Anti-theft vehicle tracking system using GPS & GSM

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ABSTRACT

Anti-theft vehicle tracking system, proposed work is an attempt to design an advanced vehicle safety system that uses GSM to prevent theft and to determine the location of vehicle. Today theft is happening on the parking or in some insecure places. The safety of the vehicle is exceptionally essential. It deals with the design & development of an embedded system, which is being used to prevent /control the theft of a vehicle. The developed instrument is an embedded system based on GSM technology. The instrument is installed in the engine of the vehicle. When someone tries to steal the car then microcontroller gets an interrupt and orders GSM Modem to send the SMS, the owner receives a SMS that his car is being stolen then the owner sends back the SMS to the GSM modem to 'STOP', while the vehicle will be stopped The control instruction is given to the microcontroller through interface, the output from which activates a relay driver to trip the relay that disconnects the ignition of the automobile resulting in stopping the vehicle.

1.INTRODUCTION

A vehicle tracking system collects the fleet data from the vehicle and tells about the location. Present-day vehicle tracking systems use GPS technology to trace the vehicle. The origin of the tracking system is established in the shipping industry. {4]

The corporations of the owner found the difficulty of tracking fleets when the fleet was extended over the broad area of oceans. They required a remote system to track where the vehicle is located and how long it has traveled. The need of this system is to prevent any sort of theft and also can help the police to find the stolen vehicle by using tracking reports. There are several types of vehicle tracking devices are currently available. "Passive" devices store GPS speed, location and trigger event like On/Off of the keys and Open/Close of the doors in the vehicle. Once the vehicle reaches the predetermined point, the device will be detached, and the information is downloaded to a system for evaluation. Passive systems transfer the data through the wireless download. However, the passive system does not prevent the vehicle from being stolen.[2]

To overcome this problem, the developments of active systems has progressed. Actual time vehicle tracking system could transfer the information to the monitoring station when it is required. It transfers the real-time vehicles data to a satellite network or remote monitoring station for evaluation. Now a days automatic vehicle tracking systems are available to locate a vehicle. It is done by finding coordinates position of the vehicle and transferring the data to remotely monitored station.[3]

2.LITERATURE REVIEW

According to research by Smith et al. (2018), GPS-based tracking systems provide accurate real-time location information, while GSM technology enables communication between the tracking device and the user. This combination allows vehicle owners to monitor their vehicles remotely and receive instant alerts in case of unauthorized access or theft.

In a study by Johnson and Brown (2019), it was found that GPS and GSM-based tracking systems have significantly reduced vehicle theft rates. The ability to track stolen vehicles in real-time and share location information with law enforcement agencies has proven instrumental in recovering stolen vehicles and apprehending criminals.

Furthermore, research conducted by Patel et al. (2020) emphasized the importance of software installation and the integration of LCD components in anti-theft vehicle tracking systems. These components enable users to access the tracking system's features, such as location tracking, vehicle immobilization, and emergency notifications, through a user-

Overall, the literature suggests that anti-theft vehicle tracking systems using GPS and GSM technologies have a promising future in deterring vehicle theft and enhancing vehicle security. These systems offer real-time tracking, remote monitoring, and effective recovery options, making them a valuable asset for vehicle owners.

3. EMBEDDED SYSTEM

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure. [2]

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation. Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low-end consumer products use very inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer.{5}

4.PROPOSED SYSTEM

An anti-theft vehicle tracking system using GPS and GSM. This system combines the power of GPS technology and GSM communication to enhance vehicle security and enable efficient tracking.

GPS, which stands for Global Positioning System, utilizes satellites to determine the precise location of a vehicle. It provides accurate and real-time positioning information, allowing owners or authorities to track the vehicle's movements. This is particularly useful in case of theft or unauthorized use.GSM, on the other hand, refers to Global System for Mobile Communications. It is a widely used cellular network technology that enables communication between devices. In the context of an anti-theft vehicle tracking system, GSM is used to transmit the GPS location data from the vehicle to a central monitoring system.[7]

The vehicle is equipped with a GPS tracking device that constantly receives signals from GPS satellites, determining its exact coordinates. This information is then sent to the central monitoring system through the GSM network. The central monitoring system can be accessed by the vehicle owner or authorized personnel, providing them with real-time updates on the vehicle's location.[1]

In the event of a theft, the owner can quickly notify the authorities and provide them with the vehicle's precise GPS coordinates. This enables law enforcement agencies to track and recover the stolen vehicle more efficiently. Additionally, the

system can be programmed to send alerts or notifications to the owner if the vehicle moves outside a predefined area or if any unauthorized activity is detected.

The benefits of this proposed system are numerous. It provides an added layer of security to vehicles, giving owners peace of mind. It also acts as a deterrent to potential thieves, as they know that the vehicle can be easily tracked and recovered. Moreover, the system can help insurance companies reduce premiums, as it increases the chances of recovering stolen vehicles.

It's important to note that the effectiveness of the system depends on factors such as GPS signal availability, GSM network coverage, and the reliability of the tracking device. Regular maintenance and updates are crucial to ensure optimal performance.

In conclusion, the proposed system for an anti-theft vehicle tracking system using GPS and GSM combines the power of GPS technology and GSM communication to enhance vehicle security and enable efficient tracking. It provides real-time location updates, improves the chances of recovering stolen vehicles, and offers peace of mind to vehicle owners.

