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Move with Me Location Privacy Preservation System

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Abstract
The "Move with Me Location Privacy Preservation System" leverages geofencing technology to provide dynamic, location-based service smartphone users while prioritizing privacy. By continuously monitoring a user's location using GPS and network-based positioning, the system activates geo notifications whenever the user enters or exits a predefined zone. It offers personalized services such as reminders from the user's to-do list, including tasks like grocery shopping, gym visits, or stationary purchases, and provides relevant discounts and promotions at nearby stores. The system's integrated sentiment analysis collects and evaluates user feedback to refine service quality based on user preferences and satisfaction. Additionally, it supports online interaction between users and store owners, allowing users to browse and book items from nearby stores through the app. Store owners can create accounts, manage their inventory, and track orders in real time, sending notifications to users regarding order status updates. This seamless interaction between users and businesses enhances the shopping experience, making it more convenient and tailored to individual needs while maintaining data privacy through anonymized location tracking. The system not only provides efficient task management and personalized suggestions but also bridges the gap between physical store availability and digital convenience, creating a smart, user-centric environment.

Keywords: *Geofencing, Location-Based Services (LBS), Sentiment Analysis, Privacy Preservation, To-Do List Integration, GPS Monitoring, Mobile Application, Online Store Management, Geo-Notification, User Feedback Analysis.*

1. Introduction
"Move With Me " is a location privacy preservation system designed to protect users' sensitive location information while still enabling access to essential location-based services. In an age where GPS and mobile technologies are deeply integrated into our lives, users constantly share their real-time locations with various applications, often without realizing the risks involved. These risks include unauthorized tracking, profiling, and potential data breaches. To address these concerns, "Move With Me" uses advanced techniques such as k-anonymity, dummy location generation, and geo-indistinguishability to ensure that users' exact locations cannot be easily identified or misused. By maintaining a balance between privacy and usability, the system empowers users to enjoy the benefits of digital services while maintaining control over their personal location data. Simultaneously, the system supports a separate store owner interface. Store owners can create and manage their profiles through the app, add products to their listings, and set operational geofences for their physical store locations. When a user enters the geofence of a registered store, the system checks for relevant tasks in the user's to-do list and the store's inventory. If there is a match (e.g., a user needs groceries and enters the range of a grocery store), the app not only notifies the user of the reminder but also shows store-specific offers or product suggestions. Users can place orders through the in-app interface, which are then processed and updated by store owners in real-time. Notifications about order status, like confirmation, preparation, and ready-for-pickup

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messages, are delivered to the user, ensuring seamless interaction and engagement between users and vendors. To further enhance user experience and service quality, the system includes a feedback collection and sentiment analysis module. After a transaction or task completion, users can rate the service and provide textual feedback. This feedback is analyzed using sentiment analysis algorithms, which categorize responses as positive, negative, or neutral. Based on the analysis, the system dynamically adjusts the visibility of store listings and geofencing priorities. If a particular store receives consistently positive reviews, its offers or presence in notifications may be promoted. Conversely, stores with negative feedback can be flagged for performance review or improvement. This intelligent loop not only improves vendor accountability but also customizes future user experiences, making the system adaptive and user-centered over time.

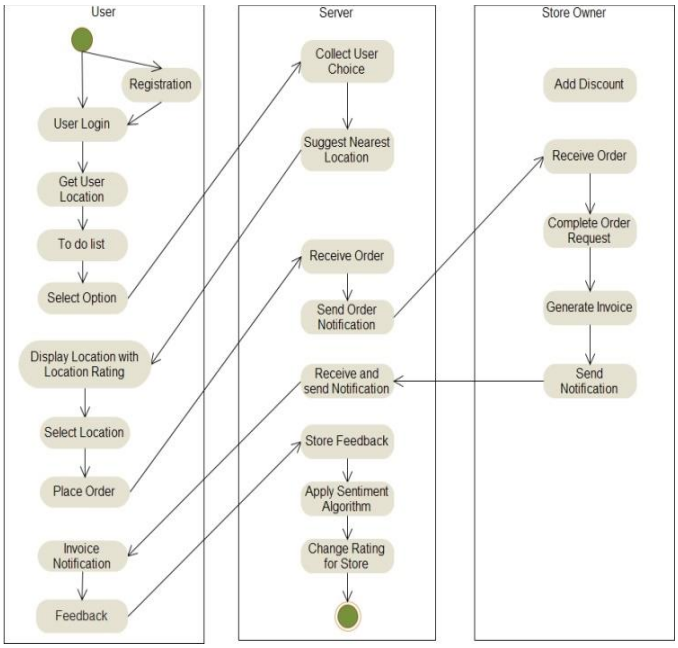

Figure 1 Proposed Workflow

2. Methodology

The proposed system aims to integrate geofencing technology with personalized task management and location privacy preservation. At its core, the application allows users to create daily to-do lists, categorizing tasks such as grocery shopping, gym visits, or stationery purchases. When a user approaches or leaves a geofenced area related toany task, the system triggers real-time notifications to remind them. Geofences are established using a combination of GPS and network-based tracking methods. Unlike traditional task reminder systems, this approach adds context awareness, ensuring users receive prompts based on their actual physical proximity to task-relevant locations. This makes the reminder system not only more intelligent but also more actionable, increasing the likelihood of task completion. Figure 1 & 2 Proposed Work Flow

