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Design and Implementation of Automatic Engine Off and Theft Detection of Vehicle

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Abstract:- In recent times property theft has become a major concern. Vechile theft is at the top of the list and happens frequently everywhere in the world. several technologies are developing in response to this problem, and new approaches are being created to find a solution. Since burglars are now aware of the techniques used in vehicle theft detection, they attempt to compromise the system in order to take the vehicle. This paper proposes to enhance vehicle safety by integrating alcohol detection, obstacle avoidance, and theft detection systems. The alcohol detection system ensures responsible driving by monitoring the driver's alcohol level, while the obstacle avoidance mechanism uses sensors to detect obstacles and navigate the vehicle accordingly. Additionally, a theft detection system employs sensors to identify unauthorized access. Upon detection of alcohol influence or potential theft, the system triggers an automatic engine shutdown and activates a buzzer for alerting authorities, promoting safer driving practices and enhancing vehicle security.

Keywords:- *Vehicle Theft, GSM, Arduino, Sensors.*

I. INTRODUCTION

It is now essential to integrate advanced technologies in the current automotive security landscape. A comprehensive approach to vehicle protection includes features like the manual engine-off capability that actively respond to security breaches, going beyond simple theft prevention[1]. This story delves into the workings of a state-of-the-art car security system, which is painstakingly assembled from a variety of high-tech parts, such as an Arduino Mega 2560, a MQ3 gas sensor, an ultrasonic sensor, a PIR sensor, a buzzer, a DC motor, a GPS module, a GSM module, and a relay. The Arduino Mega 2560 microcontroller, which acts as the mastermind coordinating the smooth integration of multiple sensors and modules, is at the center of this security architecture. Crucial to preventing attempts at break-ins involving toxic materials is the MQ3 gas sensor, which keeps watch over the car to identify any unusual gas emissions. Concurrently, ultrasonic sensors positioned in strategic locations track the nearness of objects to guarantee prompt reaction to possible hazards and avoid inadvertent collisions.

The Passive Infrared (PIR) sensor enhances the system's ability to detect intrusions because it is extremely sensitive to infrared radiation released by living things. This sensor makes sure the system reacts specifically to human presence inside the vehicle, improving its accuracy in detecting security breaches in addition to serving as a deterrent to theft[2]. The system sounds a buzzer placed in a strategic spot to alert people nearby and serve as an audible deterrent to anyone attempting to break in or gain unauthorized access. Simultaneously, a DC motor that is intricately linked to the car's ignition system is activated in order to manually switch off the engine. In addition to serving as a decisive deterrent to theft, this dual response introduces another level of complexity for potential intruders who might have gotten past other security measures.

In addition to these proactive measures, the integration of a GPS module significantly enhances the system's tracking capabilities. This module enables real-time location monitoring, allowing vehicle owners and authorities to remotely track the vehicle's movements[3]. The GPS coordinates are seamlessly transmitted through the GSM module, ensuring that the vehicle owner receives timely alerts on their mobile device in the event of a security breach. This integration creates a robust tracking system that improves the chances of swift recovery in case of theft.

The collaborative synergy of these components culminates in a formidable security apparatus that not only detects but actively prevents theft attempts. The combination of gas, ultrasonic, and infrared sensors ensures a comprehensive and nuanced approach to intrusion detection, covering a wide spectrum of potential threats[4]. The integration of GPS and GSM technologies equips both vehicle owners and authorities with the necessary tools for a rapid and informed response, thereby setting a new standard for comprehensive vehicle security[5].

II. EXISTING SYSTEM

The existing technology primarily detects theft using biometrics and beepers or alarms. These products are extremely expensive when purchased commercially. The user can reduce the risk of theft in adjacent parking spaces by using a buzzer. Using buzzers is an ineffective tactic if the car is parked far away, as it becomes harder to stop theft. Certain current systems cut off the fuel supply as soon as they suspect theft, which can occasionally be hazardous.

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III. PROPOSED SYSTEM

At the core of this revolutionary system is the Arduino Mega 2560 microcontroller, functioning as the central intelligence orchestrating the seamless integration of various sensors and modules. The MQ3 gas sensor assumes a crucial role in detecting abnormal gas emissions within the vehicle, serving as a preemptive measure against break-in attempts involving noxious substances. Additionally, the ultrasonic sensor contributes to the system's proficiency by monitoring proximity, ensuring rapid responses to potential threats and minimizing the risk of unintended collisions.

