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AUTOMATIC SMART VEHICLE WITH SAFETY GADGETS USING GSM MODULE

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Abstract: **In recent years, the automobile industry has made considerable strides, particularly in the areas of vehicle efficiency and safety. The system for an automated smart vehicle described in this paper, which is equipped with various sensors and a GSM module and can monitor and analyses various essential elements in real time, is complete. The suggested system has features for tire pressure monitoring, handle lock status, speed detection, oil purity checking, and fuel monitoring. By sending out timely accident notifications and essential data for maintenance and fuel management, the technology improves vehicle safety. By guaranteeing ideal fuel usage, handle lock state, oil quality, and tyre pressure, it increases economy. The merging of Arduino and GSM technologies enables efficient vehicle tracking and communication. The ecosystem of mobility will become safer and more effective as a result of this effort.**

Index Terms **- accident detection, speed detection, tire pressure monitoring, handle lock, oil purity check, fuel monitoring, GSM module.**

1. INTRODUCTION

The quick development of technology has created new opportunities for enhancing the monitoring and safety features of automobiles. This study describes a novel initiative that aims to create an automatic smart vehicle system with a wide range of characteristics to ensure its functionality and safety. The enter key is used to begin a new paragraph. Automatically applied spacing and indentation are suitable.

The study of paper investigates, the TPMS is made to keep track of the tyre pressure in cars and warn the driver if it drops below a predetermined level. Through real-time tyre pressure monitoring, which can assist avoid accidents brought on by underinflated or overinflated tires, this technology seeks to increase road safety [1]. To give a general review of the state-of-the-art in autonomous road accident detection and to point out possible topics for additional study and development is presented in paper [2].It aims is showcase to develop a system that can recognize accidents and immediately notify the necessary emergency services or authorities. The system attempts to respond to accidents in a timely manner, possibly saving lives and lessening the severity of injuries. [3].utilizing IoT technology, create an intuitive and effective engine oil monitoring system that enables prompt diagnosis of lubricant-related problems and promotes proactive maintenance and decision-making. [4]. The authors in [5] describe the automation of speed regulation, the Automatic Speed Control of Vehicles project seeks to improve traffic safety and lower accident rates. It provides a promising solution to enhance the driving experience and reduce dangers on the road by utilizing cutting-edge technologies and clever algorithms [5]. [6] Presents a system to offer a precise and immediate mechanism for monitoring vehicle fuel use. The team suggests using motion-based sensors and algorithms to calculate fuel consumption based on the movement and acceleration patterns of the vehicle [6]. The potential benefits and applications of is to speed up emergency response, perhaps saving lives and lessening the seriousness of injuries brought on by accidents. It increases the effectiveness of accident detection and reporting through automation, ensuring quick action is taken in urgent situations [7].

As there are more cars on the road, safety and effective monitoring are more important than ever. This paper offers a novel concept that combines a number of cutting-edge characteristics to build an intelligent vehicle system that can monitor fuel, speed, and tyre pressure, handle lock status, oil purity, and identify accidents. A GSM module allows for the smooth integration of these features, allowing for real-time data transmission to the driver's mobile device.

The safety and monitoring systems in vehicles have significantly improved as a result of technological developments. In this paper, propose an effort to create an autonomous smart car system that combines a number of modern capabilities to improve monitoring, safety, and overall vehicle performance. Through the integration of a GSM module, the system includes features for accident detection, speed detection, tyre pressure monitoring, handle lock, oil purity check, and fuel monitoring.

Accident prevention is a key component of auto safety. Potential accidents might be indicated by sudden movements in a vehicle's acceleration. The system can accurately identify such occurrences and send the driver timely alerts by integrating an accelerometer-based sensor. This reduces the possibility of injuries and reduces the effects of accidents.

A vital component of maintaining safe driving processes is speed detection. The method uses a speed sensor to continuously and rapidly monitor the vehicle's speed. This data is implemented to give drivers feedback so they can maintain safe speed limits and prevent any accidents brought on by speeding.

Monitoring tyre pressure is crucial for sending the best possible driving performance and safety. Improper tyre pressure can result in reduced traction, additional fuel being used, and tyre failure. The solution, which includes a tyre pressure sensor, enables drivers to keep track of their tyre pressure and perform the appropriate measures, like filling or fixing tyres, to maintain ideal pressure levels.

