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Alcohol Detection System for the Safety of Automobile Users

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Abstract - *This paper mainly emphasizes on reducing automobile accidents caused by drunken drivers by presenting a new approach to increasing automobile safety and security. An integrated system with an ethanol detector is designed such that it is mounted on the steering wheel of the car and monitors the presence of ethanol in air. When alcohol content is detected, the ignition will fail to start. For the safety of two-wheeler riders, the same system can be mounted in the helmet of the rider. A receiver is placed in the ECU of the two-wheelers so it doesn't start without the rider wearing the helmet. Another receiver is placed in the ECU which takes the output of the alcohol detecting system, and if alcohol is detected the ignition will fail to start. The Global Positioning System (GPS) captures the location and sends information to respective authorities using Global System for Mobile (GSM) device with the OTP (one-time password). Only after the one-time password is entered, the vehicle can be restarted. All the functions are carried out with the help of an ARM microcontroller.*

Key Words: **automobile safety, ethanol detector, ECU, GPS, GSM, ARM Microcontroller.**

1. INTRODUCTION

Nowadays, a growing crucial problem faced by the world is an unnatural death due to drunk driving and driving under the influence of alcohol (DUI). The main aim of this paper is to reduce traffic accident cases based on driving under the influence of alcohol, especially in India. As per the data from the transport research wing of India [1], the percentage of accidents has increased by 2.5% between 2014-15. From these, we can concur that the road accidents which occur are responsible for around 1,374 deaths that take place every day in India. Among them, 70% of total road human deaths were caused under the influence of drunken driving. These days, the majority of road accidents are caused by drink-driving. Driving in an intoxicated condition is highly dangerous as our mind is in an unstable condition and hence, the decisions taken by us have a huge impact. Most of the deaths caused by drunken driving are preventable. Although the proportion of alcohol-related crashes has dropped dramatically in recent decades, there are still far too many such preventable accidents [2].

Hence, to avoid these situations we need a more efficient system that will, *primarily*, be able to verify whether the driver is in an intoxicated situation or not, and *secondly*, after the driver is found to be drunk, the vehicle ignition function should get disabled and a message in the form of vehicle location will be sent to the driver's relative whose number is pre-installed in the system. This can be implemented using Arduino, internetworked with various other sensors and modules [3].

The entire paper is divides as follows.
Section I: Introduction
Section II: Methodologies and Materials
Section III: Proposed System
Section IV: Conclusion

2. METHODOLOGIES AND MATERIALS

Much research effort has been directed to the design of efficient systems that will monitor drink-driving, and some of those prominent methodologies are mentioned here.

i. A popular idea proposed by J. Dai [4], which was implemented by an android phone. An android app is installed in the system with stores the data about the average vehicle acceleration speed and sudden braking system. If the vehicle crosses the speed limit, sudden braking was to be initiated and the app would activate a startling alarm.

   The drawback of this system was that the entire network was based on a single algorithm and was dependent on the functioning of the phone application. Though the method was simple and efficient, the margin of error also increased significantly.

ii. Another, Z. Xiaoronget [5] proposed a model based on alcohol detection using sensor MQ-3 and IoT. An STC12C516A microcontroller and alcohol sensor was used as main components, to detect the alcohol content in the breath. If the alcohol content detected was over the limit, would start buzzing, ignition would be turned off and at the same time, would send the information to nearby cops with the exact location of the vehicle.

iii. The drawbacks of this system was that although it was easy to implement, the entire setup was dependent on the MQ-3 sensor, whose malfunction would render the entire operation useless.

iv. Another method involved the physiological behavior and changes of the drunken person [6], which could be detected by using special sensors like heartbeat sensors, eye blink detection, etc.

The main drawback of this method was the need for real-time data transmission and verification, which would lead to slightly complex systems.

