Review on Vehicle Tracking System using GPS, GPRS and GSM

[1] Yogesh Kumar

[1] Department Of Electronics and Communication Engineering, Galgotias University, Yamuna Expressway Greater Noida, Uttar Pradesh

[1] singhyogesh2002@yahoo.co.in

Abstract:Global Positioning System (GPS) is becoming widely used for vehicle tracking and surveillance. Many systems were created to provide those services that make them more popular and needed than ever before. GPS tracking has many uses in today's world; the system can be used for tracking children, assets, cars or any tracking equipment and as spy equipment. Because of their wide availability and reliability, many tracking systems are based on the Global Positioning System (GPS), Global Mobile Communications System (GSM), and Smartphones. Recently applications based on tracking have been quite popular. Most were restricted to commercial applications such as vehicle tracking (e.g. tracking a train, etc.). Not much work has been done, however, towards designing a personal tracking system. Object tracking systems play important roles in tracking moveable objects and overcoming issues such as security, security, and other applications related to locations. Problems arise from the challenges of creating a well-defined and comprehensible description of tracking systems.

Keywords: GPS, GPRS, GSM, Mobile network, Tracking System

INTRODUCTION

Effective transport and logistics has become a very important part of the business due to the ever-increasing price of oil. Due to the rising oil price, several efforts have attempted to deploy methods of making transport even more efficient in order to reduce costs. Vehicle tracking is one of the ways to cut costs by knowing the current location of a vehicle such as a truck or a bus in real time. A fleet operator uses the location of a vehicle to efficiently plan a schedule in order to reduce the time and distance of transport. This research uses Global Positioning System (GPS)[1] for positioning, General Packet Radio System (GPRS)[2] for data transmission and Google Earth software for location display to introduce a vehicle tracking system.

The Intelligent Transportation System (ITS) tracking system can also be very useful. For instance, it can be used to measure real-time traffic data in probe cars to identify the congesting area. In an emergency case, it can also be a life saver to report a vehicle position to a rescue agent swiftly and automatically when a vehicle accident occurs. Additionally, when stolen, it can be attached to a vehicle with an anti-theft system to identify its location.

Vehicle tracking system[3] in today's world is one of the most important systems mostly used by drivers and most vehicle owners. The maps given to the driver are the key weapon which plays a key role in this field. The owner corporations often found it problematic to keep track of what was happening when large objects or vehicles were a blowout over the ground. The author suggested that with various upcoming technologies, Vehicle tracking has become so advanced and simple. But the cost-effectiveness has become high, and its implementation. Many organizations and individuals nowadays find a need for safety tracking. Having a vehicle tracking system as for better vehicle

implementation as well as for safety is a concern. Mostly, Internet and external data servers are used as a primary requirement in all tracking systems. Therefore, this leads to a large amount of money being invested into the system. In this paper, therefore, a survey is carried out with the aim of reducing costs in tracking systems and making it feasible to implement on school buses which take a specific route on a daily basis for better time and safety management. This system also has to be implemented in public transport vehicles, various companies and many more. Some type of system requires determining where each object was at any given time and for how long it traveled. GSM and GPS built tracking system will provide effective, real-time vehicle location and report vehicle location. GPS-GSM based tracking system will inform how long the vehicle has been and where it is. The system will fetch the geographic location and time information from the Global Positioning Satellites. The system takes advantage of wireless technology to give the vehicle tracking system a better way. Vehicle tracking system is the technology used to assess a vehicle's location. It is a system mostly used to keep an eye on the moving objects and the best way to find the object's position is by using surveillance systems such as global positioning system. This survey found GPS system can observe the vehicle's activities all the time and allow the vehicle's position to be viewed by the owner or third party. In general, a study on GPS tracking finds that tracking vehicles by GPS uses a space-based global satellite navigation system to track vehicle location information. This information is then forwarded to a third party who has access to the location of the vehicle. A vehicle tracking system requires GPS device to be placed inside the vehicle for implementation. The vehicle position will be updated as the vehicle moves at all times. This system allows car owners to observe and track the vehicle, and can find out about the movement of the vehicle and its past activities. The tracking system works competently in areas with improved mobile connectivity in as many major cities, highways, towns and towns as possible

BACKGROUND

GPS Technology:

Global Positioning System (GPS) is a system consisting of a network of 24 U.S. satellites originally used in military services and subsequently permitted for commercial use. The satellites regularly emit short pulsed radio signal to GPS receivers. To calculate distance, a GPS receiver receives the signal from at least three satellites and uses a triangulation technique to calculate its two-dimensional position (latitude and longitude) or at least four satellites to calculate its three-dimensional position (latitude, longitude, and altitude). Once a location is calculated, an average speed and direction of travel can be calculated. GPS is thus a key technology to give the device its position.