Security of the handle lock is essential in preventing unwanted access to the vehicle. So the solution has a handle lock sensor that analyses the lock's condition and gives the driver feedback in real time. By doing so, the chance of theft is decreased and the vehicle is kept secure.

For the engine of the vehicle to remain healthy and effective, oil purity testing is essential. An oil purity sensor built into our system evaluates the engine oil's quality and condition. This makes it possible for drivers to plan oil changes and other maintenance tasks based on reliable data, improving engine performance and increasing engine life.

An essential component of effective vehicle management is fuel monitoring. This device properly detects the amount of fuel poured into the car with the help of a fuel sensor. This data enables drivers to efficiently plan refueling stops and monitor fuel usage.

2. SYSTEM DESIGN

2.1 Hardware architecture

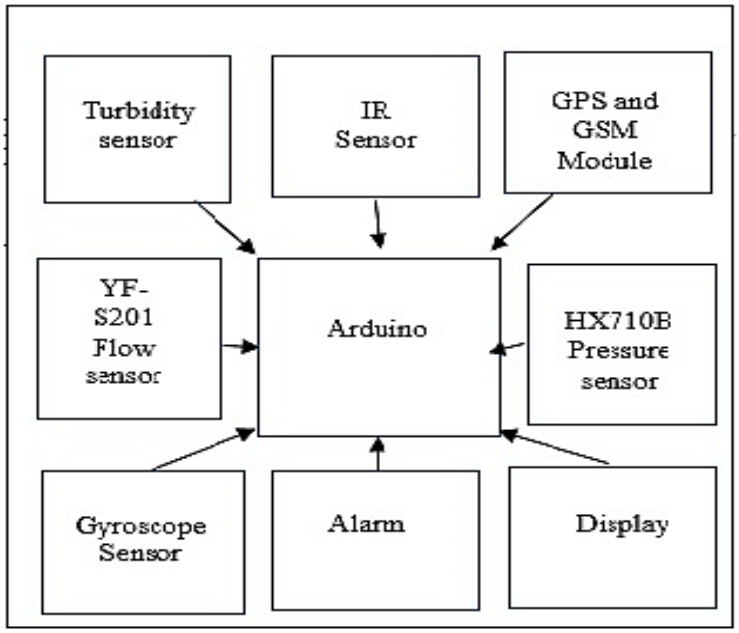

figure 2.1.1: block diagram of the hardware architecture of an automatic smart vehicle with safety gadgets using GSM module

Figure 2.1.1 shows block diagram of the hardware architecture of a automatic smart vehicle with safety gadgets using GSM module that shows the GSM module-enabled independent smart vehicle's system architecture and component interactions. Together, the hardware parts make it possible for the system to run without delay and for effective healthcare management. The main components of our hardware architecture are as follows:

Arduino Circuit: The brain of your project is a microcontroller platform called Arduino. You can use it to programmer and manage various electronic parts. The interface and connectivity required for integrating and managing the many sensors and motors in your project are provided by the Arduino circuit board.

IR sensor: The IR (Infrared) sensor is used for obstacle detection and proximity sensing. Its ability to both produce and detect infrared signals allows the vehicle to detect things or impediments in its path and choose the best course of action.

Display Unit: To give the driver visual feedback, a display unit such as an LCD screen or an OLED display can be employed. Real-time data like as speed, tyre pressure, handle lock status, oil purity, and fuel level are displayed.

Buzzer/Alarm: To provide senses alerts in critical situations, a buzzer or alarm might be provided. Any safety-related issue, such as low tyre pressure or an accident, can cause it to be activated.

Power Supply: The Arduino board, sensors, GSM module, and other system components must be connected by an effective power source, such as a battery or a regulated power source.

GSM Module: The GSM module makes it possible for the driver's mobile device and the car's electronics to communicate. It communicates to the driver in real-time alerts, notifications, and sensor data using GSM technology.

