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The Hybrid Agglomerative Nesting Algorithm And Location-Based Services (Lbs) For Online Blood Donor Identification

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Abstract: The Location Based Online blood donor identification system is a mobile application that is hooked on the location of a mobile device. This application is part of the larger service viz. the location-based services (LBS). This system uses the location based services to help user to find donors from their current location which saves his/her time by making him the facility of fast access of blood donors. Instead of searching throughout manually, one can use the gps enabled mobile device to identify the blood donors and blood bank. The Mobile devices are navigation devices normally carried by a moving vehicle or person, that uses the (GPS) to track the available services such blood bank, donors and determine its location. The proposed framework includes three user-facing components: 1) an energy-aware Android application for end users to recognize their locations and access the services available to them 2) the application, which enables end users to search for donors or blood bank available on their current location and 3)the application for donors and blood bank to specify the availability of them and in which areas. To perform faster detection of the service the proposed system is modeled with a hybrid algorithm. However, it is difficult for old clustering algorithms to handle the significant data with various information and high noise. Therefore, a three-layer hybrid algorithm is used to tackle this problem. In the first layer, it use the K -means algorithm, in which the initial center selection optimized to group the shops based on the location efficiently. Then subdivide big clusters and isolate noise to get purer clusters. In the second layer, it adopt the agglomerative nesting (AGNES) algorithm to merge the small clusters referring to near by locations. Then, it exclude most noise, reducing their further impact on the K -means in the third layer which corrects the erroneous merging occurring in AGNES.

Index Terms – GPS Tracking, LBS, K -means algorithm, AGNES.

I. Introduction

Location based service (LBS) is fast becoming a need of the smart devices getting developed based on Global Positioning System (GPS). With the users also getting smart enough, these applications are being used on daily basis by users worldwide for doing many things such as commuting from one place to another using applications like Google Maps, getting useful information about a place using the feeds provided by the people who have visited that place before, product identification provided by the Location-Based Services (LBS) offer a wealth of information and entertainment tailored to your mobile experience. By leveraging the geographical position of your device, these services allow you to discover what's nearby at any time, thanks to the input from individuals who have been there before and the application's ability to identify products based on your location. With location-aware devices, users can easily inquire about their surroundings, whether they're looking for the closest ATM, tracking a package, or trying to locate a friend or colleague. The convenience these services bring is undeniable, yet they also face challenges, including the limitations of mobile environments and the dynamic nature of users on the move. LBS encompass various applications across different contexts such as health, work, and personal life. At their core, these services function through two primary actions: first, obtaining the user's location, and second, utilizing this information to deliver a relevant service. This framework allows mobile users to receive timely and precise answers to their queries, ultimately enhancing their overall experience.

Where am I…? Where is the nearest ...?. Where is my ...?, How do I get there LBS services are generally divided into two main types: triggered LBS services (also known as push services) and user-requested LBS services (or pull services). Triggered LBS services operate by automatically retrieving the location of a user's mobile device when a pre-set condition is met. For instance, if someone makes a call to an emergency center, this can automatically initiate a location request. Advertisements may be sent to users who enter certain areas of a shopping mall, while users in regions facing severe weather changes (like hurricanes or storms) might receive timely warning messages. On the other hand, user-requested LBS services place the control in the hands of the user, allowing them to decide when and if they want to access their device's location for a specific service. These services can help with personal location needs, such as finding the user's current location, or with locating nearby services, like restaurants or banks. A prime example of a user-requested LBS service is a navigation and direction system.

