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Automatic Vehicle Accident Prevention System

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Abstract: Road accidents are a serious problem that affects people worldwide. Some major reasons for road accidents are drowsiness and alcohol consumption while driving. Our aim is to create an accident prevention system that will park the vehicle along the left side of the road if the driver suddenly falls asleep or has consumed alcohol. In this System an eye-blink sensor and an alcohol sensor are used to detect both cases and will send a signal to the microcontroller, which will park the car along the left side of the road. Our project is just a basic model of an accident prevention system, but in the future, several advancements can be made, such as auto-driving and GPS tracking systems.

Keywords: Auto driving system, Automatic parking system, drowsiness and alcohol sensor.

I. INTRODUCTION

Road accidents are a major danger to public safety and cause significant harm in terms of loss of life, damage to property, and economic burdens. The World Health Organization states that road traffic incidents are a primary cause of deaths and disabilities on a global scale. Approximately 1.35 million people lose their lives every year due to these accidents, and around 50 million suffer non-fatal injuries. Many of these accidents are caused by drivers who are drowsy or have consumed alcohol. Despite efforts to increase awareness of the dangers of driving under these conditions, accidents continue to occur. To address this problem, there is a need for reliable and effective accident prevention systems that can detect signs of driver fatigue and impairment and take appropriate action to prevent accidents. In recent years, advances in sensor technology have made it possible to develop vehicle accident prevention systems that can detect driver drowsiness and alcohol consumption.

This system uses eye-blink sensor and an alcohol sensor. Eye-blink sensor will detect whether the eyes are closed or open. Eye-blink sensor is basically an IR sensor. Alcohol sensor will give signal if the driver is drunk. Both the sensors will give command to the microcontroller. The microcontroller will automatically drive the vehicle to the left side of the road in order to park it along the left side. For this auto-driving purpose, here IR sensors are used in front and left directions to detect the obstacles in respective directions.

II. LITERATURE SURVEY

Thousands of people die in India due to drunk driving. In February 2020, there was a fatal accident in Tamil Nadu after which transport officials said that 40 percent of total road accidents were due to sleep-deprived drivers. On December 30th, 2022, cricketer Rishabh Pant had fallen asleep while driving and met with an accident. If infrastructure develops with greater speed, everybody will demand drowsiness detection in automobiles.

According to a NHTSA (National Highway Traffic Administration) report in September 2022, in the US, the number of drowsy drivers involved in fatal crashes was 1,173 in 2011, 1,306 in 2014, and 1,221 in 2018. In the same year, 24 percent of Americandrivers had admitted that they had fallen asleep behind the wheel, and in the previous year, it was 20 percent.

We went through a large number of research topics in which the system would alert the driver and stop the engine if the driver is drunk or drowsy. Alcohol consumption and sleep both are major reasons for driver inactiveness which cause accidents. Therefore, with the reference of all the research topics, we formulated our idea of making an 'Accident Prevention System' which will take the vehicle to the left side of the road and then park it in both cases, if the driver is drunk or sleepy. We have also used a buzzer to wake up and an LED to give an indication to other drivers. If the vehicle stops on the spot, it is even more dangerous as the vehicles coming from behind may collide with it. Therefore, our aim is to make a system that can 'auto-drive and park' to some extent towards the left side of the road carefully, ensuring that it does not hit anything. Indian government is planning for “Drowsiness Alert

System" to install in all kinds of road vehicles to prevent drivers from falling asleep behind the wheels.

III. METHODOLOGY

In this system an AT89S52 microcontroller. AT89S52 is used, which has several built in peripherals such as timers, interrupts and I/O ports which can be used to interface with external devices. It has simple instruction set and is also very useful in low powered applications. For quick response, we also use interrupt programming which makes it possible to stop the regular flow of execution and direct it towards the external device which needs attention. Its utilized an eye-blink sensor that employs infrared rays to detect the closure of the eye. When the eye is shut, the sensor produces a high output, whereas it generates a low output when the eye is open. We have also used MQ-3 alcohol detector which detects amount of alcohol content present in air and indicates whether the driver is drunk or not. It is a MOS (Metal Oxide Semiconductor) sensor. The sensing element of MQ-3 sensor is chemiresistive, which means its resistance changes due to its interaction with chemical reactions in its surroundings. It operates on alcohol concentrations in air within the range 25ppm to 500ppm. It has two types of outputs viz. analog and digital. Analog output varies directly with respect to concentrations. Whereas, for digital output we set a reference threshold voltage from the potentiometer which is given in the module.

