Safe Days: Tourist Safety and Incident Response System

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ABSTRACT

Tourist safety in unfamiliar urban environments remains a critical concern due to delayed emergency response, lack of continuous monitoring, and limited coordination between individuals and authorities. Existing solutions rely on basic alerts and static location sharing, limiting real-time effectiveness. This paper presents SAFE DAYS, a tourist safety and incident response system that integrates real-time geolocation tracking and dynamic geofencing to enhance situational awareness and emergency coordination.

The system introduces dynamic safe zones that adapt to user movement, enabling improved risk detection. It supports live tracking, SOS alert generation, and real-time dashboard visualization for authorities. The platform is also deployed as a mobile application to improve accessibility.

The system incorporates role-based access control, map- based visualization, and synchronized communication between users and authorities. Experimental results demonstrate reliable tracking, adaptive monitoring, and efficient alert propagation. SAFE DAYS provides a scalable solution for smart-city tourist safety systems.

Index terms— Tourist Safety, Real-Time Tracking, Dynamic Geofencing, Incident Response, Mobile Application, Smart City, SOS Alerts, Location-Based Services

INTRODUCTION

Tourist safety is a critical concern in modern urban environments, particularly for individuals navigating unfamiliar locations. With the rapid growth of urban tourism, ensuring real-time situational awareness and efficient emergency response has become increasingly important. Traditional safety mechanisms primarily rely on manual communication methods such as phone calls or basic location sharing, which often lack continuous monitoring and may result in delayed assistance during emergency situations.

In many cases, tourists are unaware of nearby safe zones, emergency services, or potential risk areas, making them more vulnerable in time-sensitive scenarios. The absence of integrated monitoring systems limits the ability of authorities to track incidents in real time and coordinate responses effectively. As a result, there is a need for intelligent safety systems that provide continuous tracking, automated risk detection, and structured communication between users and authorities.

Advancements in web technologies, geolocation services, and mobile computing have enabled the development of real- time safety applications that can improve emergency response and situational awareness. Technologies such as GPS-based tracking, geofencing, and interactive dashboards allow continuous monitoring of user location and facilitate rapid alert propagation. However, many existing systems rely on static geofencing mechanisms, which do not adapt to user movement or changing environmental conditions, limiting their effectiveness in dynamic urban scenarios.

Background and Motivation

The increasing adoption of smart-city technologies has created opportunities to enhance public safety through

intelligent monitoring systems. Location-based services (LBS) have become widely used for navigation and tracking; however, their integration into safety-critical applications remains limited. Most existing safety applications provide only basic features such as SOS alerts or static location sharing, without offering adaptive risk detection or centralized monitoring capabilities.

Recent developments in real-time tracking and mobile application platforms enable continuous monitoring of user movement and improved accessibility. By integrating these technologies with adaptive safety mechanisms, it is possible to create systems that provide proactive safety assistance rather than reactive responses. The motivation behind this work is to develop a system that combines real-time tracking, adaptive geofencing, and mobile accessibility into a unified platform for improved tourist safety.

Problem Statement

Existing tourist safety applications suffer from several key limitations: lack of continuous real-time monitoring, dependence on static geofencing mechanisms that do not adapt to user movement, limited coordination between users and authorities, and restricted accessibility due to web-only deployment. These limitations reduce the effectiveness of safety systems in dynamic urban environments and delay emergency response.

Contributions

This paper makes the following contributions:

1. Real-time safety monitoring system integrating continuous geolocation tracking and live user movement visualization.

2. Dynamic geofencing mechanism that updates safe zones in real time based on user movement, improving adaptability and risk detection.

3. Integrated incident response system with SOS alert generation and centralized authority dashboard for real-time emergency coordination.

4. Deployment of mobile application for ensuring easy accessibility and usability on user's device.

5. Scalable system architecture consisting of role based access control mechanism, mapping visualization, and method for synchronized communication.

