End: Developed in Kotlin using Android Studio, featuring interactive maps, audio guides, crowd alerts, and multilingual support (Marathi, Hindi, English).

Back-End: Powered by Firebase for secure data handling, real-time updates, geolocation services, and user management.

APIs and Services:

Google Maps SDK for GPS navigation and routing.

Position Stack API for offline geocoding.

Firebase Authentication for secure logins via Google/Facebook.

Database: NoSQL database stores user data, POIs, and offline content for fast access in low-network areas.

Crowd Management: Uses real-time data from authorities to issue crowd density alerts and suggest alternate routes.

The architecture supports both online and offline modes, ensuring a smooth experience for all users, especially during peak pilgrimage seasons.

#### **Result and Discussion**

Figure 1 showcases the primary user interface of the mobile application, providing a glimpse into the overall design, layout, and ease of navigation for users. This includes screens such as the home page, map interface, and cultural content display.

Figure 2 offers a detailed breakdown of the app's core features, such as GPS-based navigation, audio-guided tours, multilingual options, and real-time crowd updates. It emphasizes the interactive and user-friendly nature of the system.



Fig. 1 App Screenshots



#### Fig. 2 App Detailing

Figure 3 presents the section of the app dedicated to general helpline information, including contacts for tourism assistance, local authorities, and lostand-found services.

Figure 4 highlights the app's medical emergency support system, displaying quick-access contact details for nearby hospitals, ambulances, and emergency health services, crucial for ensuring pilgrim safety during peak crowd periods.



Fig. 3 Helpline details





#### 5. Conclusion

The proposed geo-intelligent mobile application aims to enhance the travel experience in Pandharpur, with a special focus on pilgrims and tourists. By leveraging GPS-based navigation, real-time alerts, and culturally contextual content, the app helps mitigate common challenges such as overcrowding, navigation difficulties, and limited access to relevant information. Offline access and multilingual support broaden its usability among diverse user groups, including those less familiar with digital platforms. Additionally, safety and crowd management tools support smoother operations during high footfall periods. The solution also offers economic and cultural benefits by promoting local businesses and preserving heritage. Future enhancements, including AI integration and local service tie-ins, are expected to further reinforce its impact on sustainable and smart tourism.

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