Application of Micro Controller in Vehicle Monitoring and Security System

Harish Kumar V C[1], Shibu Ganesh[2]

[1]Lecturer in Electrical and Electronics Engineering, NSS Polytechnic College Pandalam, Kerala, India
[2]Lecturer in Electrical and Electronics Engineering, Government Polytechnic College Kottayam, Kerala, India

ABSTRACT

As a result of the advancements in information and communication technology (ICT), people can now lead more comfortable lives. Vehicle monitoring while parked or driving is an example of a problem that needs to be addressed. Car owners, especially those whose hard-earned money was spent on a vehicle or whose loss would cause significant hassles to their family and workplaces, need to be aware of the importance of vehicle security. Every vehicle owner's major issue is now compounded by these factors. Using GSM and GPS technologies, the Microcontroller-based Car Security System with Tracking Capability is a system that can trace the position of a missing vehicle and provide authorities with solid evidence that the vehicle has been stolen. Real-time tracking and monitoring of cars in a specific area is provided by this technology. For future reference, the system keeps track of a moving vehicle's travel patterns, which can be used if necessary. The system's functionality, reliability, usability, efficiency, maintenance-friendliness, and portability were all taken into account during the evaluation process. As a result of this study, it appears that the system is both feasible and effective for this particular application. In order to send the vehicle's location (Latitude and Longitude), a GSM modem is utilised. Using a GPS modem, the vehicle's location will be constantly updated. However, just the data coming out of the GPS modem is read and forwarded to the user's phone number.

KEYWORDS: *Global Positioning System (GPS), Global System for Mobile (GSM), Microcontroller, Automobile tracking system*

INTRODUCTION

Every private and public vehicle owner relies heavily on their vehicle's safety. The theft or robbery of a vehicle is one of the most common problems faced by motorists. It is also considered as one of the biggest fears of every vehicle owner aside from crashing. There are a number of reasons why a vehicle may be stolen. Theft is one chance for those who want to indulge in this type of recreational activity. [1] Others steal vehicles to commit additional crimes, while others take vehicles to sell or remove parts. Bikes have been shown to be a popular target for thieves.

This can be done via internet services that are connected to the stolen vehicle. Once the GPS locates the stolen car, a location request is transmitted to the central processing system, allowing remote commands to be issued. Many functions of the tracking system can be performed remotely, such as stopping the ignition system or automatically reporting the vehicle's whereabouts based on time or distance. [2] The GSM (Global System for Mobile Communications) is a widely used standard for mobile phones all across the world, and for good reason. GSM service is widely used by individuals around the world. International roaming between mobile phone service providers is made possible due to the widespread adoption of the GSM standard.

In the event of an accident, the vehicle's accident alarm system is activated and GPS [3] coordinates the vehicle's location to a mobile phone, computer, etc. The fire is detected by the vehicle's built-in fire detector circuit. When the temperature inside the car exceeds a predetermined threshold, a notification is

automatically sent to the recipient. Obstacles and accidents are detected via an infrared sensor that is connected to the microcontroller. In the event of a mishap, the intended recipient will receive a straight warning. Whenever a user sends a message to the modem's phone number, the system automatically responds with the vehicle's location in terms of latitude and longitude. In order to find the exact location of a car, a programme has been built that uses Google Maps to track the vehicle as it moves. [4]

Review of Literature

Tracking the car in vehicle tracking systems can be done with the use of GPS and GSM, according to Ashwini et al. [5]. Technology from the Global Positioning System (GPS) is used to locate the vehicle.

It has been proposed that the location of cargo or product put on board for digital supply can be monitored and tracked continuously by a system developed by A. Rajasekhar et al [6]. This system uses RFID and GPS technology together. The central processor unit is a low-power 16-bit RISC microcontroller because of its small size and great efficiency. The terminal system of the vehicle, the real-time position of the vehicle, information and voice communication, and continuous observation automatically identify the loaded cargos. The precision and efficiency of the system are enhanced by the use of RFID and GPS.

P. Muruganandham, R. Mukesh presented a study on a real-time vehicle monitoring system for applications that demand constant area information of the car [7]. Active structures are generated in order to obtain an autonomous positioning system capable of logically transmitting regional data. An SMS feedback mechanism is included in the device's GPS/GSM module. The GPS/GSM module and a remote tracking server are the primary pieces of equipment in the vehicle.

