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Accident Prevention of Automobiles Using MQ3 and Ultrasonic Sensors

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ABSTRACT

Given the sharp rise in automobile accidents, it is essential to lessen collisions by equipping cars with sensors that can protect passengers' lives and enhance traffic flow. Sensors can automate processes and give the driver flexibility and independence. Technologies like the MQ3 sensor and Ultrasonic sensor are being utilised in automobiles to detect and mitigate potential road hazards in an effort to reduce accidents brought on by these factors. The MQ3 sensor is a type of gas sensor that is often used to detect alcohol levels in the driver's breath. On the other hand, the ultrasonic sensor is employed to identify any obstacles in front of the car. High-frequency sound waves are emitted by the sensor and reflected back to it by adjacent objects. The distance between the sensor and the item can be determined using the time it takes for the sound waves to return. The project's sensors determine the driver's blood alcohol content. If it goes over the limit, alcohol content information will be sent to the Arduino. If it exceeds the threshold value, then it starts identifying the end of the road using a colour sensor and an ultrasonic sensor. Then the vehicle will be diverted to either end of the road by applying the hazard lights to prevent road accidents as well as traffic. The adoption of these sensors can significantly increase road safety and lower the number of accidents brought on by drunken or distracted driving. These technologies have the potential to save lives by warning drivers of potential road hazards and, in some circumstances, even taking control of the vehicle.

Keywords*: Arduino UNO, MQ3 sensor, ultrasonic sensor, L289N motor driver.*

Introduction:

In the modern era, the global production of the vehicle industry has grown steadily. Gradually increasing the usage of vehicles is also leads to the rate of increase of accidents in our surroundings. Traffic leads to accidents and due to this many people have lost their lives on the roads. The accidents on highways and remote areas cause a huge loss of lives and collateral damage to the people and his families who are the victims in the accidents.

The most of the accidents on the highways were recorded were car accidents. To control these accidents the automotive electronics were introduced to diagnose the vehicle controlling systems and helps to prevent the major accidents on the highways. The different techniques which are introduced to control accidents were like Anti Collision System (ACS), adaptive Cruise Control systems (ACC), Antilock-Breaking System (ABS), etc. Even-though this were implemented the rate of accidents were not controlled in the desired charts. The person who met with an accident is to be given proper treatment within the time otherwise there is no use of implementation of these technologies.

The number of vehicles exponentially increase due to growth in the automobile industry. As the number of vehicle's increases, the accident also increases. Road safety is an important aspect in everybody's life. But some uncontrollable factors such as drunken drivers, unhealthy conditions occur which leads to severe accidents. An average of 3000 car accidents happens every day across the world. Up to 22% of these accidents come about due to alcohol and drug use while driving. So, it is necessary to enhance and improvise new techniques which can reduce the number of accidents. Integration of sensors can prevent the occurrence of accidents thus save the passenger's life. The location of the vehicle is continuously monitored to fulfil the needs of emergency.

Literature Survey:

A system that uses accelerometers and vibration sensors to detect accidents was proposed by S. Nanda, H. Joshi, and S. Khairnar [1]. It locates the accident site using GPS and GSM technology and notifies the local hospitals and emergency contacts as well. By taking the necessary precautions, this system's detection and prevention mechanism ensures safety and lowers the number of fatalities.

In order to secure cars, Shahad Al-Youif, Musab A. M. Ali, and M. N. Mohammed [2] created a locking mechanism. Without first assessing the driver's blood alcohol content, the car will not start. It measures the level of alcohol using an alcohol sensor. This method will make roads safer and stop accidents from happening.

Using an alcohol sensor, Dr G. Sudha, Pavithra P, Priya P, and Manikandan M [3] suggested a control system for vehicle ignition. The Arduino Uno includes an integrated alcohol sensor. When the blood alcohol level is exceeded, the ignition of the car shuts off, the GPS module locates the present location, and the GSM module sends a message to family members.

A system made up of Arduino boards, Ultra Sonic sensors, temperature sensors, accelerometers, GPS modules, and GSM modules was suggested by Pankaj Chourasia, Sakshi Choubey, and Riya Verma [4]. When an accident happens, the GSM module recognises the location of the accident and sends an alert message to the registered phones. This may be done in a very short amount of time, saving many lives in the process.

To create a model of alcohol detection, Rajib Biswas and D. Saha [5] presented a volatile liquid detector utilising a metal oxide sensor that is integrated with an Arduino kit. The volatile liquid employed in the creation of this prototype is ethanol.

Methodology:

Arduino UNO

Popular microcontroller boards like the Arduino Uno are often used in electronic projects and prototyping. With a variety of digital and analogue input/output pins for connecting with sensors, actuators, and other electrical components, it is built around the ATmega328P microcontroller. The board can be programmed using the C/C++-based Arduino programming language. Several built-in functions are present, including an LED, a reset button, and a serial port for interacting with a computer. Either an external power source or a USB cable could power it. Popular and commonly used microcontroller boards include the Arduino Uno. It is a flexible and easy-to-use board suitable for both inexperienced and seasoned users.

