GPS INTEGRATED NAVIGATION SYSTEM

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Abstract

In my project I am developing a computer program that will simulate and explain the need of technology and advance system for any person moving or navigating in a car (or any vehicle). Every person in day to day life requires some navigation for the proper working of his work .it is the human nature that ever man takes some guidance about some or another work without guidance the job taken by a human being will be completed properly or not is not known. So, for a proper working of your decided schedule you should know everything about the place where you live. You do know and if you ought to know then you can use "Emergency Navigation System".

'Emergency Navigation System' is specialized software which is able to track the current position (of any person driving vehicles) and tell the path and other detailed information about your destination. If there are occurrences of multiple paths to the same destination then it can show the shortest one among them.

Keywords: SAPI,GPS,GSM,SMS SDK,NAVIGATION

1.Introduction

The project is an application to facilitate the car drivers with some artificial intelligence and other helping features/guidance. This will be used or implemented in the near future by various car companies. So our project is mainly a navigation system for car drivers along with a map of the city with some intelligent helping and guidance features i.e. it will guide the driver about the easiest route, fuel, car's mileage etc. It will also be useful and helping in case of any accident or emergency.

The application will simulate the overall physical condition (status) of the vehicle and can even capable of guiding the driver about the speed and mileage of the vehicle. In case of low fuel it will inform the driver and will also tell the nearest petrol pump. Some of the features of our project are mentioned below

1. Using this system user can view and decide the easiest or shortest route to navigate by displaying lines on the map.

2. It will have all the names and position/situation of various landmarks, hospitals, hotels, theaters, garden, shopping malls etc within the city.

3. User also can store the useful phone numbers and emergency calling numbers.

4.It will also locate the nearest petrol pump (in case of low fuel), hospital or police station.

5.The emergency numbers stored will called/dialed automatically by the application if the emergency mode is activated.

6.It will also keep track of the cars physical status regarding any damage. Also it will have a simulation mode of engine that will display various physical aspects of the car including the engine status, temperature, oil etc.

7.It will also be capable to guide or help the driver through voice instead of displaying messages i.e. the application includes voice interaction.
8.It will have a camera attached for rear view.

9.To display the path/route a line will be drawn on the map using same x & y co-ordinates
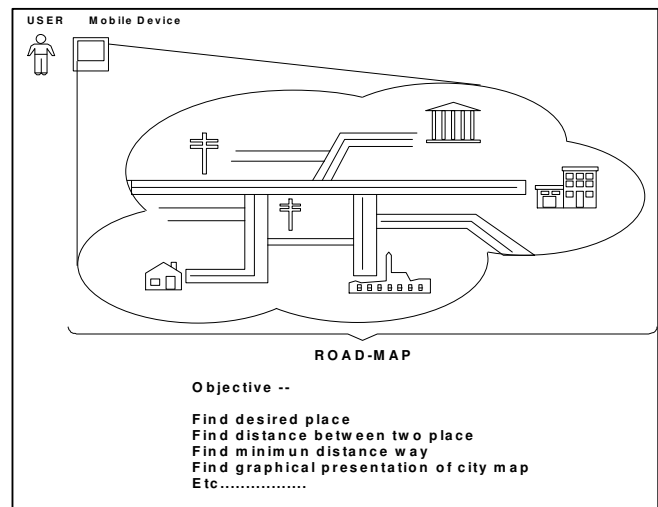
2. Description Logic

Fig. 1 Road Map

For locating various places in the city there will be a database of the places which stores the x & y Co-ordinates of various places to display the place in the map. Using the value of x & y co— ordinates we can also find out the nearest path to a desired place.
To display the path/route a line will be draw on the map using same x & y co-ordinates.

3. Logic behind Project

Get the detail map of city[18,19].
Get the detail of Land Marks
Create Digital Map[18,19]
Database for each square and place
Search path X –Y
Draw navigational line on the map[13,14]
Select desired place category
Draw place showing spot
Create the simulation for displaying the vehicle/engine status.
Create the module for voice interaction using Speech API (SAPI)

Logic behind
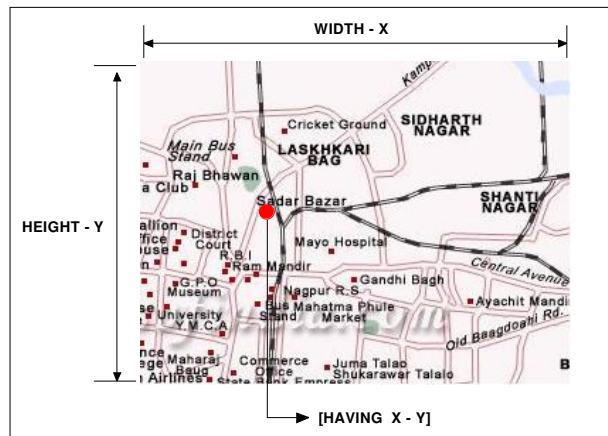

Fig. 2 Map

4. Develop Project

Testing Of project on Desktop/development PC
Build platform for our project for mobile device
Deploy project on mobile device
Implemented and ready to use

Get the detail map of city

A detail map of Nagpur was helpful in creating a database and providing names of all the squares and well known places[5,7].

