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Optimal Facility for Location Tracking of Blood Bank and Donor

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Abstract - *In critical or emergency situations where accident occurs or during on-going treatments and surgeries etc there is urgent need for specific blood group. It requires lot of time to make the blood available and it is inconvenient during emergency situation, some rare blood groups are time consuming and difficult to arrange which are O^-, AB^- etc. In our country there is less awareness of blood donation, near about 20% of Indian population donates blood.*

In this project, we have proposed an efficient way to overcome problems in existing system. We are using Global Positioning System (GPS) for tracking of nearest blood banks and donors. It requires GPS supported android device with application installed on it for the user. Donor will be prompted to enter an individual's details, like name, phone number, and blood type. During the urgency of blood, you can quickly check for contacts matching a particular or related blood group and reach out to them via Phone Call/SMS through the app. Our app provides address of nearest blood banks and donors in your city/area by GPS tracking. A large number of people carry an android mobile phone, so we are developing an Android application which is low in cost, requires less time to find out blood banks and donors.

***Key Words*: Android, Blood bank, Donor, GPS, Google map, LBS**

1. INTRODUCTION

It is healthy donating blood. So, we have created an application to simplify the blood donation process. The donor can easily locate where his/her blood group is needed. Those locations can either be entities or individuals that urgently need the donor's blood group. When there is an urgent need for a particular blood group, you can use the app to message only the people having the required blood group. This system contains different modules to maintain blood and blood donors. Emergency situations, where accidents occur, create an immediate, critical need for specific blood types. In addition to emergency need, advances in medicine have increased the need for blood in many on-going treatments and elective surgeries.

Despite increasing necessity of blood, only about 5% of the Indian population donates blood. In our project we propose a new and efficient way to overcome such scenarios. A large number of blood donors are attracted using an Android application. Cloud based services can prove important in emergency blood delivery since they can enable central and immediate access to donors' data and location from anywhere and almost any device. Since almost everyone carries a mobile phone with him, it ensures instant location tracking and communication. Using GPS and we find donors nearer to the location from where the request is generated. Thus the 'Mobile Blood Bank' can prove to be a boon for blood requesters.

2. LITERATURE REVIEW

In earlier days, there were no systems or application that locates places which are nearby the user. But now-a-days there are a few systems who can locate different places using GPS in android. GPS tracking can be used as any equipment tracking and as spy equipment and the location can be displayed on Google maps using free versions of Google Maps API (Application Platform Interface) [1].

For locating ATMs which are nearby are tracked and for that it is necessary to have an android device which supports GPS. By making use of Dijkstra's algorithm to find possible shortest path between user and the ATM booth and Haversine formula is also used to calculate the perpendicular distance. This makes use of Open Source Maps (OSM) [2]. Similarly, we can develop an application which can find blood banks and donors nearby.

The use of free version of Google Maps API is used for location visualization. By this, we can help the users for better understanding the map and help them to locate the exact location of blood bank.[3]

In LBS system, use of Google map in Android, this provides a number of objects to handle maps in LBS

system like MapView which displays the map. To handle this, a MapActivity class is there. To annotate map it provides the overlays class. Even it provides canvas by which one can easily create and display multiple layers over the map. Moreover, sufficient provisions are there to zoom the map, localize the map by means of MapController. By using GPS in android phone it is possible to develop any application that needs tracking like hospitals, schools [4].

And also it is possible to develop an application to track blood bank and donors. To track a donor, one should know the location of the donor; the donor will be none other than the registered user of our application. As he will be using our application on an Android phone, the application has to track the location of his phone to locate him on the map as a donor. Thus, how to track a donor that is to track the Android phone and to plot that location in another Android phone is also possible. It is discussed how to locate the position of an android phone and plot it [5].

There exist extended web applications to timely update the information regarding the donors, acceptor and patients where the administrator accesses the whole information about blood bank management system. Also it can have a Push technology with security, to protect the contact details of the donors in web application where it can be misused by third parties. The location-based app, the Mobile devices/smart phones are equipped with GPS receivers, which help in getting accurate location of the device [6].

The location-based app, operational on android platform, will help users easily find donors of matching blood groups in their location and access their mobile numbers for instant help [7].

Mobile devices/smart phones are equipped with GPS receivers, which help in getting accurate location of the device. The GPS satellite situated in the space continuously transmits data containing the location and time details. When the mobile device requests for the location then its GPS receiver receives the data sent from GPS Satellite and displays the current location [8].