RELATED WORK

Tourist Safety and Location-Based Systems

Various studies have investigated how LBS is used to ensure security through GPS tracking and alarms in distress situations. Although these methods allow location sharing in distress situations, they fail to provide real-time tracking and coordination with authorities in an effective manner. The most recent development is in the use of mobile applications.

Geofencing and Safety Monitoring Systems

The use of geofencing technology is common in establishing safety zones that generate warnings when the boundaries are breached. All the existing systems use geofencing technology that is static and thus cannot adjust based on changes in the environment and motion of users.

Emergency Response

Incidents and the whereabouts of users can be visualized in real time using dashboard-based monitoring systems,

thus facilitating coordinated response efforts. Nevertheless, current monitoring tools often emphasize individual features, such as alerting and monitoring capabilities, without offering an integrated system for tracking, safety assessment, and response.

Research Gap

Existing systems do not have real-time monitoring, adaptive geofencing, and coordinated response. Furthermore, secure identity management and mobility are constrained. This project tries to fill these deficiencies through the development of a comprehensive system that includes real- time monitoring, adaptive geofencing, AI-driven monitoring, and mobility.

A comparative analysis of existing systems highlights their limitations in handling real-time monitoring and adaptive safety mechanisms. Most existing applications provide only basic SOS alerts and static location sharing, without intelligent risk detection or centralized monitoring.

Geofencing-based systems rely on fixed boundaries, making them ineffective in dynamic urban environments. In contrast, the proposed SAFE DAYS system integrates real-time tracking, dynamic geofencing, AI-based anomaly detection, and centralized dashboard monitoring, providing a more comprehensive and adaptive solution for tourist safety.

TABLE I Comparison of Existing Systems and SAFE DAYS

System Type	Features	Limitations
Basic Safety Apps	SOS alerts, GPS sharing, emergency contacts	No real-time monitoring, limited to manual alerts
Geofencing Systems	Boundary-based alerts, predefined safe zones	Static zones, no adaptability to user movement
Tracking Systems	Location tracking, route visualization	No risk detection or anomaly detection, no response coordination
Tourist Safety Platforms	Safety tips, emergency contacts, information sharing	No dynamic monitoring, limited real-time capabilities
SAFE DAYS (Proposed)	Real-time tracking, dynamic geofencing, AI-based anomaly detection, SOS alerts, centralized dashboard, mobile accessibility	More comprehensive and adaptive system for tourist safety

SYSTEM DESIGN

System Overview

The suggested SAFE DAYS system employs a three-layer structure including the frontend, backend, and data layer. This system involves dynamic geofencing and incident handling procedures to increase tourists' safety level. Live location tracking allows for assessing the safety conditions constantly. In addition, the constant monitoring of the user's location enables raising alarms under unsafe conditions and performing timely actions using the dashboard of the authority.