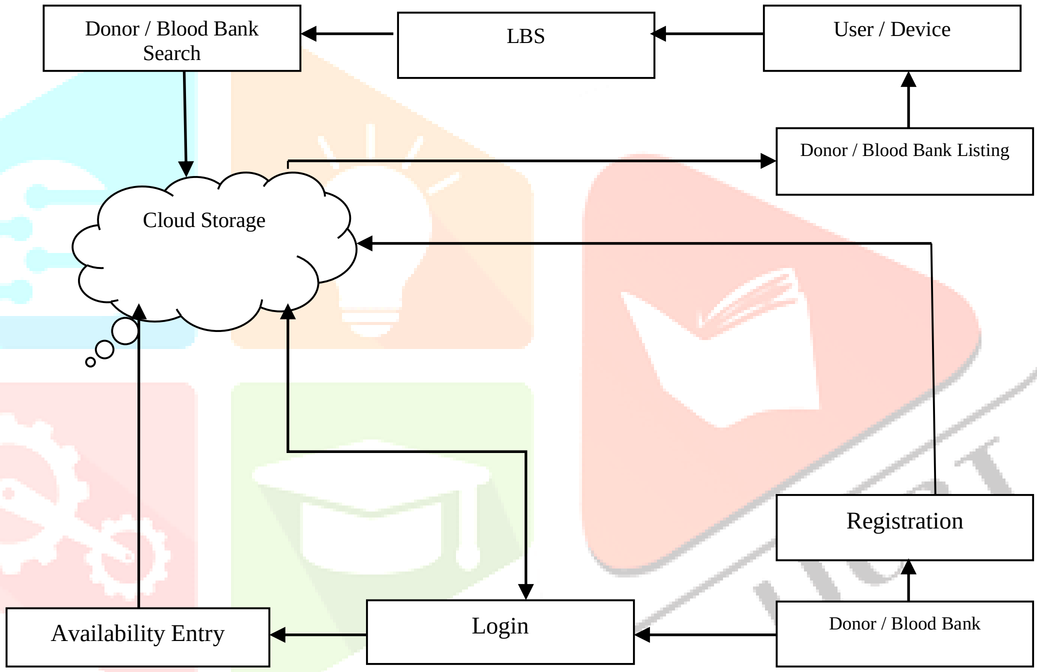
1.1 LBS Components

The components of Location-Based Services (LBS) work together to form a vital infrastructure, with each playing an essential role in delivering the service effectively. Let's break down these components: 1.Service and Content Provider: These are the companies that supply the services and data necessary for processing service requests. Examples include Location-Based Social Networks and GSM operators. 2. Mobile Device: This category encompasses all portable devices that users employ to access information. Devices such as mobile phones, smartphones, personal digital assistants (PDAs), tablets, and laptops fall into this group. They may come with built-in positioning capabilities or support external modules like GPS antennas. 3. Positioning System: At the core of LBS is user positioning. There are several methods for determining a user's location, with the two most common being GPS, which offers accuracy within a few meters, and mobile communication networks that rely on the proximity of cell towers, typically providing accuracy within a few hundred meters. Additionally, Wi-Fi positioning is another technique where specialized companies gather information from Wi-Fi networks to ascertain location, which is particularly effective in urban areas where network density is high, yielding accuracy of around several dozen meters. Indoor navigation is also a possibility and can utilize either Wi-Fi or Bluetooth to pinpoint a user's location within buildings. 4. Communication Network: Finally, the communication network is essential for transferring user data and service requests from mobile devices to service providers, and then delivering the requested information back to the user. Each of these components is crucial for the seamless operation of LBS, ensuring users receive accurate and timely information.