Because it is extremely sensitive to infrared radiation released by living things, the Passive Infrared (PIR) sensor is incorporated into intrusion detection systems to provide an additional degree of precision. A well-placed buzzer is set off in the event of unauthorized access, serving as both an audible warning to would-be intruders and a means of informing those in the vicinity of the ongoing security breach. In addition, the DC motor, which is closely connected to the car's ignition system, enables the engine to turn off automatically when it senses a security breach, adding a proactive and automated level of theft prevention. Enhancing the system's capabilities further, a GPS module is seamlessly integrated for real-time location monitoring. In case of a security breach, the GPS coordinates are effortlessly transmitted through the GSM module, ensuring swift alerts are sent to the vehicle owner or relevant authorities.

IV. BLOCK DIAGRAM

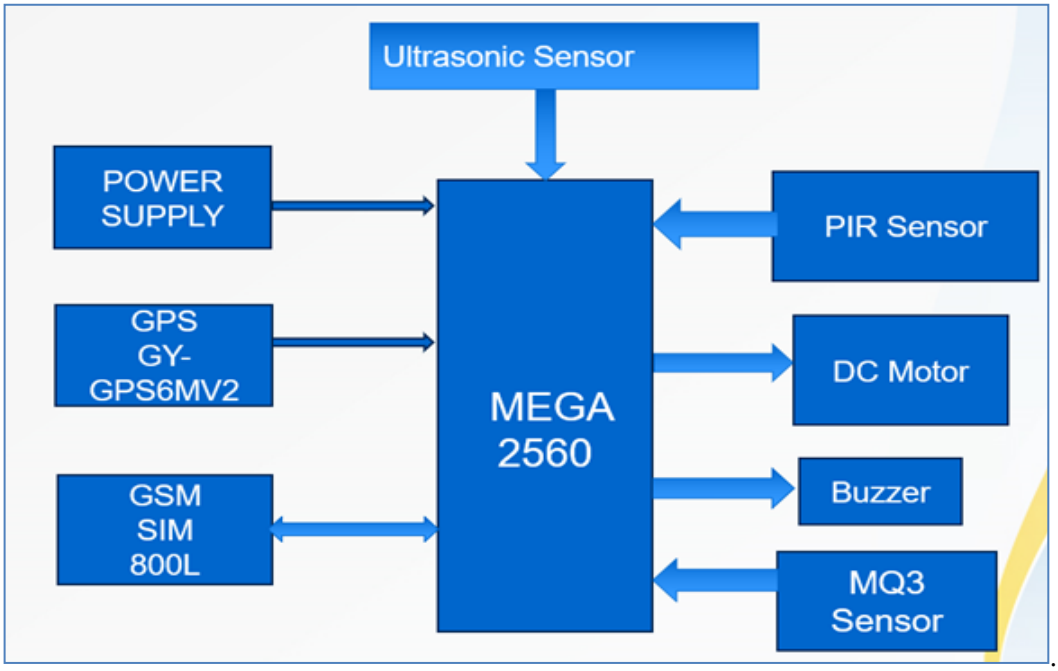

Fig 1: Block Diagram

We are introducing the enhanced vehicle theft detection and Automatic engine off. To successfully do this we have an GSM, sensors, arduino, MQ_3sensor,DC motor

