

# CHAPTER 42

## Smart Helmet and Alcohol Detection System

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### ABSTRACT

*Today in India, every four-minute one individual passes on because of street mishaps. Out of all mishaps, 25% record for 2-wheeler mishaps. As per ongoing investigations, 98.6% of bikers who kicked the bucket, was not wearing a cap. A savvy head protector is a creative method of building a cap with the most recent innovations. The standard objective of this venture is to structure a shrewd system that will shield a drunkard individual from driving and besides recognize setback accepting any. This framework is fit for giving security and well-being to the bikers against street mishaps. The circuit is structured so that the bicycle won't start without wearing a protective cap. The savvy protective cap is fixed with sensors that can identify whether the individual is wearing a head protector or not*

**Keywords:** *head protector, savvy protective cap, drunkard individual etc.*

### INTRODUCTION

A traffic accident is defined as any vehicle accident occurring on public highway roads. The thought of developing this work comes to do some good things towards society. Twowheeler accidents are increasing day by day and lead to loss of many lives. The main aim of this work is to build a safety

system that is integrated with the smart helmet and intelligent bike to reduce the probability of two-wheeler accidents. If an accident occurs no one gives information to the ambulance or parents. This is a situation that we observe in our day to day life, a thought of finding some solution to resolve this problem come up with this idea of giving them information about the accident as soon as possible and in time.

If a person met with an accident, no one is there to help him and simply leaving or ignoring the person, in such a situation informing to ambulance or family members through mobile to rescue him to an extent. Traffic accidents in India have increased year by year. In the present day scenario, numerous cases of two-wheeler road accidents lead to death. The main reason for severe head injuries is, although helmets are available everywhere, people are not wearing them for protection.

A smart helmet is a special idea that makes motorcycle driving much safer than the existing system i.e. helmet. This is implemented using the Arduino Uno development kit. By using Arduino, the overall system becomes simple. An alcohol sensor is placed near the mouth of the driver in the helmet to detect the presence of alcohol breath. If the breath of the driver is non-alcoholic the bike will get started. Also, the accelerometer is used inside the helmet where the probability of hitting is more which are connected to Arduino.

When the rider crashes and the helmet hits the ground, the accelerometer senses the tilt, and the Arduino extract data using the GSM module that is interfaced with Arduino. When the data exceeds the minimum stress limit then the GSM module automatically sends messages to ambulance or police or family members. The security system applied in this paper meets the characteristics of a perfect rider and the application should be highlighted. This work improves safety and reduces accidents, especially fatal to the motorcyclist.

The rest of the works are introduced as follows: Section 2 portrays the works related to this paper. Section 3 gives the insights regarding the proposed work. The different equipment parts are recorded in Section 4. Section 5 gives an idea regarding working along with flow diagrams. Section 6 gives the model and results. At last Section 7 gives the conclusion the ground, the accelerometer senses the tilt, and the Arduino extract data using the GSM module that is interfaced with Arduino. When the data exceeds the minimum stress limit then the GSM module automatically sends messages to ambulance or police or family members. The security system applied in this paper meets the characteristics of a perfect rider and the application should be highlighted. This work improves safety and reduces accidents, especially fatal to the motorcyclist. The rest of the works are introduced as follows: Section 2 portrays the works related to this paper. Section 3 gives the insights regarding the proposed work. The different equipment parts are recorded in Section 4. Section 5 gives an idea regarding working along with flow diagrams. Section 6 gives the model and results. At last Section 7 gives the conclusion.

The comparison of the algorithms (Support vector machines, Multi-layered perceptron and Convolutional neural network) is based on the characteristic chart of each algorithm on common grounds like dataset, the number of epochs, complexity of the algorithm, accuracy of each algorithm, specification of the device (Ubuntu 20.04 LTS, i5 7th gen processor) used to execute the program and runtime of the algorithm, under ideal

## **OBJECTIVE**

The main objectives of the project are:

- To develop a smart system that provides safety to motorcycle riders.
- To design a model that reduces the road accidents.

- To design a smart system in which the ignition starts only when the helmet is worn properly and alcohol is not detected.
- To design a smart system which recognize and respond, the vehicles coming from sides of the rider.
- To design a system that alerts the family members/friends by giving information about the accidents.

### **EXISTING SYSTEM**

The existing method was to pre-check the rider for alcohol consumption and also to insist the rider to put on the helmet. The bike would not be started if these pre-conditions fail. If the person met with the accident with the help of GPS and GSM module the message will be sent to the family members and nearby hospitals.

