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Efficient Meeting Point Notification with Vicinity Alert Mechanism

R. Shalomi Junofia [1], V.Muthamilselvi [2]

P.G. Scholar, Dept. of Computer Science and Engineering, Valliammai Engineering College, Chennai, India[1]

Assistant Professor, Dept. of Computer Science and Engineering, Valliammai Engineering College, Chennai, India[2]

ABSTRACT: In many business environments or social networking services we have different people from different region, who tends to meet periodically either it can be a casual meeting or a business oriented gathering. In the proposed system we find a common meeting point in a dynamic method using GPS position of each user's current location. Once a user's position is obtained, a safe region is calculated for each independent user using a circular safe region approach. Safe region is nothing but a region for which the query result will not change until the user resides within his/her own region. Optimal point is calculated using a centroid formula. Once an optimal spot is fixed a vicinity region is calculated from the optimal point, this region alerts the server whenever the group members approaches the destination spot. A path finding method has also been used such that it finds a shortest route between a user's position and the destination spot. Based on Elucidate distance between each individual user, we can also find the proximity of our friends in travel. Thus the GPS tracking system helps to track each user as well as in detecting the proximity of our friends.

KEYWORDS: Geographical position, Optimal meeting point, Circular safe region, proximity alert, vicinity region.

I. INTRODUCTION

Global positioning systems and mobile phone networks make it possible to track individual users with an increasing accuracy. One attractive application of knowing the geographic location of users is to compute and maintain social networks. GPS plays a vital role in many applications such as tracking persons, object, missing things, etc... Nowadays, smart phones with global positioning system plays a major role. GPS, or global positioning satellite, is a satellite-based navigation system used to give the exact location and time information anywhere on Earth. The system is maintained by the U.S. government and is accessible, free of charge, to anyone with a GPS receiver. Consumers have become increasingly reliant on GPS receivers and technology for navigation while driving around town or on long road trips. Originally, standalone GPS units, also known as personal navigation devices, were the only option available to consumers who wanted to take advantage of GPS technology. However, with the introduction of smart phones with built-in GPS receivers, standalone units are losing some of their market share. Anyone in the market for a GPS device should explore both options before deciding which way to go. GPS data mining is possible to use GPS data from multiple users to understand movement patterns. It is possible to aggregate data from multiple users to understand common trajectories and interesting locations.

Since almost every smart phone comes with a built-in GPS receiver, many people feel it is more convenient to just use their phones as navigation tools rather than bother with a separate standalone GPS unit. Using a smart phone as a GPS eliminates the need to carry two separate devices. Smartphone navigation gets frequent, automatic updates, which means all the latest maps will always be on-hand. It also can save money for the user since there is no need to purchase a second device to be used only on occasion. Using a smart phone as a GPS receiver taps into the idea of a smart phone as an all-in-one device. Most smart phone users always have their phones with them, which means they will always have a navigation tool on-hand. The convenience of only having to keep up with and carry one device rather than two is one reason many consumers are increasingly relying on smart phone apps rather than lugging around a separate personal navigation device.

Since smart phones are designed to be easily held in one hand, they are often the preferred choice for navigation while walking or biking. Personal navigation devices are typically larger and heavier, and may or may not be designed for use on foot, as the majority of them are intended for use in vehicles. Handheld GPS receivers specialized for land

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navigation are popular with hunters and hikers and are easy to carry and use while on foot, but fall short when it comes to providing navigation while driving. Smart phones can effectively perform both types of navigation.
In most of the social networking services or business meetings there will be many people from different locations. These people have get-together, which can be a casual meeting or project based meetings. In our proposed system we find an optimal meeting spot for multiple moving people in different locations. The proposed system works as follows by receiving the geographical position of each individual member of the group, then we find a safe region using a circular safe region approach. In the proposed system we use 2km as our default radius of the circular safe region. **Safe regions** are a set of geographical regions such that the query result will remain the same, until the user resides in their own regions, thus reducing communication cost and computational cost between users and the server. Then we segregate the geographical position into its latitude and longitude values, and then the corresponding latitude values are aggregated and the corresponding longitude values are also aggregated. Then by using centroid formula we find an optimal meeting spot. As a result, we obtain a pair of latitude and longitude value, using this value we can easily map their location and the name of the location is obtained from the database which has the largest collection of geographical position and their names. After choosing an optimal point, a specific meeting place is selected using range queries. Range queries are nothing but through which we define certain boundary condition and therefore a resultant are chosen from the range specified. Here we also use a region called vicinity region, which region is calculated based on circular safe region approach with 1km as radius. This region is used to detect and alert the group members that whenever one of the group members reaches the destination location. We also find a shortest path to reach the destination location. Based on the Euclidean distance between each user we can find their proximity. Proximity is alerted when one mobile node reaches the threshold value. Thus the proposed system helps in finding an efficient meeting point with proximity detection.

