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School Vehicle Safety System

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Abstract: *School vehicle safety system (SVSS) is a solution to ensure school transportation safety. Schools must provide safe transportation facilities for students. One of the reasons for vehicle accidents is the negligence of driving the school bus due to drunk driving, improper checking of the conditions of vehicle doors, and negligence while driving the vehicle. The proposed system enables various safety measures to avoid accidents. The system provides the real-time tracking location of the vehicle to ensure the safety of school kids. Different kinds of sensors are used for this purpose such as Alcohol sensors (MQ3), Halleffect sensors (KY024), and PIR motion sensors. If the driver consumed alcohol it senses the alcohol concentration Door open detection uses a halleffect sensor, and PIR motion sensor to detect the school kids at the ventral side of the vehicle. Before moving the vehicle.It alerts the driver and alerts the school administration using the blink server it helps the schools to check and manage the behaviour of the driver.*

Keywords: IoT, MQ3 Sensor, KY024 Sensor, Pir Motion Sensor, ESP8266 Microcontroller, GPS**.**

I. INTRODUCTION

A school bus safety system is one of the solutions for enhancing the safety and security of students during their daily commute from school. This system provides real-time monitoring of the location using the sensors which provide real-time data to analyze safety. The important feature of the system is GPS tracking it uses GPS technology to monitor the location of the vehicle in real-time. It can monitor the driver's behaviour with the help of sensors. The sensors are advantageous to identify driving habits and to instruct the feedback to improve driving. The alert can be sent to the administration when the alcohol concentration is detected when the door is open and the kid is in the ventral side of the vehicle. The IOT platform analyses the data from the sensors to operate. This system reduces the number of accidents by controlling the vehicle via IOT platforms. It stores the sensor's values to operate.

II. LITERATURE REVIEW

Boddapati Venkata sai Padmaja et al [1] proposed a system IOT based Implementation of a Vehicle Monitoring and Tracking System using Node MCU, the system is used to monitor the various driver parameters like eye blinking, and alcohol consumption and vehicle parameters are engine temperature, the distance between vehicles and tracking of the live location of the vehicle.

Jagadeesh G1 et al [2] suggested a system of alcohol detection with a vehicle-controlling system, this system was used to develop vehicle accident prevention by alcohol detectors to reduce accidents. This system combines the alcohol sensor and microcontroller 16F877A.The ignition system will operate blood alcohol content (BAC) during the breath.

A. Mounika et al [3] designed a system IOT Based Vehicle Tracking and Monitoring System Using GPS and a GSM tracking system is used to develop to check the position of the vehicle. The tracking system is used to locate the vehicle using GPS and GSM technology.

Pratiksha Bhuta et al [4] projected a system Alcohol Detection and Vehicle Controlling this system is used by the detection of alcohol sensors connected with Arduino such that the level of alcohol crossed the permissible limit it cutting off the ignition.

Weiye Hu [5] designed system is designed to vehicle-based alcohol detection system using IOT technology when the drunk level is reached the system uses the relay to control the vehicle and finally sends the SMS containing the GPS location to the family.

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III. WORKING PRINCIPLE

The school vehicle safety system is designed to provide safety for school kids. During the ignition of the vehicle. The alcohol sensor is kept in the driver's cabin, and the alcohol sensor senses the alcohol concentration of the driver, when the alcohol concentration is high, an alert sound is sent through Buzzer to the driver and an alert message is sent to administration team through the BLYNK application. If the driver's alcohol concentration is high, it disables the ignition of the motor. The Halleffect sensor is used to detect whether the door is open or not. When the door is open, it provides a low output when the absence of a magnetic field, the halleffect sensor gives an alert using the Buzzer to the driver and sent a notification to administration through the Blynk application. If the door is open, then the ignition motor is disabled. The PIR motion sensor is used to detect the presence of the person while ready to move forward after the dropdown of the kid. If the person is detected using the change in infrared radiation and triggers the output signal, then the ignition motor is cut off therefore no movement. The output of the sensor values is collected by the NODEMCU ESP8266 Wi-Fi module. And the values are displayed in COM 3port.All input data are sent to the cloud through Wi-Fi and analysis is done in the BLYNK app and notifications are sent to the administration. In the BLYNK application, the sensor data are stored and we can check the data whenever required. The GPS module which sends data regarding the location of the vehicle and the location is sent a notification through the IOT BLYNK application.