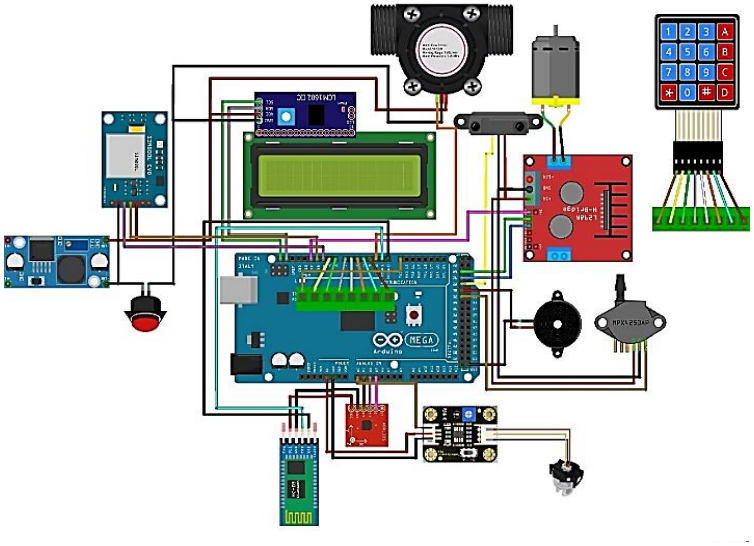

figure 2.1.2: schematic diagram of the hardware architecture of an automatic smart vehicle with safety gadgets using GSM module

Figure 2 illustrates the project's schematic diagram of the hardware architecture of an automatic smart vehicle with safety gadgets using GSM module the variety of parts and connections involved in the system can be observed in a schematic diagram of an automatic smart vehicles with safety gadgets using a GSM module.

2.2 Software architecture

The Arduino IDE, Kodular, and block coding are all used in the project's software part to control the Arduino board, organise the web pages, and format and improve the visual presentation of the web interface. Together, these software elements create a user-friendly web interface, enable the control of hardware elements, and guarantee an ideal integration of the software and hardware elements of your automatic smart vehicle with safety gadgets using GSM module.

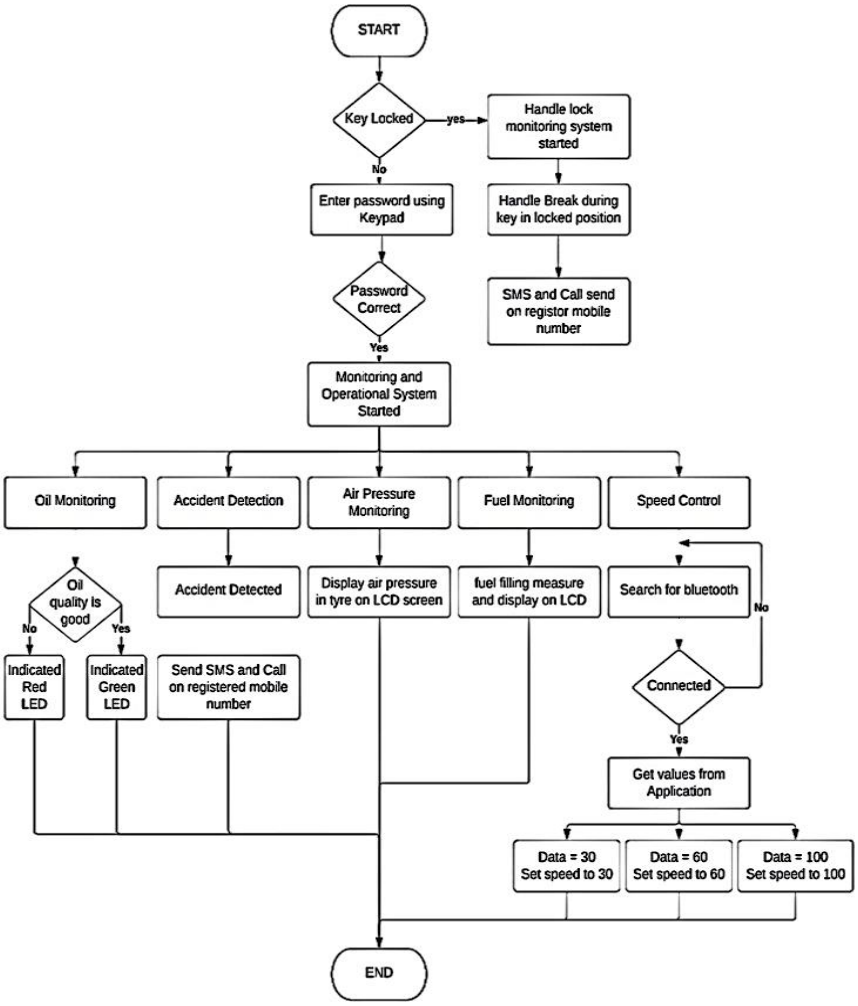

figure 2.2.1: flowchart of an automatic smart vehicle with safety gadgets using GSM module