The benefits and issues of GPS tracking and proposed a mobile framework that implements a general tracking system. The tracking system locates mobile devices with or without GPS. This finds applicability in locating lost, stolen, or misplaced devices. This is equally applicable to locating stolen valuables when equipped with such a device. It can also help locate patients suffering from dementia or mental disorders, if they carry a locatable device [9].

2.1 Problems with exising systems:

Limitations of Traditional System are -

1. Lack of information
2. Less surety of information
3. Time consuming.

So to overcome these problems we are proposing a system which overcomes these drawbacks because we are developing an application for the users which provide accurate information and more quickly.

2.2 Gap analysis:

Previously we followed a system in which we could do all the things manually like find where the blood bank is and is the blood available by means of communication with other people. This was quite time consuming task. Therefore, today there is a need to overcome all the drawbacks of this traditional system and bring a system that performs this task quickly and with better functionality.

2.3 Objective of problem:

Main objectives of proposed system are as follows:

- Users can find blood banks and donors if they want blood.
- Users can locate blood banks easily if they are willing to donate blood.
- Notifies users to donate blood after completing 3 months of donation.

2.4 Major function:

Proposed system is divided into following functions:

1. Registration of users
2. Find for blood bank and donors near by
3. Donate blood

3. PROPOSED SOLUTION

The main intension of this system is to find the place where there is necessity of blood and to provide it. In this system we are going to provide a facility to the blood banks so that they can update the stock details and also send notification to the donors that they require blood. Our proposed system is good for the blood banks and also to the users because it satisfies both of the needs.

For the blood bank we are going to provide a web application or the desktop application so that they can update the stock details and request users to donate by sending a notification. This data is maintained in a database. The stock details are necessary to be updated and maintained so that when the user wants to track a blood bank then only the specific blood bank will be located when they provide the blood group while selecting the option need for blood or donate blood.

At users end, we have an Android application which needs registration of users; this data is maintained in a database. The Registration field consists of parameters like name, address, blood group, weight, etc. The user is provided with two main options: Find blood and Donate blood.

When user selects need of blood option then the user's current location will be traced first using Google Location API and by using the current location, the blood bank and donor will be plotted on the map. And also the user has to provide which blood group he requires so that only those blood banks and donors are plotted on the map. The location of blood bank will be retrieved from Google API and the location of donor will be his current location and it will be retrieved using Google API. Now, we have also provided a facility for the users that they can select their location viz from registered location, current location and provided location. To select the provided location he has to plot this location on map with help of plotter instead of typing the entire address. The distance between the user and each blood bank or each donor will be calculated by Haversine.

The Haversine formula is as follows:[11]

$$\Delta lat = lat2 - lat1 \quad \text{..... (1)}$$

$$\Delta long = long2 - long1 \quad \text{.....(2)}$$

$$a = \sin^2(\Delta lat/2) + \cos(lat1).\cos(lat2).\sin^2(\Delta long/2) \quad \text{..... (3)}$$

$$c = 2.y2\ (\sqrt{a}, \sqrt{(1-a)}) \quad \text{..... (4)}$$

$$d = R.c \quad \text{..... (5)}$$

a = square of half of the straight line distance between two points.

c= great circle distance expressed in radians.

d = distance between the user and blood bank or donor.

R= radius of earth.

y= location of donor or the blood bank

The Dijkstra's shortest path algorithm is used to find out the shortest path from users to the blood banks or donors. Working of Dijkstra's algorithm is necessary because if the blood bank you are visiting is not able to provide your necessity then you should know which blood bank should be visited or to call that particular blood bank. The working of Dijkstra's algorithms is given below.

Dijkstra's shortest path Algorithm [10]**:**

It maintains a list of unvisited vertices.

1. Assign to every blood bank a tentative distance value: set it to zero for our initial node (current location of the user where he started to search for blood banks) and to infinity for all blood banks.
2. Set the initial node as current. Mark all blood banks unvisited. Create a set of all the unvisited blood banks called the unvisited set.
3. For the current blood bank, consider all of its unvisited neighbours (neighbouring blood banks) and calculate their tentative distances. Compare the newly calculated tentative distance to the current assigned value and assign the smaller one. For example as shown in figure no. 1, if the current blood bank A is marked with a distance of 7, and the edge connecting it with a neighbour B has length 2, then the distance to B (through A) will be 7 + 2 = 9. If B was previously marked with a distance greater than 9 then change it to 9. Otherwise, keep the current value.

