

IoT Based Smart Helmet For Accident Detection

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Abstract—We all talk about the trending technology, the Internet Of Things that is changing our lives day by day. It is creating a new world, quantifiable and measurable world where people and businesses can manage their assets in better informed way and make more timely decisions. This paper proposes a Smart Helmet for the accident detection using sensors and Arduino with IoT as a domain. The main feature of designing this helmet is to not only to make the helmet smart but also to provide safety to rider.

Keywords—Internet of Things, Arduino, Accident detection, Sensors

I. INTRODUCTION

The **Internet of things (IoT)** is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. The IoT will allow the objects to be sensed or controlled remotely across existing network infrastructure, by providing opportunities for more direct integration of the physical world into computer-based systems, and results in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, smart homes, intelligent transportation and smart cities. These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. The term "the Internet of things" was coined by Kevin Ashton of Procter & Gamble, later MIT's Auto-ID Center, in 1999.

Sensors is a device, module or a subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. Sensors are always used with other electronic devices which is as simple as light or as complex as a computer. Sensors are used in everyday objects such as touch-sensitive, elevator buttons and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware.

The proposed system uses alcohol sensor, in general gas sensor, pressure sensor and accelerometer. When the rider wears the helmet and buckles the belt of the helmet, pressure

sensor senses the pressure of the helmet and allows the vehicle to start. Alcohol sensor checks whether the rider is drunk or not. If alcohol content is detected then it doesn't allow the rider to start the vehicle.

Arduino is a software or a compiler to which a code is written to control the devices connected to the arduino microcontroller. It designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino board designs use a

variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuit.

II. RELATED WORK

The impact when a motorcyclist involves in a high speed accident without wearing a helmet is very dangerous and can cause fatality. Wearing helmet can reduce shock from the impact of accident and may save a life^[1]. As the motorcycle riders are increasing day by day, the road mishaps are also increasing. Due to which many serious injuries or death may occur. Most of them are caused due to most common negligence of not wearing the helmets, also many deaths occur due to lack of prompt medical attention needed by the injured person^[2]. Traffic accident in Malaysia has been increasing at the average rate of 9.7% per annum over the last few decades. The increase of road accidents is in link with the rapid growth in population, economic development, industrialisation and motorisation encountered by the country^[3].

III. OBJECTIVE

Smart helmet is an innovative way of designing a helmet for safety purpose using the latest and trending technology, IoT. Today a number of countries has made it mandatory to wear helmet for both rider and pillion rider. Motorcycle engine will start only when the rider wears the helmet and buckles the belt of the helmet. This will reduce the impact of accidents. In case if the rider is drunk, alcohol sensor detects the alcohol content and stops the rider from starting the vehicle. In case of emergency, SOS message will be sent to the concerned person selected by the user through the Blynk app.

IV. PROPOSED SYSTEM

Video The core element of the model is the arduino board which controls and manages all the functions performed by the other components of the model. The instructions to the components are given through arduino programming language.

This model consists of the following hardware components:

- Arduino consists of both a physical programmable circuit board and a piece of software, or IDE that runs on a computer, which we are using to write and upload computer code to the physical board.
- Accelerometer ADXL335 will detect the tilt and record the values based on co-ordinate system and sends the signal to the arduino board.
- The Gas sensor MQ3 has high sensitivity to alcohol and sends signal to stop the vehicle. This module provides both digital and analog output.
- Pressure sensor comes into picture when the rider wears the helmet and buckles it.

SOS message can be sent when rider meets with an accident. This is achieved using android app, sensors, Wifi and Cloud. Cloud send the data to the concerned person through Wifi. The android app analyzes data and performs specific actions.

