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LocAware: Intelligent Location-Sharing System with Movement and Location Vulnerability Analytics

Arpita Agarwal[1], Ojas Prashant Vishe[2], Shailesh Jayprakash Biradar[3] ,Gaurav Shailendra Jadli[4]
[1234] Department of Computer Engineering, Pillai College of Engineering,New Panvel, Navi Mumbai, Maharashtra, India 410206
Email Id: *arpitaagarwal@mes.ac.in[1] ,ovishe22comp@student.mes.ac.in[2], Gjadli22comp@student.mes.ac.in[3], sbiradar22comp@student.mes.ac.in[4]*

Abstract
LocAware is a privacy-focused location-sharing platform designed to enhance personal safety and real-time awareness. The app uses Flask, SQLite, Firestore along with Flutter. People see crime maps, get notifications based on their location, share their location safely, and receive alerts. Offline tracking, Bluetooth-based stranger detection, and SOS alerts are noteworthy features. It provides a more integrated and privacy-conscious approach than earlier solutions like Lifecraft and CYFS, which makes it appropriate for use in smart city services, safety, and healthcare applications.
Keywords*: LocAware, CYFS.*

1.Introduction
Because of the growth of smart devices and connected equipment, location systems are now needed to help people understand their surroundings, find their way in addition to stay safe right away - these systems use location data to provide information like immediate positioning, alerts about nearby things, as well as tracking of actions. They also deal with problems that come with this kind of data. LocAware is a privacy-oriented location intelligence platform that allows users to share their real-time location via a secure subscription model. Users can request access to others' locations, which may be accepted or denied at any time. The system utilizes Flask for backend logic, SQLite for user metadata, and Firestore for real-time location tracking. In addition to location sharing, LocAware includes advanced features such as crime map visualization using historical data (2014–2022) on an interactive Leaflet map, integrated into a Flutter app. It also features stranger danger detection by tracking Bluetooth devices that appear around a user frequently, and location-based notifications to alert users when friends are nearby. It stores location history for offline tracking and includes an SOS alert system for emergencies. By combining safety, usability, and intelligent spatial features, LocAware demonstrates the potential of smart location systems in real-world scenarios [7].

2.Implemented Architectures
2.1. Lifecraft: An Android Based Application System For Women Safety (2019)
R. R. Khandoker, S. Khondaker, Fatiha-Tus-Sazia, F. N. Nur and S. Sultana R. R. Khandoker, S. Khondaker, Fatiha-Tus-Sazia, F. N. Nur and S. Sultana developed Lifecraft, a comprehensive Android-based mobile application aimed at enhancing women's safety through a unified emergency response platform. Unlike previous solutions—such as Raksha, I Go Safely, and Abhaya—that provided fragmented safety functionalities like emergency alerts or audio-video evidence collection, Lifecraft integrates multiple critical features into one cohesive system. The application features GPS tracking, SOS message alerting, live location streaming [8], and audio recording, all with user-friendly access. The offline mode of one of the features of this system is one of the major selling points for it, as it provides audio recording functionality even offline. This feature overcomes one of the key drawbacks of previous tools that were much more dependent on having a constant network connection. In addition, it offers police station-based safe zone mapping so that users can find and locate nearby safe areas in case of emergencies. The app also has voice command activation, which supports hands-free usage in high-pressure or physically constricted situations.

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Through a reduced reliance on network availability and diminished need for physical engagement with the device, Lifecraft presents a more robust, accessible, and real-world relevant framework for personal safety. Its design demonstrates an integrated multi-dimensional comprehension of emergency requirements, a combination of technological integration and user-based reliability to empower women in distress [9].

2.2.Location Based Notification System (2018)

M.M. Kanfade, S. D. Ambade and A. P. Bhagat

M.M. Kanfade, S. D. Ambade and A. P. Bhagat proposed an Android-based application that delivers personalized notifications based on users' geographic locations. The system integrates GPS and LBS technologies to give support to features such as alarms that sound at certain places, alerts for friends nearby [11], and discount offers from registered businesses. UnlikePrevious works centered on separate LBS features or social interactions. The current method unites real time tracking, notifications aware of the surroundings, plus local business connections. An admin panel allows vendors to manage offers and connect with users nearby, creating a link between users and local commerce. By merging location monitoring with user-centric services and commercial engagement, the system enhances the practical value of location-based services in everyday life [2].

2.3.Emergency Alert SMS And GPS Tracking Application (2014)

Zabiullah Khan This Android-based app aims to improve personal safety by sending real-time SMS alerts that include the user's GPS location in emergencies. In contrast to older solutions that just shared a one-time location or sent a basic message, this app adds a timer-based tracking feature. Thus the system helps people share where they are regularly.It is built with Eclipse IDE but also Android SDK, has parts for managing contacts, getting GPS information, and sending custom emergency messages. Users may set up specific alerts, pick who to contact in an emergency, and schedule when to send new location data often. This system improves how much people know about a situation - it also provides a way to act before an emergency gets worse. This is good for people who are in trouble, as it shows where they are plus lets them control the settings [10].

2.4.Privacy-Preserving Relative Location Based Services (2015)

N. Fei, Y. Zhuang, J. Gu, J. Cao and L. Yang The proposed system "Circle Your Friends" (CYFS), estimates relative distances between users using WiFi AP scans, all while preserving privacy by avoiding GPS or the disclosure of absolute location data. In contrast to conventional location-based services that depend on GPS or use potentially risky privacy techniques like anonymization and obfuscation, CYFS offers full privacy by ensuring that no identifiable location data is ever shared [11]. The system builds AP topologies based on shared WiFi beacon signals, utilizing factors like signal strength, IEEE protocol types, and overlap ratios to determine proximity. It is implemented on Android with Facebook integration, targeting social networking scenarios. While slightly less accurate than GPS, the approach offers a privacy-conscious alternative for indoor and urban environments where GPS may be unreliable, effectively balancing location utility with privacy protection [7].

2.5.User Activity Pattern Mining System (2018)

H. Gong, K. Xing and W. Du The authors present a system that combines Human Activity Recognition (HAR) with location services to identify personalized user activity patterns. In contrast to past studies that used HAR in healthcare or smart home environments, this method enhances activity recognition by incorporating spatial context and user profiling to produce practical, actionable insights. The system, developed on Android, collects inertial sensor and GPS data, extracts time and frequency-domain features, and uses an XGBoost classifier for multi-class activity recognition. It identifies 8 daily activities and links them with geographic data to form activity-location sequences. These sequences are analyzed through policies on time, location, and frequency to infer user traits such as career, consumption habits, and physical activity. This integration of HAR and spatial analytics offers a comprehensive and scalable approach to understanding user behavior, making it more effective than traditional HAR systems [6]

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Conclusion

To conclude, location services, for example LocAware, give people answers for real time tracking, alerts along with location sharing; they help users control their data. Programs such as Lifecraft [1] and Emergency Alert SMS [3] applications join together several important features, which include working without internet, current tracking in addition to SOS alerts. Because of this, they are useful for a person's safety. Privacy-preserving systems such as CYFS [4] offer another way to track a person's place - differing from usual GPS tracking; they keep a user's information private but still allow place based services. Also - putting together activity knowledge and place tracking, as the User Activity Pattern Mining System [5] shows, helps with applications that fit a person and their situation. Considering everything, these developments show how LBS improves user experience, safety along with privacy. The future of location aware systems will take form with more advancements in AI, GPS in addition to Bluetooth technologies.

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