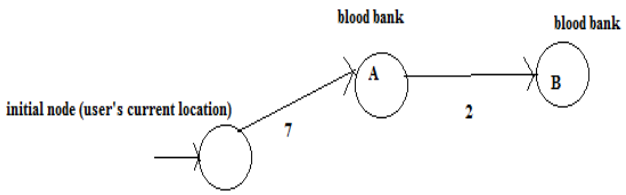

Figure No. 1. Working of Dijkstra's algorithm with example of blood banks.

4. When we are done considering all of the neighbours of the current blood bank, mark the current blood bank as visited and remove it from the unvisited set. A visited blood bank will never be checked again.

5. If the destination blood bank has been marked visited (when planning a route between two specific blood bank) or if the smallest tentative distance among the blood bank in the unvisited set is infinity (when planning a complete traversal; occurs when there is no connection between the initial node(user's location) and remaining unvisited blood banks), then stop. The algorithm has finished.
6. Otherwise, select the unvisited blood bank that is marked with the smallest tentative distance, set it as the new "current blood bank", and go back to step 3.

When the blood bank and donor are plotted on the map after clicking on that particular bank or donor, information regarding them like contact details will be provided and also the urgency of requirement can be given.

Now, when the user wants to donate blood, then he will be selecting the option donate blood. After selecting that option, according to your current location or registered location or provided location, blood banks will be plotted. This will work same as the need for blood module.

Also one of the important functionality is to Post Requests to all users. This functionality allows user to request other users which are using the android application by providing them your blood group and all users can view this posted request through View Posted Request. As well as some additional functionality like alarm so that the alarm will ring after completion of his three months of donating blood. This functionality can be provided using Alarm Manager in Android Service. When the user donates a blood this information is saved in the database, so that after three months he can give an alarm to the user that now you can donate Database will store information like location of blood bank, donors and stock of blood banks. The following is the block diagram of our system which shows the flow.

3.1 Architecture:

Architecture diagram explains the system overview, as to how system works in real.There are four main components which are central database, users(Android phone & desktop applications for blood bank), server,Google Map Services.

In figure no.2, the server will consist of database where data such as stock of blood bank, donar's details, locations are stored at this central database.Android appliaction will be for the users like us who can register themselves and once registered, they become the donor for our application. The Desktop application will be for the blood banks where blood banks will be added by admin and the user_id and password will be given to the blood bank by the admin. Then the blood bank can add or update stock and also respond to users request.Users are able to find location of blood bank and donars when they require blood or if they want to donate blood using internet through Google Map API. Users having android phone should have internet and through which tracking is done using Google Map API. Server stores this information and which is given to central database.

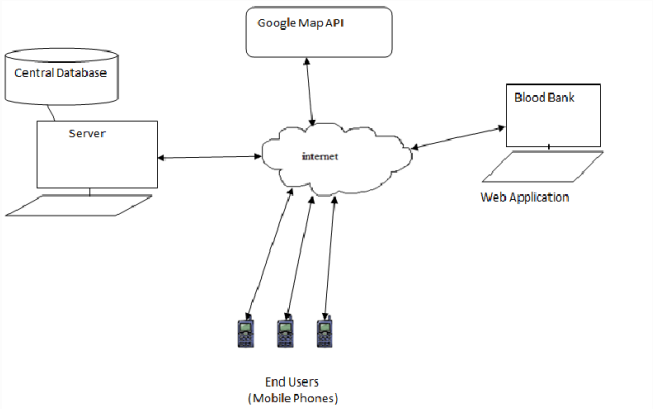

Figure no.2 Architure diagram

3.2 Sequence Diagram:

In figure no.3 sequence diagram of our system is shown, it represents objects like User, Location API, Map plotter, Algo Util, DB Util, Android GPS which shows sequences of activities in our system. User will register himself and the record will be saved in database, this record will be retrieved from database when user logins himself and checks if the login details are matched from the database. When user is valid, he can perform functions like search for blood ban and donors. For searching the blood banks and donors near by the user, location API will be used to get the user's current location. According to the location, database will provide all the blood bank in that location. Now the haversine formula is used to calculate the distance between any two blood banks or blood bank and user. This distance is given to the object Algo Util, where the dijkstra's algorithm works to find out the minimum path from starting point to all the blood banks. It tells us that which blood bank to visit first and from that blood bank which blood bank to visit next, in case if the blood bank you visited doesn't provide your requirement. This will be displayed to the user by map

