Cost Efficient Intelligent Vehicle Surveillance System

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Abstract. The rapid development in the field of electronics, provide a secured environment for the human to live in. This paper introduces a model, "Intelligent Vehicle Surveillance System", which is designed to reduce the risk involved in losing the vehicles and it also provides notification of occurrence of any accidents, which will reduce the rate of deaths in a very cost efficient manner. This paper introduces a tracking system which passes alert to the owner of the vehicle immediately regarding a theft or an accident of the vehicle with the precise location of the vehicle. There are different methods to identify and continuously track the location of remote vehicle. This proposed system has a single board GPS equipped with GSM and Arduino microcontroller attached in the vehicle. As the vehicle moves its location gets updated via SMS. User can provide real-time control, by sending messages, controlling the vehicle, changing direction as well as on and off. A Software attached would help to read, analyze, process and store the incoming SMS. This system finds its application in real time traffic monitoring. The current system will provide monitoring information from anywhere.

Keywords: GSM module · GPS module · Vibration module · Arduino · SIM900 · L293D · Surveillance

1 Introduction

Diurnally the vehicle theft incident is increasing. According to the survey, more than over 5000 vehicles are purloined in our country each year as per the reports by National Crime Records Bureau, Ministry of Home Affairs, Government of India, New Delhi. The number of accidents is also growing slowly however steady, year by year. Trucks and two-wheelers are alone answerable for an additional four-hundred deaths than by any other vehicles. The afternoon rush on the roads constructs graveyard for another hundreds each day. Also, variety of individuals abraded in road accidents succumb to their injuries a couple of days once the accident, and such deaths don't seem to be classified as results of road accidents. In rural areas, motor vehicle accidents involving animals are quite common. Near farms, accidents with tractors and alternative farm vehicles on the aspect of the

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road may occur. Rural roads are usually the smallest amount well lit, still, that create a lot of accidents during night. No matter where it occured but the victims should be provided best treatment once it occurs. The person should be given great care and for that the people around must be able to spot the accident and rush for help [1]. Though the victim do not acknowledge any injuries promptly, there could also be some lurking below the surface. A professional will examine his injuries and find him back on the trail to a full recovery. Night accidents are a lot more dangerous than those that occur at daytime. Therefore we need a quick responsive system that determine and track the vehicle [2]. There are other cases where the vehicle at the front to be tracked [3].

2 Related Works

There are many works that tracks a vehicle using the GPS system but paper [4] talks about GSM enabled vehicle tracking system. This was the cheapest anti-theft and vehicular tracking system. This has a small kit with many components and a GSM module in it. The owner can send SMS to switch the system ON and OFF. The message is actually an instruction to the microcontroller which actually turns it on and off. The microcontroller gets the location of the vehicle and it stimulates the GSM module to send the location to the owners mobile as a short message. The delivery message is sent back to the microcontroller with the help of same GSM module. The advantage of this system is that it helps the owner in tracking the vehicle very quickly, and reduces the complexities compared to other systems.

The frequency of road accidents is increasing significantly because of the rise in use of cellular phone while driving. In order to avoid this situation, the work in [5] proposes a reference in which a mobile stand is provided for the driver to fix his phone. Otherwise, the micro controller forces the driver to stop the vehicle in order to continue the conversation on cell-phone. This leads to minimum chance of accidents. Furthermore if road mishaps occur, this system allows to send an emergency message to the rescue teams.

Aarthi et al. [6] proposed a technique of extracting the registration details of a defaulting vehicle that exceeds the speed limit.

A mechanism proposed in [7] senses any accident by the vehicle and intimates to the preprogrammed mobile numbers like the owner of the vehicle, ambulance, police for immediate remedy. GSM technology is used to send the position of the vehicle as a SMS to those numbers. Using these messages the position of the vehicle can be obtained by the owner of the vehicle and this process make sure that the human life is safe though the vehicle in damaged. This proposed method uses small switching function (reset) for disconnecting the signal and when a car is met with an accident, it waits for some time and immediately the car and the GPS coordinate of the location are messaged to the nearby hospitals, thereby ensuring timely help to the needy. A smart anti-theft system which not only tracks the exact location of the vehicle but also tries to prevent the theft is discussed in [8]. GPS will provide the location information via satellites.

If the vehicle is met with some accident, then a message is automatically sent for help. The user can control other technologies installed in the system as well with his mobile phone. It includes the engine ignition cutoff, fuel supply cut-off, electric shock system (installed on steering wheel) and paint spray. This complete system is designed taking in consideration the low range vehicles to provide them extreme security.