Get the detail of Land Marks

A detail of all the landmarks in Nagpur was collected and was add to the database.

Create Digital Map

A digital map of Nagpur was created i.e. as all the linkage is done through (x, y) coordinate system a digital network is created which intern is the second face of original map[5,7].

Database for each square and place

Using Microsoft Access we have created a vast database of squares and different places. The created database contains the Name of the square and its corresponding (x, y) Co-ordinate.

Select source and Destination

User will select his source that is where he right now and will select a destination place where he wants to go. The database

Search path X –Y

Every place entered in the database is attached with a particular (x, y) value these (x, y) values are compared and the distance between these places is calculated in a value then which can be converted in to understandable distance value.

This is the part of the application which will create the voice interaction between user and application i.e. instead of displaying messages the application will speak to the user and inform various details or information while driving.

5. Process Execution
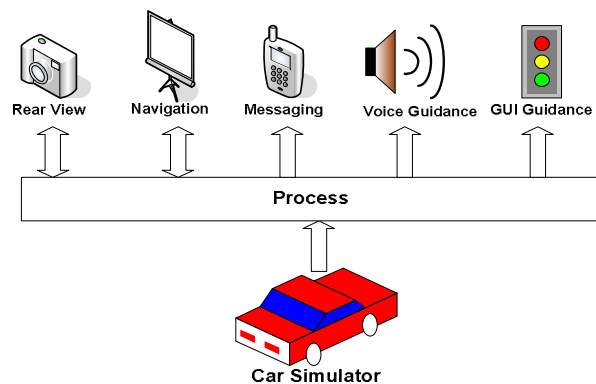

Fig 3. Process Execution

6.. Decision Making

This is how actual decision making takes place in the system. As system is dynamic then it is important to take proper decision. In project we are showing dynamic mileage indicator which will take speed and average of car as a input and calculate the approx mileage and show it on the

window. This mileage indicator varies as per speed which shows dynamic effect. Use User also need to provide the initial location of the car then system will calculate the current location using ratio of speed and the time driven. After calculating the current location system will consider it as a source..

Create the simulation for displaying the vehicle/engine status. Create a simple GUI that will graphically explain the condition of vehicle in terms of speed, fuel, mileage, engine temperature etc.

Create the module for voice interaction using Speech API (SAPI).
This is the part of the application which will create the voice interaction between use and process further and further processing is upon the mode
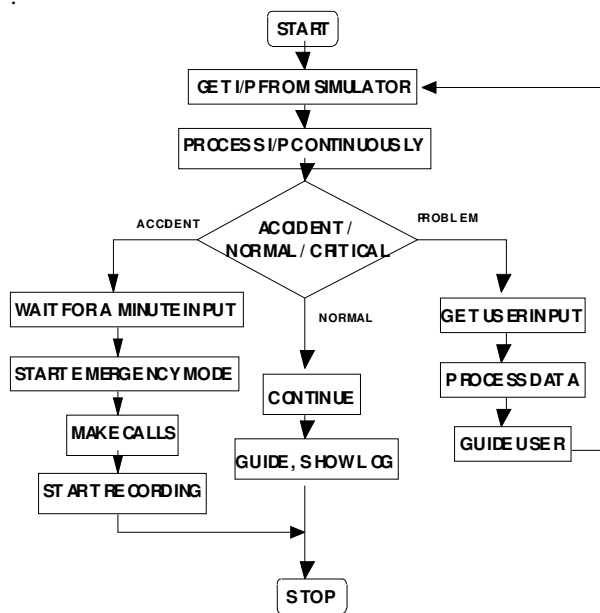
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Fig 4. Flow

7. Process normal

If in case of emergency for ex. Petrol is over or car is not working properly. In such a case system goes in normal mode and try to give maximum information to user. User will guide through mileage indicator so that user will know which speed is better to reach to nearest resource. This guidance is trough text message and also using voice messages. These messages may prerecorded or dynamically created. In this mode everything is in control of user and system is only guiding the user what is better for him or not. Rest of the decision is of user only

8. Process emergency

In this mode system will try to manage the things. Consider an accident condition. As system detect there is any accidental situation system start beeping and wait for one minute to get input from user this is only possible if user is in normal condition if no input is coming from user then system will consider it as a emergency condition and start emergency mode. In this mode system will calculate the approx location and start beeping, start making call to nearest police station, hospital and to user family so that they get idea and also important thing system start recording mode in which system start recording the voice for future use like black box in the flight.