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V. CIRCUIT DIAGRAM

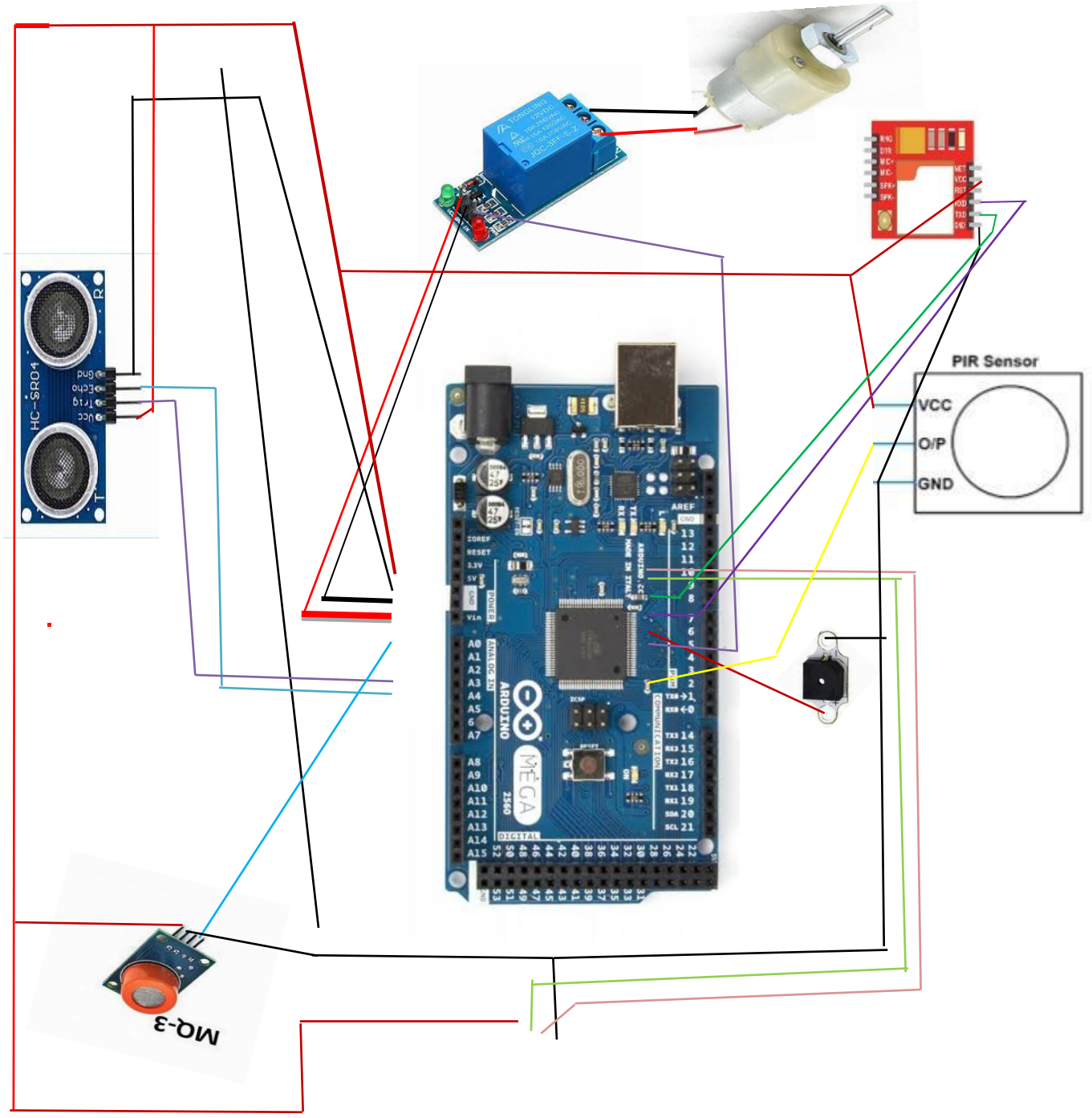

Fig. 2: Circuit Diagram

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VI. HARDWARE DISCRIPTION

A. Arduino atmega 2560:

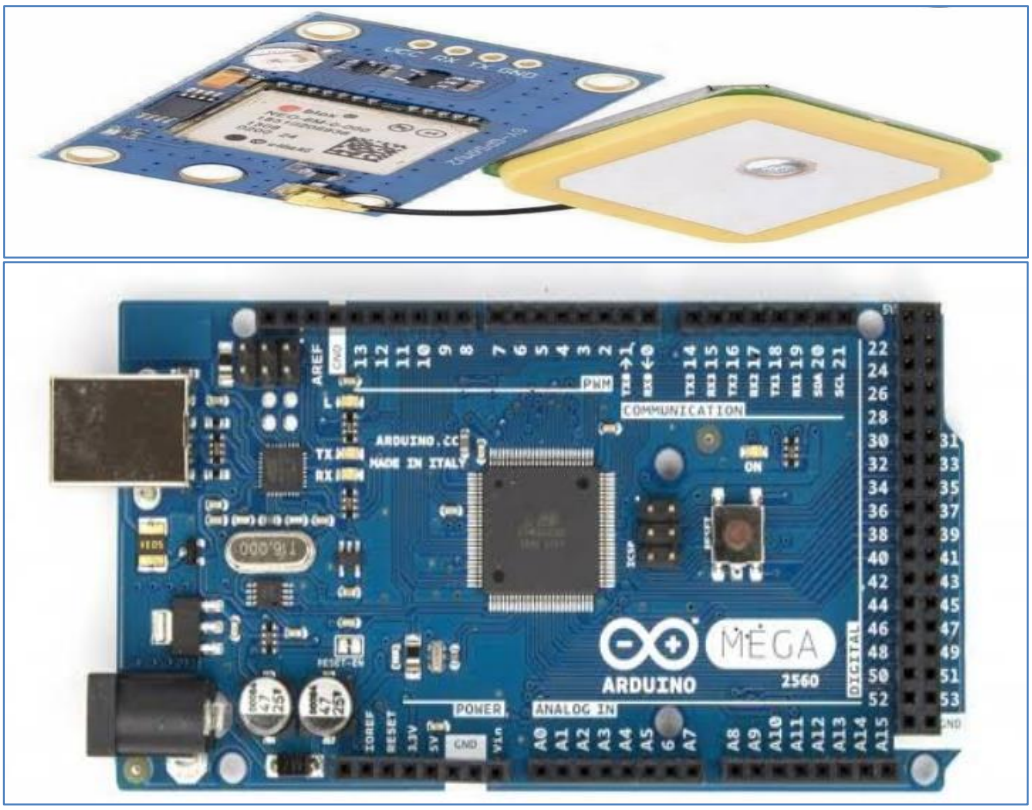

Fig. 3: Arduino atmega 2560

The Arduino Software (IDE) can be used to program the Mega 2560 board. the reference and tutorials. With the help of an external hardware programmer, you can upload new code to the ATmega2560 on the Mega 2560 because it is preprogrammed with a bootloader. It uses reference and C header files in the original STK500 protocol for communication.For more information, see these instructions.

B. MQ3 Sensor:

One of the MQ gas sensor series that can identify and track the presence of alcohol gas in the atmosphere is the MQ3 alcohol sensor. It can identify airborne alcohol gas concentrations between 25 and 500 parts per million. An overview of the MQ3 alcohol sensor's pin layout, specs, and Arduino interface is provided in this article. The alternatives of MQ3 alcohol sensor are MQ138 (benzene, hydrogen, alcohol, propane, toluene, formaldehyde gas), MQ303A (ethanol, smoke, and alcohol), MQ2(methane, smoke, LPG, butane), MQ214 (methane), MQ5 (natural gas and LPG), and MQ306A (LPG and butane).

Fig. 4: MQ-3 Sensor

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C. ULTRASONIC SENSOR:

Ultrasonic sensors are electronic devices that measure a target's distance using ultrasonic sound waves and convert those waves into electrical signals. The speed at which ultrasonic waves are emitted exceeds that of audible sound waves. The two main, necessary parts are the transmitter and the receiver. Piezoelectric crystals are used