A unique radio recurrence distinguishing proof (RFID) based car immobiliser system, presented by Sangram Bana and Dr. Davinder Kaur in their paper [8], has a low hacking possibility while still protecting the safety of passengers in a hijacked vehicle. It uses dynamic RFID technology, which allows the tag to be generated with practically infinite character sets. There are three control circuits in this vehicle that work together to make it possible for this accepting unit to bring vehicle speed down to zero in a safe and orderly manner: the vehicle's start circuit, control unit, and programmed adapt system. The

reliability of the proposed anti-robbery auto security system was tested in a variety of climates and in a variety of conceivable flag mutilation situations.

Unauthorized attempts to get access to an automobile's engine can be detected using a Real-Time automobile monitoring system, which was proposed by Muhammad Adnan Elahi, Yasir Arfat Malkani, and Muhammad Fraz [9]. The user's phone is then notified of the location of the vehicle and the moment it was accessed. Input methods are not defined for the system.

Objectives

Micro - controller GPS and GSM vehicle tracking systems will be developed and tested as part of this research project. The following goals can be met if the system is designed and deployed.

➢ When there is a request for vehicle location information, the system will obtain it.

➢ Tracking a vehicle's location ensures its safety and security.

➢ At all times, recording the audio of the conversation in the vehicle.

➢ There will be a wide range of security to ensure that any cases of stolen vehicles can be quickly traced, and monitored for the safety and recovery of the car thanks to a device tracker that uses GSM technology as a link to the vehicle.

Research Methodology

This study examines and evaluates a variety of reports on educational and scholarly endeavours in the area under consideration. These scholarly publications were gleaned from specialised web databases dedicated solely to journals. Material, the participants, and learning methods were identified as the focus of the study's identification. Papers about scientific study were identified by their subjects, techniques and results as well as the accuracy of their classification methods.. Using the findings of the analysis, a systematic overview of the learning and research in the themes was prepared.

Result and Discussion

If you're in close proximity to the Earth and can see an unobstructed path to four or more GPS satellites, you can use the Global Positioning System, a space-dependent satellite route network. In order to determine its location, a GPS system (shown in Figure 1) utilises signals delivered by GPS satellites orbiting the Earth and timing them precisely. Each satellite broadcasts signals that include the precise time and position of the message transmission at the time of transmission. [10]
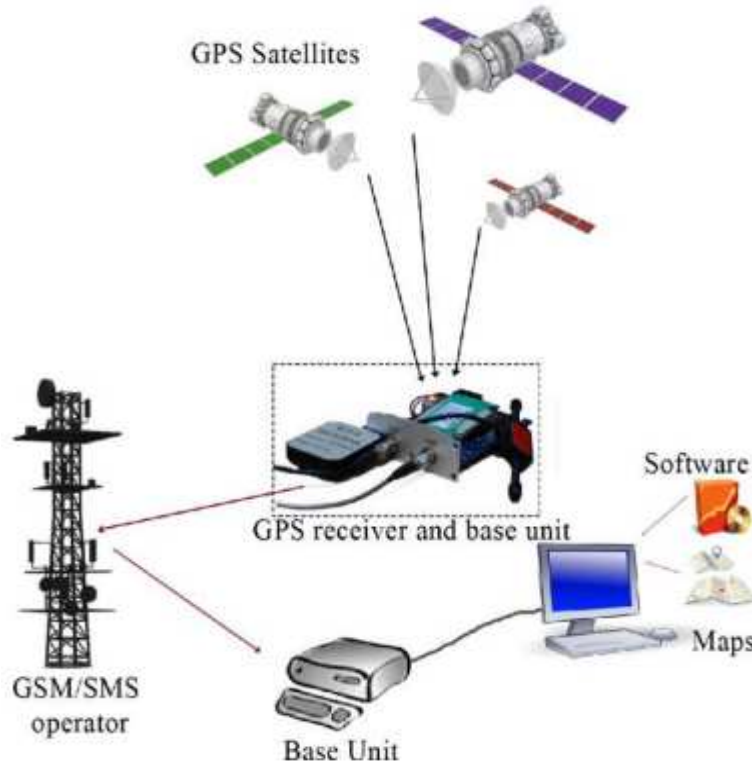
Fig.1. Block diagram of GPS tracking system

