

‘SMART SAFE SECURE HELMET SYSTEMS’

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ABSTRACT

This project aims to ensure the safety and security of the bikers against road accidents. The primary objective of the project is to develop a smart helmet which has intelligent circuit to provide precaution to the bikers.

Features of the Helmet include – **Location tracking, accident detection, helmet detection.**

This is done by incorporating various technologies like **Bluetooth module (HC-05) connection, Mobile Sensor Data Interpretation (Accelerometer)** and **Android App development processes in Java.**

Master and Slave Architecture is implemented using Arduino Uno (ATmega328P).

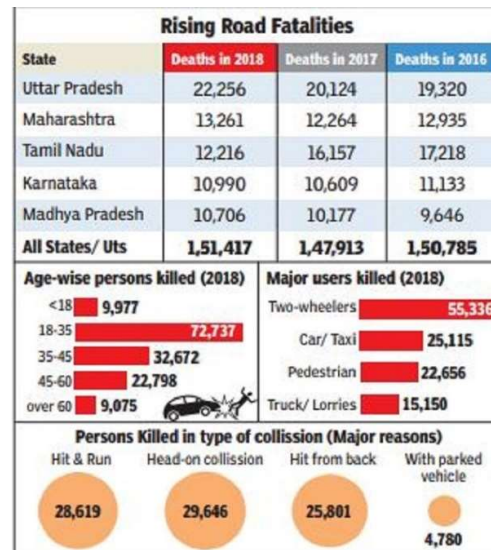
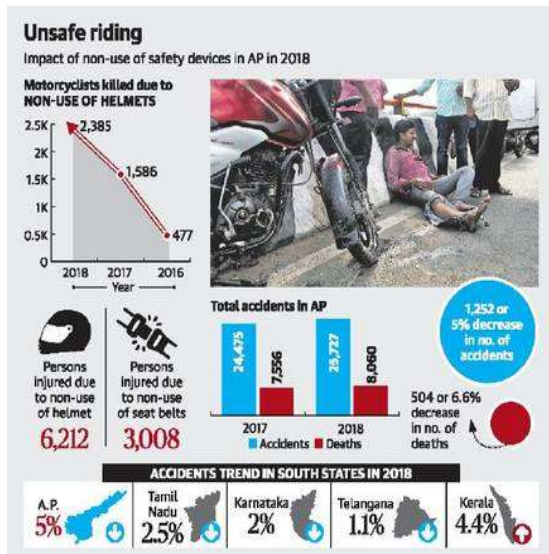
CHAPTER 1

INTRODUCTION

1.1 Background

The number of road accidents has increased at an alarming rate over the past decade. Majority of the casualty involved was that of the bikers. According to the statistics provided by the government, out of 73 people killed in road accidents in 2017 in Bengaluru, 66 died due to not wearing helmets. In 2018, out of 44 people killed in road accidents, 40 died due to not wearing helmet.

Wearing a helmet may significantly reduce the injuries incurred by the rider and may also prevent worst case scenario of death.



1.2 Relevance:

Thus, this project aims to improve road safety by ensuring the rider has worn Helmet while riding a two wheeled vehicle, to avoid serious head injury during an accident. If the rider has not worn his/her helmet, an alarm goes off reminding the rider to wear the helmet.

In case of an accident, the concerned authority like the Police Department and the Medical department, along with the rider's emergency contacts shall be informed along with the rider's location.