2.1 GSM

Global System for Mobile communications (GSM) is a technology used for communicating over the mobile network. We can track the vehicle continuously and also inform to the Local ambulance if the vehicle is met with any accident using GSM technology. This is an affordable device that reduces the matter related to accident notification and antitheft management. If the user is somewhere off from the vehicle and he needs to understand wherever his vehicle is correct from the place he's standing, he has got to send a predefined message to the modem [9].

Features of GSM are

Value added features: GSM provides value added features. Because of this more than 450 million people all over the world is currently using GSM technology.

No Additional Charges: No additional charges are involved. As GSM is used in more than 200 countries all over the world, we can simply use our GSM phones when we are going through these countries.

Secure Data Transmission: GSM is a completely dependable device. There is no down time until an excessive electric typhoon damages the transceiver or cellular at someplace.

Variety of Service: Variety of service providers and handsets are available in the market which helps the customer to choose from a variety of options.

Less Consumption of Power: Less consumption of power and extensive coverage. So the user can use GSM spectrum to transmit any amount of data. Cheaper call rates compared to others moreover the messaging options are also free. The quality of the calls compared to GSM is much better than CDMA.

2.2 GPS Module

There is a family of stand-alone GPS receivers that offers high performance u-blox 6 positioning engines. This is the NEO-6 collection. The receivers are very value effective that they provide several connectivity options in a miniature $16 \times 12.2 \times 2.4$ mm package. Their architecture is very compact and they have high energy and reminiscence option which makes these NEO-6 modules perfect for cellular gadgets that operates on battery.

2.3 Microcontroller Arduino

Arduino board designs use a diversity of microprocessors and controllers. The Mega 2560 microcontroller board is one of the variety from arduino which is based on the ATmega2560 has 54 digital input/output pins, 16 analog inputs, 4 UARTs (hardware serial ports), a USB connection, a 16 MHz crystal oscillator, an ICSP header, a power jack and a reset button. It supports a microcontroller. It can be connected to the computer with a USB or it can be powered to an adapter or a battery and it will get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards. Figure 1 shows the pin diagram of Arduino mega 2560.

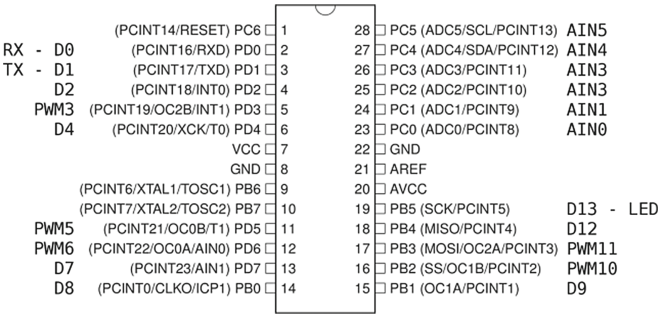

Fig. 1. Pin diagram of Arduino Mega 2560

3 Design Methodology

There are a great volume of areas where a need exists for some gadgets that identifies and tracks the geographic area of a vehicle and does a steady monitoring of the same. Passing of alert messages to the owner or any person directed owner about the theft or accident that happens in every much necessary and this should happen without any delay. The location of the vehicle is actually shared. This paper introduces a tracking gadget which includes worldwide Positioning device (GPS) and GSM. GPS and GSM together determine the vicinity of the vehicle. A microcontroller equipped with GPS and GSM modems on its sides and is organized as a single board embedded machine. This is attached to the vehicle [10]. Throughout the car movement, its area can be suggested by the use of SMS. A software is created to read, technique, analyses and save the incoming SMS messages. Using of the GSM and GPS technologies, permits the device to track the car and gives the maximum up to date statistics approximately about the vehicle. If a pre-defined message is dispatched by the proprietor, it routinely stops the car and it can offer actual time control. The motive of this system is to layout and combine a new mechanism that's incorporated with GPS-GSM to

offer features like the location information and real time tracking using the SMS and also to control the speed.

Block Diagram. This project is implemented by building a protocol known as robo vehicle. This robo vehicle consists of two dc motors, a voltage amplifier L293D, microcontroller ARDUINO MEGA 2560 and switches. DC motors are used to move the vehicle in forward, backward, right and left. But the current supplied by the controller is not sufficient for rotating the dc motor. Hence, an amplifier L293D which amplifies the current is used to produce the sufficient current. For the notification of thefts and accidents, we are interfacing GSM and GPS modules on robo vehicle through serial communication. Figure 2 shows the block diagram of proposed system. GSM and GPS are both CMOS devices and the controller is a TTL device. The final output for all CMOS devices is RS232. The internal voltage levels for CMOS devices are 18-23 v. As the controller is a TTL device it operates at 5 v. In order to convert the voltage levels from 18-23 to 5 v we used MAX232 which acts as amplifier [11].

