Intelligent Helmet For Vehicle Riders Using Internet of Things

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Abstract- *According to the Status Report on Road Safety in India by TRIPP IIT Delhi, 150,785 persons were killed and 494,624 injured in road traffic crashes in 2016, and MTWs were involved in 34 percent of these. About 98.6 percent of bikers who died in RTIs in 2015 didn't wear a helmet. With this reason, this project aims to improve the safety of the motorcycle's rider. Our aim is to create an Intelligent Helmet that doesn't allow the bike to start unless the helmet has been properly worn and detects accidents and informs about it to the authorities, medical centers and relatives to provide aid to the rider quicker*

Keywords- IoT, Intelligent Helmet, MTWS (Motorized Two Wheelers), RTIs (Road traffic Incidents).

I. INTRODUCTION

I.I. Background:

India holds an unenviable record of occurrence of highest number of road accidents every year. Road accidents are a human tragedy involving high human suffering. Expansion in the road network, surge in motorization and a rising population of a country contribute towards increasing numbers of road accidents, road accident injuries and road accident fatalities.

WHO says that 1.25 million people die each year due to road accidents. In India there is one death every 4 minutes due to road accidents. The total number of road accidents increased by 2.5 percent from 4,89,400 in 2014 to 5,01,423 in 2015. The major reason behind these accidents is carelessness and fault of the driver and it has been revealed as the single most responsible factor for road accidents, killings, and injuries on all roads in the country over a long period. In India 377 people die every day due to road accident which is four times more than the annual death toll from terrorism. Among these two wheelers account for one fourth of total road crash deaths. Predictably most of those who die on roads perish because of preventable causes: speeding, drink driving and overloading. In recent times, helmets have been made compulsory.

This paper provides an intelligent system for two wheeler accident prevention and detection for human life safety. The prevention part involves, Smart Helmet, which automatically checks whether the person is wearing the helmet. The micro-controller controls the overall functionality of the system.

II. MOTIVATION

According to a survey 70% of people riding motorcycles don't wear a helmet for no specific reason, with a motive of getting these and other people as well to wear a helmet, this project was started.

III. LITERATURE REVIEW

a) M. K. A. Mohd Rasli, N. K. Madzhi and J. Johari, "Smart helmet with sensors for accident prevention," 2013 International Conference on Electrical, Electronics and System Engineering (ICEESE), Kuala Lumpur, 2013 Abstract: Motorcyclist will be alarmed when the speed limit is exceeded. A Force Sensing Resistor (FSR) and BLDC Fan are used for detection of the rider's head and detection of motorcycle's speed respectively. A 315 MHz Radio Frequency Module as wireless link which able to communicate between transmitter circuit and receiver circuit. PIC16F84a is a microcontroller to control the entire component in the system. Only when the rider buckled the helmet then only the motorcycle's engine will start. A LED will flash if the motor speed exceeds 100 km/hour.

b) V. Ahmed and N. P. Jawarkar, "Design of Low Cost Versatile Microcontroller Based System Using Cell Phone for Accident Detection and Prevention," 2013 6th International Conference on Emerging Trends in Engineering and Technology, Nagpur, 2013 Abstract: A low-cost micro controller based system with 3-axis accelerometer sensor and discarded cell phone model is developed to provide warnings to driver for abnormal conditions or unsafe driving and capability to detect accidents. The system has versatile features like alerting

the driver about servicing schedule, abnormal engine temperature, over-speeding and rash driving situations. It also incorporates facility to capture images and send multimedia and text messages to predetermined users immediately after occurrence of accident.

c) A. Das, S. Goswami and P. Das,"Design and implementation of inteligent helmet to prevent bike accident in India", 2015 Annual IEEE India Conference (INDICON), New Delhi, 2015 Abstract: This paper presents a new intelligent helmet that ensures that the rider cannot start the bike without wearing it. This helmet uses a simple cable replacement for wirelessly switching a bike, so that the bike will start only with both the key and the helmet. The switching on and off of a led indicator will be used to demonstrate the working of the model. The Basic principle used is a remotely switched relay. The trigger is on the helmet itself, and is activated only when the rider wears it, which in turn switches the relay in the bike's ignition circuit, thereby making it mandatory for the rider to wear it in order to start the bike.