3.1 Flow Chart

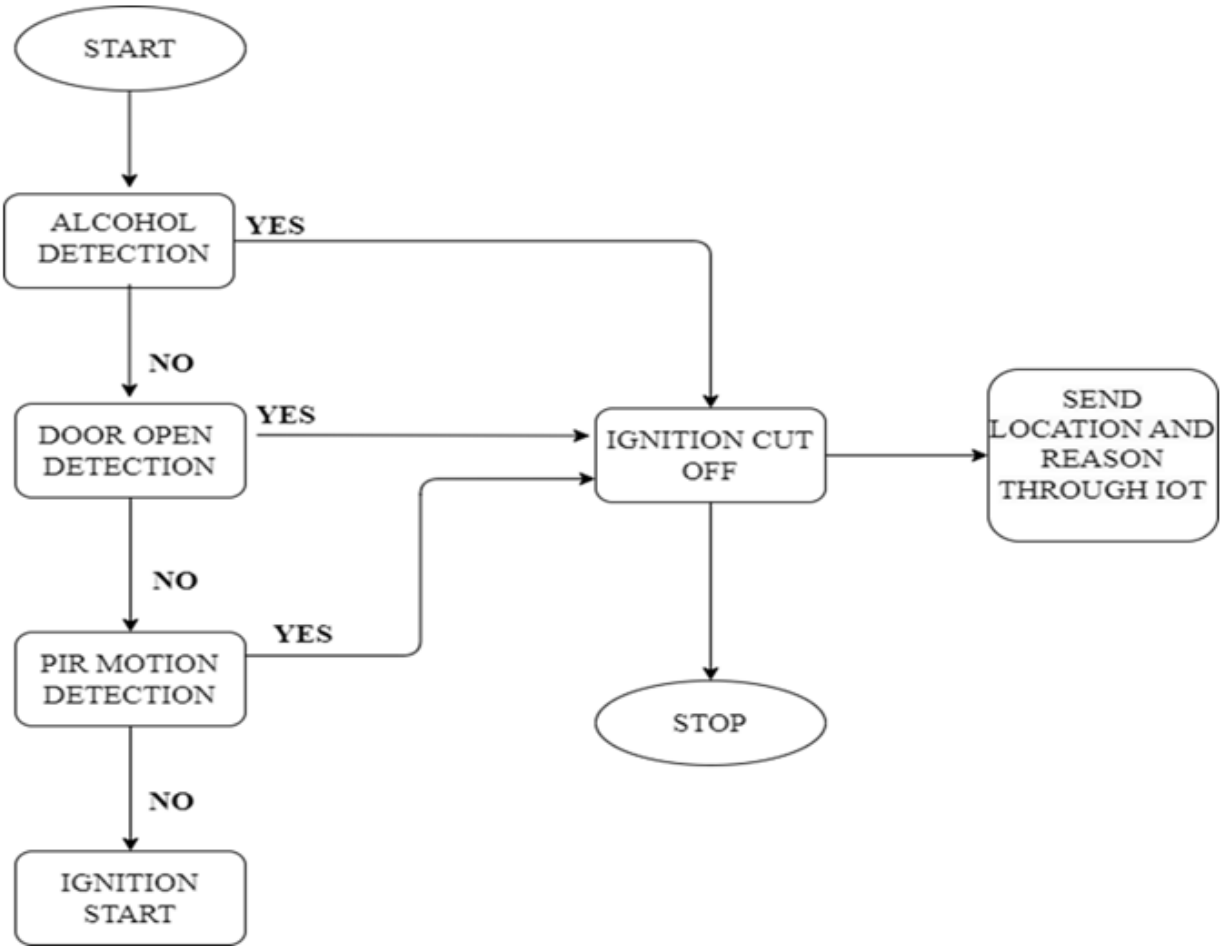

Fig.1. Flow chart of working principle

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3.2 Block Diagram

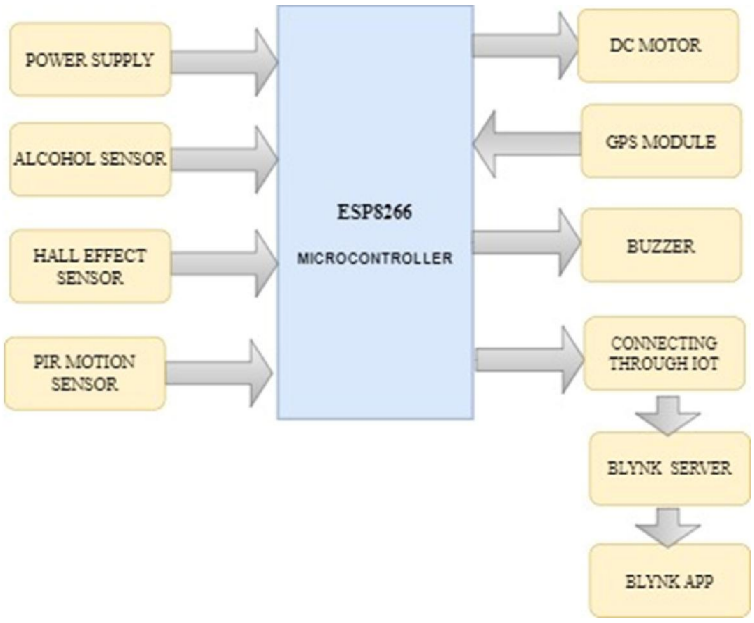

Fig.2. Block diagram of working principle

3.2 Sensors

Sensors are devices that detect and measure physical, chemical, or biological properties of the environment and convert them into signals that can be processed and analyzed. The sensors are used according to the specification and requirements of the application.

3.2.1alcohol Sensor

The MQ3 alcohol sensor uses 5V DC and can detect alcohol concentrations between 25 and 550 ppm. The output pins for the alcohol sensor are analog pin A0 and digital pin D0. Alcohol concentration is proportional to the analog output voltage produced by A0, so higher concentrations produce higher voltages and lower concentrations produce lower voltages.

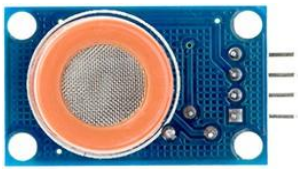

Fig 3: ALCOHOL SENSOR

3.2.2 Hall Effect Sensor

A Hall Effect sensor is an electronic device that can measure the strength of a magnetic field. The sensor works based on the Hall Effect principle, which is the generation of a voltage difference across an electrical conductor when it is placed in a magnetic field that is perpendicular to the direction of current flow.

Figure 4: Hall effect Sensor

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3.2.3PIR Motion Sensor

