Vehicle Tracking and Controlling System Using GPS

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ABSTRACT:" The scale of theft of vehicles worldwide is worrying and the act needs to be curbed. Vehicle monitoring and controlling systems are different, with one or more disadvantages. Information and communication technologies (ICT) have positively succeeded in life by addressing many pressing problems to allow people to lead more easy lives. One such issue is automobile surveillance while parking or driving to ensure the safety of the vehicle and the people inside. This work suggests a tracking system for automobiles using wireless technology, including mobile phones, microcontrollers and GPS technology. An affordable and effective vehicle monitoring and safety mechanism using Global Positioning System (GPS) is developed in this paper. This system consists of a hardware device which is mounted in the car and a controlling unit cell phone to track the vehicle is used. The system receives feedback from the GPS satellites, sends this data via SMS to the designated user's phone with the assistance of the Global Mobile Communication System (GSM) module installed in the device. For presentation of graphical location information, the data sent to the control phone is processed and fed into a Geographic Information System (GIS) interface."

KEYWORDS: GPS, GIS, GSM Module, Mobile Station, SMS, Microcontroller.

INTRODUCTION

Increasing the number of vehicles, particularly in some metropolises such as Delhi Kolkata and Mumbai etc., makes it really difficult to solve the problems of car accidents and hazards. Accidents in these cities have reached the stage of standards and are causing risks and loss of people. In dispute this dilemma, driving safety systems have been designed according to the specifications and have been promoted for many years in many developed countries. Thousands of cars are robbed in the highways and unsecured parking spaces every year. Sometimes by opening the door or breaking windows, thieves attempt to steel the vehicle parts. Because of such incident people are scared to leave the vehicles on the road or unfamiliar parking areas.

Several prototypes and technologies have been designed and implemented within the vehicles to avoid this problem. Besides the fact that such kinds of alarm systems are restricted to some distance, the driver may not have the chance to set other related safety measures that may discourage the automobile from being stolen[1] when assaulted at the gunpoint. This demonstrates that most conventional vehicle safety systems are ineffective in the handling of advanced theft.

Designing an automobile safety device[2] and sharing data the owner's mobile phone tracking will however be the effective solution for the current situation and need. An automobile monitoring system is an electronic device that is mounted in a car so that the driver or a third party can determine the location of the vehicle. There are technical details which can be used to describe the ability to judge a mobile station's location, including position, geolocation, and radiolocation. By position, we mean mobile station's coordinates which can be three dimensional or two dimensional. It also includes details such as longitude and latitude of position of the mobile station.

There are some firms that have the requisite technologies in vehicle monitoring[3] but their customers have to pay for the subscription made services that make it incredibly costly to access to the majority an accurate and cost-effective vehicle monitoring and security system is needed for this reason. This paper describes a lower cost monitoring and safety program for vehicles that needs very little maintenance. This could be run by the vehicle owner and does not need to pay the third party their monthly charges. The proposed solution will relay the vehicle's location information for or at a certain pre-set period as needed. The system contains a hardware device mounted in the vehicle body and a user controlled cell phone to monitor. The system collects signal from the GPS satellites[4] and sends this data via SMS to the user's phone, using the GSM

module installed in the device. The information sent to user controlled cell phone will be processed and loaded into a GIS interface.

1.1 Exiting Technology for Tracking the Vehicle:

The review of the literature on the previous work pertaining to automobile navigation shows that only the automobile is tracked. But no relevant work is being discussed on safe and secure measures to prevent accidents. Fig.1 is showing the block diagram for tracking the vehicle using GPS[5] technology. The major disadvantage of existing art is that they can only track the vehicle but not give any information related to safety of the vehicle or passenger traveling via that vehicle.