9. How Voice

As we said that we will guide user through voice it is important to know the speech related functions detail to use it in the code. For this we will use speech API it has functionality to develop speech related software. Like text to speech or speech to text.

10. Camera

We will provide one more feature that is showing rear view to user but on screen except from mirror. For this we capture the web camera motion and play it on the software. We can move the camera to see the 360 motion.
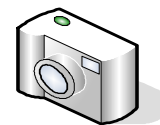
Rear View

Fig.5 Real View

11. How we do it

We are not demonstrating our project in actual car. We are building the software. Demonstration is not live. To give all the input to the system we will build small car game like simulator user can play it also. User needs to drive car in simulator and Software will track it and process further. Also we show car crashing /car state /damage in the simulator using some graphics function.

12. SAPI

As explained above we will use the Speech API for specific functionality. These are not avail with O.S. User need to install it to make use of it in the code. These are not the part of VB.net these are language independent but can use in the language like VB, VB.net, VC++ etc. these are provided by

Microsoft following are some functionality provided by SAPI[8]
Text to speech
Speech to text

13. GPS

Like many great technologies of our time, the Global Positioning System (GPS) [9,10,11,12]began as an exclusive military tool that was later made available to the general public. Using more than 24 satellites, GPS makes it possible for a single device to determine its position with an accuracy ranging from 15 meters to less than a centimeter. Now, portable GPS devices are being widely used in automotive navigation and are being hailed as a breakthrough in automobile safety. However, as with every technological advance there are those who oppose this new way of living. Claiming it as an invasion of privacy and an infringement on freedom, these individuals strive to get such systems banned from commercial use. The purpose of this paper is to briefly describe and comment on the economic, social, and ethical implications of these personal automotive GPS devices. So the proposed system will provide user personal navigation on Google Map

An automotive navigation system is a satellite navigation system designed for use in automobiles. It typically uses a GPS navigation deviceto acquire position data to locate the user on a roadin the unit's map database. Using the road database, the unit can give directions to other locations along roads also in its database. Dead reckoning using distance data from sensors attached to the drive train, a gyroscope and an accelerometer can be used for greater reliability, as GPS signal loss and/or multipath can occur due to urban canyons or tunnels.
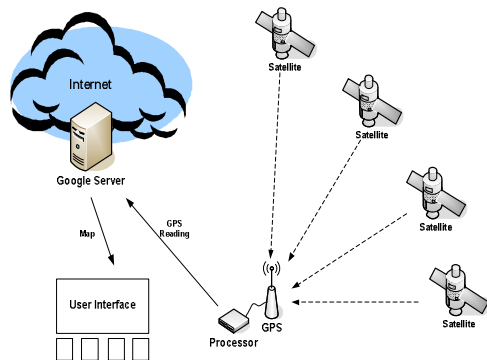

Fig 6. Basic Working Diagram

Normally GPS Navigation Software comes in two types:
Navigation with route calculation and directions from the software to the user of the route to take, based on a vector-based map, normally for motorized vehicles with some motorized forms added on as an afterthought.
Navigation tracking, often with a map "picture" in the background, but showing where you have been, and

allowing "routes" to be preprogrammed, giving a line you can follow on the screen. This will also be used for geocaching.
Basic idea behind the project is to provide a detailed navigation to user by using GPS and Google Earth technology. Following are some points that we keep in consideration while developing the system.

14. Track

A track is a trace of somewhere that you have actually been (often called a "breadcrumb trail"). It will normally leave a trace on a screen, or a series of recorded points. A GPS unit (external or internal) will send details of the location, probably once per second. The software will have some selection method to pick up some of these details and record them, either by taking a reading based on a set time interval, based on a set distance, based on a change in direction by more than a certain angle, or a combination of these. Each point will have a date and time stored with it, and the points can be linked by a line, which is the track. Retracing your steps is a simple matter of following the track back to the source.

15. Route

A route is a preset series of points that make up a set route to follow for your destination. Most software will allow the route and the track to be displayed at the same time.