1.3 Literature Survey

<u>Sr No:</u>	<u>Title</u>	<u>Authors</u>	<u>Techniques</u>	<u>Advantages</u>	<u>Disadvantages</u>
1)	<u>Smart Helmet with Sensors for Accident Prevention</u>	By: Mohd. Khairul Afiq, Mohd Rasli, Nina Korlina Madzhi, Juliana Johari.	Use of FSR and BLDC fan to detect accident	Reduces response time in case of accident	Uncontrolled radiation of the RF module
2)	<u>Smart Helmet</u>	By: Nitin Agarwal	Circuit prevents ignition of vehicle if helmet is not worn	Improves motorcycle safety	Uncontrolled radiation of the RF module
3)	<u>Smart Helmet to Avoid Road Kills (SHARK)</u>	By: Ashwinkumar, T. Limbanee.	Review of all other smart Helmet systems	Provides information about the necessity of smart helmet systems	Bike will not start when there is no helmet. So, the vehicle cannot be used at the time of emergency
4)	<u>Accident Detection and Smart Rescue System using Android Smartphone with Real time Location Tracker</u>	By: Arsalan Khan, Farzana Bibi and Mohd. Dilshad.	Detection of accident using smartphone sensors	Reduces response time	Less reliability
5)	<u>Smart Helmet</u>	By: Jawwad Patel	Wireless Communication using Bluetooth between components.	Additional Features like Smoking, alcohol, and theft detection	Complicated design and not feasible for real world implementation
6)	<u>Accident Detection System using Android Application</u>	By: Ashish Patil and Yadav Abhilash.	Automatic Accident Detection using Android Application	Reduces fatality rate even in rural areas	High cost due to expensive components
7)	<u>Go Safe: Android Application for Accident</u>	By: Isha Khot, Madhura Jadhav, Abhijeet Desai and	Notifies user in case of Accident nearby using	In case of an accident, the system finds the nearest	Not 100% Accurate due to various obstacles

	<u>Detection and Notification</u>	Vaibhav Bhangar.	sensors like accelerometers	emergency point.	
8)	<u>Car Accident Detection and Notification System using Smartphone</u>	By: Zainab Salim Alwan	Accident Detection using Smartphone sensor and notification system using Web Server	Image and Video Monitoring in case of Accident for Precision.	False Positives

1.4 Motivation

We started our investigation with the basic question – “What can we do to reduce the fatalities in road accidents?”. We came to know, that use of Helmets can reduce the risk of death in case of accident by almost 85%. Also, we intrigued to ourselves – “How can we reduce the response time of emergency services in case of an accident?” All this motivated us to develop our system, which we proudly rely on, to reduce the risk of death in case of an accident.

1.5 Problem Definition

Today in the age of ‘Smart India’, there is a need to provide a Smart Helmet system, which will reduce the risk of death, as well as ensure that the helmet is worn by the rider. In doing so, one faces many problems like reliability, range, and the most important part – Cost of the system.

1.6 Scope and Objectives

The main objective is to ensure that the helmet is present on the rider’s head. The second objective is to reduce the response time of emergency services in case of a mishap accident by notifying them. Future scope is to increase the accuracy in detection of an accident by testing the system in relevant environments.

