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INTELLIGENT HELMET FOR ACCIDENT AND ALCOHOL DETECTION

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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.*

Key Words: **Road accidents, GSM, Security, Alcohol detection, Accident detection**

1. 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. Two-wheeler 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.

2. RELATED WORKS

Several studies had been conducted to make protective headgear. All of the works concentrated on designing the helmet in such a way that it helps in the well-being of the human. Most of the accidents occur because of not wearing a helmet and also driving the vehicle after consuming alcohol.

- Uses wireless advanced helmet and accident-free transportation systems [1]. The system comprises a helmet module including stereo speakers and a microphone and a bike-mounted base unit. The system also uses a wireless protocol.

- Here microcontroller is used to control the system and speed sensors, FSR is also used as a sensor to operate [2]. The drawback of this work is the motorcycle engine starts, only if the helmet is worn.

3. PROPOSED WORK

The main aim of this paper is to make a protection system in a helmet for good well-being of bike rider. The savvy cap is fixed with sensors that are utilized to recognize whether the rider has worn a protective cap or not. There are two different microcontrollers utilized in this work. Every unit utilizes separate microcontrollers i.e. for bike unit Arduino Uno is used and for protective cap unit ESP232 Wi-Fi module

is used. Signal transmission among head protector and bike utilizing RF idea. The block diagram of the helmet unit and bike unit appears in Fig-1 and Fig-2 respectively.

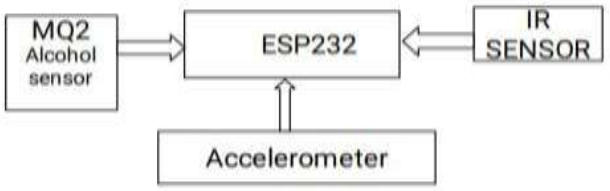

Fig-1: Helmet Unit

Fig-2: Bike Unit

The work is divided into two units, namely, helmet and bike. In the helmet unit, the IR sensor is placed inside the helmet which senses whether a helmet is worn or not. An alcohol sensor is placed in front of the mouth [3]. It can sense whether the driver is drunk or not. The battery and regular circuits are fixed inside the helmet. The bike unit is mounted on a two-wheeler. An accelerometer is fixed on the helmet unit for fall detection.

4. HARDWARE DESCRIPTION

The hardware consists of various components like ESP232, MQ2 sensor, IR sensor, accelerometer, GPS, GSM, relay.

4.1. Grove - gas sensor (MQ2)

The Grove - Gas Sensor (MQ2) module is helpful for gas leakage detection (home and industry). It is suitable for identifying H2, LPG, CH4, CO, alcohol, smoke, or propane. Because of its high affectability and quick reaction time, an estimation can be taken at the earliest opportunity. The affectability of the sensor can be balanced by a potentiometer. MQ-2 is shown in Fig -3. It can identify LPG, Smoke, Alcohol, Propane, Hydrogen, Methane, and Carbon Monoxide fixations somewhere in the range of 200 to 10000 ppm. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor otherwise called chemiresistors as the detection depends on the change of resistance of the detecting material when the gas interacts with the material [4]. Utilizing a simple voltage divider network, concentrations of the gas can be distinguished.

Fig – 3: MQ2 sensor

The module adaptation of this sensor accompanies a Digital Pin which causes this sensor to work even without a microcontroller and that proves to be useful when you are just attempting to identify one specific gas. With regards to estimating the gas in ppm the simple pin must be utilized, the simple pin additionally TTL driven and takes a shot at 5V and consequently can be utilized with most basic microcontrollers.

4.2. Accelerometer

The ADLX345 is a small, triaxle accelerometer with goals of 13bit. The yield of the accelerometer is computerized and utilized 16bits 2's commendation information. The ADXL345 is a low-power, 3-pivot MEMS accelerometer modules with both I2C and SPI interfaces. The Adafruit Breakout sheets for these modules include on-board 3.3v voltage guideline and level moving which makes them easy to interface with 5v microcontrollers, for example, the Arduino. The ADXL345 highlights 4 affectability ranges from +/ - 2G to +/ - 16G. Also, it bolsters yield information rates extending from 10Hz to 3200Hz. It can associate through sequential fringe interphase or I2C interphase. ADLX345 is utilized for both estimations of static and dynamic speeding up as appeared in Fig - 4. In this venture, we use an accelerometer to gauge the static quickening of gravity. Freefall detecting sees if the bicycle is falling.