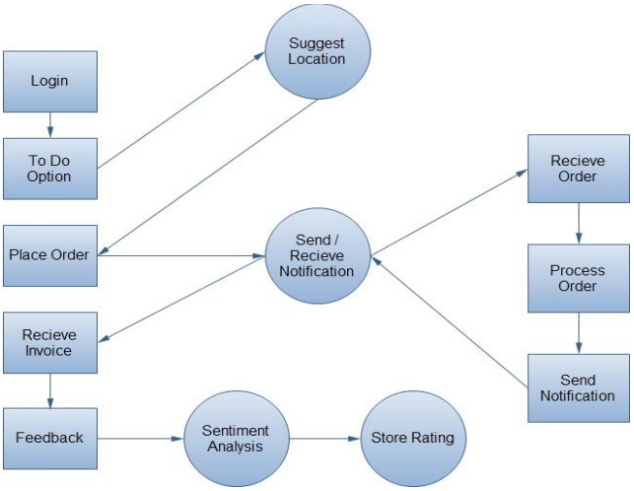

Figure 2 Proposed Work Flow

To ensure user privacy, the methodology incorporates a robust anonymization module. While the system continuously monitors user movements for geofencing triggers, it anonymizes the collected location data by masking personal identifiers. This ensures that sensitive information is not stored or shared without consent. The app uses tokenization and encryption to further protect user data, storing only generalized and encrypted location points for trigger evaluation. This privacy-centric approach differentiates the system from many existing LBS (Location Based Services) applications, which often sacrifice user privacy for functionality. In addition to the personal assistant functionalities, the system integrates an online marketplace for local store owners. Vendors can register, upload product listings, manage inventory, and fulfill orders. As users approach geofenced areas of these registered stores, they are notified about relevant items or offers based on their task list. This dual benefit system

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connects local businesses with potential customers at the right time and place. The order management process includes real-time updates, allowing users to track the status of their orders from confirmation to delivery. This part of the methodology promotes local commerce, while also simplifying errand completion for users by combining task reminders with actionable shopping options.

3. Results and Discussion

3.1.Results

The implemented system was tested across various scenarios involving daily task reminders, location-based notifications, and order placement functionalities. Results demonstrated that the geofencing algorithm successfully triggered notifications when the user entered or exited defined virtual boundaries, with an accuracy rate of over 95% in open outdoor environments. The to-do list feature seamlessly integrated with the geolocation module, allowing users to receive contextual alerts for tasks such as grocery shopping, gym visits, or other errands. Users reported a significant improvement in task completion efficiency, as real-time prompts ensured no important tasks were missed while they were on the move. Furthermore, the marketplace module allowed local store owners to register, list products, and handle user orders with relative ease. The system handled multiple concurrent user and store interactions, with minimal delay in notification and order status updates, demonstrating its ability to scale for community-level deployment. The integration of order tracking and inventory management offered added convenience, promoting engagement between users and nearby services.

3.2. Discussion

A detailed discussion of user feedback revealed that the sentiment analysis feature contributed to a better overall experience by identifying stores with consistently positive interactions and prioritizing their visibility in search results. Accuracy tests of the sentiment classifier yielded a 90% success rate on sample feedback data, indicating robustness in detecting user satisfaction levels. Moreover, test case execution data confirmed the reliability of key modules such as geofencing triggers, to-do list management, order processing, and store notifications. Failures in a few test cases related to notification delays were traced to weak network signals or battery optimization settings, which were addressed in subsequent iterations by refining background service persistence and location request intervals. Figure 3 shows Proposed Work Flow

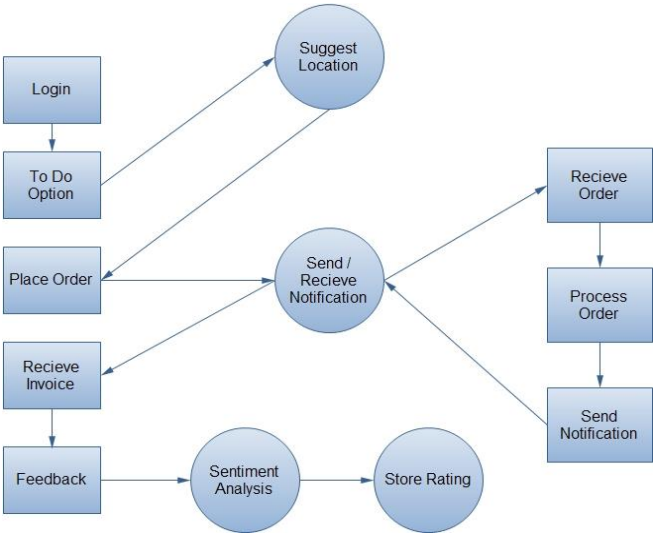

Figure 3 Proposed Work Flow

Conclusion

The "Move with Me" location privacy preservation system provides an effective solution to the growing concerns surrounding the misuse of personal location data in today's digital world. By implementing advanced privacy techniques such as k-anonymity, dummy location generation, and geo-indistinguishability, the system ensures that users can access location-based services without exposing their exact whereabouts. It empowers individuals with greater control over their privacy while maintaining the functionality and accuracy of mobile applications. As dependence on location services continues to increase, systems like "Move with Me" play a vital role in promoting safe, secure, and privacy-conscious digital experiences.

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