Vehicle Tracking and Transportation Management System

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Abstract- *A Transportation management system focuses on improving the process of vehicle distribution. For which we will create a software for easy maintenance of data related to vehicle. To make it more reliable tracking system is included for which GPS and GSM are used. By using this tracking system, monitoring of assigned trip can be done on demand and to increase the number of trips, reduce idle time, eliminate unauthorized halts and detours. By this, we introduce the technology behind Vehicle Tracking System which would benefit people including commercial vehicle owners. A vehicle tracking system works using Global Positioning System (GPS) and Global System for Mobile Communication (GSM) technology, which would be the cheapest source of vehicle tracking and it would detect the location of vehicle. It is an embedded system which will continuously monitor a moving Vehicle and report the status of the Vehicle on demand.*

Keywords - *GPS, GSM, Microcontroller. Arduino*

I. INTRODUCTION

The GPS based "Vehicle Tracking and Transportation Management System" is one that makes use of the Global Positioning System (GPS) to determine the precise location of a vehicle to which it is attached. It is sought to design a GPS vehicle tracking system that enables administrators to view the present and past positions recorded of the target vehicle on Google Map so as to keep track on vehicle and ensure proper delivery of goods through a purpose designed website. The vehicle tracking and transport management system includes- It checks of availability of vehicle, depending on the customer requirements when a customer shows interest to get a vehicle for transportation of goods. The trip is assigned, if vehicle is available if vehicle has completed its previous trip, then upon successful completion of the trip, next trip is allocated to it. Vehicle is tracked using GPS to ensure that the vehicle has reached its proper destination without travelling aimlessly or unsystematically.

Details of the customer, trip allocated, in time, out time and the current location of the vehicle etc. are stored in database. Other details such as trip allocated, to which vehicle trip is allocated, customer details, driver details, etc. will also be stored. For cross verification of the trips, all the trips will be assigned to pre-defined location where system is having geographical details of every location completion of trips and successful transportation of goods will be cross checked as all the trips are assigned to pre-define location. Here the system will have the geographical details of the destination.

II. LITERATURE SURVEY

This tracking system permits the location of automobile and transmitting the position to owner through SMS. In the paper [1] tracking server consists of a Socket listener application running in the back-ground which listens at a particular port. This system composed of GPS receiver, Microcontroller and GSM modem.

In the paper [2] the system mentioned consists of an on-board module which is mounted in the vehicle which is to be tracked. This system is helpful for conveyance vehicles like buses and taxis, it provides Tele monitoring and management system for the transportation of the taxis and buses within the city. This on-board module consists of Global Positioning System, a GSM modem and ARM processor.

In the paper [3] the vehicle tracking system ensure the safety of private and public vehicles while travelling. It has fleet management functions such as routing, dispatch, on-board information and security. By using this system police can follow the signal emitted by tracking system to locate stolen vehicle that works using GSM and GPS technology.

The paper [4] system integrate the tracking system such as tracking device, web- based application and GPS navigator. This system useful to track and manage rental cars that are used by customer, using GPS tracking technology with GPS navigator.

In the paper [5] the tracking system is built on a recently produced VTS (The Aram Locator) offering a SOC replacement of the microcontroller-based implementation. This is done by fetching the information like speed, time, distance, latitude and longitude. The two microcontrollers along with memory are incorporated into or better supported with a high-density PLD.

III. METHODOLOGY

The general framework of Transportation management system with vehicle tracking is defined in system design (figure). Data regarding vehicle location, distance comes from mounted GPS devices on vehicle. This coordinators are inserted into the

database after using some transformation. After, several queries are made from database using reporting tools. Finally active vehicle tracking is achieved for "Transportation management system with vehicle tracking"

It consist of GUI for easy interaction. This GUI is designed for easy interface between user and system. Tracking window will take information from server and convert into readable form and will also show it on Google maps. This received information will consist of co-ordinates which will help to mark the location.