Fig – 4: Accelerometer

4.3. Infrared Sensor

An infrared sensor is an electronic gadget that transmits so as to detect a few parts of the environmental factors. An IR sensor can gauge the warmth of an item just as it recognizes the movement. These sorts of sensors measure just infrared radiation, as opposed to producing it that is known as a passive IR sensor as appeared in Fig -5.

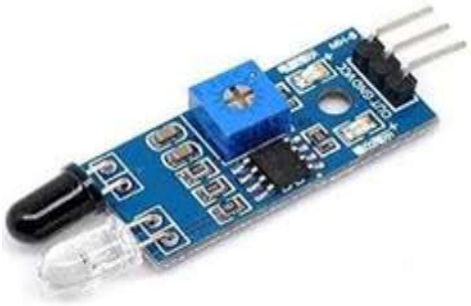

Fig -5: IR Sensor

Normally, in the infrared range, all the items transmit some type of thermal radiation. These kinds of radiations are imperceptible to our eyes that can be identified by an infrared sensor. The emitter is basically an IR LED (Light Emitting Diode) and the detector is just an IR photodiode that is touchy to IR light of a similar frequency as that discharged by the IR LED. At the point when IR light falls on the photodiode, the resistances and the yield voltages will change in relation to the size of the IR light got**.**

4.4. NodeMCU

NodeMCU is an ease open-source IoT stage shown in Fig-6. It at first included firmware that sudden spikes in demand for the ESP8266 Wi-Fi SoC from Express if Systems and equipment which depended on the ESP-12 module later, support for the ESP32 32-piece MCU were included. ESP32 is equipped for working dependably in modern situations, with working as ESP32 is exceptionally coordinated with in-assembled reception apparatus switches, RF balun, power enhancers, etc.

Fig -6: NodeMCU

ESP32 adds invaluable usefulness and adaptability to your applications with insignificant Printed Circuit Board (PCB) prerequisites. Designed for cell phones, wearable hardware, and IoT applications, ESP32 accomplishes ultra-low force utilization with a blend of a few sorts of exclusive programming.

4.5. GPS Module

Global Positioning System (GPS) is a satellite-based framework that utilizations satellites and ground stations to quantify and figure its position on Earth as in Fig-7. GPS is otherwise called Navigation System with Time and Ranging (NAVSTAR) GPS.GPS beneficiary needs to get information from in any event 4 satellites for exactness purposes.

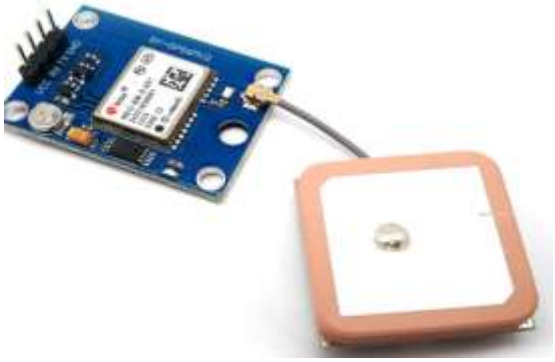

Fig – 7: GPS Module

GPS beneficiary doesn't transmit any data to the satellites. This GPS collector is utilized in numerous applications like cell phones, Cabs, Fleet administration, and so on. GPS recipient utilizes a group of stars of satellites and ground stations to figure precise areas in any place it is found. These GPS satellites transmit data flags over radio recurrence (1.1 to 1.5 GHz) to the recipient. With the assistance of this got data, a ground station or GPS module can figure its position and time.

