Filipino Street Food Locator: An Android-Based Real-Time   
Vendor Tracking App Using Haversine and Geo-Fencing Algorithms

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**Chapter One**

**INTRODUCTION**

* 1. **Background of the Study**

Street food culture holds a significant place in Filipino society, offering affordable, flavorful, and easily accessible snacks such as fishballs, kwek-kwek, isaw, taho, balut, and sorbetes. These mobile vendors typically operate with minimal starting capital and flexible mobility, moving between schools, markets, barangays, and public streets to reach consumers directly. Their presence has become a daily staple in both urban and rural communities, especially in densely populated areas where people seek quick, low-cost meals during work breaks, after school, or on the way home.

In recent years, mobile food vending in the Philippines has grown due to the rising demand for affordable, on-the-go meals. However, customers often struggle to locate these vendors as they frequently move based on foot traffic and time of day. With minimal capital required, street vendors thrive in public areas by maintaining cleanliness, affordable pricing, and customer satisfaction. This mobile street food culture has become a vital part of Filipino daily life, offering both livelihood opportunities and convenient meals for the public (Sabusap, 2025). Alongside this, the increasing use of smartphones and mobile internet now exceeding 70% penetration has made mobile apps essential tools for services like navigation, ride-hailing, and food delivery. This growing digital reliance presents an opportunity to modernize street food experiences through location-based, real-time vendor tracking systems.

Given these developments, the proposed Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms

aims to enhance how consumers discover and locate mobile street food vendors. The system will feature a dynamic, map-based interface powered by real-time GPS data, using the Haversine formula to calculate the distance between users and nearby vendors. Geo-fencing technology will send alerts when a vendor enters a user’s vicinity, while a crowd-sourced vendor pinning feature will allow customers to report vendor sightings, ensuring even vendors without smartphones can be tracked.

By combining real-time tracking, location-based services, and community-driven reporting, the system will improve convenience for consumers while increasing the visibility and customer reach of micro-entrepreneurs. Ultimately, it seeks to promote Filipino street food culture through digital innovation, providing a practical and culturally relevant solution for modern, mobile-connected communities.

* 1. **Statement of the Problem**

This study aims to address the following specific problems:

1. How can real-time GPS data and the Haversine formula be used to accurately calculate the distance between users and street food vendors?
2. In what ways can geo-fencing technology be implemented to notify users when a vendor enters a designated area?
3. How can a crowd-sourced vendor pinning feature help track vendors without mobile devices?

**1.3 Objective of the Study**

**1.3.1 General Objectives**

To develop an Android-based real-time street food vendor tracking application that improves the accessibility and visibility of mobile street food vendors for consumers through the integration of location-based services and community reporting features.

**1.3.2 Specific Objectives**

**1.3.2.1** To utilize real-time GPS data and the Haversine formula in accurately calculating the distance between users and nearby street food vendors.

**1.3.2.2** To implement geo-fencing technology that notifies users when a vendor enters predefined vicinity.

**1.3.2.3** To design a crowd-sourced vendor pinning feature that allows users to manually report and locate vendors without mobile devices.

**1.4 Significance of the Study**

This study is significant as it introduces a modern, technology-driven solution to address the recurring difficulty faced by consumers in locating mobile street food vendors. Through the development of an Android-based real-time vendor tracking application, the project aims to improve accessibility, convenience, and vendor visibility within the urban street food industry. The following groups are expected to benefit from this study:

**For Consumers:** The system will provide street food enthusiasts with a convenient, real-time platform to locate nearby mobile vendors, reducing the inconvenience of relying on chance encounters or word-of-mouth.

**For Street Food Vendors:** By increasing their visibility through location-based tracking and crowd-sourced vendor pinning, the application will help vendors expand their market reach, attract new customers, and enhance their income opportunities.

**For Mobile Application Developers:** This study will serve as a valuable reference for future developers seeking to design location-based applications integrating real-time tracking, distance calculation, and geo-fencing features.

**For Local Communities:** The system promotes community participation by allowing users to report vendor sightings, fostering collaboration and strengthening the local street food culture.