Start: The program begins running.
Initializing the vehicle: If the key is lock and someone trying to start the vehicle that time SMS or call is sent to the registered smartphone. And to start the vehicle enter password using keyboard, if password is correct vehicle will be start bus if password is incorrect it will shows WRONG PASSWORD on the display of the screen.
Activate Sensors: Set the Arduino board's sensors, such as the accelerometer for accident detection, the speed sensor, the tyre pressure sensor, the handle lock sensor, the oil purity sensor, and the fuel sensor, to their initial settings.
Read Sensor Data: If you want details about the current state of the vehicle, such as acceleration, speed, tyre pressure, handle lock status, oil purity, and fuel level, read sensor data.
Sensor Processing Data: Process the sensor data to carry out particular operations in accordance with the system requirements. This may entail calculating the vehicle's speed, determining the tyre pressure levels, monitoring the handle lock state, determining the oil purity, and counting the amount of fuel.
Communicate Data via GSM Module: Connect to the GSM module and use SMS or GPRS to communicate the sensor data that has been processed to a remote control device. Transmit necessary information, such as updates on the fuel level, tyre pressure measurements, handle lock status, speed alerts and accident alarms.
Commands/alarms: Use the GSM module to receive commands or alarms from the remote control unit. The instructions might contain warnings about impending threats or directions on how to lock or release the handle.
Update Vehicle state: Based on the commands or alerts received, update the vehicle's state. In this case, update the handle lock status immediately if an instruction to lock the handle is received.
Data display on the control unit: On the user interface of the control unit, show the sensor data, alarms, and vehicle status. This could be a computer-based interface or a mobile application. Make sure the information is presented in an easy-to-understand way.
User Interaction: Enable user interaction through the control unit interface so that the driver may track the status of the vehicle, respond to notifications, and operate particular functions remotely.
Loop: Repeat steps 3 through 9 repeatedly to track the status of the vehicle, process sensor data, send and receive data via the GSM module, update the vehicle's status, and show pertinent data on the control unit.
Put an end to the programme.
The autonomous smart car project incorporates an Arduino board, a GSM module, and a number of sensors. It guarantees ongoing data collection, processing, and transmission to improve vehicle security and effectiveness.

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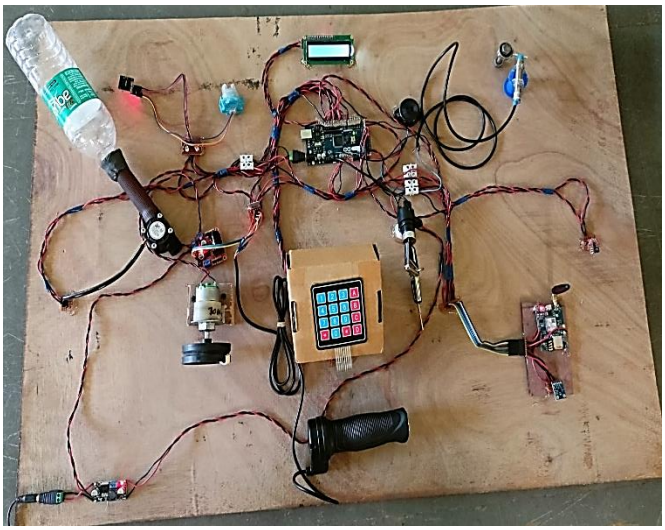

figure 2.2.2: body structure of an automatic smart vehicle with safety gadgets using GSM module

Above diagram illustrating the body structure of our project (automatic smart vehicle with safety gadgets using GSM module)

3. RESULT

The project aims for enhanced vehicle safety, monitoring, and efficiency by leveraging advanced sensors, Arduino-based control, and GSM communication technology. In this section, we present the results obtained from our experiments and data analysis, which aimed to evaluate the effectiveness and performance of our automatic smart vehicle with safety gadgets using GSM modules.