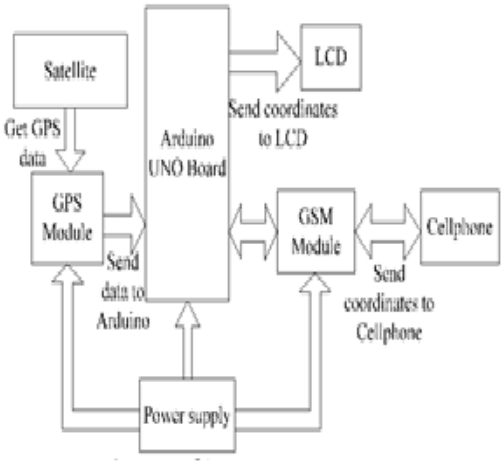

Fig. 1 Block daigram of Arduino based tracking system

A. *Working of GSM*

GSM for Mobile Communications is that the preferred wireless cellular communication technique, used for public communication. Global System for Mobile Communications (GSM) uses a combination of Time Division Multiple Access (TDMA) and Frequency Division Multiple Access (FDMA).

Fig. 2 GSM Modem

B. *Working of GPS*

The Global Positioning System (GPS) is a network of about 30 satellites orbiting the Earth at an altitude of 20,000 km. Wherever you're on the world, at least four GPS satellites are 'visible' at any time. Each one transmits data concerning its position and therefore the current time at regular intervals. These signals, travelling at the speed of light, are intercepted by your GPS receiver, which calculates how far away each satellite is based on how long it took the messages to arrive. Once its data on however far a 3 satellites are, your GPS receiver can pinpoint your location using a process called trilateration.

Any instant of time, there are at least 4 GPS satellites in line of sight to a receiver on the earth. Each of these GPS satellites send information about its position and the current time to the GPS receiver at fixed regular instants of time. These information are transmitted to the receiver in the form of signal which are then intercepted by the receiver devices. These signal are radio signals that travels with the speed of light. The distance between a GPS receiver and the satellite is calculated by finding the difference between the time the signal was send from GPS satellite and the time the GPS receiver received the signal.

Once the receiver receives the signal from a minimum of 3 satellites, the receiver then points its location using trilateration process. A GPS requires at least 3 satellites to calculate 2-D position (latitude and longitude on a map). In this case, the GPS receiver assumes that it is located at mean sea level. However, it requires at least 4 satellites to find receivers 3-D position (latitude, longitude and altitude).

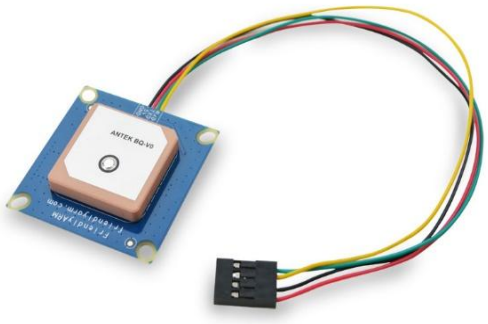

Fig. 3 GPS Modem

C. *Working of Hardware Module*

The 3 components in hardware module are Microcontroller, GPS and GSM. These components together are used to get the current location. The hardware module is to be placed on vehicles. It gets power supply from battery. GPS is used to track the location with the help of GPS transmitter, which is also known as GEO satellite. The GPS transmitter

sends the data in the NMEA (National Marine Electronics Association) format. It is a standard data format supported by all GPS manufacturers. The purpose of NMEA is to give equipment users the ability to mix and match hardware and software. NMEA-formatted GPS information conjointly makes life easier for software system developers to write down software systems for a type of GPS receivers rather than having to write down a custom interface for each GPS receiver.
For example, Visual GPS software (free), accepts NMEA-formatted data from any GPS receiver and graphically displays it. Without a customary like NMEA, it would be time-consuming and expensive to write and maintain such software.