GPRS Technology:

Other than existing GSM data services such as Short Message Service (SMS) and Circuit Switched Data (CSD) for fax transmission, the General Packet Radio Service (GPRS) is an enhancement of GSM networks to support packet switched data services such as email and web browser. GPRS operates on the existing GSM network infrastructure which uses the time slots available during each frame transfer. Thus, the existing GSM network traffic is not overloaded and can provide data services efficiently. The GPRS can transfer data at a maximum rate of 115.2 kbps (with each frame having eight available slots). GPRS becomes the largest available and always-on data service network due to a very large coverage area of GSM networks

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 1, January 2018

worldwide; thus, it is best suited for a real-time tracking management system.

GSM Technology:

GSM (Global Mobile Communication System)[4] is a digital mobile network which is widely used by mobile phone users in Europe and elsewhere in the world. GSM uses multiple accesses (TDMA) time division variation and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and multiple access code division (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other user data streams, each in their own slot of time. It operates on either the frequency band 900 megahertz (MHz) or 1800 MHz

VEHICLE TRACKING SYSTEMS

1. GPS Based Vehicle Tracking and Monitoring System:

Tracking systems are widely used to keep an eye on the objects in motion. Public transport vehicles are the primary mode of transport in India. Public transport vehicles are always vulnerable targets for many different crimes. Surveillance of such antisocial activities is required. It can be done through the use of surveillance systems such as global positioning. The vehicle activities can be observed by GPS system twenty four-seven.

Most applications for vehicle tracking are developed using GPS technology. GPS technology is widely used to verify the status of a moving object mounted onto a GPS receiver. This paper provides a solution to track and monitor the use of GPS technology for public transport vehicles.

1.1 Hardware Design:
1.1.1   Raspberry Pi:

The Raspberry Pi[5] is a low-cost, credit-card-sized computer that connects to a computer monitor or TV, using a standard mouse and keyboard. It's a smart little device that allows people of all ages to explore computing, and learn how to program in languages such as Scratch and Python. It runs on the programming language of Python[6].

For the Raspberry Pi a considerable number of programming languages were adapted, either by the language creator or by users of the language who wanted to see their language of choice available on the Raspberry Pi. Python, C, C++, Java, Scratch and Ruby all come on the Raspberry Pi by default.

1.1.2   GPS Antenna:

A GPS antenna[7] is a device that boosts the signal received to a GPS unit, be it a standalone unit or an embedded unit. Signals can be transmitted and received by GPS antenna. Through the transmitting signals it can contact the positioning satellites in the sky, so that the satellites can know the user's situation. In a situation where the GPS unit itself is somehow removed from a line of sight into the sky, a GPS antenna often is used.

The GPS antenna simply receives the electromagnetic signals from the satellites. We need a GPS receiver unit to convert the electromagnetic signals into digital values. This GPS receiver unit stores the GPS data to an SD card.

1.2 Software Design:
1.2.1   Raspbian Operating System:

Raspbian is a free Raspberry Pi board operating system. Raspbian has all the packages needed for running Raspberry pi board. The Raspberry Pi

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 1, January 2018

operating system is stored in a well-formatted SD-card. This SD card is connected to Raspberry Pi's SD port to charge the Operating System when power supply is ON. Raspberry Pi can run on Linux and Windows operating systems.