IV. HARDWARE COMPONENTS

- AT89S52 Microcontroller
- Drowsiness sensor
- MQ-3 Alcohol sensor
- IR sensors
- Gear motors
- Motor driver module

1. AT89S52 Microcontroller

Fig. 1 AT89S52 Pin Diagram

The AT89S52 employs the 8051 architecture, characterized by separate program and data memories, following a Harvard architecture approach. CPU: An 8-bit CPU is featured, with a single accumulator and a variety of registers for data and address manipulation. Clock Speed: The microcontroller is capable of operating at a maximum frequency of 33 MHz, enabling the execution of instructions at high speed. Program Memory: The AT89S52 incorporates 8 KB of Flash memory to store programs. This Flash memory is non-volatile, ensuring program retention even after power is disconnected. Data Memory: On-chip RAM is available for data storage, offering 256 bytes. Additionally, there is an indirect access feature, providing another 128 bytes of on-chip RAM. I/O Ports: Four 8-bit ports (Port 0, Port 1, Port 2, and Port 3) are present, totaling 32 I/O pins. These ports can be configured as inputs or outputs, facilitating communication with external devices. Timers/Counters: Two 16-bit timers/counters (Timer 0 and Timer 1) are integrated into the microcontroller, alongside a programmable serial port (UART). Interrupts: The AT89S52 supports both internal and external interrupts, with five interrupt sources available. The interrupt priority can be configured. Serial Communication: The microcontroller incorporates a full-duplex UART (Universal Asynchronous Receiver Transmitter) for serial communication. This enables communication with other devices utilizing standard serial protocols like RS-232. Power Supply: The microcontroller operates within a voltage range of 2.7V to 6V, ensuring compatibility with a broad array of power supply sources. Development Tools: Various programming tools and integrated development environments (IDEs) supporting the 8051 architecture can be utilized for programming and debugging the AT89S52 microcontroller.

2. Eye-blink senor

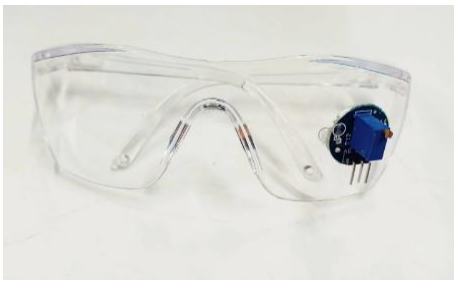


Fig. 2 Eye-blink Sensor

Eye-blink sensor is basically an IR sensor which is made enough sensitive to detect blinking of an eye. It emits and receives infrared with the help of transmitter and receiver. When our eyes are closed, the infrared rays get reflected back from our eyelids and hence we get the output as HIGH. When our eyes are open, infrared rays are absorbed by our eyes and we get the output as LOW.

3. MQ-3 Alcohol Sensor

Fig. 3 Alcohol Sensor

MQ-3 is an alcohol sensor which detects the presence of alcohol molecules in the surrounding air. Inside the MQ-3 sensor there is a sensing element and 6 connecting legs. Sensing element is nothing but a tube of Aluminum Oxide (Al3O3) based ceramic coated with Tin Dioxide (SnO2). Inside this tube, there is a nickel-chromium heating coil which provides heating current to the tube and this coil is connected between 2 connecting legs out of 6. The remaining 4 legs are used VCC, GND, AO and DO pins. When the sensing element is heated, it absorbs the oxygen molecules from the alcohol and due to this, an electron depletion region is formed beneath the Sn2O3 layer which prevents the electron flow and the resistance of sensing element increases. Its working voltage is 5V. Its output voltage is within the range of 0 to 5V.

4. IR sensors

Fig. 4 IR Sensor

IR sensors are used to detect objects or motion with the help of infrared rays. It has transmitter and receiver. Transmitter transmits waves which hit the object and are sensed by the receiver. When transmitter receives waves it gives the output as HIGH. This is how an IR sensor detects objects or motion. The supply voltage for IR sensor must be 5V. it senses objects within the distance range of 2cm to 20cm and angular range of 0 to 35 degrees. It can detect wave within the wavelength 780nm to 1mm and frequency range 300GHz to 400THz. Its output voltage is 5V.