Figure 2 depicts the system's block diagram. You can use the vehicle's battery directly to power this system, or a nine-volt supply (12 volts). On the Arduino's pins 0 and 1, a SIM900A GSM is connected. Serial communication pins are located on these two pins. The engine's revolutions per minute (RPM) speed is displayed on pin number 2. Checking the lights of the door, bonnet, and boot is done using pins 3 to 5. [11] An appeal key (AK) can be pressed by the driver in an emergency to transmit appeal messages to family members, paramedics, and the police. Pin 6 is used to check its status. Pins 10 and 11 of the Arduino board are used to power a GPS module of type 6Y-GPS6MU2. Finally, the clock (SCL) and data (SDA) pins are connected to a gyroscope of type L3G4200D to support two wired interfaces (TWI) [12]. The Arduino board powers the gyroscope with five volts.
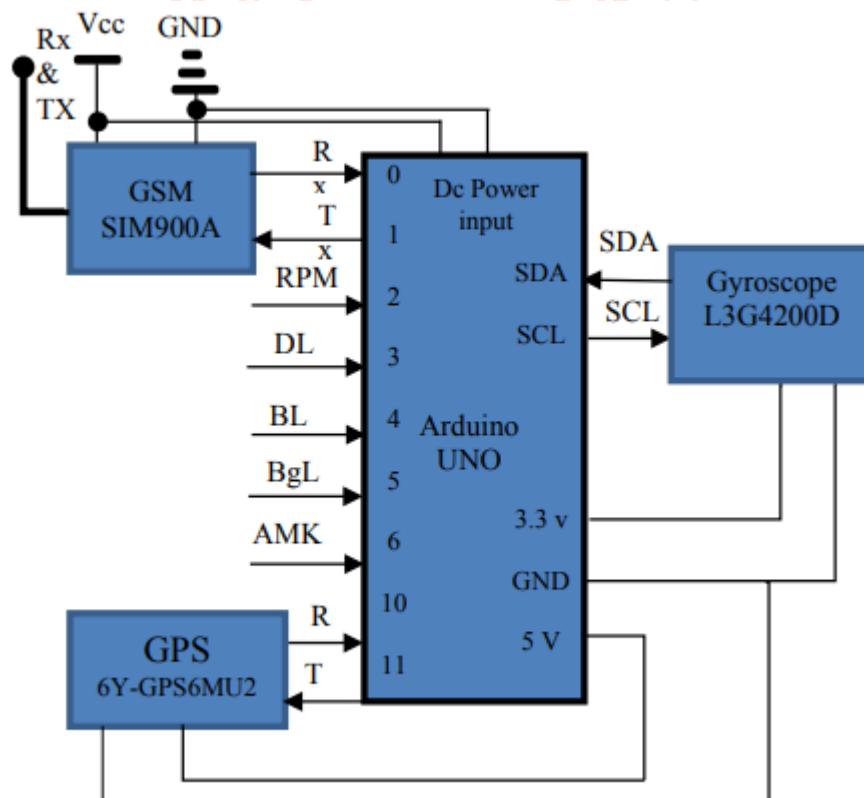
Fig. 2 General block diagram of the proposed system

System context flow is depicted in Fig 3 (shown). There are four entities in the project that each supply IPOs for system execution: Security, Visitor, Device, and Homeowner's Officer Visitors will be issued a gadget by security, and the system will monitor the area in which they are situated.. Entering the system is made possible by a visitor's request and the visitor's location. [13] The device broadcasts its present position and any movements it detects to the system. Users' accounts can be accessed by the Homeowners officers, who will also receive system reports.
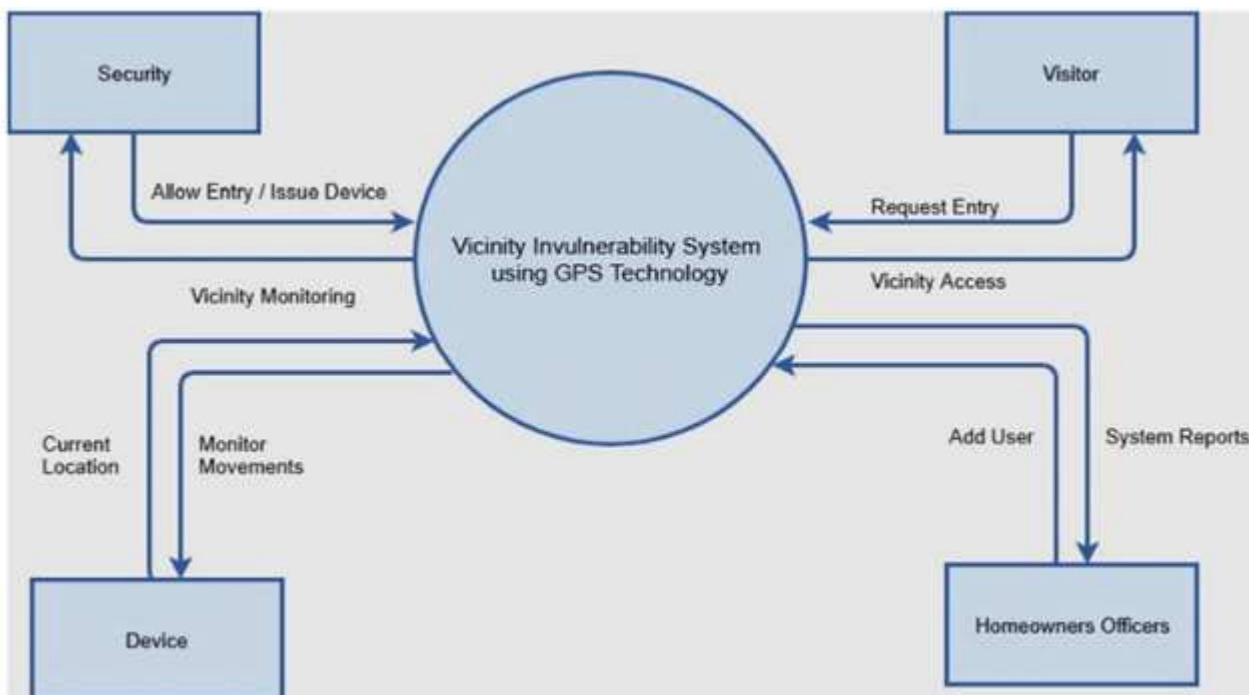

