

Spatial Information System for Medical services in Chennai city

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Abstract

Chennai is a city with high population density extending its suburban limits day by day. Having an international importance in industrial and tourism sector the city is flooded with naïve commuters. The public does not know the nearby location and the level of services provided by the hospitals. The lacuna of such information at hand may cause several casualties. This insists for the need of Location Based Services (LBS).

The LBS refers to the applications, which react to a geographical trigger. A geographical trigger can be in the form of a signal generated by a GPS device or by any pointing device on the satellite image of the city. On the basis of the geographical position given as the input, the application will have the capability to integrate these spatial attributes with the non-spatial database. The result shown will be all the corresponding medical services surrounding the GPS location specified as the input.

The user will have a choice of giving a query in the form of specialization of hospital, or the nature of illness, which the patient is looking for. Based on the input, only those hospitals and clinics will be displayed which will provide service of the user queries.

Other than the database of the medical services, the application will also provide the shortest and the quickest route from the current position to the required hospital or clinic. So that a visitor to the city will have his ease in locating the nearest hospital in due time. This can save a lot of time which otherwise can turn to be fatal.

Introduction

The necessity for the usage of location based services in our daily life is becoming an eventuality day by day with the advent of new technology and increase in need of the common man. Technology has made it possible to bring necessary and vital information to the people much easier and much more affordable. The application of location based services in the geo informatics region can be seen or visualized in virtually every field at

least conceptually such as in the area of mineral resources, medical services, vital utility services, transport services and other emergency services such as the police etc.

Conceptually these features have been implemented up to a certain level in some places. We can find some services for emergency facilities like blood banks or ambulance services in some select cities. But there is hardly a major metropolitan city in India which has a comprehensive system for location based services for emergency management, the medical module being a vital part of this emergency system. The following proposed system being developed by the authors in association with the DST aims at developing one such comprehensive system for a major metropolitan such as Chennai. The basis for developing such a system was drawn from the fact that there was hardly any information database or system available where a person could access the necessary medical details he required. Also in view of the fact that the city being developed and modeled as a destination hub for medical facilities it was decided that incorporating details of road network with the medical details would be a useful help desk for getting information about the medical facilities.

Now such systems have been formerly devised for a limited service such as blood bank or ambulance etc. This system aims at developing a comprehensive system for all medical services present in the city. The medical facilities being covered by the system will be

- Hospital details with location, contact numbers
- Department details of each hospital
- Doctor details of the department
- Details of the facilities available at the medical centre such as blood bank, dispensary no of beds etc

So basically the user has a comprehensive database from where he can make a suitable choice from.

The area for which the system is being developed is huge. This will probably be the first time in India that such a comprehensive system is being devised for such a huge area. This is the first time that a metropolitan is being covered to develop a location based service system.

The system is making use of a GPRS device to get the coordinates of the medical centers that are present in the city. Also the system is making use of satellite maps that have been purchased for the purpose of developing a detailed information system. The coordinates that are taken using the GPRS device are to be incorporated onto the detailed city maps. Although to an extent the google maps is a system that gives the map image along with the location but that is only when the user knows what he is looking for and also if that location is already entered into the google map database. Also the level of detail complexity is not present in the google map database.

The most important and standout feature of the system is the use of the quickest and shortest path algorithm for determining the best possible route by which the user can reach his centre of choice. The system allows the user to select the type of route he wants i.e. the user can select a route which is the shortest or else he can select a route which has less traffic. The basic aim at developing such a system with this feature is keeping in view the need of the patient in case of an emergency where he needs to get to a certain centre fast and needs to avoid traffic. In such an eventuality and emergency this feature can play a vital and in-fact pivotal role in being of utmost use to the user in saving vital time which can be useful in saving a persons life.

The basic system being developed is in itself a very unique service in a manner for its simplicity and ease of use. All the user has to enter into the system would be his present location ,his choice of facility needed and the type of route he needs and he will be given details of the nearest medical facility with the required feature, the route to the facility along with the details for contacting the hospital. This in itself makes the system unique and the existence of such a system unprecedented in the country.

Related Work

Prior works on database designing for the hospital network in the Chennai city includes the non-spatial database generation which just gives the address of the hospital required by the user. The database also provides the phone number and other contact details of the hospital and other medical services. There is no such specific service which can provide us with the exact route of the destination from the point where we are. In such case the use of spatial database comes to the rescue.

Other kind of spatial database which are present includes the information about the geographical location of the destination and it can be modified by the user. These applications will give the satellite image of the city and any user can put his/her tag on to it and identify a specific location. This kind of service eases the procedure of locating the hospital which we know, but the database is not specific to the requirements of the situation.

In this paper we will be handling the spatial database such that each of the medical service will be associated with the database of all the facilities available with it, the database of the doctors and the working hours of the doctor in that particular institution. So it can be useful in the real time environment for locating the hospital needed for a specific cause.

