Implementing racing application using GPS and GPRS/GSM device.

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Abstract— Integration of GPS and GSM technologies is flamboyant solution for many unsolved problems and which made them popular in their own context. This paper gives idea that to provide an effective application for vehicle tracking as well as personal tracking, the integration of GPS and GSM technologies into one system is used. To implement real time racing application, use of GPS and GSM technologies can be made. For tracking and tracing of multiple movable objects at a same time, this real time racing application is used which is also termed as Multi-Tracking System. For vehicles live tracing and tracking, GPS is used and GSM using sms or GPRS which is useful for controlling its subsystem parts. GPS can be used in banking, mobile phone operations. In this paper, the proposed solution contained that there is GPS and GPRS/GSM enabled device assigned to each vehicle (Bike, Jet Ski) participating in a race. That device will send the data containing, the speed, latitude, longitude and time of each vehicle (Bike, Jet Ski). Using this data received from the devices, we will calculate the real time results. We can also watch the live race over the internet. We can see the replay of races as well by using the data recorded. This paper describes that GPS & existing system of Jet Ski race is a manual one and time consuming. To make it faster and efficient this use of combined GPS & GSM/GPRS is helpful.Using Microsoft .Net Technology, we have implemented the whole system. C#.net is used for system components and ASP.net is used for web based parts.

Index Terms— Global Positioning System, General Packet Radio Service, Global System for Communication, Socket Listener, Dedicated Server, FM Teltonika 1100.

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1 INTRODUCTION

Trying to figure out where we are is probably man's oldest pastime. Consider a transport company having many vehicles, managing all such vehicles, keeping a track of their drivers, maintaining all the vehicles is a very hectic job. So there is a need of a system which could maintain all this essential details. We can provide an add-on to this by getting the live location of each vehicle and finding their path, also we can determine what their current speed is. By precisely timing the signals sent by GPS satellites high above the earth is useful for GPS receiver for calculating its position.

The GPS receiver uses the messages it receives from GPS satellites. To determine the transit time of each message and computes the distance to each satellite, GPS receiver is used. With the possible aid of trilateration, these distances along with the satellites' locations are used. Depending on this location, algorithm is used, to compute the position of the receiver. With a moving map display or latitude and longitude, this position is then displayed and also elevation information may be included. From position changes, we calculate derived information such as direction and speed which is shown by many GPS units [2], [3]. To track anyone and any-thing these days, GPS tracking systems are used. By using rapid GPS and GSM/GPRS combined technology, every average person easily handle a tracking system. When we have a vehicle, we may want to place a GPS tracking system under our dash or in our glove compartment. Using this GPS and GPRS/GSM tracking system we are able to find out our car within seconds and also we can catch the culprit, when our car ever gets stolen. This tracking system is also useful to find out the location of the anything which get lost or wander off., so a tracking device is imperative to avoid a possible disastrous and heart-breaking outcome. Using this GPS and GPRS/GSM tracking system, we can keep our valuable items like jewellery, or electronics safe in our home. To locate items inside buildings and parking garages, there are also various tracking systems. Using GPS and GPRS/GSM tracking system in cars, any family also keep watch on their teenager son or daughter to make sure that they are driving responsibly or not and they also keep watch on them.

2 EXISTING TECHNOLOGIES

2.1 Automotive Navigation System [7]

A satellite navigation system is also an automotive navigation system which is designed to use in automobiles. We may see this system primarily in high cost cars. To achieve greater reliability, a gyroscope and an accelerometer can be used. GPS signal loss and/or multipath can occur because of urban canyons or tunnels. Using this system, we can lead the driver to a particular destination by sensing the position of the car continuously. To increase and enhance safety for the people, the portable GPS devices have helped. For every traveller, the GPS system is a phenomenal navigational tool and in addition, that is vital to every traveller. This system is good for the driver but by this system the owner of the vehicle cannot know the current vehicle details as and when needed, so this system may be useful to the driver but it is not that useful to the owner of the vehicle who may want to keep a watch on the driver.

2.2 GPSylon System [8]

GPSylon System is the desktop based application for monitoring vehicles. It downloads maps from mapblast or expedia server. It is a java built application. It is used for tracing of path traversed. For reading GPS data in the NMEA (National Marine Electronics Association) standard from a serial GPS device & a file or a GPS daemon across a network, gpsylon is used. The display of various maps is the main feature of gpsylon. User navigates around like in a gpsylon, using digital atlas. Gpsylon show the next larger scale when there is missing maps of one scale, so do not result in a black screen & also it shows maps of different scales. Using mapblast or expedia map servers, gpsylondownload a single map for a given location or multiple maps in a given rectangular area. User may choose to download maps for a larger areaby dragging a rectangle with the mouse, or user may choose a single map, in download mouse mode. Using this gpsylon functionality, user download maps in a given scale for a larger area.