5. Gear Motors

Fig. 5 Gear motor

This is a mini dc gear motor which runs between the voltage range of 3V to 12V.Its maximum speed is 150 RPM and runs on a torque of 0.35kgcm

6. **L293D Motor Driver**

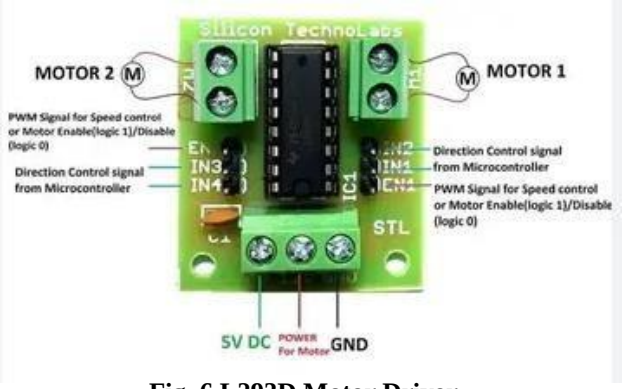


Fig. 6 L293D Motor Driver

Motor driver is used to control the rotation of dc motors. With the help of motor driver we can decide whether the motor should stop or should rotate in clockwise or anti-clockwise direction. Here, we are using an L293D motor driver which has four input pins and four output pins, which means, it can operate two motors. The work of motor driver is to control the flow of current within the circuit to operate the motors. It requires supply voltage within the range of 4.5V to 36V. The minimum input voltage that must be given to it in order to make it logic high is 5V. The maximum current it can handle is 600mA.

V. SYSTEM DIAGRAM

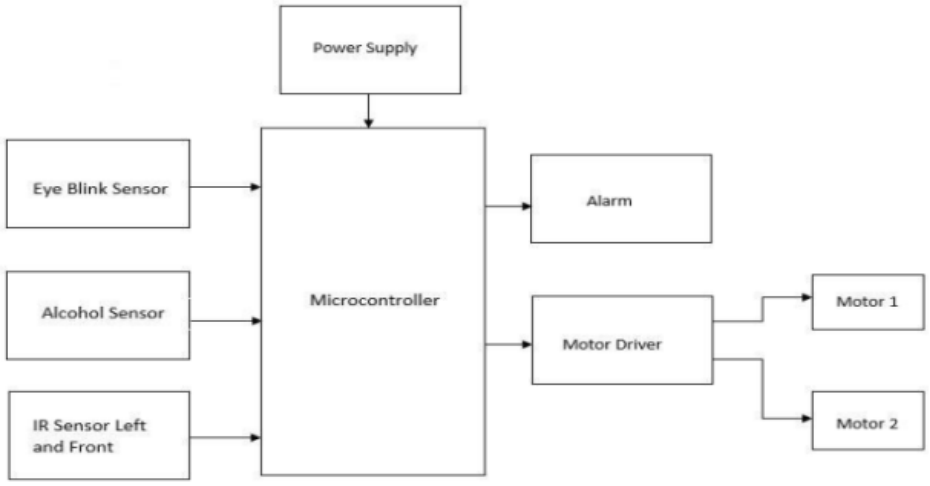
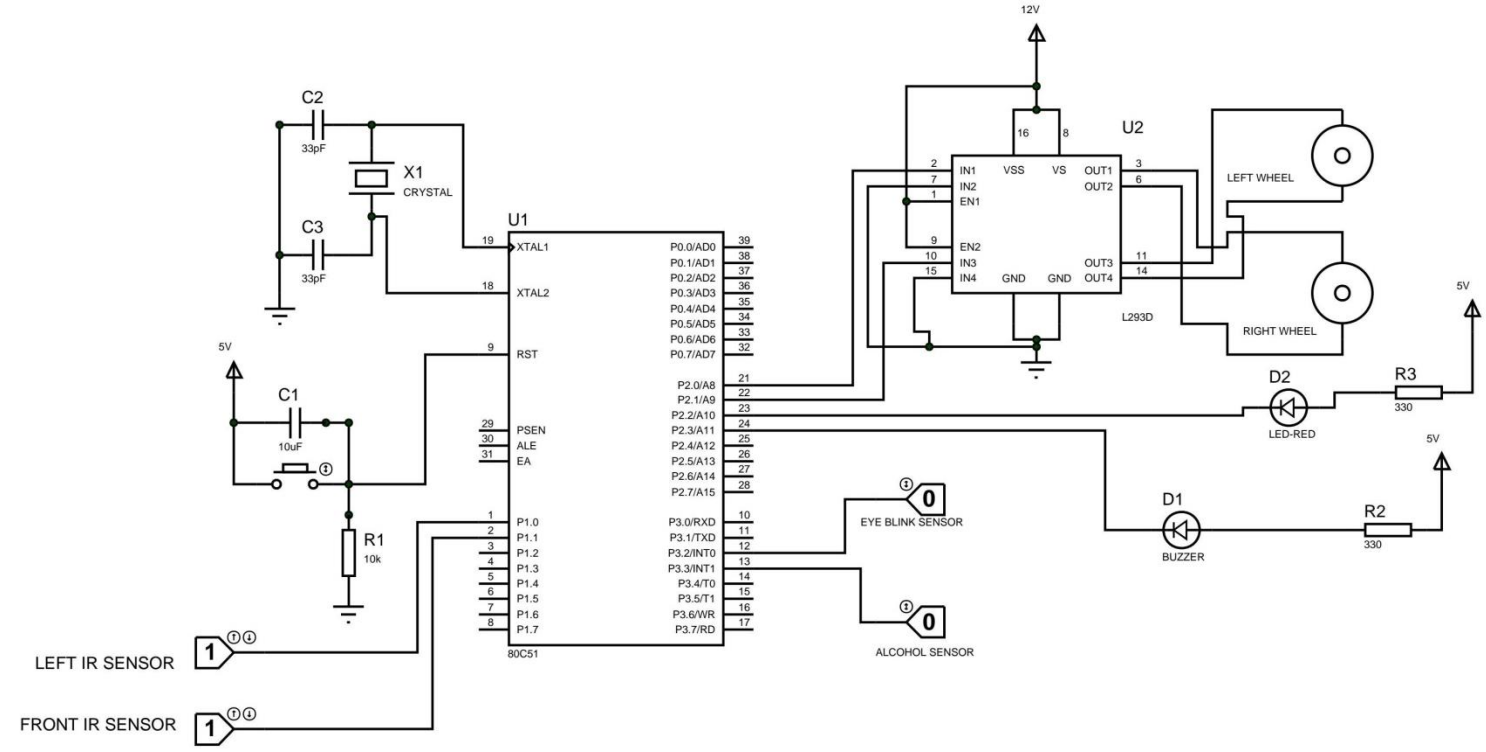