MQ3 sensor

Alcohol vapour in the air can be found using the MQ3 sensor, a type of gas sensor. It operates on the basis of a chemical reaction between the vapour of the alcohol and the delicate substance coated on the surface of the sensor. When the alcohol vapour comes into contact with the sensor's sensitive material, it causes a change in the electrical resistance of the sensor. A microcontroller or other electronic device measures and processes this change in resistance to calculate the amount of alcohol in the air. MQ3 sensors are commonly used in breathalyser devices, car ignition interlock systems, and other applications where detection of alcohol vapour is necessary.

Gas sensors like the MQ3 sensor are frequently used to find alcohol vapour. It operates according to the conductivity of gases theory. Tin dioxide (SnO2) semiconductor, which has a high sensitivity to alcohol vapours, makes up the sensing element of the sensor. Alcohol molecules are adsorbed onto the surface of the SnO2 semiconductor when the sensor is exposed to alcohol vapour, changing the semiconductor's conductivity. The sensor's circuitry subsequently measures this alteration in conductivity and transforms it into a corresponding output signal. The MQ3 sensor's output signal is analogue, which means that it varies in direct proportion to the amount of alcohol vapour present in the atmosphere.

Ultrasonic sensor

A sensor known as an ultrasonic sensor uses sound waves with frequencies higher than those that are audible to humans to find objects or gauge distance. It operates by sending out high-frequency sound waves and timing how long it takes for them to return after striking an object. The distance between the sensor and the object can then be determined using this data. Ultrasonic sensors have shown to be successful in detecting objects even in low light or dusty environments, and they are frequently used in a variety of industries including automotive, manufacturing, and robotics. They are also relatively inexpensive and easy to use, making them a popular choice for many applications.

Colour sensor

A colour sensor is a particular kind of sensor that is used to identify and gauge an object's colour. A certain wavelength of light is emitted by the sensor, which then measures the light that is reflected back from the item. The colour of the object is then ascertained by analysing this reflected light and comparing it to a standard colour reference. Several industries, including printing, the production of textiles, food processing, and the automotive, frequently use colour sensors. In order to capture images as effectively as possible, the colour balance and white balance settings are also adjusted in electronic devices like digital cameras and cell phones. The three fundamental colours - red, green, and blue—as well as a plethora of other colours that may be made by mixing the primary colours can all be detected by colour sensors. Together with the colour temperature, they can also be used to measure a colour’s brightness or intensity.

L298N motor driver

The L298N is a helpful device for managing motors in many projects. It can handle two DC motors or one stepper motor and allows you to manage their speed and direction. Several voltage levels can be used by the L298N, and it can supply enough power to run motors at up to 2 amps per channel (or 4 amps in total). Moreover, it has a function that guards against voltage spikes when the motor is turned off. When precise motor control is needed, such as in robotics and automation projects, the L298N is frequently used.

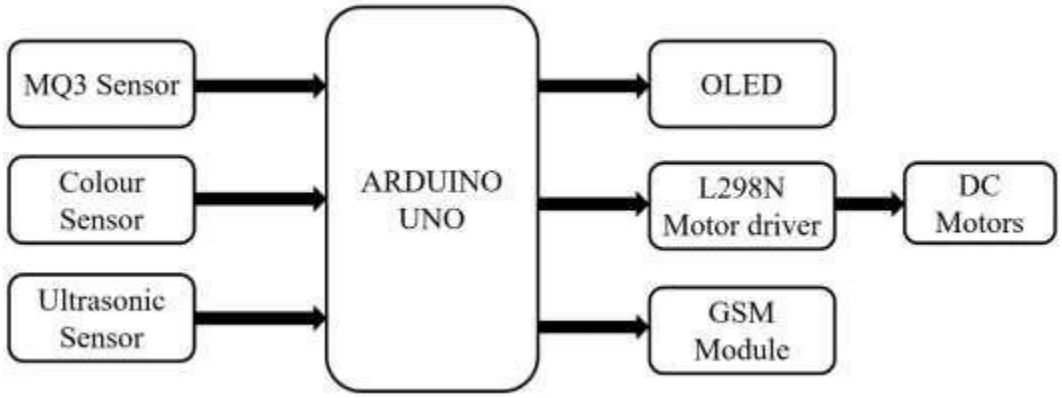

Figure 1 Block diagram of Prototype

This research helps to reduce accidents that occur due to drunk driving. The MQ3 sensor, which detects the presence of alcohol in the driver's body, is connected to the Arduino. Depending on the alcohol concentration, the sensor outputs data. The Arduino receives a signal if the alcohol concentration exceeds the threshold. Next a colour sensor is started, processing the colour of the road to determine the ends of the roads on either side. When it reaches the end, the ultrasonic sensor activates and begins to look for surrounding impediments. The sensor notifies Arduino whenever the car is getting close to a lane separator or railing. The L298N motor driver is then in communication with Arduino, which promptly stops the vehicle's motor.