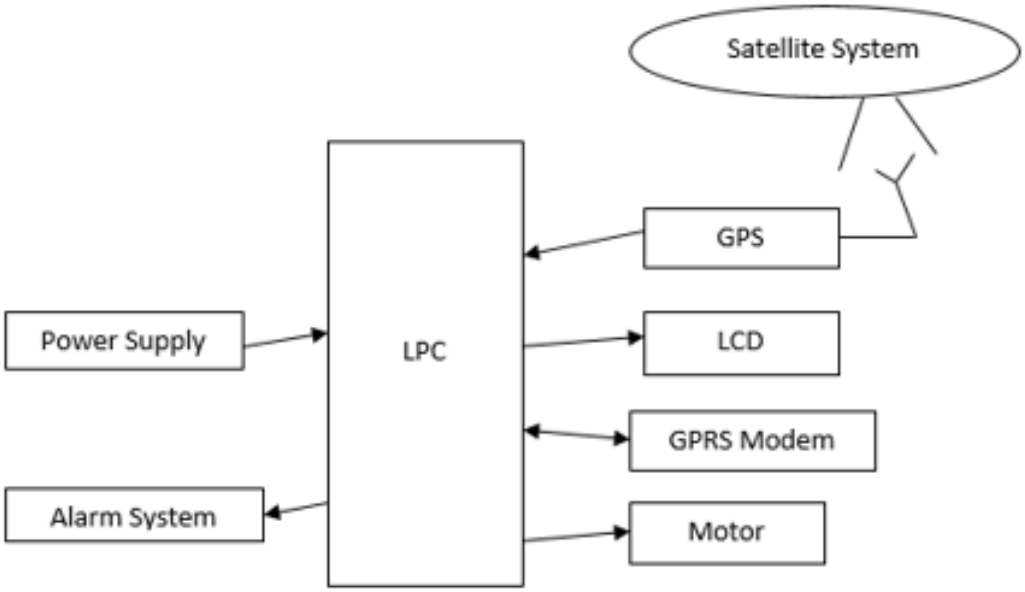

Fig. 1: Block Diagram of Existing Technology for Vehcile Tracking System

2. Element Used for the Proposed Model:

In a practical system of vehicle tracking, the use of GPS is very important to determine the location. There's a need for channel communication to and from the control unit where details about positions can be reached. The propagation process could be done via terrestrial, satellite or cellular. The monitoring data may be transmitted after acquisition using any option of telemetry or wireless communications systems. For this purpose GSM is the most common service used. The obtained data can be processed and loaded into a GIS system via the control phone. So here is a brief detailed discussed about the element which is used for tracking and monitoring the vehicle.

2.1 GPS (Global Positioning System) System:

The Global Positioning System (GPS) is a bandwidth-based global satellite navigation system that offers effective positioning and time based data in all atmospheric conditions and on all periods and wherever on or near the Earth when and where there is an unbroken line of view of around four or more GPS satellites. It is preserved by the government of the United States, which is publicly accessible to anyone with a GPS receiver. GPS comprises of a network of 24 satellites spaced in six distinct 12-hour orbital paths, so that at least five are viewed from each point in the world. The GPS does not need any data sent by the user, and it operates independently of any telephone or internet service, although these developments may increase the reliability of the GPS tracking data[6]. The GPS offers capability for vital monitoring to military, private, and commercial users around the world. The government of the United States developed, implements, and makes the system freely accessible to anyone with a GPS receiver.

2.2 GIS (Geographic Information System) System:

A GIS[7] (Geographic Information System) is a structure for data collection, management, and analysis. Rooted in spatial analysis, GIS combines several data types. It evaluates the perceptual location and organizes information layers using maps and 3D scenes into visualizations. GIS shows greater insight into data with this

unique capability, including patterns, situations and relationships for helping users to make smarter decisions. It is a system that analyses, collects, handles, records and displays location-related data. GIS is the integration of statistical analysis, cartography and computer technologies in the simplest possible words. For applications such as mapping, remote sensing, cartography and spatial search engines, GIS technologies are used. In every areas thousands of companies use GIS to create maps that share information, evaluate, connect and solve complex worldwide problems. This will change the way of working in the world.