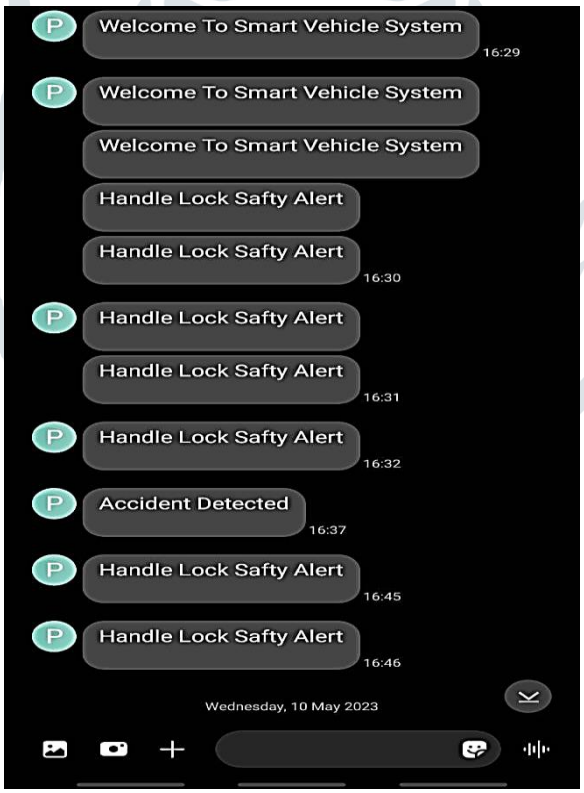

fig 3.1 efficient communication between the vehicle's system and the driver's mobile device

Fig 3.1 shows the GSM module facilitates reliable and efficient communication between the vehicle's system and the driver's mobile device. The driver receives instant alerts, notifications, and real-time data updates through SMS or GPRS, ensuring timely awareness of critical events and enabling remote control of certain vehicle features.

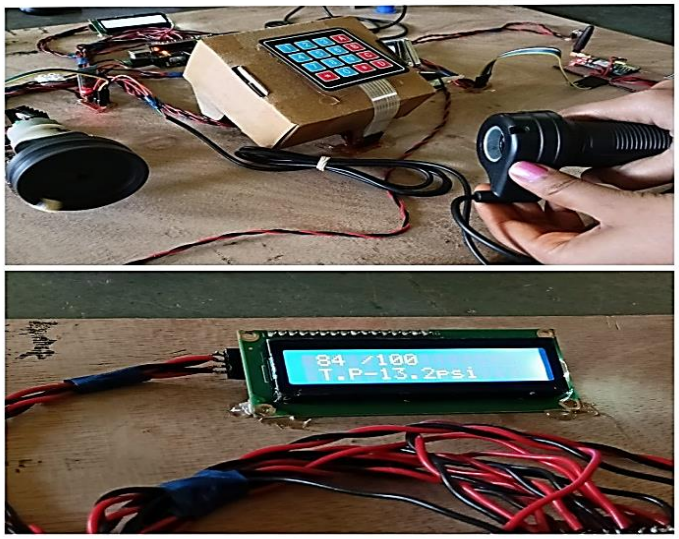

fig.3.2 initializing of the vehicle

Fig 3.2 shows Initializing of the vehicle, once the user has entered the password, they can used the password verification feature to see if it matches the pre-set password. Display the outcome on the control unit or send it via the GSM module if the password is accurate. Display an error message or block further access to the system if the password is wrong.