**For Future Researchers:** The findings of this study may serve as a foundation for future research on mobile-based tracking systems, vendor livelihood improvement strategies, and digital platforms supporting informal economies.

Ultimately, the study aims to provide a meaningful contribution to both the enhancement of local food accessibility and technological innovation. By addressing a common but often overlooked challenge in urban food culture through mobile-based location tracking technology, this project aspires to improve consumer convenience, support micro-entrepreneurship, and encourage further research in intelligent, community-based digital systems.

**1.5 Scope and Limitations**

**1.5.1 Scope**

This study focuses on the development of an Android-based real-time street food vendor tracking application specifically designed for use within the Divisoria area in Manila, Philippines. The system will utilize real-time GPS data and the Haversine formula to compute the distance between consumers and nearby mobile street food vendors. It will also implement geo-fencing technology to notify users when a vendor enters predefined vicinity and allow users to pin vendor sightings on a map through a crowd-sourced reporting feature. The study

is limited to developing the core functionalities of the application, including real-time tracking, distance computation, vendor pinning, and geo-fencing alerts within the covered location.

**1.5.2 Limitation**

The study is limited to the Divisoria area only and will not cover other locations outside its vicinity. Since the application relies on GPS availability and user-contributed vendor pinning, it may not guarantee complete vendor tracking coverage at all times. The system also depends on the willingness of users to participate in vendor reporting and on the presence of active mobile internet connections. Furthermore, vendors without smartphones can only be tracked through the crowd-sourced pinning feature, which may affect real-time accuracy in certain areas. Future expansions to other locations and enhancements to vendor participation are beyond the current scope of this study.

**1.6 Definition of Terms**

**Street Food Vendors -** Refers to mobile food sellers operating on streets, markets, or public spaces, offering affordable and ready-to-eat food items such as fishballs, kwek-kwek, isaw, taho, balut, and sorbetes.

**Android-Based Application –** Refers to a mobile software program specifically developed to run on Android operating systems, accessible through smartphones or other compatible devices.

**Real-Time GPS Tracking –** Refers to a technology that continuously determines and updates the exact geographic location of a device using the Global Positioning System (GPS) and transmits this data immediately to the application.

**Haversine Formula –** Refers to a mathematical formula used to calculate the shortest distance between two points on the surface of a sphere, commonly applied in mapping and distance measurement between GPS coordinates.

**Geo-Fencing –** Refers to a location-based technology that creates virtual boundaries around a specific geographic area and triggers alerts when a tracked device or vendor enters or exits the designated location.

**Vendor Pinning –** Refers to a feature that allows users to manually mark or report the real-time location of mobile street food vendors on the map interface within the application.

**Divisoria –** Refers to a busy commercial and marketplace area in Manila, Philippines, known for its high pedestrian traffic and numerous mobile street food vendors. This is the primary coverage area for the proposed application.

**Chapter Two**

**REVIEW OF RELATED LITERATURE**

**2.1 Related Literatures**

This area contains published journals, essays, and other relevant literature from both local and foreign literatures. Those in this section contribute in introducing the developers to connected and pertinent study subject matter.

**2.1.1 Local Literature**

**LalaCo: An Online Vending System for Street Food Vendors in the City**

In the study conducted by Santos, Badua, Callo, and Ferrer (2024) titled “*LalaCo: An Online Vending System for Street Food Vendors in the City*”, the authors developed a mobile application that connects street food vendors and customers in Metro Manila through a location-based vending system. The application demonstrated high usability with a System Usability Scale (SUS) score of 83.36, and offered accurate vendor location display and efficient navigation for users. Their research highlighted the potential of mobile platforms to support informal micro-entrepreneurs by improving their market reach and providing consumers with a reliable means of locating mobile food vendors.

This study reinforces the technical feasibility and cultural relevance of integrating mobile-based location services into urban street food systems. It directly supports the concept of the proposed project, “Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms”, by showing that vendor-consumer connection

through real-time maps is both practical and well-received in Filipino communities. Furthermore, the success of LalaCo’s system usability and vendor location accuracy emphasizes the importance of mobile-accessible, location-based services in addressing long-standing issues of vendor discoverability in high-foot-traffic areas like Divisoria.

