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Crime Alert System

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Abstract*— The Crime Alert System is an Android-based application developed to improve public safety by allowing users to instantly report crimes and emergencies. It enables users to send alerts with location details to nearby police stations and registered contacts through an SOS feature. The system also stores reported incidents securely in a cloud database for further investigation. By integrating Java, Firebase, and location services, this project ensures quick response, efficient data management, and better coordination between citizens and law enforce.

Keywords*— Android, Crime Alert System, Public Safety, Firebase, GPS, SOS Alert.

I. INTRODUCTION

Public safety remains one of the most critical concerns in today's society. The advancement of mobile and cloud technologies presents new opportunities for developing efficient and responsive crime reporting systems. The Crime Alert System is an Android-based mobile application developed to bridge the gap between citizens and law enforcement authorities. It provides a fast, secure, and user-friendly interface through which users can report crimes, emergencies, or suspicious activities directly from their smartphones. The SOS feature allows individuals in distress to transmit their live location to nearby police stations and registered emergency contacts. Additionally, users can upload multimedia evidence such as photos, videos, and text descriptions to provide valuable context for investigations. All information is securely stored in the Firebase cloud database, ensuring both privacy and accessibility for authorized personnel. Through the integration of Java, GPS, and Firebase, the system aims to improve real-time emergency response and foster a safer, more connected community.

A. Objective of the Project

The primary objective of the Crime Alert System is to design and develop an interactive Android-based mobile application that enhances public safety by facilitating fast, reliable, and efficient communication between citizens and law enforcement authorities during emergencies. This project aims to empower individuals to take immediate action in critical situations while enabling authorities to respond promptly and effectively.

The system allows users to send SOS alerts that automatically share their real-time location with nearby police stations and registered emergency contacts. Additionally, it enables citizens to report crimes, suspicious activities, or accidents by submitting detailed information such as images, textual descriptions, and timestamps. All collected data is securely stored and managed in a Firebase cloud database, ensuring both data integrity and accessibility for authorized personnel.

Furthermore, the project focuses on improving the responsiveness of police operations and enhancing community awareness by establishing a reliable digital link between the public and law enforcement. Through the integration of Android, Java, Firebase, and GPS technologies, the system provides a comprehensive, technology-driven solution for real-time emergency response and crime reporting. used to format your paper.

B. Scope of the Project

The Crime Alert System aims to provide an efficient, accessible, and technology-driven platform that enhances public safety and facilitates effective crime reporting. The project's scope extends to both citizens and law enforcement authorities, ensuring that information related to crimes or emergencies can be exchanged instantly and accurately.

This application allows users to report crimes, accidents, or suspicious activities in real time through their smartphones. With the help of GPS-based location tracking, users can share their exact position, enabling nearby police stations to take quick action. The system also integrates a panic/SOS button, allowing individuals to alert authorities and trusted contacts during emergencies with just one click.

For law enforcement, the system provides access to a centralized Firebase cloud database, where all crime reports are securely stored and managed. This ensures efficient monitoring, record-keeping, and data analysis for future reference.

The project has potential future scope in integrating AI and machine learning for crime prediction, data analytics for hotspot mapping, and multi-language support for broader accessibility, making it a comprehensive public safety tool.

II. LITERATURE REVIEW

A. Related Work.

Several crime alert and reporting systems have been developed in recent years to enhance public safety through technology. Most existing systems focus on enabling citizens to report crimes or emergencies quickly and share information with law enforcement agencies. Some mobile applications use GPS to track user location and send alerts to nearby police stations or registered emergency contacts.

Earlier systems like "Online Crime Reporting Portal" and "Emergency SOS Applications" allowed users to manually file complaints or send distress messages. However, these systems lacked real-time location tracking, automated alert generation, and integration with cloud databases for centralized crime data management.

Recent research has explored the use of Android applications, Firebase databases, and Google Maps APIs for real-time communication and location-based crime detection. Some projects also incorporated Machine Learning algorithms to predict crime-prone areas by analyzing past data. Despite these improvements, many existing systems still suffer from limited automation, delayed response time, and poor user interface design.

The proposed Crime Alert System overcomes these limitations by integrating real-time crime reporting, SOS emergency alerts, and automatic location detection. It provides a user-friendly mobile platform that connects citizens directly with nearby police stations and trusted contacts, ensuring faster and more efficient responses during emergencies.

B. Limitations of existing systems.

Existing crime alert and reporting systems have several limitations that reduce their effectiveness in ensuring public safety. Most applications depend on manual reporting, which delays communication between victims and law enforcement authorities. Many systems also lack real-time location tracking, preventing immediate identification of the user's exact position during emergencies.