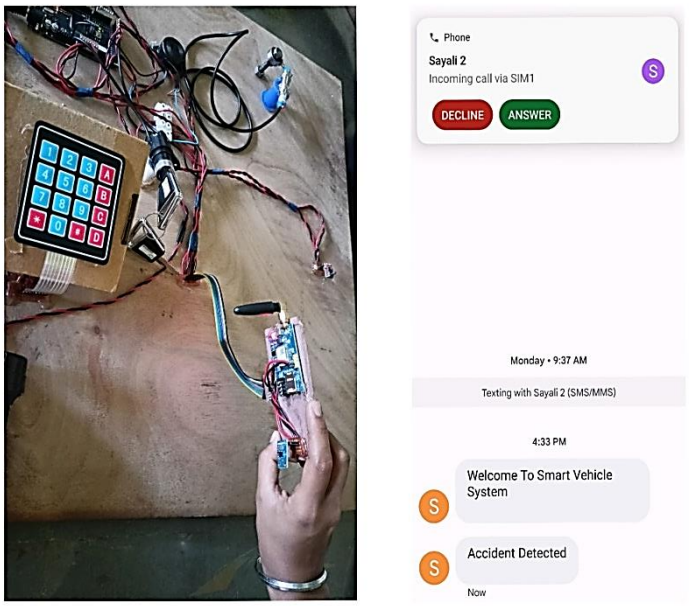

fig.3.3 accident detection system

Fig 3.3 shows Accident detection system, accidents or unexpected changes in vehicle acceleration are carefully monitored by the system. The driver receives immediate notifications of the impending Accident on their mobile device. This makes it possible to react quickly and take the appropriate action, such calling for help from emergency services or informing them know where you are.

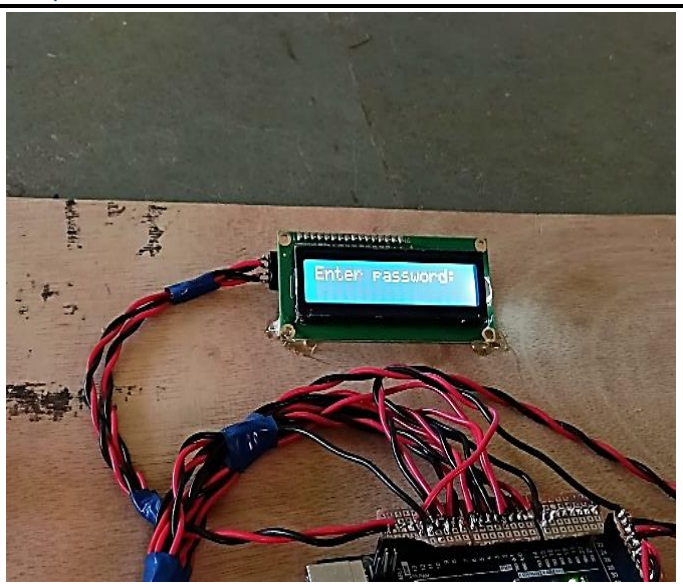

fig.3.4 speed control and tire pressure

Fig 3.4 shows the Speed Control and Tire pressure, this system effectively detects and monitors the vehicle's speed in real-time. The driver receives speed-related notifications and can ensure they adhere to speed limits, promoting safer driving habits and reducing the risk of accidents caused by excessive speed.

The system continuously monitors the tire pressure and detects deviations from optimal levels. Real-time alerts are sent to the driver if the tire pressure is too high or too low. This helps prevent tire-related accidents, improves fuel efficiency, and extends tire life by maintaining proper inflation.

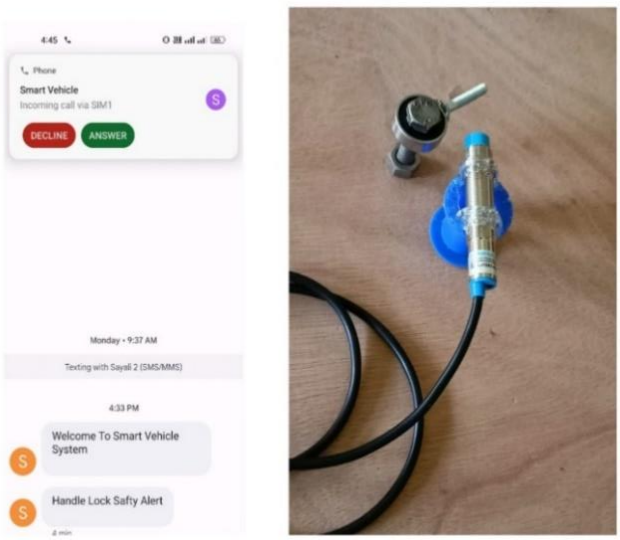

fig.3.5 handle lock System

Fig 3.5 shows the Handle lock System, this system accurately detects the status of the handle lock. The driver is promptly notified if the handle is not locked properly, reducing the risk of theft and ensuring the vehicle's security.