A PIR (Passive Infrared) motion sensor is an electronic sensor that detects motion by sensing changes in infrared radiation levels. It works by detecting the heat signature of a moving object, such as a human or animal, and can be used in a variety of applications. When an object moves in front of the PIR sensor, it will detect the change in infrared radiation and trigger an output signal. The sensor typically consists of a pyroelectric sensor, which generates a voltage when it detects changes in temperature and a lens that focuses the infrared radiation onto the detection distances for indoor passive infrared sensors range from 25 cm to 20 m. The detection range for outdoor passive infrared sensors is 10 to 150 meters.

FIGURE 4: PIR Motion Sensor

3.2.4 NODEMCU ESP8266

A development board and open-source Lua-based firmware designed specifically for Internet of Things applications are called NodeMCU. It is powered by Espressif Systems' ESP8266 Wi-Fi SoC, and its hardware is based on the ESP-12 module. The USB port can be used to supply power to NodeMCU. On its PCB, NodeMCU features 16 general-purpose input-output pins. For SPI communication, there are four pins accessible. Analog Input Pins (ADC): 1, and 2 UART ports are available on NodeMCU. 64 KB of SRAM, 4 MB of Flash Memory, with an 80 MHz clock speed. It has a powerful processor and built-in Bluetooth and Wi-Fi.