II. RELATED WORK

In Previous work, the processing of moving queries over mobile data can be classified into two categories: first, report, query results to a single user continuously, e.g., KNN queries [6], [8] –[11], circular range queries [12], moving window (rectangle range) queries [1] then, second detect relationships among moving objects e.g., proximity detection [5].

The safe region concept has been widely used in moving query processing to reduce the communication cost between clients and servers. When a user registers a continuous query, the server will return POIs along with a safe region. The query result remains the same if the user stays in the current safe region. Upon leaving the safe region, the user requests from the server an updated result together with a new safe region. The shape of the safe region depends on the query type, e.g., an order-k Voronoi cell for a kNN query or an arc-based region for a range query [12].

On paper [4] they have proposed an approach that enables mobile clients to determine the validity of previous queries based on their current locations. One of the advantages this paper is that the server returns an additional query result, a *validity region* around the client's location within which the result remains the same. And the disadvantage is that, here we use a static dataset thus we need to pre compute the dataset which is more hectic. In paper [5] it deals with the issues related in location update rather than location based spatial queries such as kNN or v* diagram. One of the advantages of this paper is that server-initiated probe and update mechanism is used, (i.e) whenever the node moves out of its safe region it automatically update the server. But this paper could not address the problem of maximum speed and steady movement of mobile nodes. Suppose if we consider this in the future we can reduce the 40 % communication cost. In paper [3] overcomes the difficulties in moving k nearest query (MkNN) processing by using a V* KNN algorithm. V*-Diagram uses safe-region based techniques and also the query location and the knowledge of the current search space. As a result, the V*-Diagram is more economical. One of the disadvantages of v* Diagram is that even a slight change in query leads to entire restructure of the tree. And require high space. In this paper they have addressed the problem of latency of location based spatial queries using cached data by peer to peer sharing mechanism. The Main advantages of this paper is, it provides scalability, accuracy in accessing centralized database and reduce latency delay. One of the drawbacks of this method is that the cache capacity. And another drawback is that only when the density of mobile in a peer network increases then only latency decreases. In our system of finding safe region is not a tedious process since we use a compact method of circular safe region approach which is quite easy to compute and reduces the communication cost of client and server. We do not spend much of our time in query evaluation and revaluation method in previous cases.

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In paper [18] they have used the techniques related to friends tracking mechanism and proximity alert messaging method. Through which we have developed a vicinity alert messaging method and also the friends, proximity alert method using a threshold value analysis method.