d) R. Vashisth, S. Gupta, A. Jain, S. Gupta, Sahil and P. Rana, "Implementation and analysis of smart helmet," 2017 4th International Conference on Signal Processing, Computing and Control (ISPCC), Solan, 2017, pp. 111-117. Abstract: Two modules one on the helmet and bike each will work in synchronization, to ensure that the biker is wearing the helmet. A radio frequency module is responsible for the wireless communication between the helmet and the bike circuit. The Piezo electric buzzer is used to detect speeding and this feature is extended by limiting the speed of the user. The ALCHO-LOCK function is used to prevent drink and drive scenarios Accelerometer detects accidents, and this is extended by employing GSM module in our circuit, which is designed to automatically send one message to one personal contact and one concerned authority that the person has been into an accident and a fog sensor for increasing visibility in case of fog or smog are also used. Another feature known as E-HELMET allows for automatic deduction of the required amount from the users virtual wallet wirelessly preventing the rider to stop and pay for it.

e) B. A. Valli and P. Jonnala, "Vehicle positioning system with accident detection using accelerometer sensor and Android technology," 2017 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR), Chennai, 2017 Abstract:Embedded technology is used to detect the accident using accelerometer sensor and android technology is used to determine the name of that location instead of latitude and longitude values so that even a layman can understand these values and can know about the vehicle location. An android app that specifies the location name when the mobile receives GPS data plays a major role in the paper.

f) D. Selvathi, P. Pavithra and T. Preethi, "Intelligent transportation system for accident prevention and detection," 2017 International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, 2017 Abstract: The prevention part involves, Smart Helmet, which automatically checks whether the person is wearing the helmet and has non-alcoholic breath while driving. The relay does not ON the engine if these two conditions are not satisfied. The microcontroller controls the function of relay and thus the ignition. The system also enables detection of an accident at any place and reports about the accident to predefined numbers with GSM module.

IV. PROPOSED SYSTEM

We propose an Intelligent Helmet System that will improve the safety of MTW (Motorized Two Wheelers) riders. The Intelligent Helmet uses sensors and microcontrollers to implement a system; termed as the 'Smart Ignition System', that makes it compulsory for the rider of a MTW to wear a helmet before they can start the bike's ignition. It also consists an 'Accident Detection System' which detects if the riders has been involved in an accident and if so, it requests help from nearby authorities autonomously. In case the rider is riding in an empty area or at night, when there aren't many (or any) people around them to provide assistance such a system can be the difference between the life and death of that person.

V. OBJECTIVES

1. The main objectives of the Intelligent Helmet are:
2. Make it compulsory for MTW riders to wear a helmet and thus make the roads safer for them.
3. To prevent riders from cheating the helmet detection system.
4. Turn the MTW off when the helmet is removed or Accident occurs.
5. Detect Accidents.
6. Provide quick assistance to the rider in case of an accident.
7. Inform about these accidents to the rider's chosen relatives.
8. Also provide medical or police assistance to the rider in case the rider is in distress.

VI. SYSTEM SPECIFICATIONS

- **USER CLASSES AND CHARACTERISTICS**

The Intelligent Helmet functions with the help of some core components that are Arduino Mega Microcontroller (ATMega 2560), ESP8266 Microcontroller, Arduino Nano Microcontroller, GPS Module, Accelerometer, RF Transmitter and Receiver and an Android device.

Using the capacitive coupling principle and contact sensor the microcontroller determines if a human has worn the helmet. On confirming this it allows the ignition of the bike. Then the system keeps checking if the SOS button has been pressed or the G force measured by the accelerometer exceeds a threshold value. If any of these two events takes place then the GPS module sends the current co-ordinates to the NodeMcu microcontroller which in turn sends those to the mobile application. On receiving the coordinates the mobile application determines the name of the locality, city and state of those coordinates and sends these coordinates and the user's details in an emergency message that is sent to the closest police station, hospital and selected relatives of the user. All of this will allow the emergency services to reach the accident location on time and thus can be the difference between the life and death of the user.