Our proposed work requires various modules and units which will make up the system, like the alcohol detection unit, power supply unit, ignition system unit, display unit, etc. A DC motor can be used as an engine to illustrate the concept of engine locking. A microcontroller under the name of Arduino Uno is used to keep looking for the output from the alcohol sensor [7]. The Arduino Uno sketch, i.e. an environment that can be used to program, writing and compilation of code, generation of hex file and loading on to the microcontroller.

The diagram of the proposed project is as follows. It consists of an influence supply section, MQ-3 alcohol sensor, DC motor, LCD, microcontroller, and other sensors. the varied units are designed and tested separately [8][9].

MQ3 SENSOR

The sensor is formed of Tin Dioxide (SnO2) sensitive layer. The sensor is configured with a high sensitivity to alcohol and tiny sensitivity to Benzene. it's an easy drive circuit with fast response, stability, and long life. It's an analog interface type. On the sensor, port pins 1, 2 and three represents the output, GND and VCC respectively.

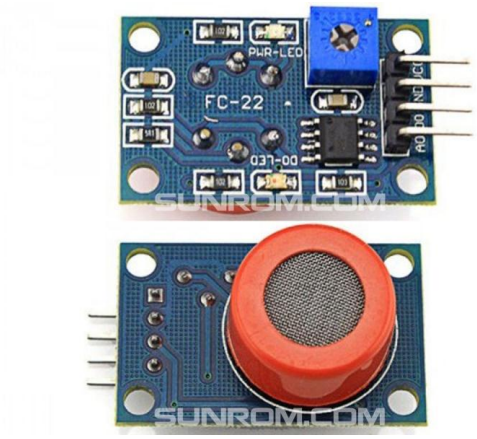

Fig 1: MQ3 Sensor

MICROCONTROLLER UNIT

The proposed system is made around ATmega328 Arduino Uno microcontroller board. The unit consists of 14 pins which allows inflow and outflow of feeding (it is feasible to use 6 of these pins as Pulse Width Modulation signal outputs), 6 continuous signal with time changing quantity, 16 megahertz electronic oscillator, a Universal Serial Bus port, an influence connector, an on-board transformer, ICSP header, and a push. The Atmega328 has 32 KB non-volatile storage, 2 KB SRAM and 1 KB EEPROM.

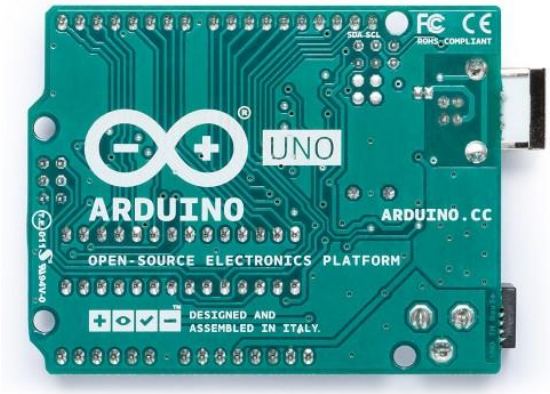

Fig 2: Arduino Uno

Fig 3: Block diagram of proposed system

DC MOTOR

The DC motor is an electrical DC motor accustomed demonstrate the concept of engine locking. Here, the DC motor is connected to pin 9 on the microcontroller. When content of alcohol is detected, the DC motor stops, and continues running when there's no alcohol detected.

HEARTBEAT SENSOR

It is accustomed sense a person's vital sign to verify whether it's in normal condition or not. Vital sign sensor is employed to detect heart beats. It will be wearing on the finger or earlobe and connected to microcontroller via cables. It also carries an open-source program to display heart beat rate via diagrams in real time.