Fig. 7 System diagram

VI. CIRCUIT DIAGRAM



(Here the output of sensor is HIGH when logic is 0)

Fig. 8 Circuit diagram

VII. WORKING

This system aims to prevent accidents caused by drunk driving and drowsiness while driving. The project uses sensors to measure drowsiness and alcohol levels in a driver. The drowsiness sensor consists of an IR transmitter and receiver. By default, the sensor has a very high output without receiving any signal. The IR transmitter sends infrared rays to the driver's eye, and the IR receiver detects the reflected rays to determine whether the driver's eye is open or closed. If the eye is closed, the output of the IR receiver is high, otherwise it is low. This allows us to detect when the driver's eyes are closing or opening.

The alcohol detector measures the content of alcohol in the driver's breath and attempts to prevent drunk driving. The system uses a microcontroller, an alcohol detector, and a buzzer. Interrupts of the microcontroller, such as INTO for eye blink and INT1 for alcohol sensor, are used. The output of the alcohol sensor is directly proportional to the content of alcohol consumed, and this output is given to a logic circuit to indicate an alarm. When the driver's eyes are closed for three seconds, an alarm is triggered.

The output of the sensors is then fed to the microcontroller for comparison. The sensor outputs are analog in nature, and they need to be converted into digital format. This is done by the analog-to-digital

converter of the microcontroller unit. Additionally, there are two IR sensors to detect obstacles in front and to the left of the vehicle. If the driver is drunk or drowsy, the vehicle will go into an auto-drive mode and park on the left side of the road. It also makes use of a parking LED for indication purposes. This way, we can prevent accidents caused by unconscious driving due to drowsiness or alcohol consumption.