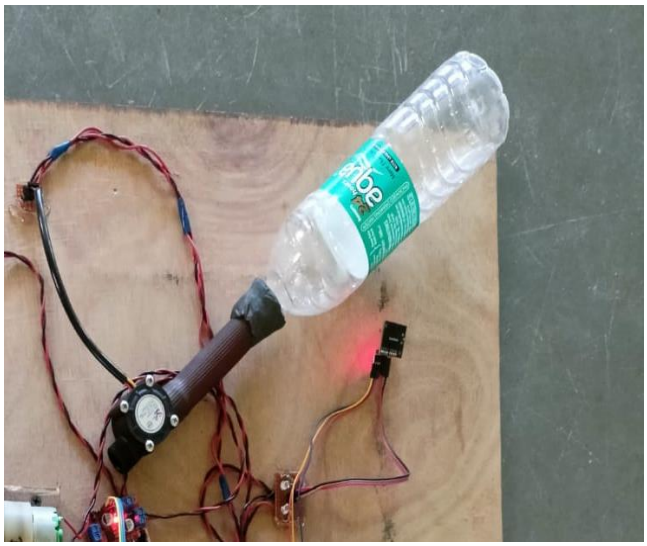

fig.3.6 fuel monitoring system

Fig 3.6 shows the Fuel Monitoring System, this system accurately measures the amount of fuel poured into the vehicle. The driver receives real-time information about the fuel level and can effectively manage fuel consumption. This prevents fuel-related issues, such as running out of fuel unexpectedly, and helps optimize fuel efficiency

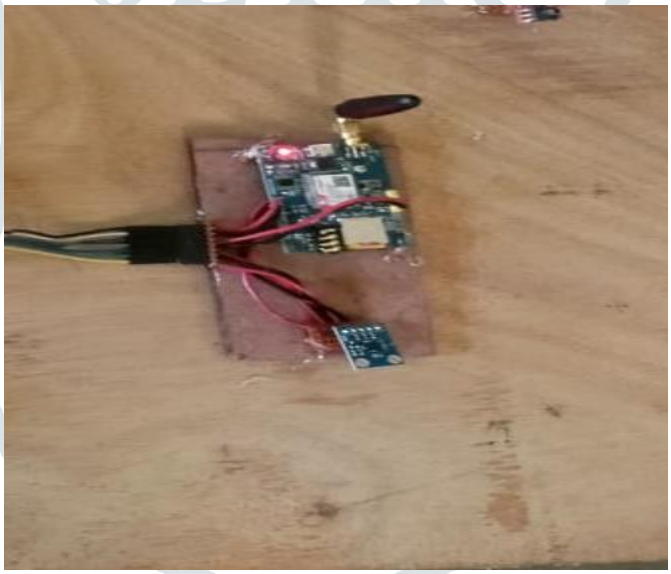

fig.3.7 GSM module

Fig 3.7 shows GSM Module, The owner's smartphone and the vehicle's system can communicate safely and efficiently because to the GSM module. Through SMS or GPRS, the driver receives immediate alerts, notifications, and real-time data updates. This allows for remote control of some car features as well as timely awareness of vital events.

4. CONCLUSION

In summary, the GSM module and Arduino-based automatic smart vehicle project with speed detection, tyre pressure monitoring, handle lock, oil purity check and fuel monitoring has been successfully designed and put into practice. Through the use of numerous sensors, Arduino boards, and a GSM module, the project aimed to improve the safety, monitoring, and effectiveness of vehicles.

The software architecture of the system was developed to collect data from sensors, process it using Arduino programming, and then transfer essential data to a central control unit using the GSM module. The driver might take proactive measures to avoid accidents, maintain optimal vehicle performance, and guarantee passenger safety thanks to the control unit's real-time monitoring, s of the handle lock. The driver is promptly notified if the handle is not locked properly, reducing the risk of theft and ensuring the vehicle's alerts, and notifications.

The system proved stable functionality, accuracy in sensor readings, and effective data transmission through careful testing and validation. Drivers can engage with the car remotely and quickly acquire crucial information thanks to the control unit's user-friendly user interface.

In conclusion, the automatic smart vehicle project using a GSM module and Arduino has demonstrated the potential for modern technology to significantly enhance vehicle safety and monitoring capabilities. This project includes accident detection, speed detection, tyre pressure monitoring, handle lock, oil purity check, and fuel monitoring. Future developments in this field hold a lot of possibilities for the development of smart vehicles and greater roadway safety.

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