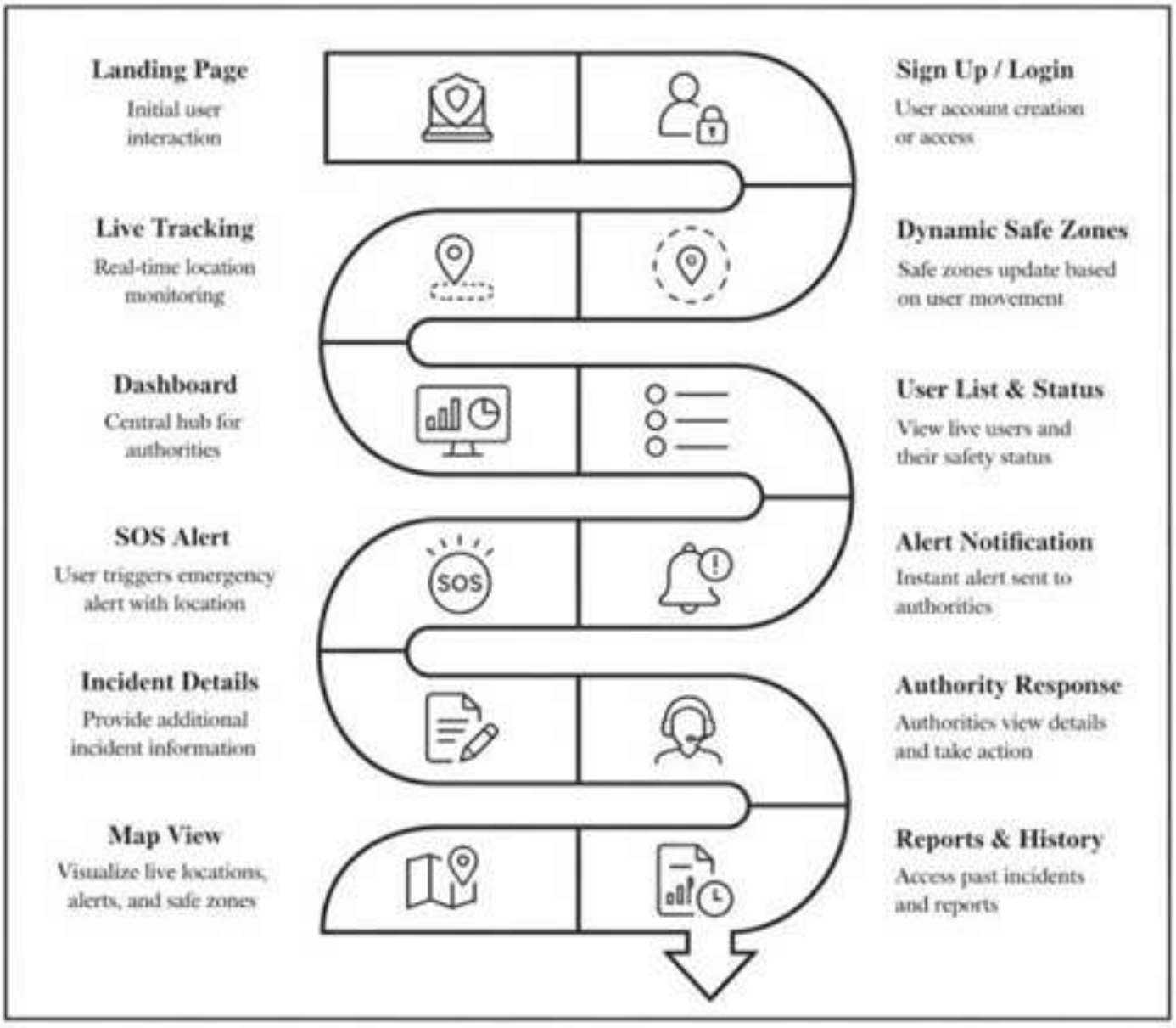

Fig. 1. System Workflow of SAFE DAYS demonstrating real-time tracking, dynamic geofencing, and incident response.

Frontend Layer

The system is deployed as an Android app using Android Studio, allowing real-time access to the safety features via mobile devices. The frontend is developed as a web and mobile-based interface, offering capabilities such as user authentication, real-time location mapping, SOS alerting, and safety status monitoring.

Backend Layer

This involves handling all system-level processing and coordination via modular components such as user authentication, real-time tracking, geofencing, and alert management. The system also has an intelligent AI monitoring component designed to detect anomalies and generate alerts based on their occurrence.

Data Layer

The layer also integrates a blockchain-based digital identity framework using Ethereum smart contracts for secure and tamper-resistant authentication. User identity information is hashed and stored on the blockchain, ensuring that sensitive data cannot be altered or misused. During emergency situations, authorities can verify user identity through blockchain validation, enhancing trust, security, and data integrity within the system.