III. SYSTEM ARCHITECTURE

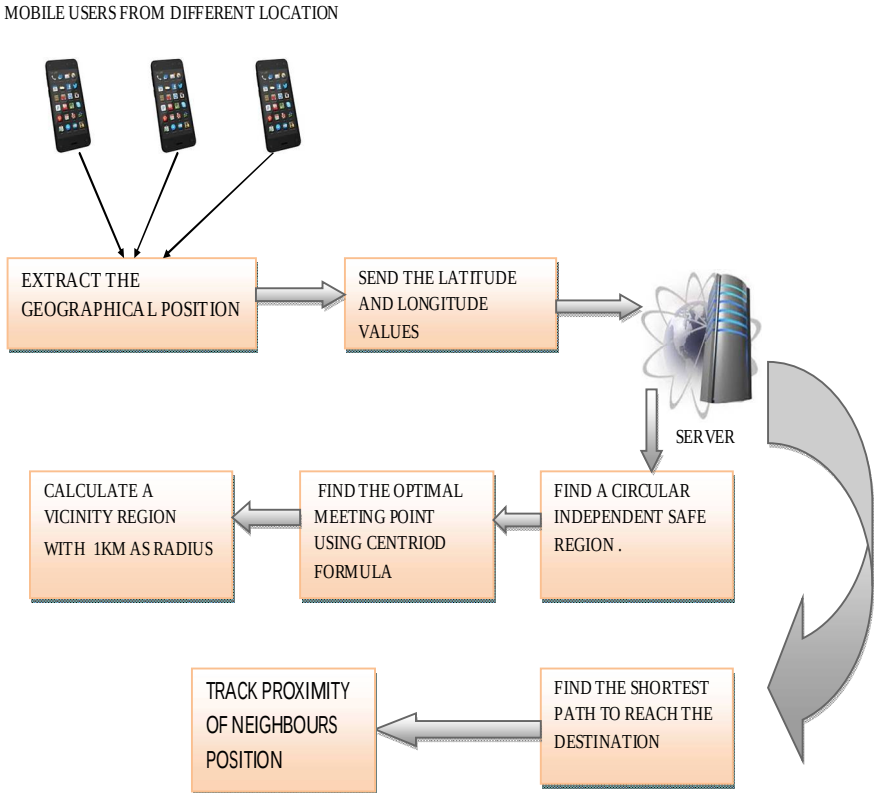

Fig 1: System Architecture

A. GLOBAL POSITIONING SYSTEM

The Global Positioning System (GPS) is a space-based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The GPS receiver figures out which satellites it can hear, and then starts gathering those messages. The messages include time, current satellite positions, and a few other bits of information. The message stream is slow, this is to save power, it can take 30-60 seconds to get a location on a regular GPS. When it knows the position and time code of at least 3 satellites, a GPS receiver can assume it's on the earth's surface and get a good reading. 4 satellites are needed if you aren't on the ground and you want altitude as well.

In order to save cost, most cell phones share the GPS receiver components with the cellular components, and we can't get a fix and talk at the same time. People don't like that (especially when there's an emergency) so the lowest form of GPS does the following:

1. Get some information from the cell phone company to feed to the GPS receiver - some of this is a gross positioning information based on what cellular towers can 'hear' our phone, so by this time they have already phoned our location to within a city block.
2. Switch from cellular to GPS receiver for 0.1 second (or some small, practically unnoticeable period of time) and collect the raw GPS data (no processing on the phone).

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3. Switch back to the phone mode, and send the raw data to the phone company.
4. The phone company processes that data (acts as an offline GPS receiver) and send the location back to our phone.

This saves a lot of money on the phone design, but it has a heavy load of cellular bandwidth, and with a lot of requests coming it requires a lot of fast servers. Still, overall it can be cheaper and faster to implement.

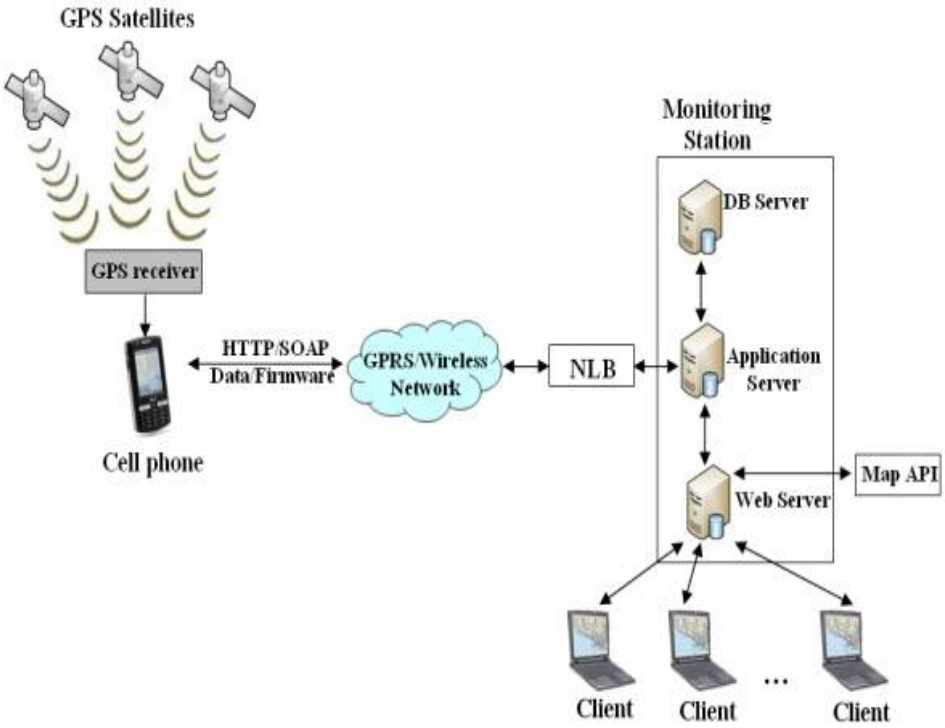

Fig 2: GPS working model

B. INDEPENDENT SAFE REGION

The *Safe region* is set of geographical region within which the query result will not change until the user resides in his/her own location.