### **PROPOSED SYSTEM**

The purpose of the proposed system is to address two main issues, which motivates for developing this project.

- 1) To identify whether the rider is wearing a helmet.
- 2) To detect alcohol consumption in the rider.

The first issue concentrates to prevent not wearing helmet and detect the rider is drunken drive these factors are the main reason for the accident cause. If the helmet is not worn properly the ignition of the bike is blocked and will not start and when the helmet is worn by the rider it will also check for alcohol condition if the rider consumed any alcohol, it will detect and the ignition will automatically stop for this module IR sensor and MQ-3 sensors are used. The IR sensor is fitted inside the helmet so it can detect the rider head. This eliminates the case of the rider keep the helmet on the top of bike fuel tank. The MQ-3 gas sensor is fitted in front of the rider mouth of the helmet. It detects the alcohol and set the value to HIGH means the alcohol is detected and bike ignition will stop.

### **WORKING PRINCIPLE**

Nodule MCU is one of the open source used in Internet of things raised area. It uses ESP-12 module to identify the hardware from Espressif system which is connected by WIFI and attached with firmware. The other name of Nodule MCU is firmware. This type of firmware is less cost and used in end points of the IOT environment, this will act as transmitter and receiver wireless device.

Infrared sensors are act as detector to sense the infrared lights these are small microchips. Generally it is used in television to get signals from remote for operation, TV remote also attached by this IR sensors for transmitting signal. This sensor used in smart helmet to check speed.

The MQ3 sensor is used to identify the alcohol consumption, its made by gas inside and simple electronic circuits convert the conductivity to the gas concentration. Its contained few harmful gases like ammonia, sulfide, and benzene steam etc. So this sensors very sensitive, also it contains many different types of sensors to check the alcohol consumption.

### **COMPONENTS DETAILS**

**HARDWARE CONFIGURATION:**

- NODEMCU
- Power Supply
- IR Sensor
- alcohol Sensor
- Lcd Display
- Buzzer

**SOFTWARE CONFIGURATIONS**

- Software = Arduino IDE
- Language = embedded C.

**COMPONENTS DETAILS**

NodeMCU is an open-source firmware for which open-source prototyping board designs are available. The name “NodeMCU” combines “node” and “MCU” (micro-controller unit). The term “NodeMCU” strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. Nodemcu ESP8266 and Nodemcu ESP32 are becoming very popular and are almost used in more than 50% IoT based projects today.

The firmware uses the Lua scripting language. The firmware is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface- mounted board containing the

MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially was based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

**NodeMCU ESP8266 Specifications & Features**

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1

- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT projects

## **APPLICATION**

- Prototyping of IoT devices
- Low power battery operated applications
- Network projects
- Projects requiring multiple I/O interfaces with Wi-Fi and Bluetooth functionalities

## **ARDUINO IDE**

The Integrated Development Environment (IDE) is a combination of editor, linker and a compiler which helps the developer to make their Firmware for their Innovative Projects. Arduino IDE play a major role in open source platform for fast prototyping and easy to access of library. It is user friendly tool for beginners and it supports programming language like embedded C, Luna etc. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. Its supports all the variant of Arduino boards like Arduino Uno, Nano and Mega etc. As soon as it reaches a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments

## **ARDUINO IDE SOFTWARE**

With this Arduino Integrated Development Environment you can edit, compile and upload Arduino sketches to the Arduino boards. This is a simple approach to obtain a 12V and 5V DC power supply using a single circuit. The circuit uses two ICs 7812 and 7805 for obtaining the required voltages. The AC mains voltage will be stepped down by the transformer, rectified by bridge and filtered by capacitor to obtain a steady DC level. The 7812 regulates this voltage to obtain a steady 12V DC. The output of the IC1 will be regulated by the 7805 to obtain a steady 5V DC at its output. In this way both 12V and 5V DC are obtained.

Initially small stepdown transformer is used to reduce the voltage level 230V AC into 12V AC. The output of the transformer is a pulsating sinusoidal AC voltage, which is converted to pulsating DC with the help of a rectifier. This output is given to a filter circuit which reduces the AC ripples, and passes the DC components. 7812 regulator is used to convert 12V DC to 5V DC. And 7805 regulator is used to convert constant 5V DC voltage.

### **IR LED Transmitter**

IR LED emits light, in the range of Infrared frequency. IR light is invisible to us as its wavelength (700nm – 1mm) is much higher than the visible light range. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimeters to several feet, it depends upon the type of IR transmitter and the manufacturer. Some transmitters have the range in kilometers. IR LED white or transparent in colour, so it can give out amount of maximum light.