The Android Application asks the user to enter their medical details such as age, gender, blood group, any specific or acute conditions or allergies, etc. These details of the user will allow the medical staff to quickly assess the situation and provide the appropriate treatment and help skip some redundant checks beforehand

- **REQUIREMENTS:**

1. Hardware requirements:

A) Microcontroller: Arduino mega 2560 Rev. 3

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC- to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

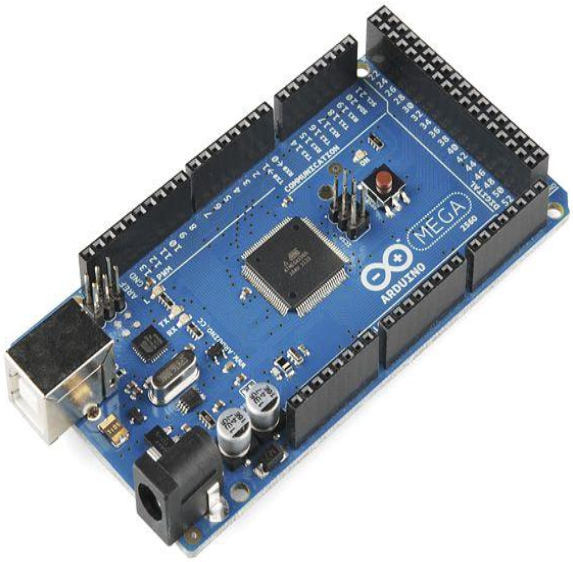

Figure 1: Arduino Mega Microcontroller

B) G-Force sensor (accelerometer): ADXL 335 or chip MPU-6050

An accelerometer is a device that measures proper acceleration. Proper acceleration, being the acceleration of a body in its own instantaneous rest frame, is not the same as coordinate acceleration, being the acceleration in a fixed coordinate system.

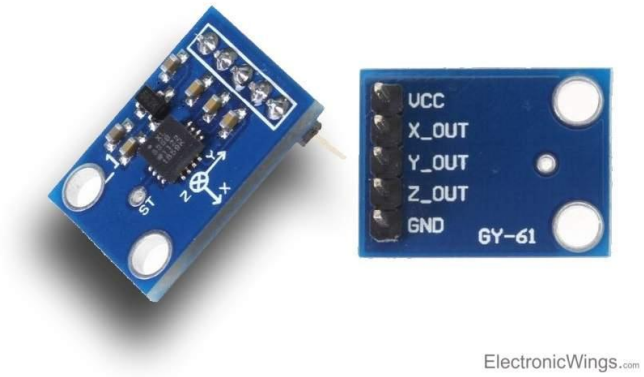

Figure 2:3-axis Accelerometer

C) Wi-Fi: ESP8266 Microcontroller

The ESP8266 is a Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by manufacturer Espressif Systems in Shanghai, China.

Figure 3: NodeMcu Microcontroller

D) GPS module: Ublocks Neo-6m

The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module.

Figure 4: GPS module-Neo6m

E) RF Modules: Generic 315/433 MHz transmitter/receiver module

An RF module is a small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency communication.

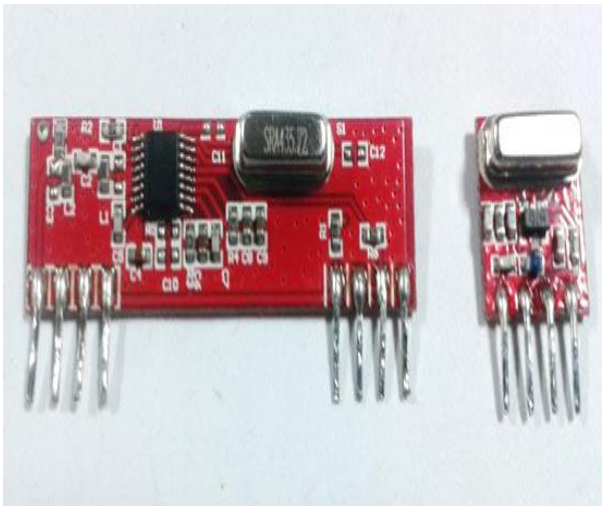

Figure 5: RF Receiver (Left) and Transmitter (Right)