4.6. GSM Module

GSM (Global System for Mobile Communications, initially Group Special Mobile), is a standard created by the European Telecommunications Standards Institute (ETSI). It was made to portray the conventions for second-age (2G) advanced cell systems utilized by cell phones and is presently the default worldwide standard for versatile interchanges – with over 90% piece of the pie, working in more than 219 nations and domains [4]. GSM is a versatile correspondence modem; it represents a worldwide framework for portable correspondence (GSM) depicted in Fig- 8. GSM framework was created as an advanced framework utilizing time division numerous entrance (TDMA) strategy for correspondence purposes.

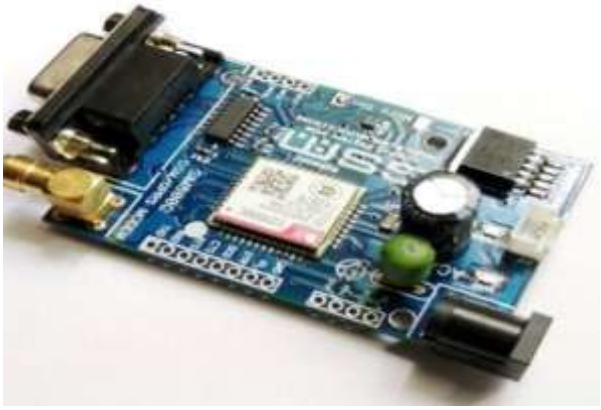

Fig -8: GSM Module

A GSM digitizes and decreases the information, at that point sends it down through a channel with two distinct floods of customer information, each in its specific schedule opening. The advanced framework can convey 64 kbps to 120 Mbps of information rates.

4.7. Relay

A relay is an electrically worked switch shown in Fig -9. It comprises of a set of input terminals for a solitary or numerous control signals, and a set of working contact terminals. The switch may have any number of contacts in different contact structures, for example, make contacts, break contacts, or mixes thereof[5]. Relays are utilized where it is important to control a circuit by an independent low-power signal, or where a few circuits must be controlled by one signal.

Fig -9: Relay

An electromechanical relay is essentially structured utilizing barely any mechanical parts like Electromagnet, a movable armature, contacts, yoke, and a spring/frame/stand. All these are masterminded logically to frame into a relay.

5. WORKING

The microcontroller utilized is ATmega 328 which goes under the AVR section given inside the Bike area. Arduino board is given in the Bike segment though an IOT board– NodeMCU is given in the Helmet area. Right off the bat, the IR sensor detects whether the rider is wearing a protective cap or not. On the off chance that truly, the bicycle begins which is shown by a green LED or probably the bicycle won't start, demonstrated by an orange LED. IR comprises of transmitter and beneficiary. The transmitter transmits, hits a specific article, says the protective cap, and returns as a got signal. At that point, the MQ-2 liquor sensor detects whether the rider has devoured liquor or not. If the rider has expended liquor it is demonstrated by a red LED and the orange LED. On the off chance that liquor isn't expended, the green LED shines which shows it's all set. There is a working system to keep away from the blast as the detecting material gets warmed up. Ordinarily, there would be an O2 layer as it is artificially responded, henceforth conduction doesn't occur. At the point when the rider inhales, if there is a nearness of alcoholic substance, it responds with concoction substances, and the O2 layer gets wrecked which prompts an ascent in the electrical conductance. At the point when the detecting material contacts with gas, there would be an adjustment in the opposition esteem as conductance expands obstruction esteem gets changed. There is a warmer material in the middle alongside 2 kinds of anodes. There would be A-terminals, B-anodes, and H-cathodes. At the point when a voltage is applied, the H-anode gets warmed up. The detecting material is comprised of nickel-chromium. SnO2 covering is available at the highest point of the detecting material. At the point when the rider has expended liquor and inhales the layer above SnO2 gets wrecked. The yield relies upon the degree of gas focus. An accelerometer is likewise given in the protective cap area to recognize mishap. An accelerometer is a gyroscope [6]. Any sort of tilt is detected by the accelerometer. At the point when a tilt happens, the rider's head hits any side of the protective cap and delivers positive and negative directions dependent on how the rider falls on the ground. This is about the protective cap part.