2.3 Open GTS (GPS Tracking System) [6]

To provide web-based GPS tracking services for a "Fleet" of vehicles, open GPS tracking system is specifically designed. Also it is an open source project. To fill the needs of an entry-level Fleet tracking system, this system was designed. There are many other applications similar to these applications which may have some advantages or disadvantages.
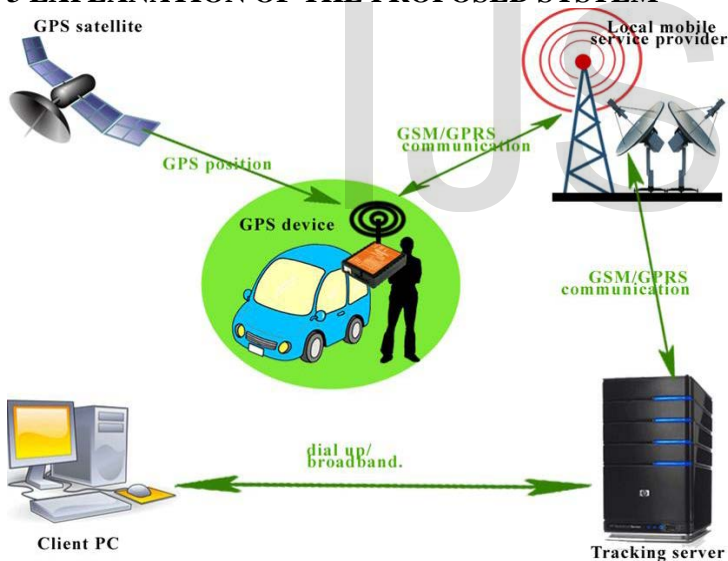
3 EXPLANATION OF THE PROPOSED SYSTEM

Fig. 1. Physical working of the proposed system

The Physical Components of Tracking System are
- GPS Satellite
- Car, Bike or Person with compatible GPS and GPRS/GSM Device
- GSM Service Provider
- Tracking Server
- Client PC

There is GPS and GPRS/GSM enabled device assigned to each vehicle (Bike, Jet Ski) participating in a race. GPS satellite sends GPS data to the device and that device will send us the speed, latitude, longitude and time of each vehicle (Bike, Jet Ski). Using GPRS module which will connect the cellular antennas through

the local network and the data on the device is send to the tracking server. There is a software component, on the tracking server called as Socket Listener, to get the data from the device on a particular socket. We have created parallel sockets. We have developed parser and hex to ASCII convertor to convert the incoming data. After the data is received in hexadecimal format it is parsed and converted to readable format by the parser and converter. The data is then stored into the database and we have used FIFO to dump the data into database using single connection string. The proposed website based on Google Map will display the vehicle tracking using the data from the database servers containing the GPS position. Using this data, further processing is done for alerts and to calculate real time results, and also reports generation. The user can access the website for monitoring the vehicle objects.
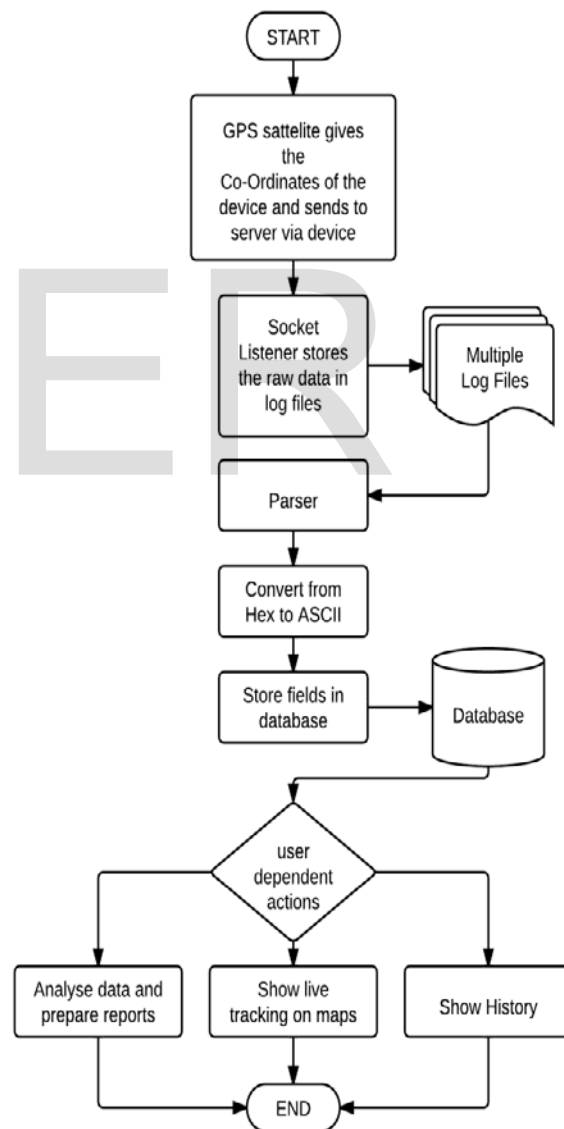
4. WORKING OF THE SYSTEM