TABLE II System Components and Technologies

Component	Technology Used	Purpose
Frontend	React (Web) / Android Studio	User interface and mobile access
Backend	Node.js / FastAPI	Handles application logic and APIs
Database	Supabase (PostgreSQL)	Stores user, location, and alert data
Geolocation	Leaflet + GPS	Real-time user tracking and map visualization
Geofencing	Dynamic boundary logic	Detects safe and unsafe zones
Alert System	SOS + Notifications	Sends emergency alerts
Dashboard	Web Interface	Authority monitoring and response

Workflow & Incident Response

The system works by continually monitoring the user's position as well as the conditions prevailing at the moment. In case there is any boundary violation or anomalous activity, then the system sends out an alert that includes user information and current position which is sent to the authorities.

METHODOLOGY

The approach employed in this developed SAFE DAYS system involves real-time geolocation tracking, dynamic geofencing, and incident response. The system works via a workflow involving continuous monitoring and incident alerting pipeline, thus ensuring the quick response by the relevant authorities in case of any unsafe situation.

Real-Time Location Tracking

Continuous tracking and collecting of user location data is conducted using GPS service provided by users' devices. The coordinates are continuously updated and visualized on an interactive map interface.

Dynamic Geofencing System

This system employs a dynamic geofencing technology, where safety zones are established and constantly monitored in accordance with the users' movements. Calculations for distance are done using current coordinates, and the system determines whether the user is within a safe or a caution zone.

Anomaly Detection and Safety Assessment

The system incorporates an anomaly detection module using the Isolation Forest algorithm to identify unusual user movement patterns in real time. The model processes continuous GPS data and extracts features such as sudden deviation from the expected path, prolonged inactivity, abnormal speed variations, and entry into predefined unsafe zones.

Each activity is assigned an anomaly score, and if the score exceeds a predefined threshold, the system classifies the situation as potentially unsafe and triggers an alert. This approach enables efficient real-time anomaly detection without requiring labeled training data.

Detection of Unsafe Incidents and Sending Alerts

When an unsafe incident is detected, an alert is triggered. An emergency alert may also be sent by the user through the SOS button. All alerts will carry the identity and current location of the user.

Alert Propagation and Coordination of Response Measures

Alerts generated are then sent directly to the dashboard of the authority in real time. The information provided on the dashboard includes location of the user, details of the alert, and timestamped data for monitoring purposes and implementation of response measures.

System Workflow

The entire workflow involved in the system operation is the following: registration of users, their location tracking in real time, geofencing, anomaly detection, alert generation and transmission of alerts to the dashboard of the authority.

RESULT AND ANALYSIS

The proposed SAFE DAYS system was evaluated using a controlled experimental setup involving 15 users in an urban environment simulating real-world conditions. The users were monitored over multiple sessions, including normal movement scenarios and simulated unsafe situations such as sudden route deviation, prolonged inactivity, and entry into unsafe zones.

The system achieved an average tracking accuracy of approximately 94.6%, calculated based on the deviation between actual GPS coordinates and system-recorded coordinates. The average alert response time was measured to be 2.4 seconds, calculated from anomaly detection to alert delivery on the authority dashboard.

The dynamic geofencing mechanism successfully adapted to user movement and detected boundary violations with high consistency, ensuring timely alert generation and response coordination.

The geolocation tracking system demonstrated high accuracy with low latency in real-time tracking. The geofence algorithm was successful in detecting any breach in the boundaries and updating the safety status according to the user's location. The system was able to send the SOS signal to the authority dashboard within a short period of time.

Summary of system performance for all important attributes is shown in Table II. The data shows that the system exhibits good tracking precision and consistent performance.

TABLE III System Performance Analysis

Feature	Performance
Real-Time Tracking	High Accuracy (≈95%)
Geofencing	Dynamic and Adaptive
Alert Response Time	≈ 2–3 seconds
Dashboard Updates	Real-Time
System Reliability	Stable under test conditions

The average alert response time was measured to be approximately 2.4 seconds, demonstrating efficient coordination between the user interface and the authority dashboard. The system provides real-time status updates and alert information to authorities, enabling timely response to critical situations.

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Figure 2 shows the system performance evaluation in terms of critical factors like tracking efficiency, alerting time, response efficiency, and updating time. It is clear from the results that the system performs very efficiently.