The segments in the head protector parts are associated with the Arduino present in the bicycle unit through Wi-Fi. GPS is available in the bicycle unit to distinguish the area of the rider if any mishap occurs. GPS transmits and gets through satellites. Satellite is a transmitter and it generally transmits. GPS is a neighborhood collector. At any rate, 3 satellite is required to get the precise time. As the number of satellite increments, the yield would be progressively exact. GPS knows its area. Data in regards to the GPS arrange, GPS transmitted time, GPS got time, signal speed, and so on is known. Subsequently, the separation can be discovered. It checks the separation with multiple satellites to get a precise worth. The yield of GPS would be a $string. $GPMRC is the necessary string here. It contains the data to facilitate, time, speed, position, fixed information, and so forth. These data are given to the Arduino and it very well may be separated as various strings through dismemberment. At whatever point a mishap or tilt in accelerometer happens, it initiates the GPS module. GPS module distinguishes the area of the mishap

and the GSM module gives the data in regards to a mishap with area through SMS to the enlisted versatile numbers.

5.1. Flow Diagrams

Fig -10: Alcohol Detection

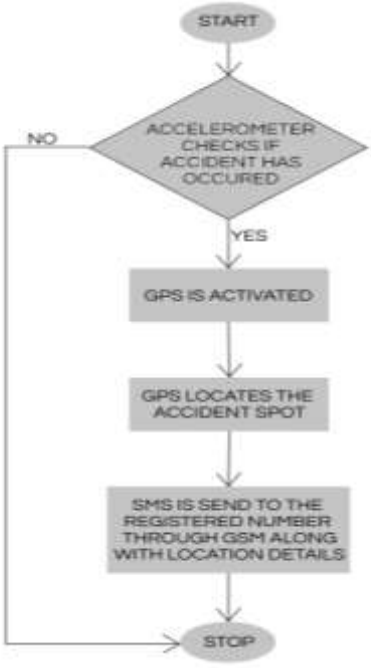

Fig -11: Accident Detection

6. RESULTS

It is an overall implementation of the proposed hardware system. We have successfully designed and made a prototype of the proposed design. Fig-9 shows the prototype of this work.

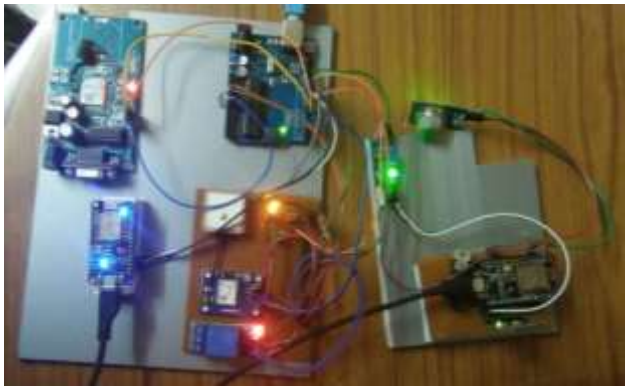

Fig -9: Prototype

7. CONCLUSION

The bike security framework created with a savvy protective cap and clever bicycle framework is dependable and expects to help in the anticipation, recognition, and detailing of mishaps subsequently lessening the likelihood of the alcoholic drive cases. It additionally has a few points of interest contrasted with the past frameworks. Our proposed framework gives the essential significance of forestalling mishaps and guarantees wellbeing to a more noteworthy degree in a bike. These days, most mishap cases happen because of motorbike. The severities of those mishaps are expanded in light of the nonappearance of head protectors or by the utilization of mixed beverages [7]. By actualizing this framework, a protected bike venture is conceivable which would diminish the head wounds all through mishaps caused because of the nonappearance of cap and moreover decrease the mishap rate because of plastered driving. A GSM modem is utilized in this framework that will make an impression on the predefined numbers that are modified utilizing a smaller scale controller in the event of a mishap.

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