Transmitter Unit:

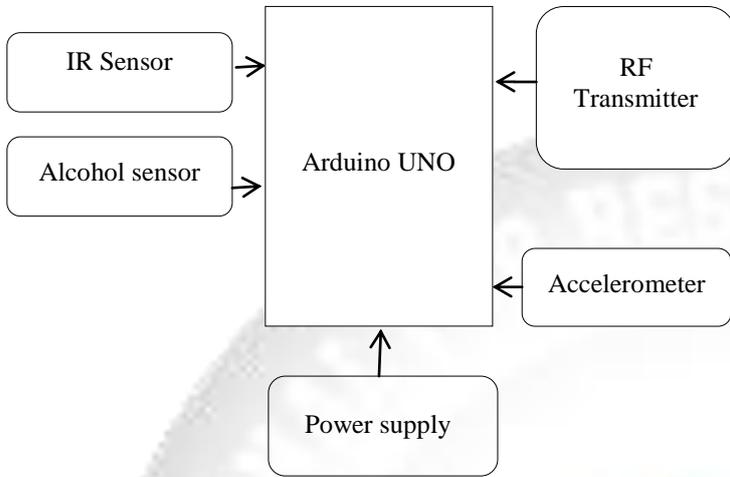


Fig. 1 Block diagram of Helmet

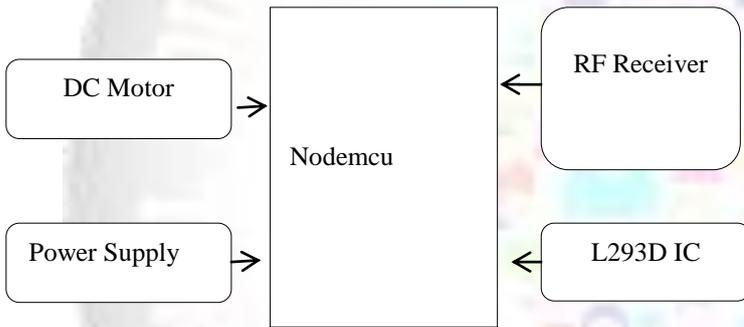


Fig. 2 Block diagram of Vehicle

Receiver unit:



Fig. 3 Architecture

V. HARDWARE DESCRIPTION

A. Infrared Sensor

The Multipurpose Infrared gives the ability to detect lines or nearby objects. It works by detecting reflected light coming from its own infrared LED. By measuring the amount of reflected infrared light, it can detect light or dark (lines) or even objects directly in front of it. An onboard RED LED is

used to indicate the presence of an object or detect line. Sensing range is adjustable with inbuilt variable resistor.



Fig. 4 IR Sensor

B. Alcohol Sensor

Alcohol sensor that we use in the model is MQ3, which is a low cost semiconductor sensor which can detect presence of alcohol gases at concentrations from 0.05mg/L to 10mh/L.



Fig. 5 Alcohol sensor

C. Accelerometer

Accelerometer is an electromechanical device which is used to detect acceleration. The acceleration can be static such as gravitational force, while dynamic acceleration can be sudden movement or vibration.

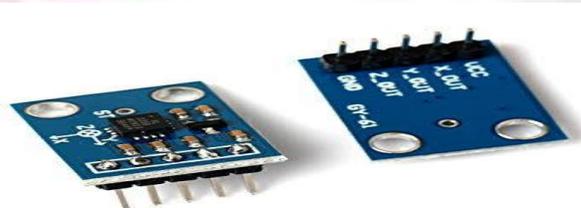


Fig. 6 Accelerometer

D. Arduino Board

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.



Fig. 5 Arduino board

D. NodeMCU

The NodeMCU is an open-source firmware and development kit that helps you to prototype your IOT product within a few Lua script lines. It includes firmware which runs on ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.



Fig. 6 NodeMCU

VI. CONCLUSION

In this paper, we developed a smart helmet which was designed to help local people get benefitted from wearing a helmet while riding. IR Sensor is used to detect whether the rider is wearing the helmet or not. Alcohol Sensor will detect the presence of alcohol and stops the rider from starting the vehicle. Accelerometer detects the tilt in the helmet in case of accident and sends SOS message with the location to the concerned person. The message is sent to Blynk App.

VII. FUTURE SCOPE

This model can be equipped with a camera mounted to the helmet where entire video will be recorded and it will be stored in the data storage of the helmet, videos can be accessed wirelessly so that helmet will act like a BLACK BOX containing all data. Biometric device can be embedded into the helmet to make it more secure and avoid theft.

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