F) Touch Sensor: TTP223

The TTP223 is a touch pad detector IC replicating a single tactile button. The LED will turn on when we touch the TTP223 Capacitive Touch Sensor Module.

Figure 6: Touch sensor

G) Relay:

A relay consists of an electromagnet that, when energized, causes a switch to close or open. Relays provide complete electrical isolation between the control circuit and the circuit being controlled.

Figure 7:Relay Module

2. Software requirements:

A) Android Application with Internet and mobile network connectivity.

- **USER INTERFACE**

The User Interface is provided by the mobile application of the Intelligent Helmet System. It is easy to use and interact with and allows the user to enter their medical details and specify the contacts or people that they want to be informed in case of an accident. The application allows to specify multiple contacts and all of them will be specified with the help of an SMS.

- **PROPOSED SYSTEM ARCHITECTURE:**

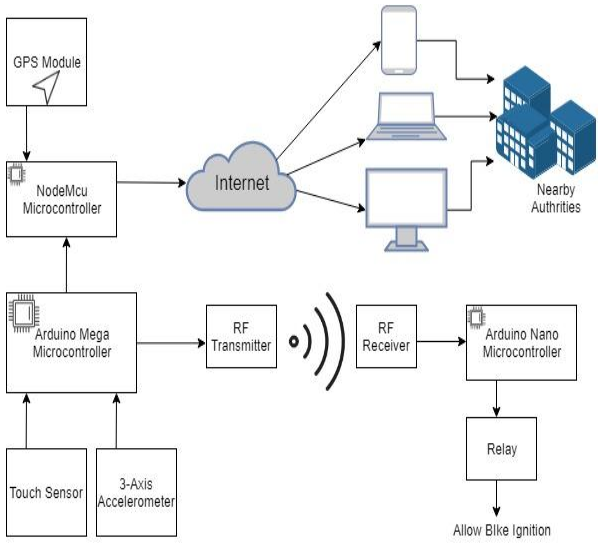

Figure 8: System Architecture

VII. ADVANTAGES and LIMITATIONS

1. **Advantages-**

- User Friendly.
- Access to authorized personnel only.
- Emergency Services provided in case of accidents.
- Enhances the user safety.
- Relatively Inexpensive.
- Reduced delay in providing required assistance.
- Informs Medical officers regarding the medical details of the user stored by the android application

2. **Limitations-**

- Requires Internet Connectivity.
- Requires Android Device
- Requires Mobile network connectivity

VIII.FUTURE SCOPE

Currently the system stores the details of only a single user, in the future this can be extended to store the details of multiple users and also their specified contacts in the form of different user profiles.

Example: Suppose there are three profiles-First profile is of Sanjay B. Age-28, Gender-Male, Blood Group-AB+, Has Asthma, No allergies.

Second profile is of Anita J. Age-33, Gender-Female, Blood Group -A+, suffers from Low Blood Pressure, No Allergies.
Third Profile is of Omprakash G. Age-59, Gender – Male, Blood Group-B-, suffers from high sugar and thoiroid, Allergic to Dairy.

Also, a system can be implemented to store the location of all the accidents in a centralized server and then using an AI system the High Risk roads and areas can me recognized and thus informed to the government and meanwhile advise the riders to take an alternate route to avoid accidents.

IX.CONCLUSION

This project work will help make riding motorbikes safer for people by enforcing the use of helmet and enable

quick response to crashes from emergency services and hence save precious lives.

X. ACKNOWLEDGEMENT

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