2.3 Microcontroller:

A microcontroller is a compact and small-cost computer designed to perform the specific functions of integrated systems such as displaying information about the microwave, receiving remote signals etc. A microcontroller is an integrated circuit (IC) unit that is used to monitor many parts of an electronic system, typically via a memory, microprocessor unit and certain input and output peripherals. Such systems are designed for integrated systems that require responsive, flexible interaction with analogy digitally or electromechanical elements for processing and functionality.

2.4 GPRS Module:

A GSM module or GPRS module[8] is a cellular module that operates with a fixed GSM network. A module that is cellular operates like a dial-up phone. The key difference is that a dial-up module transfers data via a fixed telephone line while a cellular module transfers data via radio waves. The GSM module is aligned via a serial cable or a USB cable to a computer. A GSM module or GPRS module is a circuit or chip used to connect with a GSM or GPRS network between a phone or tablet device or a computer machine. A critical part is modem which is referred as a modulator or demodulator device. These devices consist of a computer powered GSM or GPRS modem with power supply circuit and communication interfaces. A GSM modem can either be a dedicated modem system with a USB, cable or Bluetooth link, or a mobile phone with GSM modem capability.

3. Proposed Model:

The tracking device is mounted in a car[9] and is capable of receiving GPS and GSM signals, respectively, via GSM module and GPS receiver. The GPS transmitter receives the approximate current position of the car from any four accessible satellites in the orbit in the form of latitudinal and longitudinal coordinates between the constellations. Such positional details are then presented on the LCD of the system and sent via a communication network to the control phone in the form of an SMS as needed, this connection is possible due to the GSM module in the tracking device. The recording device is triggered upon receiving a specified SMS requesting its current location information.

In fact, a SMS from the control phone could de-energize the relay on the tracking device thus shutting off the engine performance from the vehicle hence the vehicle stops when a robbery has been reported. This behaviour is validated by the system transmitting a confirmatory text to the control unit. A SMS from the control phone would allow engine performance and the vehicle will work again to energize the relay. The unit therefore confirms this operation by submitting to the control phone a confirmatory text. A MATLAB program converts the positional data obtained from the tracking device into minute-seconds-degree, and this is fed into a Google map application in which the exact place of the automobile could be considered. The Figure shows real time tracking and monitoring overview.