II. Related Work

GIS-supported location-based services (LBS) represent an exciting and rapidly evolving area in the realm of mobile internet applications. This paper primarily explores how Geographic Information Systems (GIS) and their current datasets can enhance LBS. We examine the features of GIS in relation to the requirements of LBS while introducing our own pilot system. This system utilizes an XML-based vector format for city maps and operates on Java-enabled mobile devices, including smartphones and PDAs. Location-based services are programs designed to leverage the geographic location of an entity, allowing them to furnish information about a user's position to other parties. By definition, a location-based service involves at least two entities, much like a traditional phone call requires two participants. In a generic geographic coordinate system, such as those mapped by longitude and latitude, one entity (Entity A) exists in relation to another (Entity B). Furthermore, each of these entities may either be stationary or on the move. In the context of context-aware mobile systems, the goal is to provide tailored information and services based on the user's current situation. A major application for these systems lies in tourism, where LBS can significantly enhance the traveler's experience, offering support both in planning trips and during the journey itself. Despite the proliferation of mobile tourism information systems, many exhibit notable limitations. These include reliance on proprietary interfaces with other systems, such as GIS, and their own data repositories, which hinder portability and complicate content management. Additionally, existing LBS solutions often utilize thick clients that, while offering rich functionalities, lack ease of use without extensive setup. They may also be rigid in terms of configuration options. To address these challenges, we propose a lightweight, domain-independent framework for location-based services. This framework adheres to established GIS standards, integrates accessible web content, allows for immediate implementation, and features a web-based interface for configuration. Location Detection Based on Latent Semantic Analysis and Structural Property, Traditional location detection methods fall short when applied directly to microblog location identification, mainly because microblog content is typically short, fragmented, and informal. To effectively pinpoint trending locations within microblog texts, we propose a novel detection method that leverages both latent semantic analysis and structural properties. This approach begins by establishing a semantic space from the interactions following posts, addressing the issue of data sparsity inherent in such platforms. Next, we develop a microblog model utilizing latent semantic analysis, and finally, we introduce a semantic computation method that incorporates time-related information. In addition, we present an improved location detection model specifically designed for Chinese microblogs, which employs hierarchical clustering. To mitigate the influence of noise, we enhance the feature selection and weight calculation processes, implementing a scoring system that effectively filters out tweets unrelated to any location. Our refined algorithm introduces a new vector distance metric and an updated center vector approach. Experimental results indicate that this technique successfully eliminates a substantial number of irrelevant tweets while accurately and efficiently identifying microblog locations. This research on microblog location detection methods serves to assist users and service providers in dynamically uncovering trending locations within the microblog sphere.

III Architectural Design



IV. Project Implementation

The Android handset system is composed of several key components, including the User Interface, Google Location Manager, and the phone's communication manager. These components interact with the application server's elements, which include the Authentication Manager, Database Manager, and a request-response handler. This setup is crucial for managing user requests and processing responses from both the server and the database, where user-defined locations and data are securely stored. The location manager is responsible for the locations provided by Google Maps, including all nearby places such as blood banks and donation centers. The communication manager is responsible for keeping the communication between the client and the server always online when the application is in use. The authentication manager is responsible for authenticating the user by comparing the credentials provided by the user with the data stored in the database. If the data matches, then only the user will be able to use the application.

- Login
- Product details
- Clustering
- LBS and querying
- Shop listing

4.1 Login

The shops have to register with the system with their current location and contact no's. The registered shops can obtain the validation process using their username and password. The authorized shops are provided with services. The services are denied to unauthorized users.

4.2 Product details

The shops have to enter the product details periodically. It has the following responsibilities:

- Adding new products, amount details
- Updations
- Deletion

4.3 Clustering

The first layer divides the data set into several pure and small clusters when users are unaware of the specific location. The second layer plays a role in merging the above small clusters at the same location and then removing the unusually small clusters. The third layer finally gives all locations another chance to choose their correct cluster.

The Jensen–Shannon (J–S) distance measures the resemblance between likelihood distributions. Thus, it computes the similarity between location vectors obtained and the semantic similarity considered. When the two locations were the same, if the value was 0 and the similarity was the highest. Otherwise, the larger the value, the lower the similarity.