Fig. 3 Context flow of vehicle tracking and monitoring system

In the vehicle tracking system, the microcontroller is the most important component to understand. The open-source Arduino UNO microcontroller is available to everyone. The 16 input and output pins on the Arduino controller board are utilised to interface embedded devices. It can be powered by a voltage of 5 volts. As far as storage capacity goes, it features a flash memory of 32KB and 2KB of static RAM. [14]

Fig. 4 ARDUINO UNO microcontroller

Fig 5 shows the driver's message, which contains the vehicle's location. Second, when the gyroscope suddenly changed or if the appeal key was touched, the gadget sent SMS messages to the specified family and friends as well as the ambulance and police. [15]
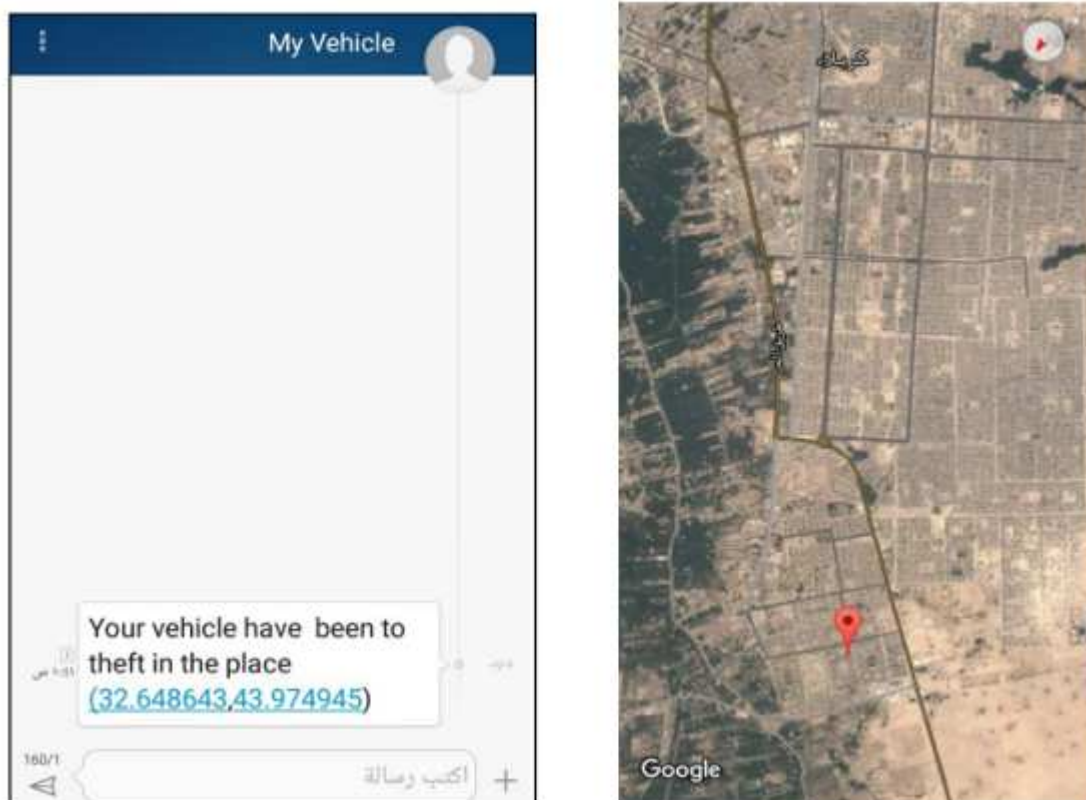
Fig. 5 (A) Alarm message from the proposed device (B) Map of the current position of the device