Additionally, current platforms often do not support instant notifications to nearby police stations or emergency contacts, resulting in delayed assistance. The absence of cloud-based storage limits data accessibility and scalability. Furthermore, there is minimal use of data analytics or machine learning for crime prediction and pattern analysis. These limitations highlight the need for a more advanced and integrated Crime Alert System that enables faster reporting, real-time monitoring, and improved coordination between users and police authorities

III. SYSTEM DESIGN AND METHODOLOGY

The Crime Alert System is designed to enable quick, reliable, and secure communication between citizens and law enforcement authorities during emergencies. The system follows a client–server architecture, where the Android mobile application acts as the client and communicates with the Firebase cloud server for real-time data exchange.

A. System Architecture

The overall system architecture consists of three major components:

1. User Module (Citizen): Allows users to register, log in, report crimes, and send SOS alerts. When the SOS button is activated, the user's live GPS coordinates are automatically captured and transmitted to the Firebase cloud along with the alert message.
2. Police Module: Provides law enforcement officials access to all active crime reports and SOS alerts. They can verify incidents, track victims' locations, and update response statuses in real time.
3. Admin Module: Manages the system's users, monitors reports, and ensures data consistency. The admin can verify police

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accounts and maintain the overall integrity of the platform.

B. Data Flow and Communication

The system uses the Firebase Realtime Database to synchronize data between the client and the server. When a user submits a crime report or triggers an SOS alert, the data is immediately stored in Firebase and simultaneously broadcast to the relevant authorities. Firebase Cloud Messaging (FCM) is used to deliver instant push notifications to police stations and emergency contacts, ensuring that alerts reach responders within seconds.

C. Location and Mapping Services

The system integrates Google Maps API and Location Services API to enable precise location detection and visualization. Users' latitude and longitude values are captured using GPS sensors and displayed on a map interface within the application. Police officials can use this feature to track real-time positions of victims and nearby incidents.

D. Database Design

The database is structured using Firebase's JSON format, which ensures hierarchical and real-time data access. Major entities include *User*, *CrimeReport*, *PoliceStation*, and *Alert (SOS)*. Relationships between these entities are maintained through unique user and report IDs, ensuring secure data linkage and integrity. Firebase Authentication manages user logins, while Firebase Storage securely stores multimedia evidence such as photos and videos.

E. Working Principle

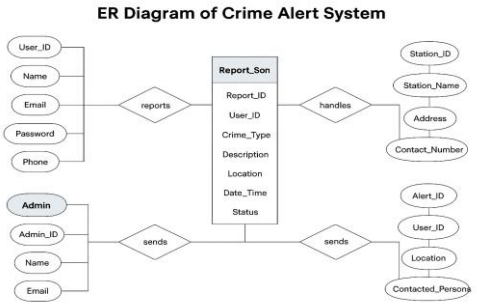
The workflow of the system is as follows:
The user registers and logs in to the application.
In case of an emergency, the user presses the SOS button, triggering automatic GPS location capture.

The data is transmitted to Firebase and relayed to the nearest police station and registered contacts.

Police view the alert on their dashboard and take immediate action.

The system stores all reports and responses for future reference and analysis.

The modular and cloud-based design ensures scalability, reliability, and low latency, making the Crime Alert System a robust solution for real-time crime reporting and emergency management.



IV. SYSTEM IMPLEMENTATION AND RESULTS

A. System Implementation

The Crime Alert System was implemented as a modular Android application to ensure scalability, security, and efficient emergency communication. The major functional modules include:

1. User Authentication Module: provides secure registration and login using Firebase Authentication. Users can manage their profiles, reset passwords, and access system features based on verified credentials.
2. SOS Alert Module: Enables one-tap SOS activation that automatically captures the user's GPS location and sends instant notifications to nearby police stations and emergency contacts using Firebase Cloud Messaging (FCM). Live location sharing supports continuous tracking.
3. Crime Reporting Module: Allows users to report incidents by submitting descriptions, images, videos, and GPS-tagged locations. All reports are uploaded to Firebase Realtime Database and Firebase Storage for secure retrieval by authorities.