by the transmitter to generate sound, which is subsequently transmitted to the target and returned to the receiver component. By measuring the amount of time it takes for sound waves to travel from the transmitter to the receiver, the sensor calculates the target's distance from it.

An ultrasonic sensor works similarly to a sonar or radar, analyzing the characteristics of a target or object by deciphering the echoes that arrive from sound or radio waves. These sensors evaluate the echo they receive after producing high-frequency sound waves. The sensors calculate the time that separates sent and received echoes to determine the target's distance.

Fig. 5: Ultrasonic Sensor

D. PIR SENSOR:

An electronic sensor that detects motion is called a passive infrared sensor (PIR). When an object enters its field of view, the sensor detects the infrared (IR) light that it emits. They have mostly been utilized in PIR-based motion detectors.The sensor is triggered (activated) when a person moves within its field of view because it detects a sudden change in infrared energy. It serves as a toggle.They are not capable of measuring or detecting heat, but they can identify infrared radiation emitted by objects.These sensors are frequently found in alarm, lighting, and security systems.PIR sensors have a range of about six meters, depending on the circumstances.

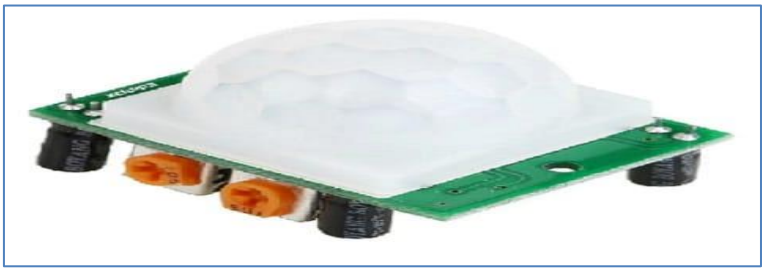

Fig. 6: PIR Sensor

E. GPS MODULE:

Fig. 7: GPS module

A GPS module is a device that receives signals from satellites to determine its precise location. Key specifications include: Describes how close the reported location is to the actual position.The communication protocol used to connect the module to a device, often UART or I2C.

