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Vehicle Tracking System

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Abstract. *In this project, we are taking a step further by utilizing GPS and GSM technologies to track vehicles. This Vehicle Tracking System has the potential to be utilized for various purposes such as an Accident Detection Alert System or Soldier Tracking System, with a few modifications to both the hardware and software components. Tracking a vehicle involves monitoring its location in terms of GPS coordinates, specifically latitude and longitude. This system is particularly effective for outdoor applications. It operates using software-controlled hardware, with Arduino playing a crucial role in its functionality. Given the increasing number of privately-owned vehicles and the prevalence of thefts in parking areas and insecure driving locations, ensuring the safety of vehicles is of utmost importance. By installing a vehicle tracking and locking system, the location of the vehicle can be monitored. This is achieved through the integration of Global Positioning System (GPS) and Global System for Mobile Communication (GSM). These systems continuously monitor the movement of the vehicle and provide status updates upon request. In the event of theft, when the responsible person identifies the situation, an SMS is sent to the microcontroller. The microcontroller then sends control signals to immobilize the engine motor. To restart the vehicle and unlock the doors, an authorized person must send a password to the controller. This system offers enhanced security, reliability, and affordability.*

1. INTRODUCTION

The Internet of Things (IoT) refers to the connection and communication between physical objects embedded with electronics, enabling them to interact with each other and the external environment. In the coming years, IoT-based technology will revolutionize daily life and offer advanced services. Various sectors, including medicine, energy, gene therapies, agriculture, smart cities, and smart homes, have already embraced IoT. Currently, there are over 9 billion connected objects, and this number is projected to reach 20 billion in the near future. In the consumer market, IoT is commonly associated with "smart" products like lighting fixtures, thermostats, home security systems, cameras, and other appliances. These devices are compatible with specific ecosystems and can be controlled through smartphones and smart speakers. Additionally, IoT has promising applications in healthcare systems. Overall, IoT encompasses a network of interconnected devices, machines, objects, animals, or people that have unique identifiers and can transfer data without requiring human-to-human or human-to-computer interaction.

2. LITERATURE SURVEY

This paper presents the implementation of a GPS-based vehicle navigation system. The system utilizes GPS and GSM to fetch vehicle information such as location and distance. The user can define the time interval at which the vehicle's information is obtained. The periodic location information is then transmitted to a monitoring or tracking server. The transmitted data is displayed on a display unit using Google Earth and electronic Google maps to show the vehicle's location. The system relies on GPS to receive latitude and longitude coordinates from satellites during critical moments. Tracking systems are widely used today for various purposes, including monitoring vehicles, tracking stolen vehicles, and more. This system employs a microcontroller, GPS, and GSM, with a single GPS device and two-way communication enabled by GSM. The GSM modem is equipped with a SIM card, utilizing regular communication processes similar to those used in regular phones. While each vehicle tracking technique mentioned has its specific function, some systems require continuous internet access and can fail if the network is down. The first system tracks the vehicle's location using GPS, sends it to the controller, and displays it on the display unit using Google maps. However, this system relies on the internet and becomes useless without it since

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the vehicle's location can only be presented through Google maps. In contrast, the other system sends an SMS with the coordinate of the location upon user request, eliminating the need for internet access. Taking all these factors into account, future implementations should focus on introducing additional user-friendly and efficient features to enhance the system.

3. PROPOSED METHOD

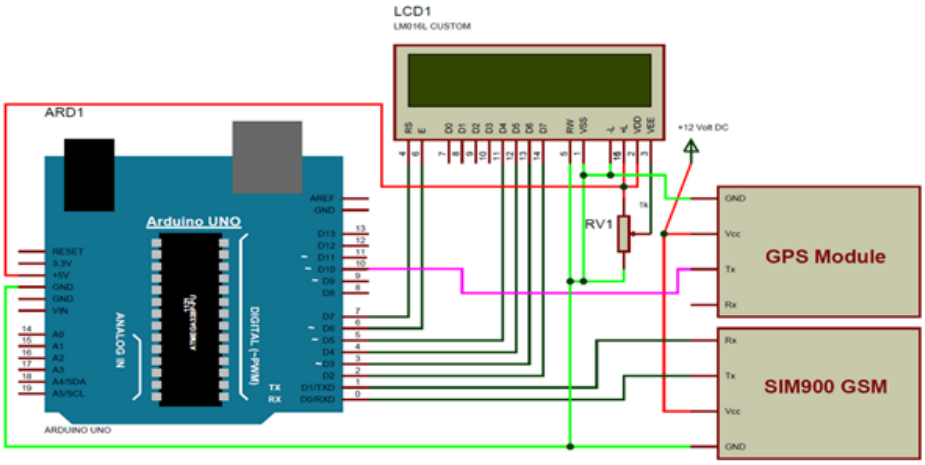

FIGURE 1. Circuit diagram

The GSM module's transmission (Tx) and reception (Rx) pins are directly linked to the Rx and Tx pins of the Arduino. Additionally, the GSM module is powered by a 12V supply. An LCD display, if used, has its data pins (D4, D5, D6, and D7) connected to Arduino pins 5, 4, 3, and 2, respectively. The command pins RS and EN of the LCD are connected to Arduino pins 2 and 3, while the RW pin is connected directly to ground. Lastly, a potentiometer is utilized to adjust the contrast or brightness of the LCD.