Conclusion

Vehicle Tracking System with Audio Surveillance utilising GPS and GSM provides an efficient location on the map by merging the various communication technologies and display settings. When a vehicle's location is displayed on Google Maps using GPS and GSM modem, the vehicle's information is sent to a tracking server. Tracking, receiving and sending SMS notifications, as well as activating and deactivating key switches, the engine and the alarm, are all controlled by a microprocessor that interfaces with the various hardware components. The produced application was able to be built and tested using a variety of software. Microcontroller outputs are consistent with what was expected. Cost-effective, reliable, and capable of preventing robbery and offering an accurate tracking system are only some of the advantages of the project that was designed. An Arduino board with GSM, GPS, and gyroscope add-ons was used to create the suggested gadget. A ringing tone and an SMS message with the vehicle's location are sent to the registered driver if the vehicle is unlocked or stolen. Additionally, the gadget can send plea messages to family, friends, ambulance services, and the police when the car is in danger.

References

[1] K. Jien, T. Watanabe, S. Joga, L. Ying, and H. Hase. An hmm/mrf-based stochastic framework for robust vehicle tracking. IEEE Transactions on Intelligent Transportation Systems, 5(3):142–154, September 2004.

[2] S. Kamijyo, Y. Matsushita, and M. Sakauchi. Traffic monitoring and accident detection at intersections. IEEE Transactions on Intelligent Transportation Systems, 1:108–119, June 2000.

[3] L. Zhu, J. Song, Q. Huang, M. Zhang, and H. Liu. A novel module of tracking vehicles with occlusion. In Proceedings of the IEEE Intelligent Vehicles Symposium, pages 894–899, June 2005.

[4] Sharon Naylor, Theft-proofing Your Motorcycle, Retrieved March 17, 2014 from Creators SyndicateInc.: https://www.creators.com/special-sections/spring-car-care-and-motorcycles-2014/101801

[5] Ashwini Dilip Lahire, "GPS & GSM based vehicle tracking and security system," International Journal of Engineering Research and Development, Volume 12, Issue 6, PP.55-60 ,June 2016.

[6] A. Rajasekhar reddy, P.Anwar basha ,"The Terminal System Design based on hybrid RFID-GPS in Vehicular communications," International Journal of Modern Engineering Research (IJMER), Vol.2, Issue.4, pp-2316-2319, July-Aug 2012

[7] P. Muruganandham, R. Mukesh, "Real Time Web Based Vehicle Tracking Using GPS",

World Academy of Science, Engineering and Technology, 61, 2010.

[8] Sangram Bana and Dr. Davinder Kaur, "Fingerprint Recognition using Image Segmentation," International Journal on Advanced Engineering Sciences and Technologies", Vol.No.5, Issue No.1, pp 12-23.

[9] Muhammad Adnan Elahi, Yasir Arfat Malkani and Muhammad Fraz, "Design and Implementation of Real Time Vehicle Tracking System," 2nd International Conference on Computer, Control and Communication, Pakistan, 2009.

[10] L. C. Agdeppa, J. A. Cabali, L. Calingasan, J. Mendoza "Motorcycle Security System with GPS and GSM Application" March 2012, pp. 2-3

[11] V.M, Ibrahim, A. A. Victor, " Microcontroller BasedAnti-theft Security System Using GSM Networks withText Message as Feedback" International Journal of Engineering Research and Development (IJERD)August 2012

[12] Pritpal Singh, 2Tanjot Sethi 3Bunil Kumar Balabantaray,4Bibhuti Bhushan Biswal,"Advanced Vehicle Security System" IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems ICIIECS'15 2015

[13] M.S. Joshi and Deepali V. Mahajan ,"Arm 7 Based Theft Control, Accident Detection and Vehicle Positioning System'', International Journal of Innovative Technology and Exploring Engineering, vol. 4, no. 2, July 2014.

[14] Fleischer, P.B.; Nelson, Atso Yao; Sowah Ribert Adjectey, Bremang, Appah," Design and Development of GPS/GSM Based Vehicle Tracking and Alert System for Commercial Inter-City Buses'', Adaptive Science and Technology, IEEE 4th International Conference, Oct 2012 .

[15] Thuong T. Le-Tien, V. Phung-The, "Routing and Tracking System for Mobile Vehicles in Large Area", Fifth IEEE International Symposium on Electronic Design, Test & Applications, pp. 297-300, 2010.