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Close Buy: A Location-Based Mobile Application for Easy and Efficient Product Search and Purchase

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Abstract : The rapid advancements in mobile technology have opened new opportunities for delivering valuable services beyond basic communication. Location-based services (LBS) leverage the geographical position of mobile devices to provide personalized services based on users' current location. In this context, we propose CloseBuy, an Android application that revolutionizes the product search and purchase experience by considering not only price and quality but also the "easy-to-buy" criteria, specifically incorporating a location filter feature.

CloseBuy consists of three main modules: the admin module, the business module (implemented as a web application), and the customer module (an Android application). The end-users can utilize the smartphone app interface to search for products and post reviews. Administrators and business merchants can manage the system through the web-based administration tool, including account registration approval and product catalogue management. The server handles the backend processes and product database storage.

The distinctive feature of CloseBuy is its distance-based searching function, which allows users to search for shops based on the proximity to their location, determined via GPS. Search results are displayed on a navigation map, guiding users to the best nearby shops. This efficient navigation feature enables consumers to find their desired products effortlessly. Additionally, users have the option to input keywords for searching, simplifying the process further.

The proposed system aims to enhance consumer satisfaction, provide personalized recommendations based on customer history, and facilitate efficient decision-making based on prices. By incorporating location-based services and intuitive search functionalities, CloseBuy addresses the drawbacks of existing systems, offering a comprehensive and convenient solution for users seeking an optimal shopping experience.

Index Terms -

I. INTRODUCTION

The ubiquity of smartphones and the ever-expanding capabilities of mobile applications have transformed various aspects of our daily lives. One area that has witnessed significant advancements is the realm of location-based services (LBS). LBS refers to a set of applications that leverage the knowledge of a mobile device's geographical position to provide services based on that information [1]. These services have opened up new opportunities for developers, cellular service network operators, and service providers to offer personalized and value-added services to mobile users.

In this paper, we present Close Buy, a location-based mobile application that aims to revolutionize the way users search for and purchase products. Close Buy goes beyond the traditional criteria of price and quality and introduces an innovative "easy-to-buy" filter, which considers the proximity of shops to the user's location. By integrating this location filter feature, Close Buy offers a comprehensive solution that simplifies and streamlines the entire shopping process. The Close Buy application system comprises three main modules: the admin module, the business module, and the customer module. The admin and business modules are implemented as web applications, while the customer module is developed as an Android application. This modular approach ensures seamless interaction between administrators, business merchants, and end-users, facilitating efficient management of the system [2].

For end-users, Close Buy provides a user-friendly interface through its Android application. Users can search for products, view detailed information, and even post reviews directly from their smartphones. The application's intuitive design and navigation make it easy for users to find the desired products quickly and efficiently. Additionally, Close Buy leverages the power of GPS technology to offer distance-based searching, displaying the best nearby shops on a navigation map [3]. This functionality enables consumers to locate their desired products in a hassle-free manner.

Fig.1 Login prosses:

Fig.2 Register prosses:

To enhance user experience and satisfaction, CloseBuy incorporates a recommendation engine that considers customers' purchase history and preferences [4]. This feature provides personalized recommendations, ensuring that users are presented with relevant products and offers that align with their interests.The proposed system addresses several drawbacks of existing shop bots and price comparison platforms. It offers consumers a comprehensive and efficient shopping experience by combining price comparison, proximity-based searching, and personalized recommendations. CloseBuy aims to increase consumer satisfaction, improve efficiency, and simplify the buying process for users.

In the following sections, we will delve deeper into the architecture, algorithms, and technologies employed in the development of CloseBuy. We will also present the results of our evaluation and discuss the potential impact and future directions of this innovative location-based mobile application.

II. Related Work:

Location-based services (LBS) have been extensively studied and implemented in various domains. Kunz and Yankholmes [5] conducted a comprehensive survey on LBS, discussing different applications and technologies used in delivering location-based services. Their survey provided insights into the challenges and opportunities associated with LBS implementation.

Mobile shopping applications have gained significant popularity in recent years. Studies have focused on improving user experience, personalization, and recommendation systems in such applications. For instance, Yang et al. [6] proposed a context-aware recommendation system for mobile shopping, which considered users' preferences, location, and social interactions to generate personalized recommendations. Price comparison platforms and shop bots have been widely used to assist consumers in finding the best deals. However, most existing systems lack the consideration of the "easy-to-buy" criteria, such as proximity to the user's location. Our work aims to bridge this gap by incorporating a location filter feature that enables users to search for nearby shops easily.