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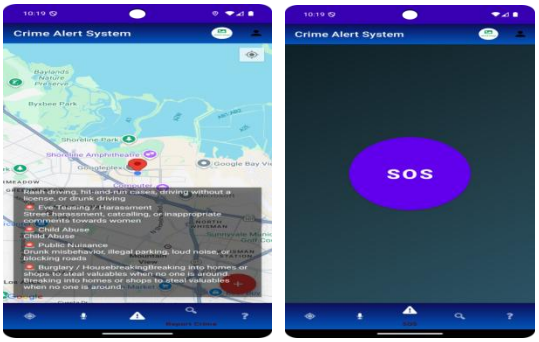
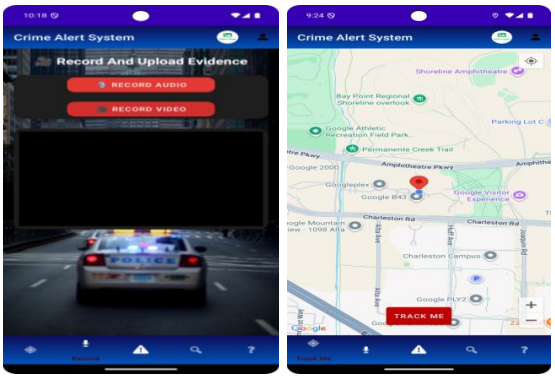


4. Police Management Module: Provides police officials with real-time access to SOS alerts and reported crimes. Officers can verify cases, track user locations through Google Maps, and update incident status (Pending, In Progress, Resolved).
5. Notification and Alert Module: Handles all system notifications, including SOS alerts, crime updates, and nearby threat broadcasts using FCM to ensure instant communication.
6. Map and Location Module: Integrates Google Maps API and Location Services to obtain accurate GPS coordinates, visualize incidents, and identify nearby police stations.
7. Technologies Used: Java, XML, Android Studio, Firebase Authentication, Firebase Realtime Database, Firebase Storage, Firebase Cloud Messaging, Google Maps API, and Google Location Services API.
8. System Requirements: Android smartphone (Android 8.0+), Internet and GPS access, Android Studio with Java JDK, Firebase Console, and Google Cloud API key



B. Results

The system was tested for performance, reliability, and usability under real-world conditions. Key results include:

- Fast Response: SOS alerts and notifications were delivered within 2–3 seconds, ensuring rapid communication during emergencies.
- Accurate Tracking: GPS location accuracy ranged between 3–10 meters, enabling precise victim tracking and quick police response.
- Stable Operation: Firebase ensured real-time synchronization without data loss, even under network fluctuations.
- User Feedback: Test users reported smooth navigation, intuitive UI, and minimal steps required to submit reports or trigger SOS alerts.
- Scalability: The cloud-based architecture allowed simultaneous handling of multiple alerts and reports without performance degradation.

The implementation successfully demonstrated that the Crime Alert System can significantly improve public safety through real-time communication, accurate location tracking, and reliable cloud-based data management.

V. CONCLUSION AND FUTURE WORK

The Crime Alert System was developed to enhance public safety by providing a fast, reliable, and user-friendly platform for reporting crimes and requesting help during emergencies. The integration of Firebase Realtime Database, Google Maps API, and Location Services enables real-time communication between users and law enforcement authorities. Through features such as SOS alerts, crime reporting, and live GPS tracking, the system ensures timely response and reduces delays commonly seen in traditional reporting methods. Testing demonstrated stable performance, accurate location detection, and minimal response time. Firebase Authentication ensured secure access, while cloud-based storage provided efficient data management. Overall, the system effectively bridges the communication gap between citizens and authorities and serves as a practical digital tool for improving community safety. The project also provided significant learning experiences in Android development, API integration, and real-time database management.

Future Work

Although the system meets its core objectives, several enhancements can further improve functionality, intelligence, and scalability:

- Offline Reporting: Allow users to record incidents without internet connectivity and sync data automatically when online.
- Authority Integration: Connect directly with police department systems to enable instant verification and faster response times.
- AI-Based Crime Prediction: Use machine learning to analyze crime patterns, identify high-risk zones, and provide safety recommendations.
- Multilingual Support: Add multiple languages to make the application more inclusive.
- Enhanced Security: Implement two-factor authentication, stronger encryption, and improved data privacy mechanisms.
- Advanced Notifications: Provide SMS, voice call alerts, and high-priority push notifications to ensure emergency messages reach recipients quickly.
- Analytics Dashboard: Enable administrators to monitor trends, visualize crime data, and generate reports.
- Wearable Integration: Connect the system with smartwatches or IoT devices to allow instant SOS activation.

The Crime Alert System has strong potential to evolve into a comprehensive public safety platform by incorporating advanced technologies and expanding multi-device compatibility.

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