F. GSM MODULE:

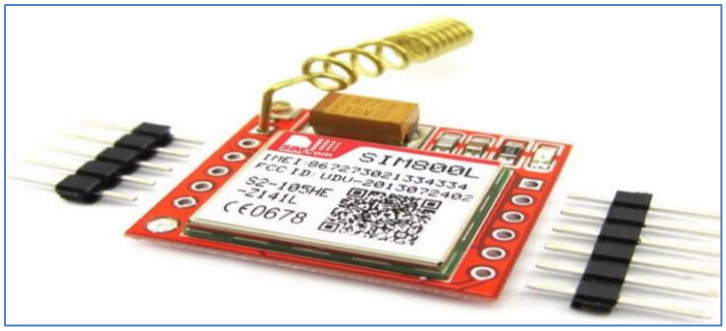

Fig. 8: GSM Module

One gadget that enables device-to-device communication over the GSM network is the GSM module. One common GSM module for GPRS/GSM communication is the SIM900A. It works with Arduino and microcontrollers in the majority of embedded applications and is inexpensive and small. The module offers GPRS/GSM technology for communication with a mobile sim. The 900 and 1800MHz frequency band is used by users to send and receive SMS messages as well as mobile phone calls. The keypad and display interface of the application can be customized by developers. It also includes command mode and data mode. Different protocols and frequencies are used by the GPRS and GSM in different countries. In command mode, developers can change the default configuration to suit their needs. The 68 pins on the module facilitate the development of numerous commercial applications. If we choose to interface with Arduino using a module, we will require a few pins.

G. BUZZER:

Fig. 9: Buzzer

An electronic part that makes noise is called a buzzer. This component is commonly used in most electronic applications due to its small size and compact 2-pin structure, which makes it easy to use on PCBs and breadboards.

H. DC MOTOR

Fig. 10: DC motor

dc motors are electric motors that run on direct current (dc), which can come from a dc power supply or a battery. they find extensive usage in everything from big industrial machinery to tiny toys. a brushless dc motor's speed can be adjusted by varying the input signal's frequency, whereas a brushed dc motor's speed can only be changed by altering the voltage1.it's crucial to take into account the following performance requirements when choosing a dc motor.

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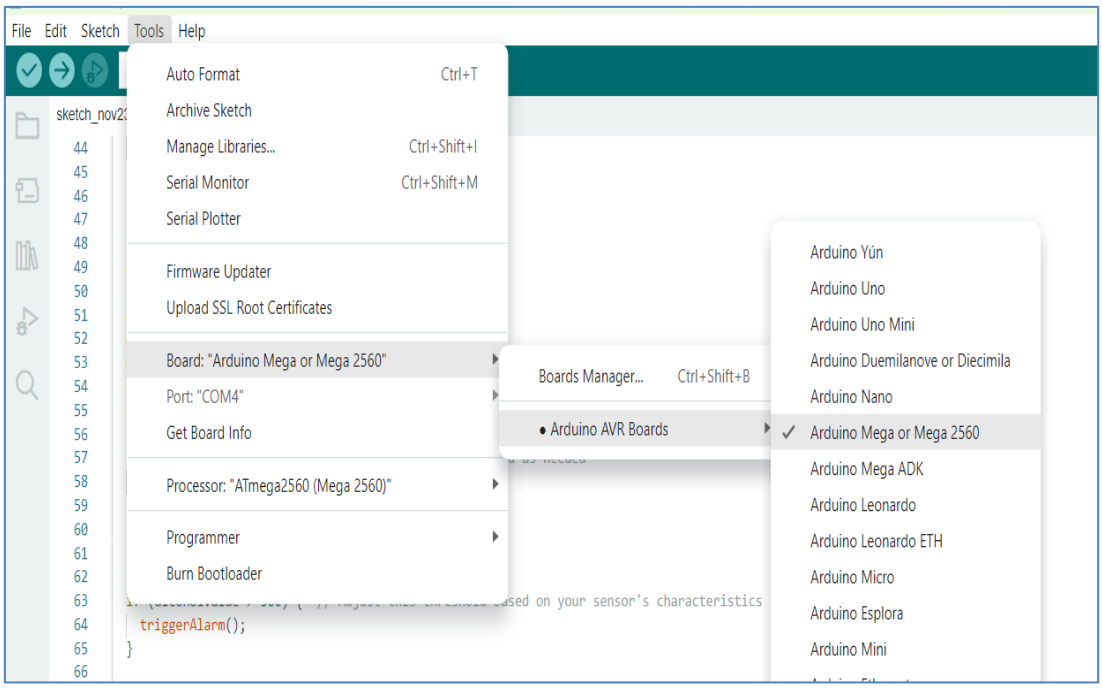
VII. SOFTWARE REQUIREMENTS