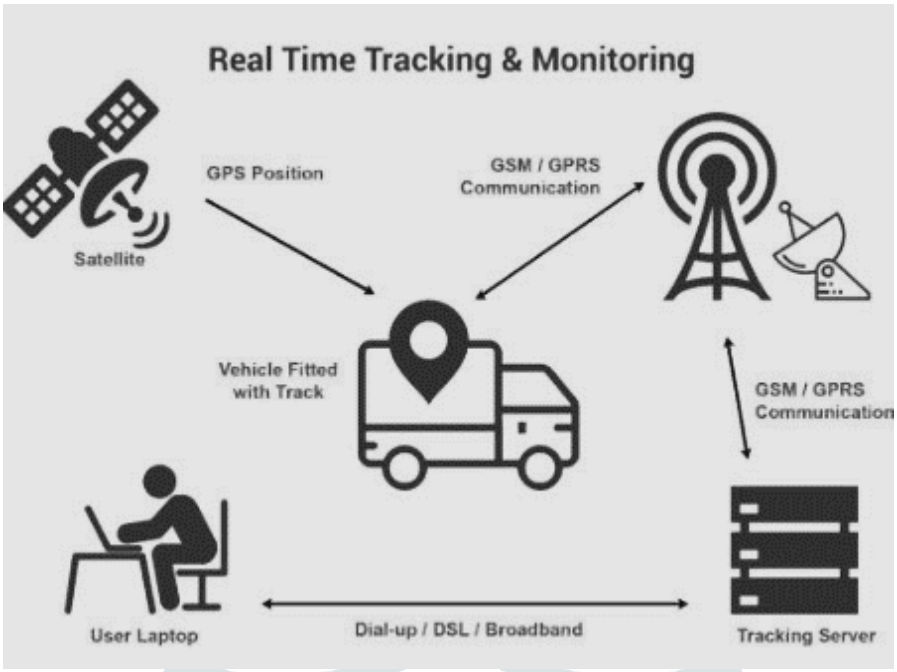

Fig. 2: Proposed Diagram of Vehicle Tracking and Monitoring System Using GPS

The MTK3329 modulating device is used for GPS module job. It is a receiver without antenna and is used as it does not need an additional GPS antenna. The built-in antenna allows the system more lightweight and accurate to monitor. The used microcontroller is ATMEGA32. Two of those microcontrollers communicate with each other. The integrated microcontroller is configured in this vehicle monitoring to be able to read and decode SMS that has been sent in the form of codes by a phone or a GSM module. The GSM module acts as the interface between the tracker of the GPS automobile and the control unit[10]. Through submitting SMS to the control phone, it communicates and also serves as a recipient when transmitting SMS from the control phone. The GSM modulating device in the network consists of a SIM port where a SIM card is injected, an antenna for receiving and a serial of input and output port for attaching and programming to other cellular computers. The GIS used in this project is the Satellite view Application which converts the latitudinal and longitudinal coordinates into pictorial view. Here, the key components are two microcontrollers, GSM board and a GPS receiver.

4. Result and Analysis:

Once energised for action, the monitor device works effectively. The system boots for a few seconds while the GPS signal is being transmitted and read out. The device reads the details after contact with the GPS has been created, and shows its current position on the computer. This is shown in fig. 3. The current location of the tracker is shown in both longitudinal and latitudinal coordinates.

Fig. 3: System Showing Current Status

When the tracker reaches the initiation stage of the GPS signal being collected and interpreted, it sends a message to the controller cell phone advising the operator about what to do. The notification includes the order code which is understood by the computer. Any kind of cell phones could be used as the controlling phone since it operates with the SIM card's mobile number included in the source code. Fig. 4 displays the format sent by the SMS to the phone of the operator.

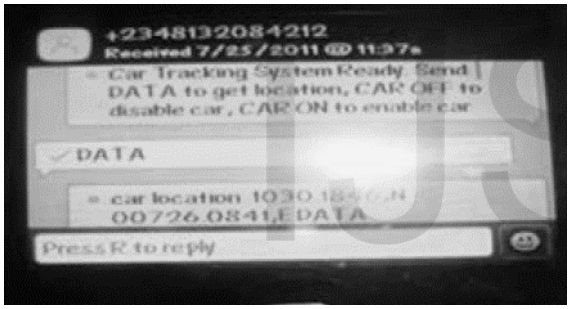

Fig. 4: Format of the SMS

Cell phone controller can type the text in a given format for controlling the operation of the vehicle (ex. Start/stop operation of the vehicles). The longitude position send by GPS System is in the form of DD, MM, MM (Degree, minute, second) which will not be readable for google map. So to make this position readable a MATLAB code is installed into the system which will convert the format into DD MM SS (degree, minute, second) which is readable by the google map. So google map in the cell phone can easily detect the position of the vehicle. Fig. 5 is shows the exact location of the vehicle rad by the google map.

Fig. 5: Location of the Vehicle

CONCLUSION

Vehicle tracking system is becoming increasingly important worldwide owing to the alarming rate of robbery. The paper describes a highly accurate and affordable and efficient vehicle monitoring and safety system utilizing GPS that could be used to control and secure any remote vehicle fitted with the In-Vehicle System. The system consists of a Control Phone and an In-Vehicle unit. Using GSM modem on GSM network, the location information is transmitted via SMS to the authorized user control phone. The controller cell phone also has a GSM module that gathers information about the location of the automobile over the GSM network. Once it has been indicated that there is a robbery a Text messaging from the regulate phone cuts the remote vehicle's engine by stopping the fuel flow and thus the vehicle stops. The results presented in this paper include routine start up execution, control phone logs, converted position coordinates and GIS map of the vehicle's current location. Evaluation of the system by performance shows effective operation.

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