The next step will be finding out the shortest and the quickest route of the destination point from the point where the user is presently residing. This can be done by taking into

account different attributes which shall be discussed in the coming sections. The shortest path can be found out by applying dijkstras shortest path algorithm.

Implementation

The idea presented in the above section can be materialized by the usage of following technologies

- Asp .net using Visual Basic
- Asp Map 3.0
- Arc View
- Microsoft Access

These technologies when combined together can be used to build a web application which will satisfy the requirements presented in the sections.

Asp .net technology is used to develop the asp page which will act as the interface for the web application which the user can access from internet. Asp .net is the latest version of Microsoft's Active Server Pages technology (ASP). It is a part of the Microsoft .net framework, and a powerful tool for creating dynamic and interactive web pages. It is a server side scripting technology that enables scripts (embedded in web pages) to be executed by an Internet server.

AspMap is a high-performance, Web mapping component for embedding spatial data access, display and analysis capabilities in ASP.NET and ASP applications and services. AspMap gives you the ability to generate map images, drill-down capability, thematic mapping, point-to-point routing and other features that - generated on the server - will make the map images fully interactive on the client-side.

AspMap can create images in any standard image file format, or even send a bit-stream directly to the browser. Whether you have a local government web site, a real estate web site or a vehicle tracking web site, or if you provide location-based services

ArcView is full-featured GIS software for visualizing, analyzing, creating, and managing data with a geographic component. Most data has a component that can be tied to a place: an address, postal code, global positioning system location, census block, city, region, country, or other location. ArcView allows you to visualize, explore, and analyze this data, revealing patterns, relationships, and trends that are not readily apparent in databases, spreadsheets, or statistical packages.

Microsoft Access is a development environment used to create computer databases for the Microsoft Windows family of operating systems.

Development of the project

The two vital aspects of the system being developed involve developing a compact database design and doing the needful data collection. The database design has been done keeping in mind the requirements of the user that the system hopes to cater to. That is to incorporate all the vital data fields that are necessary.

The data collection work in short involves the collection of all the required data from the sources both on the net as well as during fieldwork.

Database design:

Firstly the requisite details that might be required by the user of the system were drawn up. It was assessed that the basic requirements on the outside would be limited to doctor details and location. So in order to attain these details it was necessary to obtain the details of the various hospitals located in the metropolitan. So a database for storing all the hospital details such as name and location was drawn up. Then also it was assessed that a database with all the departments was mandatory. It was decided that in this database a list would be maintained for each department as to which hospital has it or not. Also a database to maintain the records of the doctors and the hospital with which they are associated was drawn up.

These databases were thought sufficient to meet the requirements that this system was aimed at catering to. Also the gps coordinates that are collected are to be incorporated into the satellite images that have been procured. Also these details are to be incorporated into the maps using the ARCVIEW desktop .The roads are to be mapped using vector lines drawn using this software.

This basically took care of all the requirements needed to store the data to be collected.