VIII. RESULTS AND DISCUSSION

Fig. 9 Front look of system

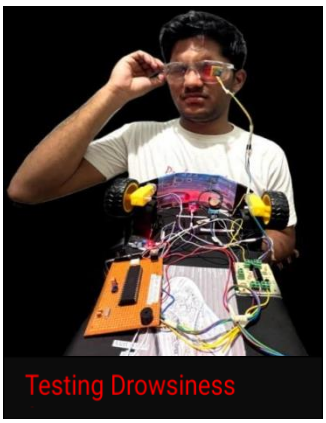


Fig. 10 Drowsiness Testing of system

Fig. 11 Drowsiness Detected

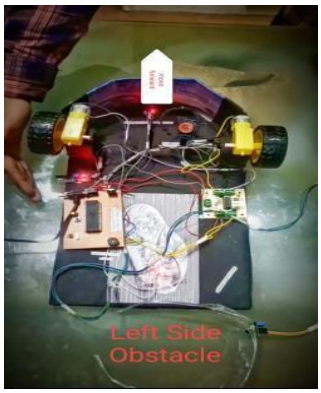


Fig. 12 Left side Obstacle detection

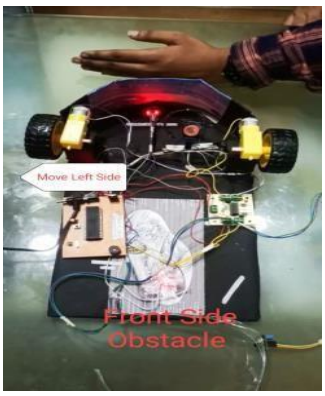


Fig. 13 Front side Obstacle detection

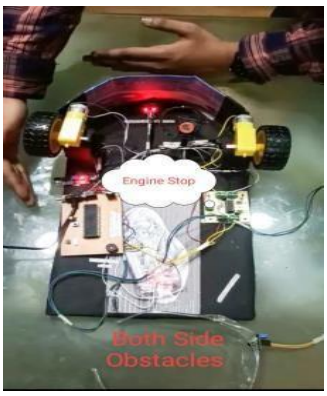


Fig.14 Both side Obstacle detection

As mentioned in the above images (**Fig. 9 to Fig. 14**), the proposed system works in auto-driving mode and parks the vehicle by detecting the obstacles whenever driver is drunk or drowsy. The prototype for this system is works, but for actually implementing in vehicles many things must be included in it like actuators. Till now, many systems have been introduced which have drowsiness detection, drunk detection and auto driving which work separately. This system makes use of all the mechanisms in order to provide safety to drivers and prevent accidents wisely**.**

IX. APPLICATIONS

1. Reducing fatalities and injuries: By automatically guiding the vehicle to a safe stopping point, the system can prevent accidents from becoming more serious. This can help reduce the number of fatalities and injuries.
2. Providing peace of mind for drivers and passengers: Knowing that there is a safety system in place can provide peace of mind

for both drivers and passengers, especially if they are concerned about the potential risks associated with drowsy or drunken driving.

3. Insurance Companies: Insurance companies could use this system to reduce the risk of accidents and lower insurance premiums for drivers who have the system installed in their vehicles.
4. Commercial Fleets: Companies that operate large fleets of vehicles, such as delivery trucks or transportation companies, could use this system to ensure that their drivers are operating vehicles safely.
5. Automatic Parking System: This system can also be used for automatically parking the vehicle.

X. FUTURE SCOPE

1. Incorporating Artificial Intelligence: The system could be enhanced by incorporating artificial intelligence (AI) algorithms to improve its accuracy in detecting drowsiness or drunkenness. AI could help the system to adapt to different driving conditions, individual driving styles, and physiological responses.
2. Personalization: The system could be personalized for individual drivers by incorporating data from wearables, such as smartwatches or fitness trackers, to track individual sleep patterns and adjust the system's settings accordingly.
3. Improved Sensors: One potential advancement is the use of more advanced sensors that can detect a wider range of physical indicators of drowsiness or intoxication.
4. Remote Monitoring: The system could be remotely monitored by a central control system that can alert emergency services in case of an accident or other emergency .

XI. CONCLUSION

The Accident Prevention system developed using an Eye Blinking Sensor and Alcohol Detector has been successfully implemented. This device is capable of detecting alcohol levels and drowsiness in drivers, and can be easily installed in vehicles, making it a highly useful safety feature. It has the potential to significantly reduce the number of accidents caused by drunk or drowsy drivers by auto-driving the vehicle to some extent and park the vehicle to left side of the rode. This part is not discussed anywhere. By using a microcontroller, the system has been programmed to include both an alcohol sensor and an eye blinking sensor, providing a comprehensive safety solution.

In essence, this project is a significant step towards enhancing road safety and improving the overall safety of public spaces. Its success highlights the importance of using advanced technology to mitigate the risk of accidents caused by impaired drivers, and it has the potential to save numerous lives in the process.

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