5. ANALYSIS & DESIGN

The anti-theft vehicle tracking system using GPS and GSM is a comprehensive security solution that combines the power of GPS technology with the communication capabilities of GSM networks. This system ensures the safety and security of vehicles by providing real-time tracking and monitoring.[5]

1.   **GPS Module Installation:** The first step is to install a GPS module in the vehicle. This module receives signals from multiple satellites to determine the precise location of the vehicle. It collects latitude, longitude, and altitude data, which are crucial for tracking purposes.

2.   **GSM Module Integration:** The next step is to integrate a GSM module into the vehicle's system. The GSM module enables communication with the central monitoring system. It uses a SIM card to establish a connection with the mobile network and transmit data.

3.   **Central Monitoring System Setup:** The central monitoring system is the core component of the anti-theft tracking system. It receives the GPS data from the vehicle via the GSM module. The system processes this data and displays the real-time location of the vehicle on a map.

4.   **Theft Detection and Alerts:** The system is designed to detect any unauthorized access or movement of the vehicle. If suspicious activity is detected, the system can send immediate alerts to the vehicle owner or a security service. These alerts can be in the form of SMS messages or notifications on a mobile app.

5. **Remote Control Features:** Advanced tracking systems offer remote control capabilities. This includes the ability to remotely lock or unlock the vehicle, disable the engine, or activate an alarm system. These features provide an additional layer of security and control.[3]

6. **Recovery Assistance:** In the unfortunate event of a vehicle theft, the anti-theft tracking system can aid in recovery. The real-time tracking data collected by the GPS module helps law enforcement agencies locate and retrieve the stolen vehicle quickly. The system can also provide valuable information such as the vehicle's last known location and route taken.

7. **Data Storage and Analysis:** The central monitoring system stores all the tracking data, including historical records of the vehicle's movements. This data can be analyzed to identify patterns, optimize routes, and improve overall vehicle security.

By combining GPS and GSM technologies, the anti-theft vehicle tracking system provides a robust and reliable security solution. It ensures real-time tracking, theft detection, remote control capabilities, and assists in the recovery of stolen vehicles. This system offers peace of mind to vehicle owners and enhances overall vehicle security.[7]

Figure 1 Architectural View of Anti-Theft Vehicle Tracking System

6.SOFTWARE USED

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are:

• Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.

• You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).

• Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.

• Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.

• Finally, Arduino provides a standard form factor that breaks the functions of the microcontroller into a more accessible package.

After learning about the main parts of the Arduino UNO board, we are ready to learn how to set up the Arduino IDE. Once we learn this, we will be ready to upload our program on the Arduino board
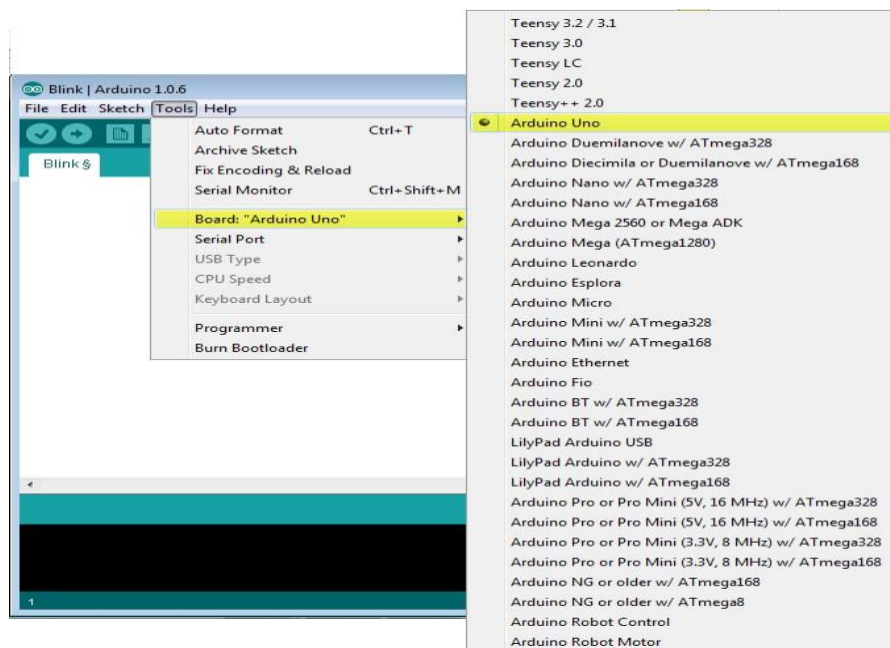

Figure 2 selection of Arduino Uno Board

7.RESULTS

This is the working procedure of the Anti theft vehicle tracking system using GPS & GSM

STEP 1: Firstly, initialize the GSM after connecting to Microcontroller.

STEP 2: Then it will ask to enter the key. This is the first step of Initialization. Enter key then the microcontroller compares the key with predefined key. Then it sends the message that vehicle is authorized.

STEP 3: Finally, we will get the message to our phone that "SOME ONE IS TRYING TO ACCESS THE VEHICLE. PLEASE AUTHINTICATE". This is the second step of authentication. This will authenticate using the predefined key then vehicle starts moving.

STEP 4: GPS to track the Longitude and Latitude co-ordinates of Vehicle.

Figure 3 receiving messages through GSM

8.CONCLUSION

The integration of GPS and GSM technology in anti-theft vehicle tracking systems offers a powerful solution to enhance vehicle security. The combination of GPS enables accurate and real-time tracking, while GSM provides seamless communication for remote access and control. This technology not only deters theft but also increases the chances of recovering stolen vehicles. With its wide range of applications in fleet management, logistics, and personal vehicle security, the use of GPS and GSM in antitheft tracking systems is a promising and effective solution.

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