1.3 System Architecture:

Fig. 1 shows the system architecture, GPS Receiver module continuously captures the current location's longitude and latitude values. A passenger boarding the vehicle can provide the system with various intermediate locations between the locations of the source and destination.
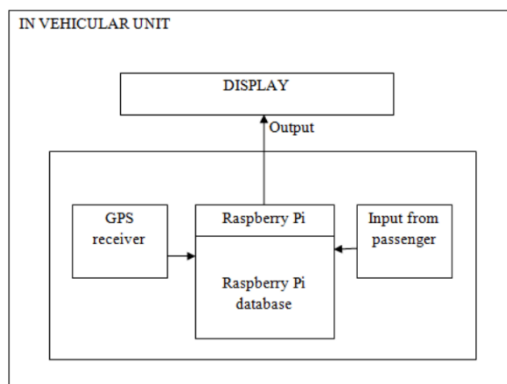

Fig.1: System Design

GPS receiver module continuously records the current location's longitude and latitude values. A passenger boarding the vehicle can give the system various intermediate locations between the locations of source and destination. Those values are stored within the database of Raspberry Pi. When the system starts the vehicle compares the current location values to the stored location values. If the comparison gives less tolerance then we can say the driver is driving in the right direction, otherwise the display system will receive a warning message. Passengers can therefore be informed of wrong directions.

2. Android App Based Vehicle Tracking Using GPS and GSM:

2.1 Methodology:

2.1.1 Block Diagram:

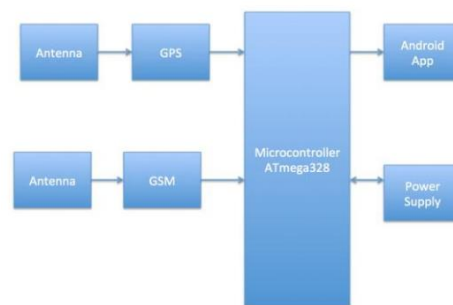Fig. 2 illustrate the block diagram of the vehicle tracking system.

Fig. 2: Block Diagram Vehicle Tracking System

2.1.2 Diagram Description:

The 8052 microcontroller[8] is used to interface peripherals to the hardware. Between the 8052 microcontroller and the GSM modem and GPS receiver there is serial interface. The system works with taking input from the GPS. This input is then forwarded to RS232. It is then sent to MAX232 where the data is formatted to enable it to be forwarded to the microcontroller's receiver pin (Rx). After this the data is stored in the buffer of the microcontroller and then sent via the TX (Transmitter pin) to the MAX232. The data is forwarded to GSM via MAX232's RS-232 protocol. On request it will send the location of the device to the registered mobile user by pressing the Track location ' button in the android app. The user will be shown the location of the vehicle on the designed android app. The device code is written and tested in Arduino IDE, a cross-platform application where the code is

written, debugged, and tested. The Android app is designed in studio android.

2.2 Functionalities and Overview of the System:

2.2.1 GPS Technology:

GPS (Global Positioning System) works absolutely free in all weather conditions whether it's stormy or flooding, covering the whole world 24 * 7 year-round. This satellite-based navigation system has GPS satellites, orbiting the Earth twice daily. Every satellite sends the GPS receivers a unique signal. Then the GPS receivers decode the signals and calculate the user's exact location. As the source of calculating position, the receiver basically takes the time it takes to receive signals.

2.2.2 GSM technology:

Global Mobile Communication System (GSM) works exactly like a mobile phone. It is basically a modem that has a SIM installed on it and operates over a subscription. GSM networks consist essentially of three main systems:

• The Switching System (SS)

• The Base system (BS)

• Mobile Station (MS)

2.2.3 Microcontroller:

ATMega328[9] is the ATMEL Microcontroller which is based on Arduino UNO. It is a single chip microcontroller in the mega AVR family created by AMTELAVR is a family of Atmel engineered microcontrollers. It facilitates GPS interface and GSM module interfacing. Its use reduces system costs and the small, compact design makes the device handy.

2.2.4 MAX232:

The Max 232 is an integrated 16-pin circuit that converts the signal from serial port RS232 to the proper signal used in digital logic circuits compatible with TTL. It is a dual transmitter and receiver used to convert signals from RX, TX, CTS and RTS. To cover the voltage levels for TTL devices; the integrated circuit MAX 232 is mostly used in RS-232 communication systems.