A rescue mission will begin following the vehicle's stop. The SIM900A GSM module is utilised for this. When the Arduino and GSM module are in communication, messages are transmitted to the pre-loaded emergency contacts.

Results and Discussions:

In this work, a working model as shown in figures 2 & 3 has been developed for vehicles, to prevent accidents occurs due to drunken driving. It checks the alcohol concentration continuously and whenever it exceeded the threshold value, it took a left turn and forwarded. Then it turned on the colour sensor and ultrasonic sensor. The colour sensor produced RGB values based on the colour, when it detected the white line, Arduino detected the distance against obstacle through ultrasonic sensor. If the distance is less than 10 cm, the vehicle is stopped. After the stoppage of the vehicle, SIM900A GSM module sent the information regarding drunken driving to the emergency contacts.

The results of the project demonstrate that the use of MQ3 and ultrasonic sensors can effectively prevent road accidents. The MQ3 sensor is capable of detecting alcohol vapors with a high degree of accuracy, allowing the system to alert the driver when they are not fit to drive. The ultrasonic sensor is capable of detecting obstacles in the vehicle's path and alerting the driver to take corrective action to avoid a collision.

The use of these sensors can significantly reduce the risk of road accidents caused by drunk driving and reckless driving. The system can also be integrated with other safety features, such as automatic emergency braking, to further enhance the safety of the vehicle.

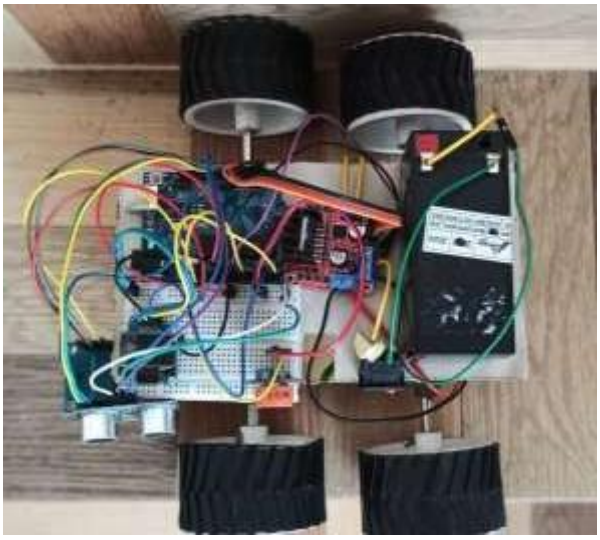

Figure 2 Top view of prototype

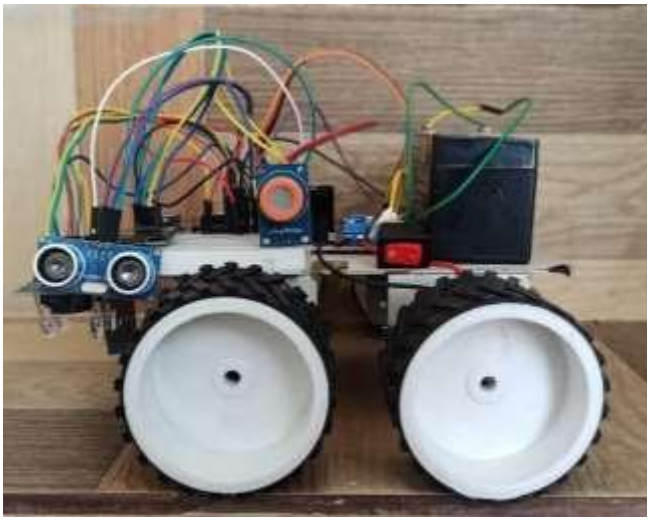

Figure 3 Side view of prototype

Conclusion:

Incorporating a range of sensors in automobiles can greatly improve safety on the roads. With a colour sensor, drivers can be alerted when traffic lights change, making intersections safer. An MQ3 sensor can detect the amount of alcohol in a driver's breath, preventing the vehicle from starting if the limit is exceeded. Ultrasonic sensors can detect obstacles in blind spots or while reversing, warning drivers to avoid collisions. These sensors not only increase safety for the driver and passengers, but also for pedestrians and other drivers. By integrating these sensors into vehicles, accidents can be prevented, reducing injuries and fatalities on the road.

In conclusion, by incorporating colour sensors, MQ3 sensors, and ultrasonic sensors, we can greatly improve accident prevention measures in automobiles. As technology continues to advance, it is expected look forward to even more advanced sensors and features that will increase safety on the roads.

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