16. Waypoint

Waypoints are used to mark particular locations, typically used as markers along the "way" to somewhere. They are either key entered by users or downloaded from other sources, depending upon the sophistication of the device. Although not linked to tracks or routes, they can be used to simplify the construction of routes, by being able to be re-used. Frequently, waypoints serve a "safety" purpose, enabling a route to be taken around obstacles such as shallow water (marine navigation) or streams/cliffs/other hazards which may prevent a safe passage directly from point "A" to point "B".

18. Software

There are currently several navigation software packets. These can be divided in commercial navigation software with imbedded maps, open source and free navigation software with maps, and navigation software where the maps are downloaded from a remote server, depending on the GPS-location.Using GPS system[9,10,11,12] will get main two entities that require by Google Earth those are, Latitude and Longitude

19. Latitude

The latitude of a place on the earth's surface is the angular distance north or south of the [equator].[Latitude is usually expressed in degrees (marked with °) ranging from 0° at the Equator to 90° at the North and South poles.[2] The latitude of the North Pole is 90° N, and the latitude [16,17]of the South Pole is 90° S.[2] Historically, mariners calculated latitude in the Northern Hemisphere by sighting the North Star Polaris with a sextant and sight reduction tables to take out error for height of eye and atmospheric refraction. Generally, the height of Polaris in degrees of arc above the horizon is the latitude of the observer.

20. Longitude

Similar to latitude, the longitude of a place on the earth's surface is the angular distance east or west of the prime meridian or Greenwich meridian. Longitude is usually expressed in degrees (marked with °) ranging from 0° at the Greenwich meridian to 180° east and west. Sydney, Australia, for example, has a longitude of about 151° east. New York City has a longitude of about 74° west. For most of history, mariners struggled to determine precise longitude[16,17]. The problem was solved with the invention of the marine chronometer. Longitude can be calculated if the precise time of a sextant sighting is known.

21. Messaging

Connected GSM Modem (Mobile) inside car (or User Mobile)
Use to send SMS to other
Need SMS SDK
Operated Using Software

Messaging

Fig 7. Messaging

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1. Microsoft Corporation. "SAPI System Requirements".MSDN. Retrieved on 2006-04-12

2. "GPS Support Notes" (PDF). January 19, 2007. Retrieved on 2008-11-10

6."Navstar GPS and GLONASS: global satellite navigation systems". IEEE.

7. How GPS works. Konowa.de (2005)

Application

➢ Navigation system for city
➢ Find desired place
➢ Find distance between two places
➢ Find minimum distance way
➢ See graphical presentation of city map
➢ Find the way where you want to go
➢ It will help in the maintenance of the vehicle.
It will help in case of an accident.

22. Future Aspects

In future development we are tying following things Deploy the system on mobile devices for deploying the system on mobile devices requires embedded technology knowledge.
If the system gets connected to phones we can just use the network service of user identification of finding out the source so at that time user would not have to enter his source or current location. If the system is able to find its current location then it will be very easy for a programmer to create such software for big cities even for state
In India but it will be possible by using GPS (Global positioning system) only.
We can also implement or can say extend the project that will tell the user about chances of accidents by scanning or reading the traffic conditions.

Conclusion

Proposed system is developed for assisting car driver in navigation, car driving, alerting. System will work automatically in emergency mode in case of accident to tell detail to predefined cell numbers.

References

1. "Map Matching Augmented Dead Reckoning", by W. B. Zavoli et al., Proceedings of the 35th IEEE Vehicular Technology Conference, pp. 359-444, 1986, IEEE CH2308-

2. Automated Provision of Navigation Assistance to Drivers", by Matthew McGranaghan et al., The American cartographer 3. Digital Map Dependent Functions of Automatic Vehicle Location Systems", by C. B. Harris et al., IEEE Position and Location Symposium, pp. 79-87, 1988, IEEE CH2675-7.

3. History of GPS, including information about each satellite's configuration and launch

4. Jurgen, R. K. 1998, Navigation and Intelligent Transportation Systems, Pennsylvania: Society of Automotive Engineers, Inc

5.. Zito, R., D'este, G., & M. A. P. Taylor, 1995, Global Positioning systems in the time domain: How useful a tool for Intelligent Vehicle-

Highway systems?, Transportation Research-C,
6C: 193-209.

6. www.insteptech.com (2005-07-22). "What's
new in VB6?".www.insteptech.com

7 "The   End   of   DLL   Hell".   Microsoft
Corporation. Retrieved on 2009-07-1

8. "Linker Support for Delay-Loaded DLLs".
Microsoft Corporation. Retrieved on 2009-07-1