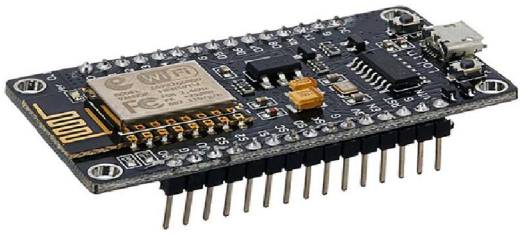

FIGURE 5: NODEMCU ESP8266

3.2.5 GPS Module

In the NEO-6M GPS module board, you can find a small LED that is used to indicate that the GPS module can communicate with the satellites. No blinking indicates that it is searching for satellites. Blink in every 1s indicates that its Position Fix is found (the module can see enough satellites). The module comes with a -161 dBm sensitive patch antenna that can receive radio signals from GPS satellites and it is 3.3V perfect event that you are new to Node MCU at that point read our Getting Started with NodeMCU. This module communicates with the host microcontroller via a serial interface, allowing the microcontroller to receive the GPS data and use it for various applications.

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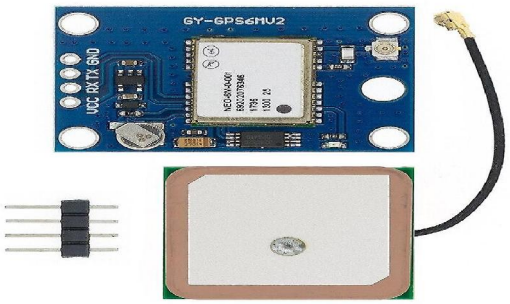

FIGURE 6: NEO-6M GPS MODULE BOARD

3.2.6 ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a software application used to develop code for Arduino boards. The IDE provides an easy-to-use interface for writing, compiling, and uploading code to the Arduino board. One of the key features of the Arduino IDE is its simplicity. The IDE is designed to be easy to use, even for those with little to no programming experience. It uses a simplified version of the C++ programming language, with pre-built functions and libraries that can be easily incorporated into code. The Arduino IDE also includes a variety of tools and features for working with different types of Arduino boards, such as the ability to select the board type, set the serial port, and adjust the upload speed. It also supports third-party libraries and extensions, which can be easily installed and integrated into the IDE