### **Photodiode Receiver**

Photodiode acts as the IR receiver as it conducts when light falls on it. Photodiode is a semiconductor which has a P-N junction, operated in Reverse Bias, means it starts conducting the current in reverse direction when light falls on it, and the amount of current flow is proportional to the amount of light. This property makes it useful for IR detection. Photodiode looks like a LED, with a black colour coating on its outer side, Black colour absorbs the highest amount of light.

### **LM358 Opamp**

LM358 is an Operational Amplifier (Op-Amp) is used as voltage comparator in the IR sensor. The comparator will compare the threshold voltage set using the preset (pin2) and the photodiode's series resistor voltage (pin3).

Photodiode's series resistor voltage drop > Threshold voltage = Opamp output is High  
Photodiode's series resistor voltage drop < Threshold voltage = Opamp output is Low

The variable resistor used here is a preset. It is used to calibrate the distance range at which object should be detected.

## **APPLICATIONS**

- Obstacle Detection
- Industrial safety devices
- Wheel encoder

The MQ series of gas sensors utilize a small heater inside with an electrochemical sensor. These sensors are sensitive to a range of gases and are used at room temperature. MQ135 alcohol sensor is a SnO<sub>2</sub> with a lower conductivity of clean air. When the target explosive gas exists, then the sensor's conductivity increases more along with the gas concentration rising levels. By using simple electronic circuits, it converts the change of conductivity to correspond to the output signal of gas concentration.

This is a very easy to use low cost semiconductor Gas sensor Module with analog and digital output. This module uses MQ3 Alcohol gas sensor as an alcohol gas sensing element. It requires no external components just plug in Vcc & ground pins and you are ready to go.

For Digital output the threshold value can be easily set by an on-board potentiometer. Using this module you can easily interface MQ3 Alcohol sensor to any Microcontroller, Arduino or even Raspberry Pi.

Since this Gas Sensor module is sensitive to alcohol it can be used in breathalyser. MQ3 Sensor also has small sensitivity to Benzine

### **SPECIFICATION**

- Power Supply: 5 Volts
- Interface Type: Analog & Digital
- High Sensitivity to Alcohol & small sensitivity to Benzine.
- Low Cost.

### **FEATURES OF MQ-3 ALCOHOL SENSOR**

- Sensor Type - Semiconductor
- Easy SIP header interface
- Compatible with most of the microcontrollers
- Low-power standby mode
- Requires heater voltage
- Good sensitivity to alcohol gas
- Fast response and High sensitivity
- Long life and low cost
- Requires simple Drive circuit

### **APPLICATIONS OF MQ-3 GAS SENSOR**

- Gas level over-limit alarm
- Breathalyser
- Portable alcohol detector
- Stand-alone/background sensing device
- Environmental monitoring equipment

A relay is an electro mechanical switch, it consists of a coil. When small current flows through the coil, magnetic field is induced that causes the switch to move, to close or open the electrical connection. Typically a Relay is used to control High voltage (AC or DC) circuit using small DC voltage circuit

without any direct electrical connection between them. It means, high voltage circuit and low DC voltage circuit are magnetically linked but electrically separated.

When small DC current flows through the coil of the relay, coil energizes. Thus the armature is attracted towards the NO (Normally Open) pin. When the current flow through the coil stops, armature comes back to the normal position, means COM pin is connected to NC (Normally Connected) pin. Relay operation is same for all basic relays.

The above circuit shows a bare-minimum concept for a relay to operate. Since the relay has 5V trigger voltage we have used a +5V DC supply to one end of the coil and the other end to ground through a switch. This switch can be anything from a small transistor to a microcontroller or a microprocessor which can perform switching operating. You can also notice a diode connected across the coil of the relay, this diode is called the Fly back Diode. The purpose of the diode is to protect the switch from high voltage spike that can produced by the relay coil. As shown one end of the load can be connected to the Common pin and the other end is either connected to NO or NC. If connected to NO the load remains disconnected before trigger and if connected to NC the load remains connected before trigger.

## FEATURES

- Trigger Voltage (Voltage across coil) : 5V DC
- Trigger Current (Nominal current) : 70mA
- Maximum AC load current: 10A @ 250/125V AC
- Maximum DC load current: 10A @ 30/28V DC
- Compact 5-pin configuration with plastic moulding
- Operating time: 10msec Release time: 5msec
- Maximum switching: 300 operating/minute (mechanically)

## APPLICATIONS

- Commonly used in switching circuits.
- For Home Automation projects to switch AC loads
- To Control (On/Off) Heavy loads at a pre-determined time/condition
- Used in safety circuits to disconnect the load from supply in event of failure
- Used in Automobiles electronics for controlling indicators glass motors etc.