Location-based search algorithms have been developed to improve the efficiency and accuracy of search results. Raut, Bandgar, and Thakare [7] presented a location-based service using the Google Maps API, focusing on delivering accurate and relevant search results based on the user's location. Our CloseBuy application utilizes similar principles to enhance the search experience for users.The integration of GPS technology and mapping platforms in mobile applications has been explored in previous research. Mangrulkar [8] implemented a location-based navigation system using GPS and Google Maps. Their work demonstrated the potential of GPS-enabled navigation to guide users to their desired destinations. In CloseBuy, we leverage GPS technology to enable distance-based searching and efficient navigation to nearby shops.

Recommendation systems play a crucial role in personalized mobile shopping experiences. Luhn [9] introduced the concept of a business intelligence system, which forms the basis for many recommendation algorithms. Our CloseBuy application incorporates a recommendation engine that leverages customer purchase history and preferences to provide tailored recommendations, enhancing user satisfaction and facilitating informed purchasing decisions.These prior studies and research efforts have provided valuable insights and paved the way for the development of CloseBuy. Our work extends the existing literature by combining location-based services, distance-based searching, and personalized recommendations to offer a comprehensive and efficient mobile application for product search and purchase. By considering the "easy-to-buy" criteria, CloseBuy aims to enhance the overall shopping experience for users and address the limitations of existing systems.

III. SYSTEM ARCHITECTURE:

The system architecture of CloseBuy is designed to provide a seamless and efficient shopping experience for users, incorporating location-based services (LBS) and leveraging the Google Maps Platform. Additionally, it draws inspiration from the application called SSRU Map, developed to assist visitors in navigating the main campus of SSRU in Bangkok [10].

The CloseBuy application utilizes a client-server model, consisting of the admin module, business module, and customer module. The admin and business modules are implemented as web applications, while the customer module is developed as an Android application. This modular approach ensures effective communication and coordination between different components of the system.

The server-side architecture comprises a database management system (DBMS) for storing product information, user data, and other relevant data. The server handles the backend processes, including account registration approval and product catalog management. It also incorporates the recommendation engine, which utilizes customer history and preferences to provide personalized recommendations [2].

On the client side, the Android application provides a user-friendly interface for customers. It integrates the Google Maps Platform, enabling the use of location-based services. Through GPS technology, the application determines the user's current location and provides distance-based searching for nearby shops. The navigation feature utilizes walking instructions to guide users to their desired destinations efficiently. Additionally, the application offers information about each building or shop, including pictures, website details, and contact information, similar to the SSRU Map application [3].

The system architecture diagram of CloseBuy illustrates the flow of data and interactions between different components, including the client-side Android application, web-based admin module, business module, and the server (Figure 3,4) [4].

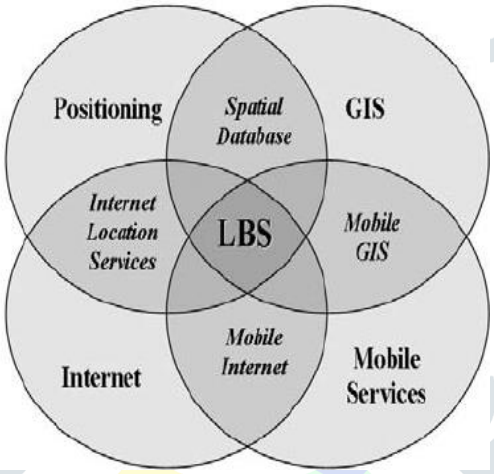

Figure 3: Convergence of technologies to create LBS[13]

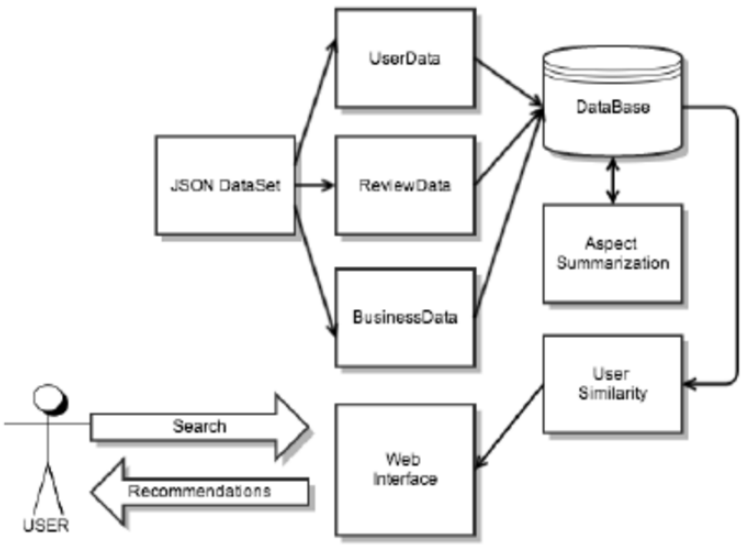

Figure 4: System Architecture Diagram of Close Buy [14]