2.2.5 RS232 Protocol:

Recommended Standard Number 232 (RS-232) asynchronous to serial data exchange protocol. It defines common ground between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE), for voltage and signal level. Your PC is a DTE gadget whereas most gadgets are usually DCE gadgets. This standard defines the attributes, timing, and significance of the signals, physical size and pin out of the connectors.

2.2.6 Arduino IDE:

In Arduino IDE[10], the code to be uploaded to the Arduino is written, tested and debugged. It is an IDE (Integrated Development Environment) for the language of programming processes and the project Wiring.

CONCLUSION

The paper's aim is to give an overview of the system for tracking vehicles. This system used to track the vehicle using GPS which is one of the greatest advances in technology to track the vehicle's activities. This system can be used to improve safety and security both for personal as well as business purposes. This technology can also help advance the transportation system, and can be used for security purposes and tracking purposes in many organizations. This system allows organizations to track their vehicles and get exact vehicle location.

REFERENCES

[1]   J. L. Awange, "The global positioning system," in *Environmental Science and Engineering (Subseries: Environmental Science)*, 2012.

[2]   S. Lee, G. Tewolde, and J. Kwon, "Design and implementation of vehicle tracking system using GPS/GSM/GPRS technology and smartphone application," in *2014 IEEE World Forum on Internet of Things, WF-IoT 2014*, 2014, doi: 10.1109/WF-IoT.2014.6803187.

[3]   K. Maurya, M. Singh, and N. Jain, "Real Time Vehicle Tracking System using GSM and GPS Technology-An Anti-theft Tracking System," *Int. J. Electron. Comput. Sci. Eng.*, 2012.

[4]   GSM Association, "Mobile Infrastructure Sharing," 2012.

[5]   J. Newmarch and J. Newmarch, "Raspberry Pi," in *Linux Sound Programming*, 2017.

[6]   "Python?," *Seibutsu-kogaku Kaishi*, 2019, doi: 10.1201/b19104-3.

[7]   M. Chen and C. C. Chen, "A compact dual-band GPS antenna design," *IEEE Antennas Wirel. Propag. Lett.*, 2013, doi: 10.1109/LAWP.2013.2247972.

[8]   T. S. Ng, "Microcontroller," in *Studies in Systems, Decision and Control*, 2016.

[9]   Atmel, "ATmega328 / P," *AVR Microcontrollers*, 2016, doi: 10.1104/pp.108.130294.

[10]   D. Wheat and D. Wheat, "Arduino Software," in *Arduino Internals*, 2011.

[11]   Vishal Jain, Dr. S. V. A. V. Prasad, "Ontology Based Information Retrieval Model in Semantic Web: A Review", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), Volume 4, Issue 8, August 2014, page no. 837 to 842 having ISSN No. 2277- 128X.

[12]   Vishal Jain, Dr. S. V. A. V. Prasad, "Role of Ontology with Multi-Agent System in Cloud Computing", International Journal of Sciences: Basic and Applied Research (IJSBAR), Jordan, Volume 15, No. 2, page no. 41 - 46, having ISSN No. 2307-4531.

[13]   Vishal Jain, Gagandeep Singh Narula, "Improving Statistical Multimedia Information Retrieval (MIR) Model by using Ontology and Various Information Retrieval (IR) Approaches", International Journal of Computer Applications 94(2):27-30, May 2014 having ISSN No. 0975-8887

[14]   R.Santhya , S.Latha , Prof.S.Balamurugan , S.Charanyaa" Investigations on Methods Developed for Effective Discovery of Functional Dependencies,", International Journal of Innovative Research in Computer and Communication Engineering, Vol.3, Issue 2, February 2015,

[15]   T.Kowshiga, T.Saranya , T.Jayasudha , Prof.M.Sowmiya and Prof.S.Balamurugan" Developing a Blueprint for Preserving Privacy of Electronic Health Records using Categorical Attributes,", International Journal of Innovative Research in Computer and Communication Engineering, Vol.3, Issue 2, February 2015.

[16]   P. Lavanya, R. Meena, R. Vijayalakshmi, Prof. M. Sowmiya, Prof. S. Balamurugan , " A Novel Object Oriented Perspective Design for Automated BookBank Management System", International Journal of Innovative Research in Computer and Communication Engineering, Vol.3, Issue 2, February 2015.