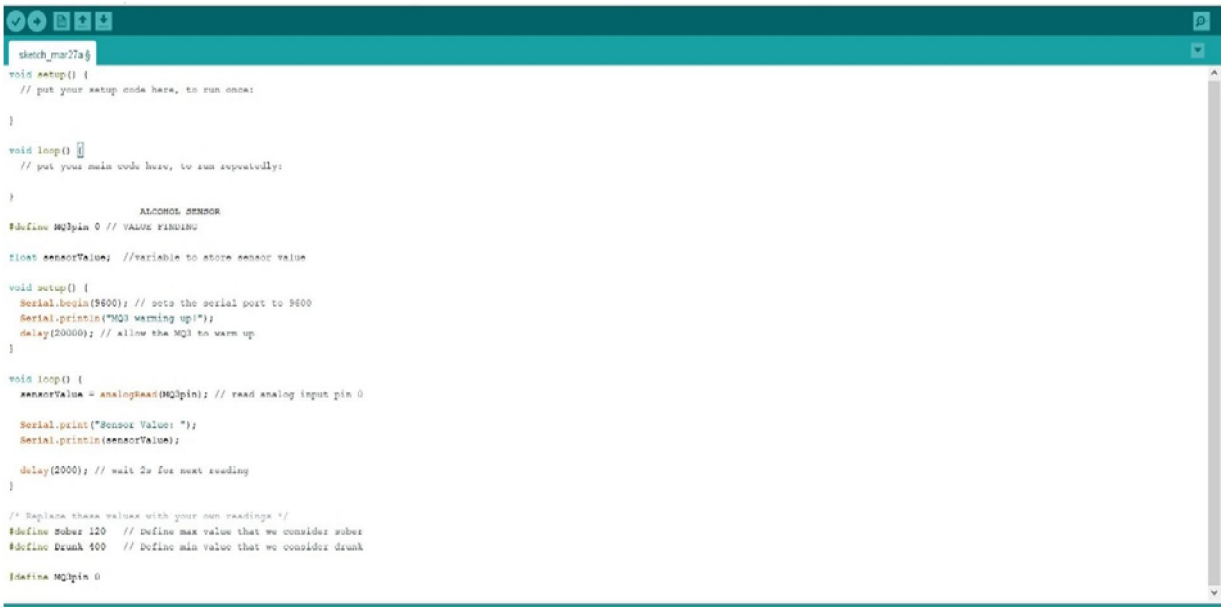

Figure 7: Arduino ide software

3.2.7 BLYNK

Blynk is a mobile and web-based platform that allows developers to create Internet of Things (IoT) applications for various devices. It is designed to help developers build apps for controlling and monitoring hardware devices such as sensors, actuators, and other connected devices. Blynk also provides a cloud-based backend infrastructure that developers can use to securely communicate with their devices and send data to and from the devices. The platform supports multiple hardware platforms such as Arduino, Raspberry Pi, ESP8266, and others. One of the main features of Blynk is its drag-and-drop mobile app builder, which allows users to create custom interfaces for controlling their IoT devices without any coding. The platform also includes a library of pre-built widgets, such as buttons, sliders, and gaugesthat can be easily customized to meet the specific needs of a project

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IV. RESULTS AND DISCUSSION

Using the Arduino IDE software, the conditions for the sensors are programmed .Whenthe sensors reach the threshold value it alerts the driver using the buzzer and disables the ignition of the motor. The sensor values are displayed in the com 3 windows in the Arduino IDE software. In the COM3 port in Arduino IDE software, the sensor values are sent to the BLYNK software. The BLYNK software analyses the values and sends a notification to the administration. The real-time tracking of the location is the GPS module communicates with the host microcontroller via a serial interface, allowing the microcontroller to receive the GPS data and use it for tracking the vehicle location.

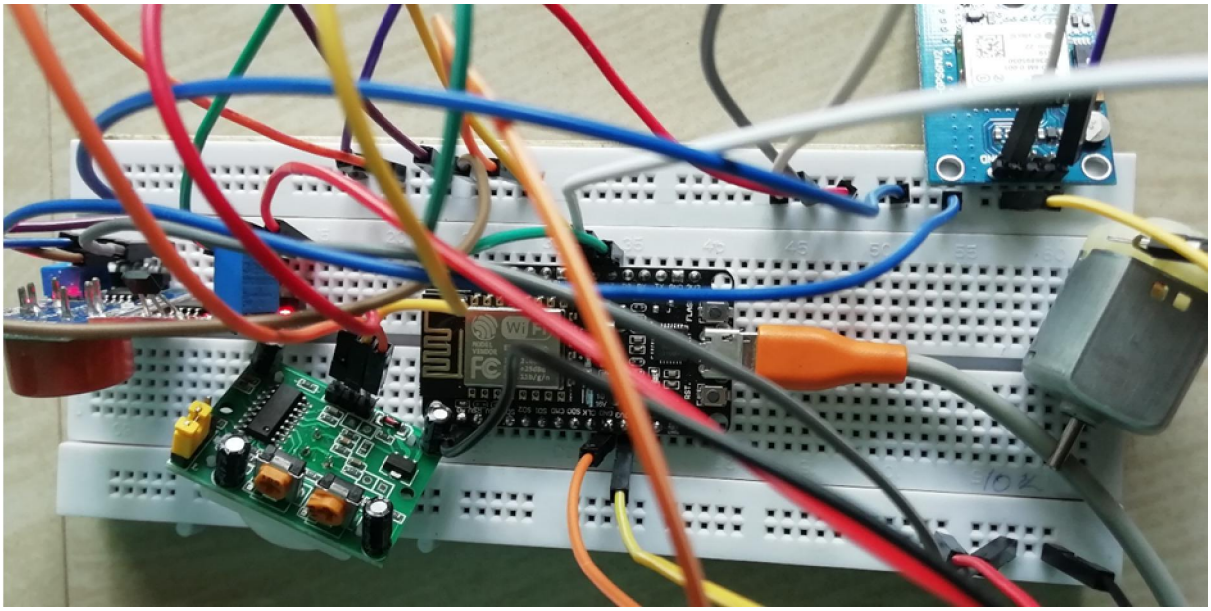

Fig 9 SVSS KIT

V. CONCLUSION

The School Vehicle Safety System uses the various parameters of sensors and a GPS module which helps the administration authority monitor the driving of the driver and provides some alertness to the driver whenever the sensor threshold value reaches its parameters. This SVSS ensures the necessary safety of the kid who commutes through the school vehicle.

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