NMEA Message Structure
$GPGGA,181908.00,3404.7041778,N,07044.3966270,
*W,4,13,1.00,495.144,M,29.200,M,0.10,0000*40*All NMEA messages start with the $ character, and each data field is separated by a comma.
GP represent that it is a GPS position (GL would denote GLONASS).
181908.00 is the time stamp: UTC time in hours, minutes and seconds.
3404.7041778 is the latitude in the DDMM.MMMMM format. Decimal places are variable.
N denotes north latitude.
07044.3966270 is the longitude in the DDDMM.MMMMM format. Decimal places are variable.
W denotes west longitude.
4 denotes the Quality Indicator:
1 = Uncorrected coordinate
2 = Differentially correct coordinate (e.g., WAAS, DGPS)
4 = RTK Fix coordinate (centimeter precision)
5 = RTK Float (decimeter precision.
13 denotes number of satellites used in the coordinate.
1.0 denotes the HDOP (horizontal dilution of precision).
495.144 denotes altitude of the antenna.
M denotes units of altitude (eg. Meters or Feet)
29.200 denotes the geoidal separation (subtract this from the altitude of the antenna to arrive at the Height Above Ellipsoid (HAE).
M denotes the units used by the geoidal separation.
1.0 denotes the age of the correction (if any).
0000 denotes the correction station ID (if any).
***40** denotes the checksum.
The $GPGGA is a basic GPS NMEA message.

The data sent by transmitter shows location of vehicle in form of latitude and longitude, speed of vehicle, time, etc. For tracking, we need only latitude and longitude. Program written in microcontroller extracts the information, which is present in $GPGGA format for position. The extracted information is sent by GSM module to the predefined number. This message includes the latitude and longitude of position, which when seen in Google maps it will show the exact location.

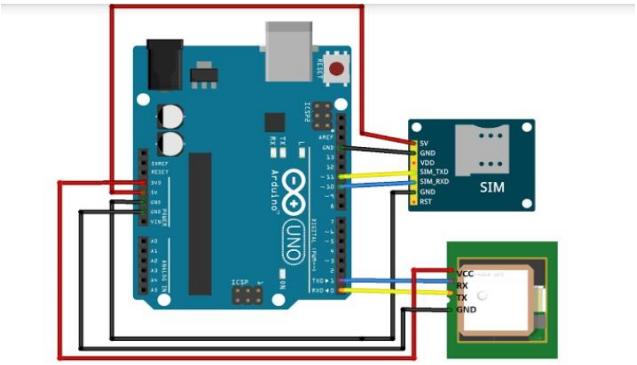

Fig. 4 Hardware Module

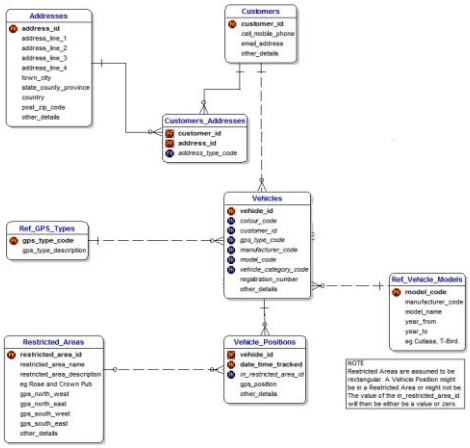

Fig. 5 Database Architecture

D. Working of Software Module

a) Registration
Registration and enquiry module consists of making of GUI which is created for easy interaction. The GUI is designed for easy interface between user and system. .Net framework is used for creation of GUI and database is used to store the details regarding vehicles. MySQL is used for backend. Admin will simply enter their details of vehicle driver and customer like first name, last name, destination, source and other details on the registration form. After that, they will click on a button to register themselves the details will be entered on database.

b) Database
The database contains fields as shown in Fig. 5 above. The database includes various information about vehicle and also about the location of vehicle.