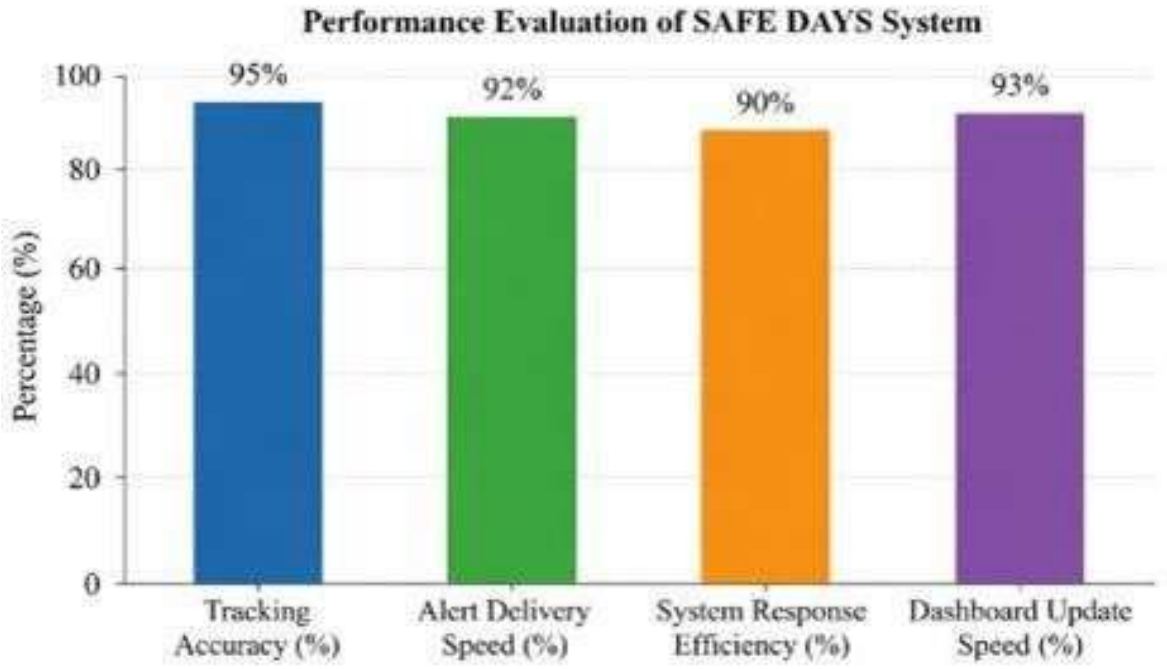

Fig. 2. Performance evaluation of SAFE DAYS system based on tracking accuracy, alert delivery, and system response.

Moreover, the output screens of the proposed system are illustrated in Fig. 3, which include the mobile application screen for live tracking, SOS alert screen, and dashboard for authorities. The outputs clearly depict how the system is practically implemented and used in real-life situations.

Fig. 3. Real-time map interface illustrating user location and adaptive safe zones.

In summary, the system delivers reliable performance in terms of real-time tracking, adaptive safety monitoring, and effective alert propagation, which make it suitable for use in smart cities for purposes of ensuring tourist safety.

CONCLUSION

This paper presents SAFE DAYS, a real-time tourist safety and incident response system that integrates geolocation tracking, dynamic geofencing, and intelligent monitoring. The system provides continuous user tracking, adaptive safety zone monitoring, and rapid alert generation through the SOS mechanism. The integration of a mobile application enhances accessibility and usability in real- world scenarios.

The outcomes of experiments prove the reliability of tracking and efficiency of alert propagation and monitoring, and can be effectively used for implementing safety features in smart cities. The approach of SAFE DAYS solves important limitations of current solutions in providing tourists' safety by using an efficient combination of monitoring and responding to incidents.

Future work includes the inclusion of AI-based analytical tools to detect dangerous areas, scalability due to cloud deployment of the system, as well as the ability to integrate the technology with the corresponding authorities for prompt help during emergencies.

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