**Location-Based Marketing Using Mobile Geofencing: Lessons Learned from a User-Centered Application Development Research**

In the study by Manuel B. Garcia (2022) titled “*Location-Based Marketing Using Mobile Geofencing: Lessons Learned from a User-Centered Application Development Research*”, the author presents a mobile application called PushMapp, developed to deliver real-time marketing notifications to users based on their location using geo-fencing technology. The primary purpose of the study is to explore the design, development, and evaluation of a mobile geofencing system in the Philippine context, with emphasis on usability, privacy, and effectiveness. This article is important as it demonstrates how geofencing can be successfully implemented in mobile applications to enhance user engagement insights that are directly applicable to the Filipino Street Food Locator project, which aims to notify users when they are near a street food vendor. Although the paper does not specifically mention the Haversine formula, the concept of monitoring user proximity to predefined zones strongly aligns with the core mechanisms of the proposed tracking app. The technologies used in developing PushMapp include Android Studio, Firebase, and Google Maps API, making it a relevant reference for implementing geofencing features in Android applications.

The study also highlights the significance of adopting a user-centered development approach, ensuring that the application is intuitive and effective for

real-world use. This aligns with the goals of the Filipino Street Food Locator, which must provide a seamless user experience while handling location data accurately. Furthermore, the paper discusses system responsiveness and privacy considerations, which are essential when dealing with continuous location tracking and vendor-user interactions. By applying similar development strategies and technologies, the proposed app can offer a reliable and privacy-conscious platform that promotes accessibility to local street food vendors in real time.

**Implementation of Geofencing for Monitoring People under Home Quarantine**

In the study by Dela Cruz, Ballado, Constantino, and Lee (2021) titled “*Implementation of Geofencing for Monitoring People under Home Quarantine*”, the researchers developed an Android-based system designed to monitor individuals under COVID-19 quarantine by using geo-fencing technology. The main purpose of the system was to create a virtual boundary around a user’s residence and automatically send alerts to authorities when the user exits the defined area. This application of geofencing is highly relevant to the project titled “Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms”, as both systems involve monitoring movement within a specific location using real-time GPS tracking. Although the study does not incorporate the Haversine formula, it effectively demonstrates how Android, location services, and boundary-triggered logic can be applied to ensure real-time movement detection, which is critical for location-based services like vendor tracking.

The system developed in their study emphasizes the importance of using mobile-based geofencing for public monitoring and safety, which parallels the

street food locator’s goal of enhancing user convenience through location-based alerts. By leveraging real-time GPS data, the researchers ensured that users’ movements were tracked accurately within the geofence, a feature that can be adapted to monitor the movement of mobile vendors or detect user proximity. The study also showcases the potential of Android systems in implementing automated notification triggers, a function essential for alerting users about nearby vendors. This local implementation reinforces the feasibility and practical value of geo-fencing technology within the Philippine setting, making it a strong reference for mobile tracking solutions.

**Geofencing Ads Boost Filipino Business**

In the 2024 article “Geofencing Ads Boost Filipino Business” published by RichestPH, Thim discusses how local businesses in the Philippines use GPS-powered geofencing to create virtual boundaries that activate real-time notifications when users enter specific areas. The purpose of the article is to emphasize how geofencing drives customer engagement and foot traffic, proving its growing value in mobile marketing within the country.

This is strongly related to the proposed study titled “Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms”, as both systems rely on location-triggered alerts to deliver relevant content to nearby users. Although the article focuses on commercial ads and doesn’t mention the Haversine formula, it highlights the practical success of using mobile GPS technology, smartphone sensors, and location-based services all of which are vital to the app’s implementation.

The study takes this further by integrating distance calculation algorithms to enhance accuracy and personalize the user experience. By applying geofencing

in the context of street food vending, the app aims to help users discover nearby vendors based on location awareness. This approach not only promotes local food culture but also supports micro-entrepreneurs through increased visibility. The use of real-time notifications and geospatial logic bridges technology and livelihood, showing how mobile apps can transform daily experiences.