IV. RESULTS AND DISCUSSION

A. *Testing In-vehicle device*

The GPS module receives geographic coordinates from the satellites. The vehicle's location information is read in from the GPS module by the microcontroller. The vehicle's location information and vehicle's Id are then transmitted to the web server through GSM network. The received vehicle's and vehicles' ID are sent.

B. *Testing Web Server and Database*

The web server is connected to the database, and then the vehicle's location information is stored in database. Some real experimental data for a vehicle's location information, collected and uploaded to a database based on test and run.

C. *Testing Desktop Application*

The location of vehicle is updated from the in-vehicle tracking device. Whenever the vehicle's location changes, the vehicle's address will be updated regularly.

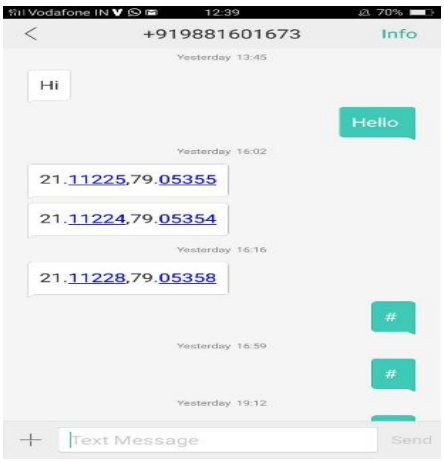

Fig. 6 Coordinates in the form of latitude and Longitude

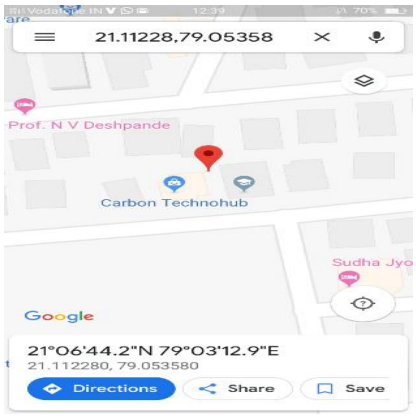

Fig. 7 Current location displayed on map

V. CONCLUSION

In this project, a Transportation Management System including Vehicle Tracking system to track the exact location of a moving or stationary vehicle in real-time is developed and tested. An in-vehicle device, a server and a Desktop application are used for the vehicle tracking system. In this work, the in-vehicle device is composed of a microcontroller and GPS/GSM module to acquire the vehicle's location information and transmit it to a server through GSM network. On the other end, the web interface is used to directly connect to a database. A vehicle's geographic coordinates and a vehicle's unique ID obtained from an in-vehicle device are recorded in a database table. And a Desktop application has been created to display a vehicle location on Google maps and this application will also help the administrator to maintain record of the vehicle. The system was able to experimentally demonstrate its effective performance to track a vehicle's location anytime from anywhere.

V. REFERENCES

[1] Shital Mohol, Amit Pavanikar, Ganesh Dhage "GPS Vehicle Tracking System" International Journal of Emerging Engineering Research and Technology ,Sryahwa publications,October 2014.

[2] .Madya, Zulkiflie Bin Ibrahim "Vehicle Tracking System Using GPS and GSM Technology" University Of Technical Malaysia,melakai.,July 2009.

[3] Kunal Maurya , Mandeep Singh "Real Time Vehicle Tracking System using GSM and GPS Technology-An Antitheft Tracking System" International Journal of Electronics and Computer Science Engineering,June 2012.

[4] Omarah Omar Alharaki,Omarah Omar Alharaki,Akram M. Zeki "The Integration of GPS Navigator Device with Vehicles Tracking System for Rental Cars Firms" , International Journal of Computer Science and Information Security(IJCSIS), Vol. 8, No. 6, September 2010.

[5] Adnan I. Yaqzan, Issam W. Damaj, and Rached N. Zantout "GPS-based Vehicle Tracking System-on-Chip".Proceedings of the World Congress on Engineering 2008 Vol I WCE 2008, July 2 - 4, 2008, London, U.K.