Based on the ATmega328P, the Arduino Nano is a compact, feature-rich, and breadboard-friendly board. With a smaller form factor, it provides the same specifications and connectivity as the UNO board.

The Arduino Software (IDE), our Integrated Development Environment shared by all of our boards, is used to program the Arduino Mega 2560. Nanotechnology Installing the Arduino Desktop IDE is required while offline. In order to link the Arduino Nano to your PC, a Mini-B USB cable is required. The blue LED, which is located on the top of the Arduino Nano 3.0 and the bottom of the Arduino Nano 2.x, indicates that the board is also powered by this.

choose board type and port

Select Tools > Board > Arduino AVR Boards > Arduino Mega2560.

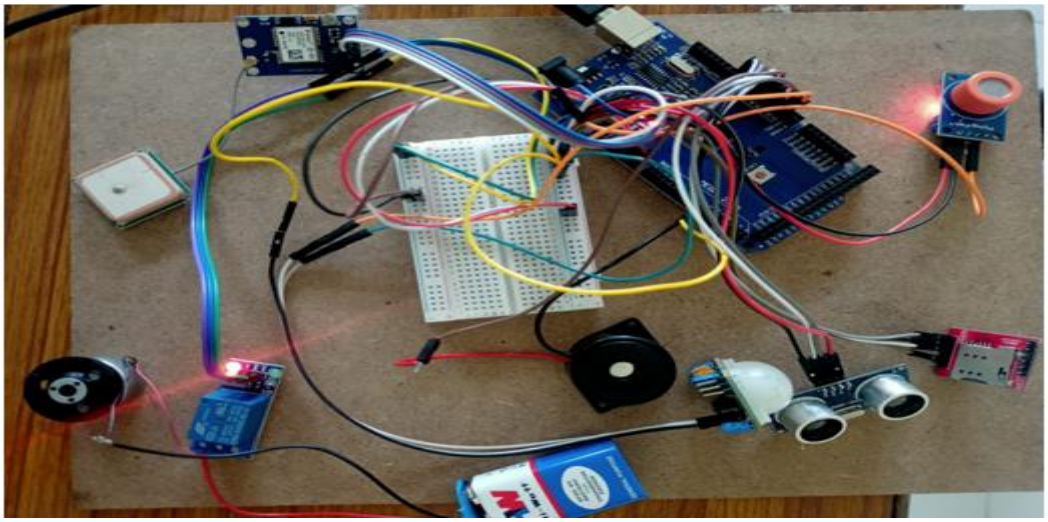


Click the Upload button located in the upper left corner of the screen to load and execute the sketch on your Arduino Nano

After a short while, the RX and TX LEDs on the board ought to start flashing. The status bar will display the message "Done uploading." if the upload is successful.

VIII. RESULTS

Automatic engine off and vehicle theft detection system is working successfully.



IX. CONCLUSION

The incorporation of a sophisticated system for automatic engine shutdown and theft detection in vehicles, utilizing a combination of cutting-edge components such as the Mega 2560 microcontroller, MQ3 gas sensor, ultrasonic sensor, PIR sensor, buzzer, DC motor, GPS, GSM modules, and relay, represents a significant leap forward in automotive security and safety. This amalgamation of diverse technologies creates a comprehensive security network that not only safeguards the vehicle against theft but also addresses potential hazards like gas leaks.

The Mega 2560 microcontroller serves as the brain of the system, orchestrating the seamless interaction between various sensors and modules. Its robust processing capabilities enable rapid decision-making, ensuring swift responses to security threats. The MQ3 gas sensor plays a pivotal role in detecting harmful gases, triggering an immediate response to safeguard both the vehicle and its occupants. This feature is particularly crucial for preventing accidents and ensuring the well-being of passengers.

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