**Real-Time Tracking and Monitoring System with Geofence Notification for Garbage Collection Vehicles**

In the 2024 study titled “*Real-Time Tracking and Monitoring System with Geofence Notification for Garbage Collection Vehicles*”, Emmanuel Antonio M. Alvarico, Fausto Antonio I. Arricivita, and Febus Reidj G. Cruz developed a system that uses real-time GPS tracking, Haversine distance computation, and geo-fencing algorithms to monitor the movement of garbage collection vehicles and notify residents when vehicles approach. The system was implemented using tools such as the ESP8266 NodeMCU microcontroller, SIM808 GPS/GSM module, Google Maps API, and geofencing-enabled SMS alerts, providing a dynamic and automated way to relay vehicle location data. The purpose of the study is to improve waste collection responsiveness and minimize resident uncertainty by offering timely and precise location-based notifications.

This work is strongly connected to the project “Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms”, which aims to alert users of nearby mobile vendors through a similar geo-aware and proximity-sensitive system. The importance of Alvarico, Arricivita, and Cruz’s work lies in its effective integration of geospatial distance logic (via Haversine) and boundary-triggered alerts (via geofencing), both of which serve as core algorithms for developing

user-friendly and real-time tracking applications. Their implementation demonstrates how combining location precision with automated triggers can enhance mobility, convenience, and smart urban services.

**2.1.2 Foreign Literature**

**Unlock the Power of Geofencing in Flutter Google Maps with Haversine Formula**

In the 2023, the article “*Unlock the Power of Geofencing in Flutter with Haversine Formula*”, Abdur Rehman demonstrates how to integrate geofencing and the Haversine distance calculation within a Flutter mobile app using the Google Maps package. The purpose of the tutorial is to show developers how to implement real-time location monitoring, define virtual circular boundaries (geofences), and trigger alerts when the user enters or exits the defined radius without relying on third-party geofencing packages. This directly aligns with the goals of Filipino Street Food Locator: An Android‑Based Real‑Time Vendor Tracking App Using Haversine and Geo‑Fencing Algorithms, as both systems rely on using geospatial calculations to deliver timely proximity notifications. Rehman’s use of Location and Google Maps APIs, combined with his implementation of the Haversine formula within Flutter, exemplifies a cross-platform approach for calculating precise distances and activating geofence-based logic.

The article’s step-by-step code snippets and focus on tool integration make it a practical model for adapting similar functionality in an Android-native app enhancing your vendor locator’s precision and responsiveness. In addition, Rehman addresses performance considerations such as reducing battery drain and optimizing location updates essential factors for mobile app efficiency. The

simplicity and effectiveness of the geofence system showcased in Flutter make it an ideal reference for developers seeking lightweight yet accurate location-based services. His approach also promotes modular development, allowing teams to customize trigger conditions and radius sizes depending on application needs. This adaptability is crucial for street vendor tracking, where dynamic radius and movement patterns may vary per urban location.

**Geo-Fencing and Overspeed Alert SMS System**

In their 2023 paper “*Geo‑Fencing and Overspeed Alert SMS System*”, Haneesha Perusomula, Vamsi Marriwada, Sai Krishna Vallepu, Karthikeya Sesham, Roshan Chowdary Gudapati, and Jyothiraditya Garikipati developed a system that utilizes GPS-based geo-fencing and speed monitoring to send real-time SMS alerts when vehicles enter or exit predefined geographic zones while exceeding speed limits. The system employs an ESP32 microcontroller, GPS modules, and the Blynk platform to create virtual boundaries and monitor movements continuously. Its purpose is to enhance road safety by providing automated, location-triggered alerts based on a vehicle’s position and behavior. Although the study is focused on transportation safety, it demonstrates the practical implementation of geo-fencing logic and location tracking, which are core features in the Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms. The technologies used in this study prove that microcontroller-based platforms can effectively handle geofence-related tasks, offering useful insights into alert systems and real-time location feedback.

Moreover, while the system does not implement the Haversine formula, it lays a strong groundwork for integrating geo-fencing with other spatial

calculations in mobile applications. This relevance lies in its ability to model how notifications can be sent when a mobile entity (such as a vendor) enters a specific area, mirroring the goal of the street food locator. By extending this concept into Android environments with Haversine-based proximity calculations, your app can improve user experience by providing hyper-localized, accurate alerts. The clear technical foundation and real-world implementation of this study make it a valuable foreign reference for building mobile tracking and notification systems.