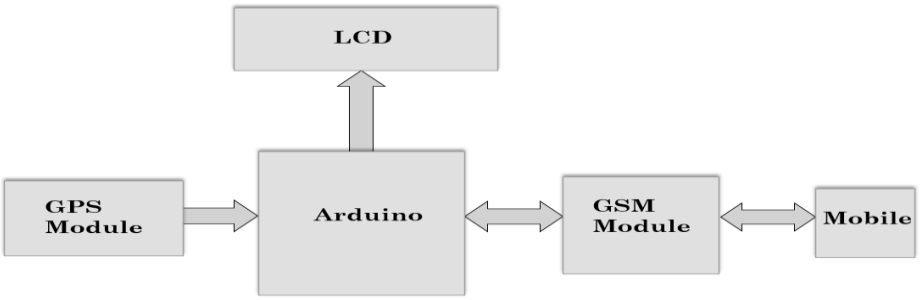

FIGURE 2. Block Diagram Working

In this project, the Arduino is utilized to control the entire process in conjunction with a GPS Receiver and GSM module. The GPS Receiver is responsible for detecting the vehicle's coordinates, while the GSM module is employed to transmit these coordinates to the user via SMS. Additionally, an optional 16x2 LCD is incorporated to display status messages or coordinates. Specifically, the SKG13BL GPS Module and SIM900A GSM Module are employed. Once the hardware is prepared and programmed, it can be installed in the vehicle and powered on. To initiate the system within the vehicle, a SMS message with the content "Track Vehicle" is sent. The GSM module, connected to the system, receives the message and forwards the data to the Arduino. The Arduino then reads and extracts the main message from the received content. This extracted message is subsequently compared to a pre-defined message stored in the Arduino. If a match is found, the Arduino proceeds to read the coordinates by extracting the $GPGGA String from the GPS module data (the GPS operation is explained above). Finally, the Arduino utilizes the GSM module to send a message to the user containing the vehicle's location coordinates.

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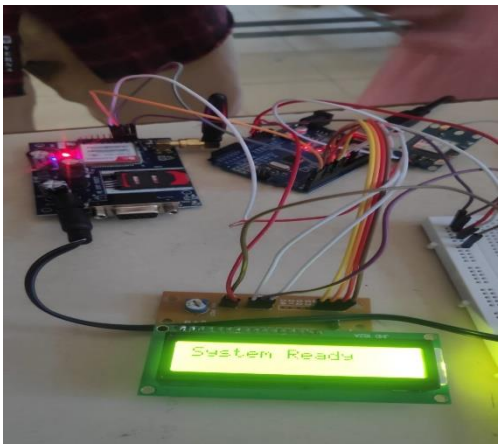
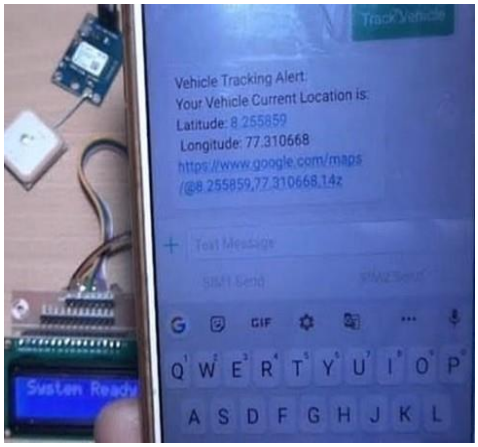
4. RESULT





5. CONCLUSION

In our thesis, we have developed a flexible, customizable, and accurate vehicle tracking system. We configured a GSM modem and successfully tested and implemented the tracking system, allowing us to monitor the vehicle's location through SMS and online on Google Maps. To display the position on Google Maps, we utilized the Google Maps API. The core of our system is the Arduino, which controls the GSM modem using AT commands for data transmission over the GSM network. The GPS module provides the location data, which is updated in the database whenever new data is received, enabling us to visualize the vehicle's location on Google Maps. Our motivation for designing a real-time vehicle tracking system stems from the increasing vehicle theft problem in Bangladesh. We aimed to create a solution that offers effective control against carjacking. The system provides accurate real-time data, allowing users to track their vehicles and facilitating prompt recovery in case of theft. Implementing GPS trackers in vehicles has the potential to bring about a revolutionary change in developing countries like Bangladesh, given the high volume of urban and rural vehicular movement on a daily basis. Furthermore, our system is designed with future applications in mind. We have ensured that upgrading the system is straightforward, eliminating the need to rebuild everything from scratch and making it adaptable to future requirements. This scalability enhances the efficiency of our system. Throughout our thesis, we gained extensive knowledge of GPS and improved our programming skills. We conducted various field tests to ensure the reliability of our system, and the initial results from our prototype are highly promising. This renders our thesis comprehensive, robust, and even opens the possibility of future commercialization of the system.

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