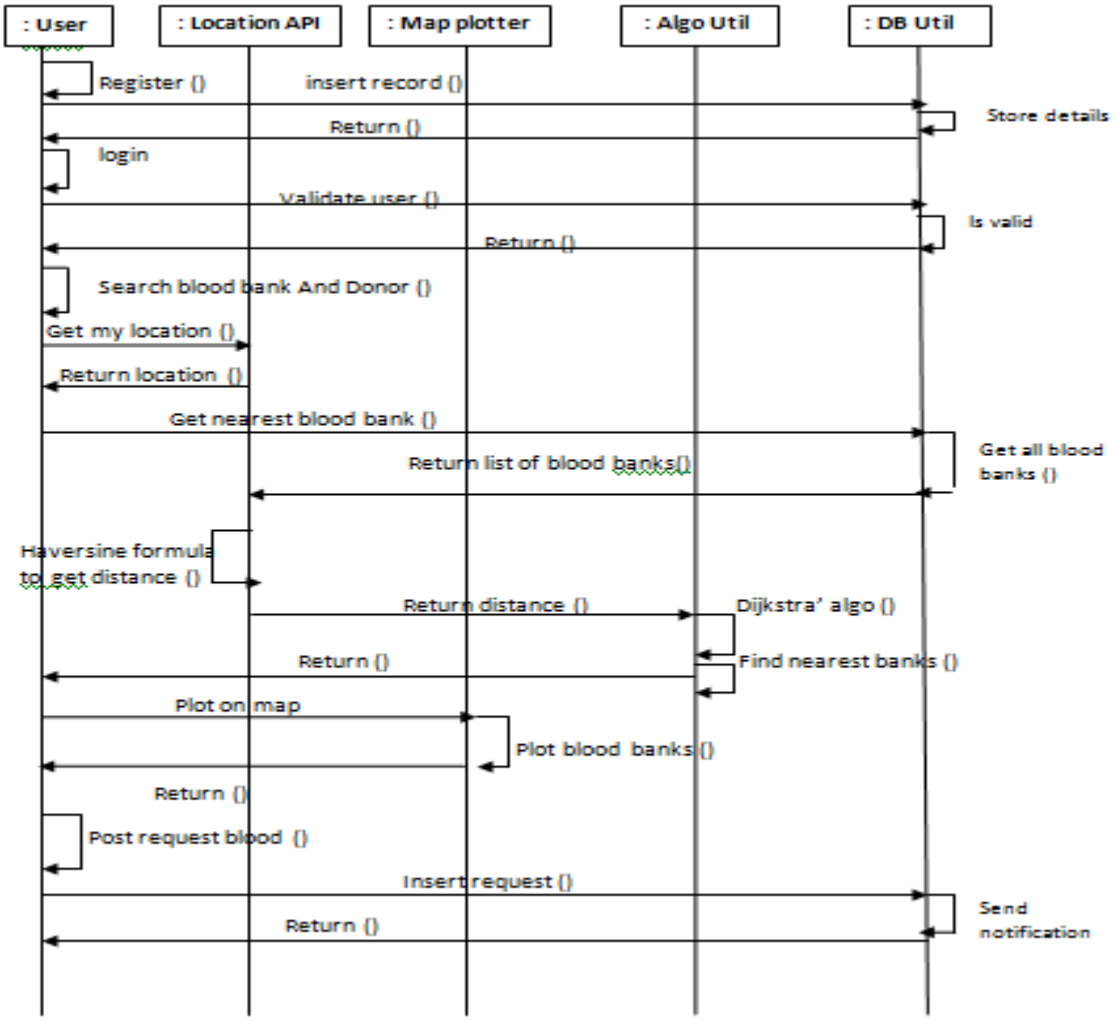

Figure no.3 Sequence diagram

Plotter. Post request is another functionality in which the users can post request to all other user, requesting for the particular blood group. This can be viewed in view request and notification will be sent to other users.

4. CONCLUSIONS

The proposed system evaluates the possibility to combine the facility of donating as well as requesting blood to the blood bank in just few tap. The user and the blood bank both can satisfy their needs whenever they require blood or if the user wants to donate blood. As most of the people carry an Android phone with them, it ensures instant location tracking and communication and thus it is an advantage to propose a system on Android platform. Thus the proposed system provides appropriate information in less time as compared to traditional method of searching blood banks and donors which included practices like man to man communication, hoardings, paper pamphlets and hence, clubs with today's high demanding blood requirement.

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