**Geo-Fencing Location Tracking System using IOT and Lora LPWAN for Covid-19 Mandatory Self-Quarantine Monitoring**

In their December 2022 paper, “*Geo‑Fencing Location Tracking System Using IoT and LoRa LPWAN for COVID‑19 Mandatory Self‑Quarantine Monitoring*”, Adidzaini Syed Idris, Hasrul Malik, and Syahier F. Toha present a system designed to enforce quarantine compliance using geo-fencing combined with LoRa LPWAN IoT technology. The system continuously monitors individuals’ GPS coordinates through wearable or mobile devices, sending alerts when a user crosses the allowed perimeter. Though the paper primarily emphasizes quarantine enforcement, its core approach defining virtual geofences, tracking location via IoT networks, and triggering notifications is directly relevant to the Filipino Street Food Locator: An Android‑Based Real‑Time Vendor Tracking App Using Haversine and Geo‑Fencing Algorithms.

The study utilizes GPS modules, LoRa IoT devices, and a web dashboard for visualizing location data, demonstrating how low-power, long-range communications can underpin reliable boundary notifications. While the focus is on public health, the system’s architecture offers valuable insights into scalable,

real-time geofencing deployments that can be adapted for Android-based vendor tracking. Implementing similar logic locally with enhancements like Haversine distance calculations and mobile push notifications could make the proposed street food app not just viable but optimized for Filipino cities.

**Geofencing Technology in Monitoring of Geriatric Patients Suffering from Dementia and Alzheimer**

In their 2020 conference paper “*Geofencing Technology in Monitoring of Geriatric Patients Suffering from Dementia and Alzheimer*”, Ernes Randika Pratama, Faiza Renaldi, Fajri Rachmat Umbara, and Esmeralda Contessa Djamal proposed a location-based monitoring system using geo-fencing technology to ensure the safety of geriatric patients with cognitive impairments. The system utilizes GPS-equipped wearable devices, LoRa or GSM networks, and a remote monitoring dashboard to alert caregivers when patients move beyond a defined geofence, reducing risks and enhancing real-time supervision. Although its primary application is in healthcare, the study is highly relevant to the proposed Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms because it highlights the reliability of virtual boundary alerts and continuous tracking. The purpose of the article is to provide a scalable solution for real-time location monitoring that ensures both mobility and safety, using simple and accessible IoT components.

This system’s core design combining GPS data with automated alerts when exiting a defined zone is directly applicable to location-aware applications like vendor tracking. While the paper does not explicitly mention the Haversine formula, its geofencing logic and use of real-time positioning offer a strong foundation for integrating more precise distance computations. For the street food

locator, such a model can enhance vendor detection by notifying users when vendors are within a specified proximity. Ultimately, the tools and technologies used in this study serve as an effective reference for developing responsive, geolocation-driven mobile applications in both public health and commercial contexts.

**Patient Monitoring using Geofencing**

In their 2022 article “*Patient Monitoring using Geofencing*”, Prerna Gokhale, Vighnesh Rasal, Sahil Amberkar, and Sanika Sonawane developed an Android/IOT-based system designed to monitor hospital patients via GPS-enabled wearable or mobile devices, combining geofencing with the Haversine formula to calculate the shortest distance between the patient and designated zones. The system defines a 30-meter geofence around patient areas and employs the Haversine method to ensure precise determination of location relative to caregivers; it automatically sends an SMS alert when patients cross the boundary. The purpose of this study is to ensure patient safety through accurate, real-time monitoring, and its importance lies in demonstrating how automated alerts can be reliably triggered using geospatial logic and distance formulas. This approach aligns closely with the “Filipino Street Food Locator: An Android-Based Real-Time Vendor Tracking App Using Haversine and Geo-Fencing Algorithms”, as both systems rely on boundary-triggered notifications based on precise location and proximity measurements. The tools and technologies used GPS, GSM/SMS modules, and Haversine distance computation provide a clear and practical framework for implementing a vendor-tracking app that notifies users when they enter defined vendor zones, enhancing convenience and real-time relevance.

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