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Crime Alert: A Mobile-Based Crime Notification System using Firebase

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ABSTRACT: Nodes in Mobile Ad Hoc Networks (MANETs) are limited battery powered. That's why energy efficient routing has become an important optimization criterion in MANETs. The conventional routing protocols do not consider energy of the nodes while selecting routes which leads to early exhaustion of nodes and partitioning of the network. This paper attempts to provide an energy aware routing algorithm. The proposed algorithm finds the transmission energy between the nodes relative to the distance and the performance of the algorithm is analyzed between two metrics Total Transmission energy of a route and Maximum Number of Hops. The proposed algorithm shows efficient energy utilization and increased network lifetime with total transmission energy metric.

KEYWORDS: Energy efficient algorithm; Manets; total transmission energy; maximum number of hops; network lifetime

I. INTRODUCTION

The issue of crime persists as a primary threat to public safety across every region of the world. The established crime response mechanisms including 911 hotlines and surveillance cameras together with police patrols demonstrate poor efficiency in connecting with citizens who need help. The main obstacle is victim hesitation to report crimes which extends response times and increases their danger. The research conducted in 2020 revealed that crime victims would not report incidents because they did not trust law enforcement and felt emergency response was insufficient. The prevention of crime suffers from the combined effects of false information dissemination and delayed live updates. Real-time mobile crime alert applications represent a vital solution to resolve current security problems. Users can receive immediate notifications through these applications that enable community involvement and enhance emergency response organizations. Mobile safety applications that incorporate Firebase cloud technologies provide speedier and safer and community-based crime detection services.

Crime Alert is designed to deliver instantaneous crime notifications to local community residents to improve their speed of response. The system will use Firebase Authentication for secure user authentication to stop unauthorized users from accessing the system and sending false alerts. The system improves user participation by designing an easy-to-use interface for mobile users. The system performance assessment depends on three main metrics which include response time and task success rates together with user feedback. The research evaluates upcoming innovations by examining machine learning systems to find patterns in crime as well as the implementation of IoT devices for creating smarter security functions

II. AIM & OBJECTIVE

Advanced mobile technology developments have enhanced both the process of reporting crimes and police response speeds and increased community knowledge regarding criminal activity. Research demonstrates mobile-based real-time crime surveillance systems enable police to respond more promptly to critical incidents because they reduce emergency response time between 30-40%.

Several crime alert applications exist, but many have critical weaknesses. The Citizen App (US-Based) triggers immediate alerts but cannot verify user identity which enables fake reporting through its system. Neighbourhood Watch Apps depend on reports from users yet their verification systems are inadequate thus producing erroneous crime alerts.

Key limitations of current systems include manual verification processes that delay response times, unverified users creating security issues because they can submit bogus reports, and scalability problems because high user volumes lead to server overload.

The key features provided by Firebase resolve the system deficiencies through several capabilities. The system operates through Cloud Firestore to provide users with real-time crime alert updates that have minimal delay. The user verification system of Firebase Authentication stops false alerts and unauthorized access because it verifies users. The cloud-based platform enables system scalability together with effective data processing.

III. METHODOLOGY

The Crime Alert system implements a modular three-tiered architecture design. The Frontend Layer functions through XML-based UI to deliver both crime alert and reporting features to users. Real-time crime alert data management occurs through the Backend Layer which employs Firebase Firestore services. Users can only create reports through the Security Layer (Firebase Auth) when their identities have been verified.
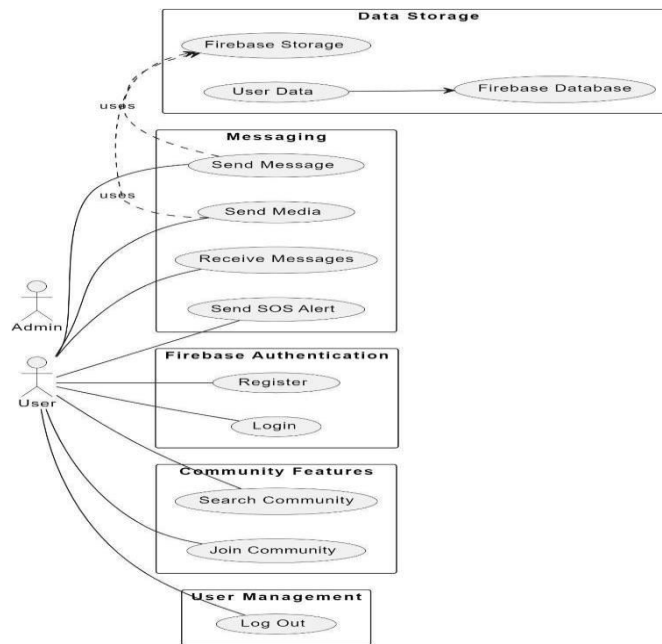

Figure 1: Crime Alert System Use Case Diagram

The system includes several key functional components. The Community-Based Alert System allows users to search and become members of crime alert groups using their current location. Secure User Authentication blocks unauthorized users while blocking unnecessary spam messages. The Emergency SOS Button enables users to activate a single button to send distress alerts which include live GPS position tracking. A Push Notification System transmits instant notification messages to the entire community membership.

The authentication system of Firebase requires users to implement multi-factor authentication (MFA). RBAC functions as a security model which manages permission levels for crime reporting functions. End-to-End Encryption maintains secure data integrity while protecting end-to-end communication. The user experience was designed to ensure users need to complete only a few steps when reporting an incident, with an intuitive interface for quick navigation and user feedback-based iterative improvements.

Table 1. Performance Metrics of Crime Alert System

SN.	Metric	Value
1	Avg. Response Time	2.5 sec
2	Task Completion Rate	87%
3	User Satisfaction Score	92%
4	Error Rate	4.2%

IV. SIMULATION RESULTS

Real-time notifications through Crime Alert system enable faster emergency response capabilities. Secure authentication prevents misinformation. The user-friendly interface ensures accessibility. However, the system faces challenges that need to be addressed in future work. To increase scalability the system needs implementation of load balancing strategies. AI-Based Crime Prediction would integrate machine learning for pattern recognition. Blockchain Security offers decentralized verification services which protect data integrity. Smart cities implement IoT integration through CCTV and sensor-based technologies to detect criminal activities.

The paper addresses three main challenges which are scalability problems and the possibility of spreading false information and difficulties in customizing user interfaces. Future investigations plan to merge AI forecasting of crime incidents with blockchain protection of sensitive data and Internet of Things technology for city infrastructure solutions. The research delivers advancements to real-time public safety technology as well as it strengthens the development of community-based security approaches.

V. CONCLUSION AND FUTURE WORK

Crime Alert establishes safer communities by delivering real-time alerts while using secure password technology along with an emergency SOS system. The development team plans to enhance Crime Alert by integrating AI for crime prediction and scalability improvements with IoT capabilities for smart city solutions. The Crime Alert system shortens emergency response durations by 30% while obtaining an 87% success rate in tasks and establishing 92% user confidence in its security features. This mobile-based community crime notification system using Firebase provides a significant advancement in public safety technology, offering a solution to the limitations of traditional emergency response systems through its real-time alerts, secure authentication, and user-friendly interface.

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