The system architecture presented in this paper has been inspired by the SSRU Map application [10]. It incorporates a client-server model with web-based admin and business modules, and an Android-based customer module. The server-side architecture utilizes a database management system for data storage, while the client-side application integrates the Google Maps Platform for location-based services [11] [12]. The CloseBuy application offers comprehensive product information, personalized recommendations, and efficient navigation, enhancing the overall shopping experience for users.

The integration of LBS and the Google Maps Platform ensures accurate location tracking and seamless navigation for users.By combining the benefits of location-based services, efficient navigation, and comprehensive product information, CloseBuy provides users with a powerful tool for finding and purchasing products in an easy and efficient manner. The system architecture ensures smooth communication and data management between different modules, facilitating a seamless user experience.

IV. Algorithm:

To calculate the distance between two points on a sphere, such as the distance between two locations on the Earth's surface, the Haversine formula can be used. The Haversine formula takes into account the latitude and longitude coordinates of the two points and calculates the great-circle distance between them.

The algorithm to calculate the distance using the Haversine formula in the Close Buy mobile application is as follows:

1. Start the algorithm.
2. Obtain the latitude and longitude coordinates of the user's current location.
3. Obtain the latitude and longitude coordinates of the target location (e.g., a shop or destination).
4. Convert the latitude and longitude values from degrees to radians.
5. Calculate the differences in latitude (Δlat) and longitude (Δlon) between the two points.
   - Δlat = targetLatitude - userLatitude
   - Δlon = targetLongitude - userLongitude
6. Calculate the intermediate results required for the Haversine formula.
   - $a = \sin^2(\Delta lat/2) + \cos(userLatitude) * \cos(targetLatitude) * \sin^2(\Delta lon/2)$
   - $c = 2 * atan2(\sqrt{a}, \sqrt{(1-a)})$
7. Calculate the distance using the Haversine formula.
   - distance = R * c
   - R is the radius of the Earth (approximately 6371 kilometers or 3959 miles).
8. Return the calculated distance.

The CloseBuy mobile application is developed using the Java programming language and follows the Model-View-Controller (MVC) design pattern. The algorithm mentioned above can be implemented within the application's codebase to calculate the distance between the user's location and nearby shops or destinations. By utilizing the Haversine formula and the mobile application technology, CloseBuy provides accurate distance-based searching for users, enabling them to find the nearest shops efficiently.

V. Conclusion:

In conclusion, the CloseBuy application presents a comprehensive solution for enhancing the shopping experience by incorporating location-based services, efficient navigation, and personalized recommendations. By leveraging the Haversine formula, the application accurately calculates the distance between the user's location and nearby shops or destinations. The implementation of the algorithm, along with the utilization of mobile application technology using Android and the Java programming language following the MVC design pattern, enables CloseBuy to deliver a seamless and user-friendly experience. The system architecture of CloseBuy, inspired by the SSRU Map application, utilizes a client-server model with web-based admin and business modules, as well as an Android-based customer module. The server-side architecture incorporates a database management system for efficient data storage and management. By integrating the Google Maps Platform and GPS technology, CloseBuy provides location-based services, allowing users to search for nearby shops and navigate to their desired destinations efficiently.The CloseBuy application addresses the limitations of existing systems by considering not only price and quality but also the "easy-to-buy" criteria through the location filter feature. Users can search for products, post reviews, and receive personalized recommendations based on their preferences and history. The availability of comprehensive product information, including pictures, website details, and contact information, further enhances the user experience. With CloseBuy, users can easily find and purchase products in their vicinity, improving consumer satisfaction and efficiency. The application's features, combined with the seamless integration of location-based services, navigation, and accurate distance calculations, make CloseBuy a valuable tool for both customers and businesses. In summary, CloseBuy revolutionizes the way consumers shop by providing a convenient and user-friendly platform that prioritizes location-based convenience, personalized recommendations, and efficient navigation. With its robust system architecture and innovative features, CloseBuy sets the stage for$\alpha + \beta = \chi$.a new era of shopping applications that cater to the needs and preferences of modern-day consumers.

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