A DC motor is any motor within a class of electrical machines whereby direct current electrical power is converted into mechanical power. Most often, this type of motor relies on forces that magnetic fields produce. Regardless of the type, DC motors have some kind of internal mechanism, which is electronic or electromechanical. In both cases, the direction of current flow in part of the motor is changed periodically.



The speed of a DC motor is controlled using a variable supply voltage or by changing the strength of the current within its field windings. While smaller DC motors are commonly used in the making of appliances, tools, toys, and automobile mechanisms, such as electric car seats, larger DC motors are used in hoists, elevators, and electric vehicles.

Here we are using 12V DC 60 RPM motor. 60RPM Centre Shaft Economy Series DC Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside.

Although motor gives 60 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque. Tables below gives fairly good idea of the motor's performance in terms of RPM and no load current as a function of voltage and stall torque, stall current as a function of voltage.

### **SPECIFICATIONS AND FEATURES**

- Operating Voltage: 12V DC
- Gearbox: Attached Plastic (spur)Gearbox
- Shaft diameter: 6mm with internal hole
- No-load current = 60 mA(Max)
- Load current = 300 mA(Max).

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or key stroke. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play."

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. It generates consistent single tone sound just by applying D.C voltage. Using a suitably designed resonant system, this type can be used where large sound volumes are needed. At Future Electronics we stock many of the most common types categorized by Type, Sound Level, Frequency, Rated Voltage, Dimension and Packaging Type.

### **FEATURES**

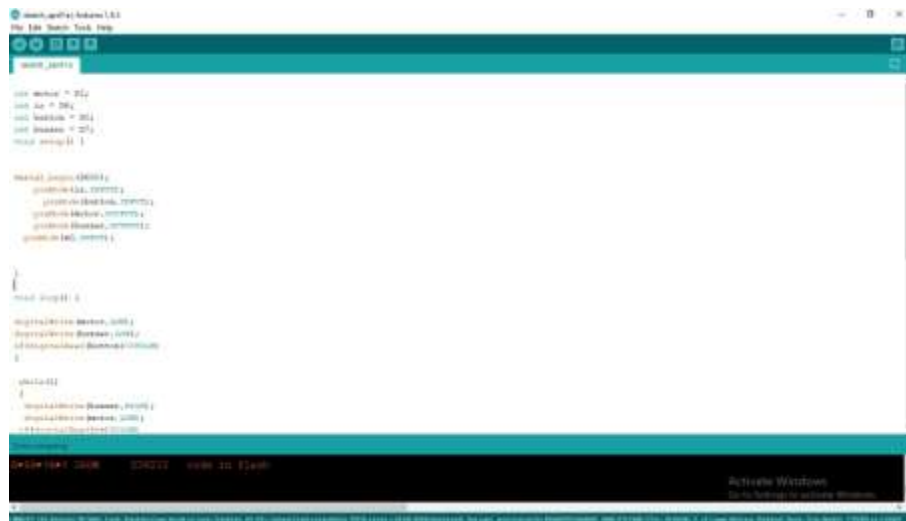
- Input supply: 5 VDC
- Current consumption: 9.0 mA max.
- Oscillating frequency: 3.0  $\pm$ 0.5 KHz

- Sound Pressure Level: 85dB min

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation.. LCD's were a big leap in terms of the technology they replaced, with light emitting diodes.

## RESULT

The smart helmet made of many sensors and microcontrollers, First of all to identify whether the person is wearing helmet or not checked by IR sensors and MQ3 sensors are attached to monitor that person consumed alcohol or not. At the result the person wearing helmet and no alcohol consumed then automatically the START signal pass to the vehicle and it gets start. When the person removed the helmet and he/she consumed alcohol the STOP signal send to the vehicle and automatically stop vehicle



## CONCLUSION AND FUTURE SCOPE

Accident cases occur due to motorcycles. The major accidents are increased by drinking alcohol and this is due to the absence of a helmet. In this we have developed an electronic intelligent helmet system, which efficiently check wearing of helmet and drunk -driving. By implementing this technology, the rate of accident due to alcohol consumption can be significantly reduced. The proposed research work has introduced advanced sensor technologies and radio frequency during this project to enhance its efficiency

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