Three-Layer Hybrid Clustering Algorithm. After the product representation, to accomplish the product detection task, it groups the locations referring to the same location together. The K-means algorithm and AGNES algorithm were extensively applied to the location detection models based on location clustering. In the first layer, the K-means algorithm is used to process the large-scale location-based data at a high speed. Though being unaware of the number of locations in the data set, it attempts to set K to be not smaller than the location number with the help of the scale of the data set. In the second layer, the AGNES algorithm is used to merge the fragmentations of the same location, with the cluster number approximating the real number of locations. Finally, in the third layer, it utilizes a novel method known as max distance centers (MDC) to search for initial cluster centers heuristically, each of which was as distant as possible from another. All the clusters were sent to be processed by AGNES in the second layer. The "big clusters" are divided into several smaller, purer clusters to mitigate their impact on the K-means of the third layer by the subdivide big cluster (SBC) method.

It groups the texts efficiently into several clusters: To increase clustering efficiency, it processes the dataset by the K-means algorithm. The algorithm began with an initial partition with a fixed number of clusters and cluster centers, and then kept reassigning every text to the cluster with the nearest mean until a convergence criterion was met. Its time complexity was O(nKt), where n was the number of locations in the data set DS, K was the number of clusters, and t was the number of iterations it took to converge.

4.4 LBS and querying

A location-based service (LBS) is used to utilize the geographic data to provide services or information to users. In the proposed system, LBS is used to identify the current location to purchase the required products. The querying section is used to search for the required products at the current location.

4.5 Shop listing

This module is used to list the shops for the users. The system will perform a search over the data based on the acquired location and display the shop details wherever the products are available based on the location. It also supports the shop-wise search.

V. Hybrid Algorithm

Step 1: Set K as the initial cluster centers and then group the shops by their locations with K-means.

Step 2: Subdivide every "big cluster" into several clusters.

Step 3: Isolate every "noise text" in every cluster as a new individual cluster and send all clusters to the next layer.

Step 4: Merge the two closest clusters by AGNES until termination.

Step 5: Remove all "noise clusters."

Step 6: Set the cluster number and select the initial centers based on the results of the above process; then, use K-means to reassign shops.

VI. Results and Discussion

The mobile application was made with Android Studio, Firebase, among other tools such as Jira, which was used to manage user stories, allowing controlled monitoring by both the team and the product owner. A review has been conducted on various initiatives involving blood donation, showcasing how technology serves as a valuable partner in this area. Traditional approaches have led to the creation of mobile applications designed specifically for blood donation, leveraging cloud services to enhance and streamline the donation process. These applications focus on managing notifications, accessing donor data, and syncing with blood banks. This technological advancement has played a significant role in advancing this vital work. About the methodology: It is an agile methodology for software development. In this group, there is a set of methodologies based on agility. However, was choice for the development of the mobile application is the short iterations known as sprints which allow early deliveries of two to four weeks and, in turn a quick feedback from users and stakeholders. Among other advantages and benefits of the methodology, we can highlight: it helps to manage and minimize project risks, it improves the relationship between cost and benefit, it allows the development of team skills, and it works mostly with small teams.

VII. Conclusion And Future Enhancement

Originally, mobile phones were designed strictly for voice calls, but the landscape has significantly evolved. Today, voice communication is just one of the many functionalities that mobile devices offer. Among the prominent features capturing attention are web browsers and GPS services. While these technologies are already in place, their full potential remains largely in the hands of manufacturers due to proprietary restrictions. Users have limited access to the hardware, which hampers direct interaction. However, with the advent of Android—a versatile, open-source mobile platform—users can now interact directly with device hardware. This opens up possibilities for creating tailored native applications that utilize web and GPS capabilities, as well as other hardware components like cameras. One potential application that could emerge from this advancement is an online product identification tool. This application would allow users to quickly locate products and purchase them from a curated list of nearby stores. By replacing traditional manual searches with automated, location-based queries, users can save valuable time. The application would function similarly to a GPS device, continually updating the user's location as they move and providing new shop options based on real-time GPS data. Looking ahead, future developments for this proposed system could focus on enhancing the quality of location-based services through real-time context-aware obfuscation, leveraging crowdsourcing to improve user experience.

VIII. References

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