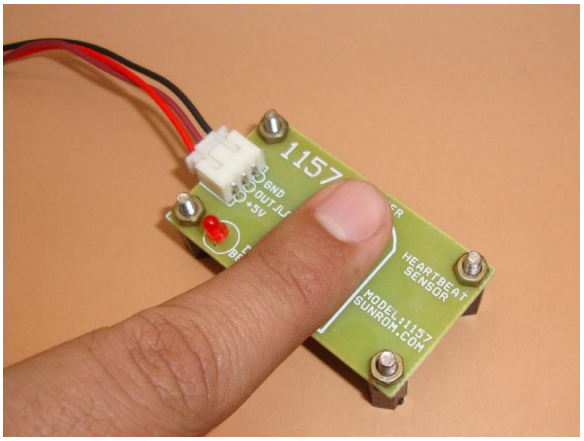

Fig 4: Heart beat Sensor

FACIAL & BLINKING SENSOR

Facial recognition could be a computerized application which detects nano changes within the person's face. The most usage of those biometric authentication is to understand whether the person is drunk or not. It scans when the motive force sits in his regular position, automatically scans his face and stores it within the memory when the motive force gets down from his place. The sensor compares the stored image and present image, and when it detects certain specific changes in his face, it gives a message tuned in to a chosen person whose information is installed, & within the same sense vehicle won't move because the ignition would be close up.

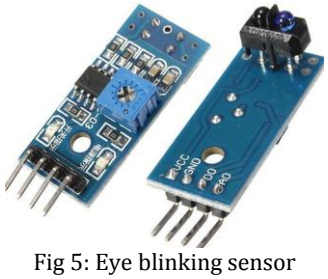

Fig 5: Eye blinking sensor

3. PROPOSED SYSTEM

A lot of different methods was proposed to solve the problem drunken driving detection, but we didn't have proper measurements for this. Therefore, we needed a method to combine a number of factors and personalize it for testing people, other than the regular approach. These considered...

- Heart rate
- Alcohol content
- Facial expressions
- Eye dilation
- Acceleration and normal motion of the car

When the driver touches the start/stop button, the detection system is powered and activated. Nowadays, our cars are becoming smarter and a replacement feature is being developed to safeguard against drunk driving. The touch-based technology reads blood alcohol below the skin surface [10]. Touch sensors are placed within the car ignition button or within the gearshift shine. A beam of sunshine on to a finger, this touch-based system uses infrared ray's spectroscopy to detect the extent of alcohol within the blood.

Alcohol tends to absorb specific wavelengths of lights, and by measuring the intensity of lights, we'll be able to precisely pinpoint driver's level of blood alcohol. If the blood alcohol concentration rises above the legal limit, the system counts as '1', if not '0'. Simultaneously the system moves to other sensors i.e. breath-based system (using MQ-3 alcohol sensor), Heart beat sensor, identity verification system. When the reading of the sensors is above the given limit, it takes it as '1'. Else it takes it as '0'. If the system matches three of the sensors automatically turns the ignition is off. For the protection measures of the driving force, we are interfacing with GSM and GPS modules, with help of those modules message alert are sent to the relations, cops. Using GPS module, it gives exact location of the vehicle with is latitude and longitude to the family and cops.

4. CONCLUSIONS

In this paper, we proposed a method to sense the presence of alcohol from the touch of the driver as drunk and driving accidents are one of the major problems faced in the society. Due to the growing public knowledge advances regarding the importance of public safety, it is gaining more acceptance than in the past. This paper provides an efficient solution to develop an intelligent system for vehicles with multi-stage testing in order to avoid accidents by shutting down the operation of vehicle.

The system is designed and implemented successfully via the use of Arduino Uno ATMEGA328 microcontroller and MQ-3 sensor. The whole system has an advantage of small volume and more reliability. The sensors are very accurate and can be configured according to the requirements thereby

increasing the efficiency. Due to various features implemented here, it will be impossible for drunk people to start their vehicle and bring any harm to innocent lives and property.

This system brings innovation to the existing technology in the vehicles, reduces the rate of accidents taking place and improves the safety features, hence providing an effective development in the automobile industry. Thus, by implementing this proposed system we can have a much safer world, free of drunk and driving.

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