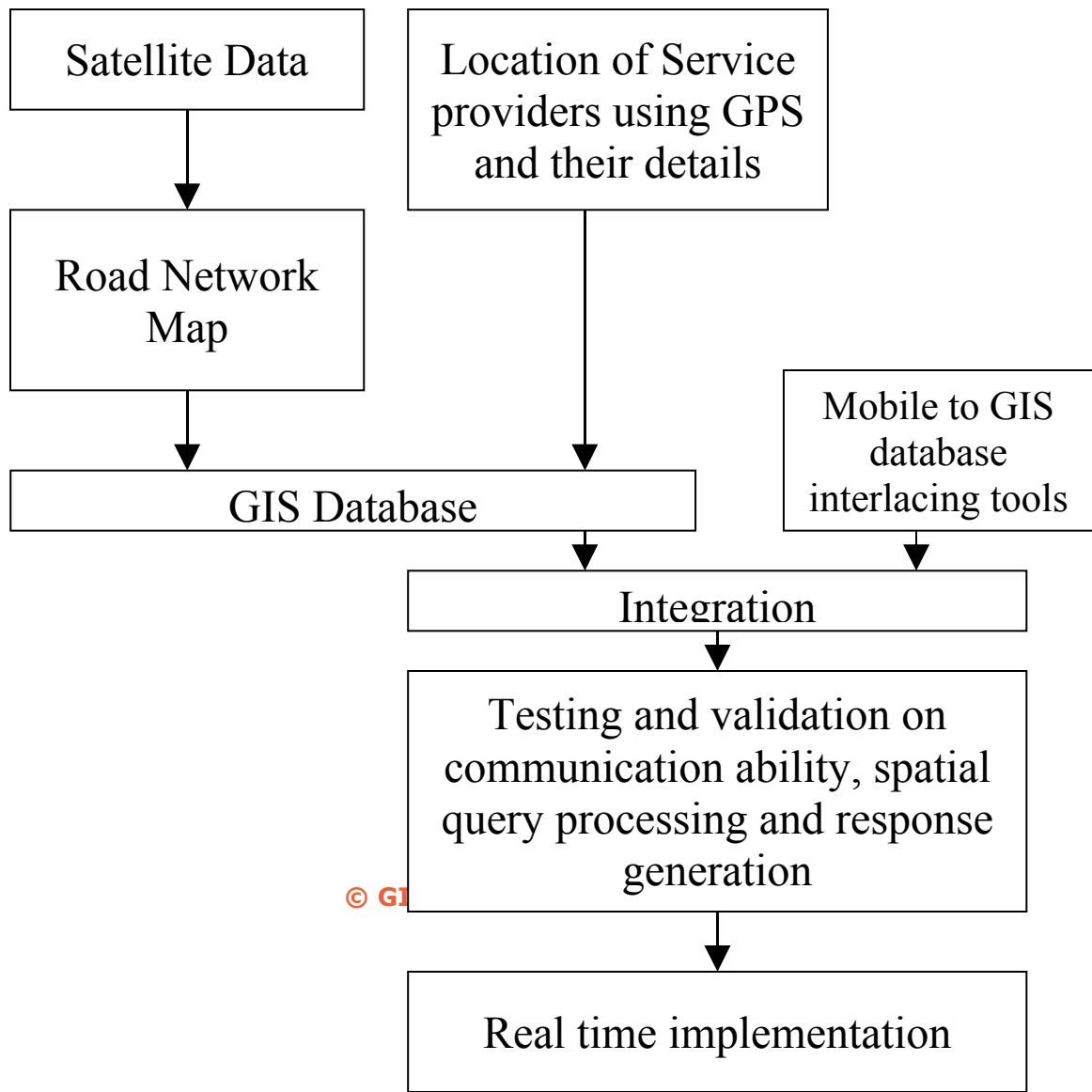
Data Collection:

The details of which data to be collected was to be collected was drawn up before the database design. So it came down to the basic field work involved in collecting the data. First the hospital details and their respective addresses were obtained from the internet. So this gave the system developers to divide and segment the metro into regions and sectors based on the density of the hospitals present in each region. Based on this the field work was to be done. Basically the work involved was to approach each hospital and obtain details of the departments in the hospitals and the doctor details of each department. Also the coordinates of the hospital was to be taken with the gps unit. The details and the coordinates thus obtained were to be incorporated into the database and onto the map using the requisite software.

Functionality of the Application

The application is developed taking into account the functional usage in the real time environment. It should be helpful for the general mass to locate the hospital providing a specific service. The service should be present in emergency situation at hand so that it can be productively used. The application would be able to be accessed from GPS enabled handheld devices so that the nearest hospital providing a service can be displayed instantly with the other contact information. Also the shortest and the quickest route to the point can be found out using the application.

The basic structure of the application is given below which shows the different modules that will be present. Each of the modules interacts with each other to provide accurate result to the user.



Apart from the structure of the application one of the most important implications is determining the shortest and the quickest route of the destination point from the point where the user is presently residing. The user location can be given as an input to the application by a pointing device in case of the application being used at the desktop level. In case of the handheld GPS device, the location is found out automatically by the device on the earth and the coordinates are given to the application. The program will then point out the source and the destination points and will try to find out the shortest path possible between the two.

This shortest route can be found by applying standard algorithms which can give the path from source to destination. The attributes to be taken into account will be the length of the road. Hence the result of the application will be the pictorial representation of the shortest path from the source to destination.

For the quickest route between the two points some other attributes will have to be taken into account which will be the traffic that is present on that road at the particular hour. The road with the maximum traffic will take the maximum time to reach the destination. It is a very important aspect while handling the emergency services. Because even a small moment can prove to be fatal.

Conclusion

The system has been designed so as to be the first of its kind help desk in a Chennai city. This system hopes to be the stepping stone for the advent of similar systems in the other major cities too. The system apart from being confined just to the medical segment can in fact be expanded to include all other emergency services such as police etc. The system being developed has made use of various resources such as gprs device, satellite images etc to get a comprehensive information system. Also by making use of the quickest and shortest path algorithms in determining the best possible route for the user depending on his choice the system has indeed been aimed at being a unique and enterprising help

information which would encourage the govt to take the initiative in implementing the same in all the other major cities as well.

This would then be a total boon to all users including the layman. The fully developed system when put up at the major hotspots in the city such as the railway station, major malls, bus stands and other major areas of public movement would lead to being very beneficial to the common man. Apart from that the system would in anyway would be accessible on the website to be hosted for this purpose.