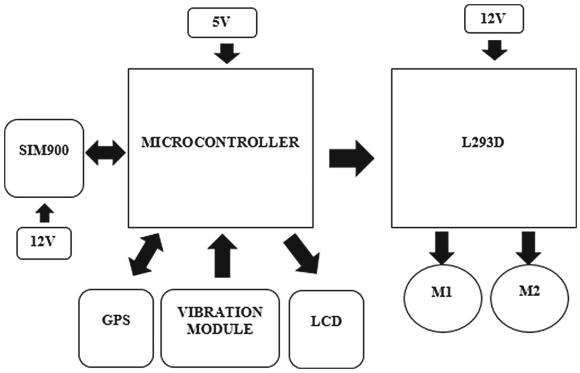

Fig. 2. Block diagram

In this proposed system which is an inexpensive tool, the troubles associated with coincidence notification and antitheft manage have been reduced. The controlling unit will be constant to the automobile. The controlling unit consists of the microcontroller and the GSM and GPS are interfaced to microcontroller [12]. The microcontroller constantly checks whether it has acquired any message from the modem. Figure 3 shows the geographical picture of the area in which the project was tested.

Fig. 3. Geographical image

4 Results

When the vehicle is stolen or met with an accident, first predefined text 'WRU' (that means Where Are You) is send to the SIM card inserted in the GSM modem. By using the AT commands the messages are send or received.

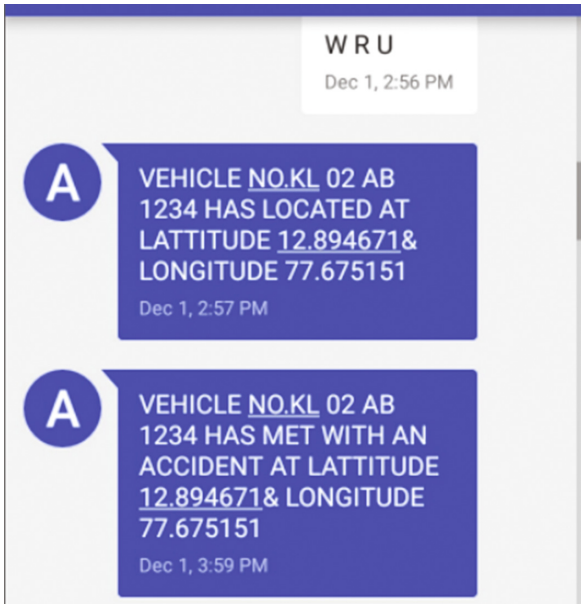

Fig. 4. W R U message and its response and scenario after accident occurs

Then the GPS locates the position of the vehicle and the GSM receives the latitude and longitude values of that particular place where the vehicle is located. Now through AT commands GSM sends the information to user's mobile immediately. It can be any type of mobile. Thus the stolen vehicle can be easily identified within no time. If we want to stop the vehicle the user send the message 'STOP' to GSM. Whenever the vehicle is met with an accident, vibration module gets activated and sends a high signal to the controller which activates the GSM modem. Now the GSM sends a reply to owner that Your vehicle is met with an accident at LT: 12.892115 LG: 77.679150, that is latitude and longitude of the position. By clicking the link which is send through GSM module to the specified number, it will automatically redirect to the map. So we can spot the vehicle. Figure 4 shows the message sent by the system after sending W R U message and the response after accident occurred.

5 Conclusion

The intention of the venture is to decrease the street accidents which causes the loss of worthwhile human life and other valuable items. Besides, the mechanism for the protection of the vehicle is also furnished to keep away from the robbery action. On this rapid moving global, new technologies have been evolved every second for our human existence style development. There have been considerable development in car technology already and nonetheless to come. Due to these technologies, now we are enjoying the vital consolations and safety. But there are lot of accidents occurring nowadays. Its miles because of multiplied automobile density, violating guidelines and carelessness. The embedded technology is used to prevent accidents, the use of cellular phones even as driving and many others. As a result by using imposing this noticeably cheap and without problems available device on a vehicle one will make certain a great deal extra security and exclusivity than that supplied through a traditional lock and key. If accidents happens in far flung areas, the function of auto-providing the coincidence vicinity to the emergency facilities for assist and guide is likewise provided. On the other hand, the safety for the car is also superior. This is made viable due to the fact the theft automobile location can be recognized to the person and the vehicle gasoline can be reduce off and middle lock is enabled. With the aid of using these concepts, we hope that the street injuries because of violating guidelines and carelessness could be minimized and this may be one of the venture required for now-a-days and with the importance of low cost. We can enforce this machine for real time programs. This will be improved in the future to actual time applications.

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