- A *circular safe region* approach is used in this approach.
- A default radius of 2kms is being chosen.
- The safe region method provides compactness to the system.

C. OPTIMAL MEETING POINT

In most of the business meetings or any social gathering, we have many people from different places to gather at a spot. In some cases, the predetermined spot can either be short or long based on the user's location. To avoid these controversies, in our proposed system we introduced a concept of optimal meeting point, which is nothing but finding an optimal spot such that each member of the concerned meeting must travel an equal distance, thus avoiding the controversy. This optimal meeting point system also helps to save time, fuel cost and travelling costs.

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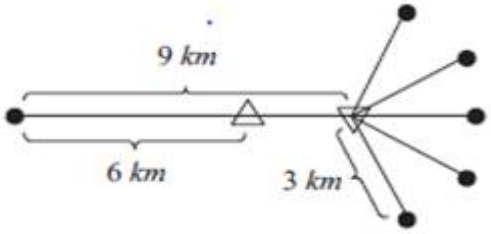

Fig.3. Optimal meeting point

In the fig. 3. The dark circles represent the location of multiple moving users at a given point of time. Each moving user current geographic location is obtained and its latitude and longitude values are segregated and a centroid formula is used in order to find an optimal meeting point. In the above given example travelling of 6km each will get you to reach the destination spot.

D. VICINITY REGION

Vicinity region is nothing but a region around the optimal meeting point, which is calculated similar to the circular safe region method with 1km as radius. The calculated vicinity region information is initially sent to the mobile node, whenever the client approaches this region, it alerts all the members of the group that which member has reached the destination location. Thus, it continuously checks whether it reaches the vicinity region or not. If the vicinity region and the current position are same then it indicates the user has reached the destination this intimate other members of the group via text message.

E. RANGE QUERIES

A range query is a common database operation that retrieves all records where some value is between an upper and lower boundary. Thus, in the proposed system a list of meeting spot such as ATM, mall, restaurant is listed within the vicinity region based on the request of the event organizer.

F. SHORTEST PATH

A shortest path is calculated from for each individual user based on their current position and destination point.

Steps:

1. User plot source and destination points in Google Maps
2. Geocode the location values
3. Latitude and Longitude segregation
4. Download json data from Google Directions API
5. Duration and Distance will be calculated to reach destination
6. A path is drawn from source to destination in Google Maps.

G. PROXIMITY DETECTION

The proximity detection is carried out in order to find the nearing neighbour at the point of time. A threshold value is fixed to indicate that a friend is in the proximity region. Whenever the friend reaches the threshold value the user will be indicated by a proximity alert message. In the proposed system while calculating the proximity region, we obtain the current position of each user and a corresponding Euclidean between each user is calculated. If any calculated distance reaches the predetermined threshold value, then each user is indicated with a proximity alert

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message.Thus a database is maintained with current value, threshold value and Euclidean distance calculated at the point of time. This problem plays an essential role in friend-locator applications and massively multiplayer online games.

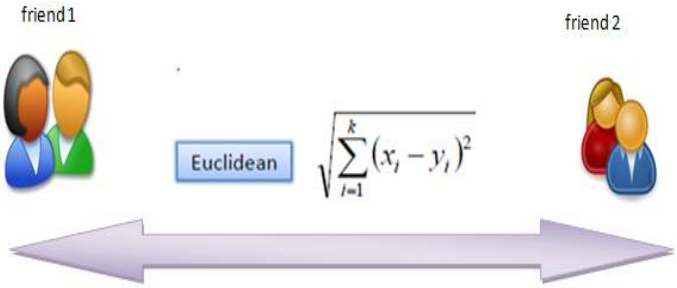

Fig. 4. Proximity detection

IV. CONCLUSION

In our proposed system, we have introduced a method of finding an optimal meeting point for the multiple moving users from different locations using a centroid formula, which reduces the computation work on the server side and the introduction of the circular safe region have reduced both communication cost as well as the computation cost of the system. Since we obtain the geographical position of each individual user only once before fixing a meeting point, we have also reduced the battery power consumption. We also enhance our system with a path finding mechanism. Path finding is the concept of identifying one of the shortest path available to reach the destination. And we also enhance the system with a vicinity alert messaging method and proximity of the nearest neighbor alert method. In future we can also develop a cost model for estimating the update frequency, the communication cost, and the running time of our methods.

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