Fig. 2 Conceptual working of the proposed system

As we have seen in the previous section, using AVL device (GPS and GPRS/GSM device), GPS satellite gives the position in the

form of latitude, longitude and altitude. All this information is then given to the Server which is received by the socket listener onto a particular port of the server. The data which is received is in the hex format which is non-readable to humans.

By this raw data a log file is prepared; this log file is further given to the Parser which parses the data according to the protocols of the device [7]. After parsing, the data is converted to ASCII format which is human readable and stored into various fields of the database table for further use. As we store the data into database we can use the data whenever we want it for getting reports, for live tracking, for preparing KML and other purposes as well.

5. PROGRAMATIC IMPLEMENTATION

As it is a web based application so the performance of the system may be hampered by the lack of proper bandwidth, even if the bandwidth is available the performance may be hampered by the working of individual components as it is an asynchronous application depending upon the performance of other parts. If the performance of one part is below average the whole application may suffer, so the performance criterion for each component is important and it cannot be compromised. Some of the components considered are as follows [12].

a) Combined GPS and GPRS/GSM device: - Teltonika FMXXXX or Go safe platinum device. It is a terminal with GPS and GSM connectivity. It has 4 digital inputs, 4 analog inputs, fuel counter inputs, external battery input, 1 MB internal memory extensible to 4 MB, power supply: 10 – 30V, 3 status LEDs, configuration update via GPRS, SMS or RS232 port, TCP/IP or UDP/IP protocol support,7500 record storing capacity (upgradeable up to 30000)

b) Socket Listener: It is the most important and critical part of the system as the working of the application and its efficiency completely depends upon the working of this component. We can implement the socket listener with any language whether it be Java or C#.net. The component must be multi threaded to handle as many clients as it can. As this component may be overloaded so the maximum number of clients which can run on a single Port must be determined and the port must be changed automatically if it is loaded.

c) Dedicated Server: There is GPS and GPRS/GSM enabled device assigned to each vehicle (Bike, Jet Ski) participating in a race. GPS satellite sends GPS data to the device and that device will send us the speed, latitude, longitude and time of each vehicle (Bike, Jet Ski). Using GPRS module which will connect the cellular antennas through the local network and the data on the device is send to the tracking server.

d) Parser and Converter: Parser is a software component. It accepts data from parser and reads records, parses each record. It converts each information from HEX format to ASCII format. It dumps the data into Database.

e) Web application- Web based GUI allowing user to login and use the application for monitoring, tracing, tracking, controlling vehicle, generating reports etc.

f) Organization of Data: As the number of clients increase it may be hectic job to find the data related to a particular carrier so the data organization also should be proper for quick retrieval, for this purpose data is organized into folders named according to users and ordered by dates.

6. CONCLUSION

GPS and GSM integration for vehicle and other objects tracking can be very helpful instead of using GPS network alone. This paper has developed the real time result calculation of races. We used concepts of GPS and GSM to get the required data. We used interpolation distance formula for earth, triangulation method and Haversine algorithm to calculate results. The extensive performance evaluation and optimization of the overall system, especially in terms of accuracy and precision of position estimation is necessary. This paper has demonstrated the GPS and GPRS technologies for a real-time vehicle tracking based on the Google map.Existing system was a manual work. They used to declare results after some time. Those results were having manual errors. So In this paper we have given solution to this problem by developing the system which will calculate real time results using GPS and GSM data. Future work will also focus on accuracy & precision of position estimation to get more accurate real time results.

ACKNOWLEGDMENT

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