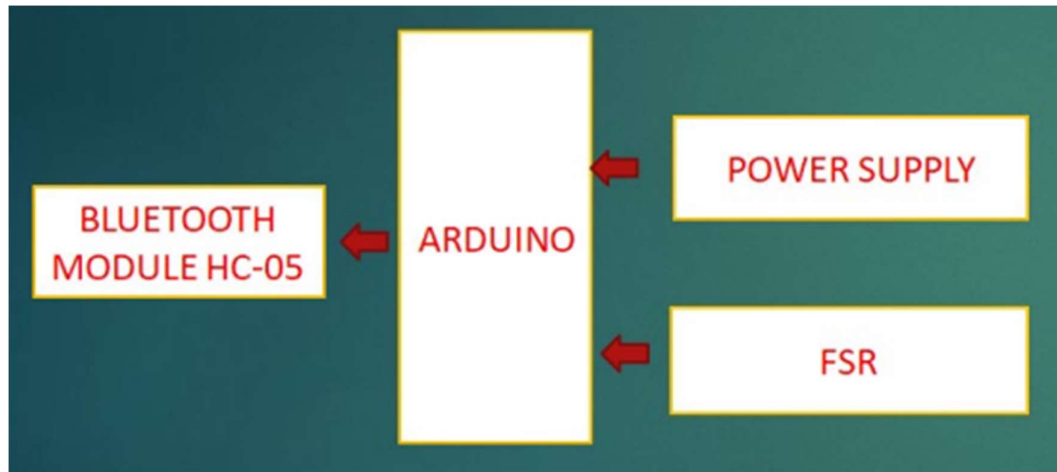
1.7 Technical Approach

We used FSR to detect the presence of helmet on the rider's head. Also, we have designed an Android application for the detection of accident, which monitors the data from the Smartphone's accelerometer. If the value exceeds a certain limit, the Location of the rider is sent to the relevant authorities and the emergency contacts.

CHAPTER 3

INTRODUCTION OF HELMET DETECTION SYSTEM

Block Diagrams:



Helmet Module



Vehicle Module

COMPONENTS USED AND THEIR FEATURES-

1) Arduino Uno (ATmega328P) (2):

- The operating voltage is 5V.
- The recommended input voltage will range from 7v to 12V.
- The input voltage ranges from 6v to 20V.
- Digital input/output pins are 14.
- Analog i/p pins are 6.
- DC Current for each input/output pin is 40 mA.
- DC Current for 3.3V Pin is 50 mA

2) Bluetooth module HC-05 (2):

- Bluetooth protocol: Bluetooth Specification v2.0+EDR
- Frequency: 2.4GHz ISM band
- Modulation: GFSK (Gaussian Frequency Shift Keying)
- Emission power: $\leq 4\text{dBm}$, Class 2
- Sensitivity: $\leq -84\text{dBm}$ at 0.1% BER
- Speed: Asynchronous: 2.1Mbps (Max) / 160 kbps, Synchronous: 1Mbps/1Mbps

3. Force Sensing Resistor:

- Actuation Force - 0.1
- Newtons Force Sensitivity Range -0.1 - 10.02
- Newtons Force Repeatability (Single part) - $\pm 2\%$
- Force Resolution - continuous
- Force Repeatability³ (Part to Part) - $\pm 6\%$
- Non-Actuated Resistance - 10M Ω
- Size -18.28mm diameter
- Thickness Range -0.2 - 1.25 mm

4. AND Gate IC7408 (1)

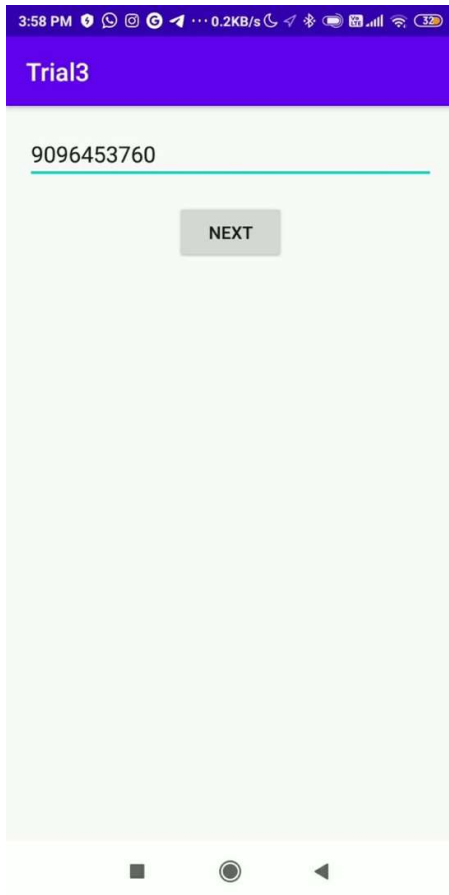
5. OR Gate IC7432 (1)

6. Buzzer (1)

7. Jumping wires

INTRODUCTION OF ACCIDENT DETECTION SYSTEM

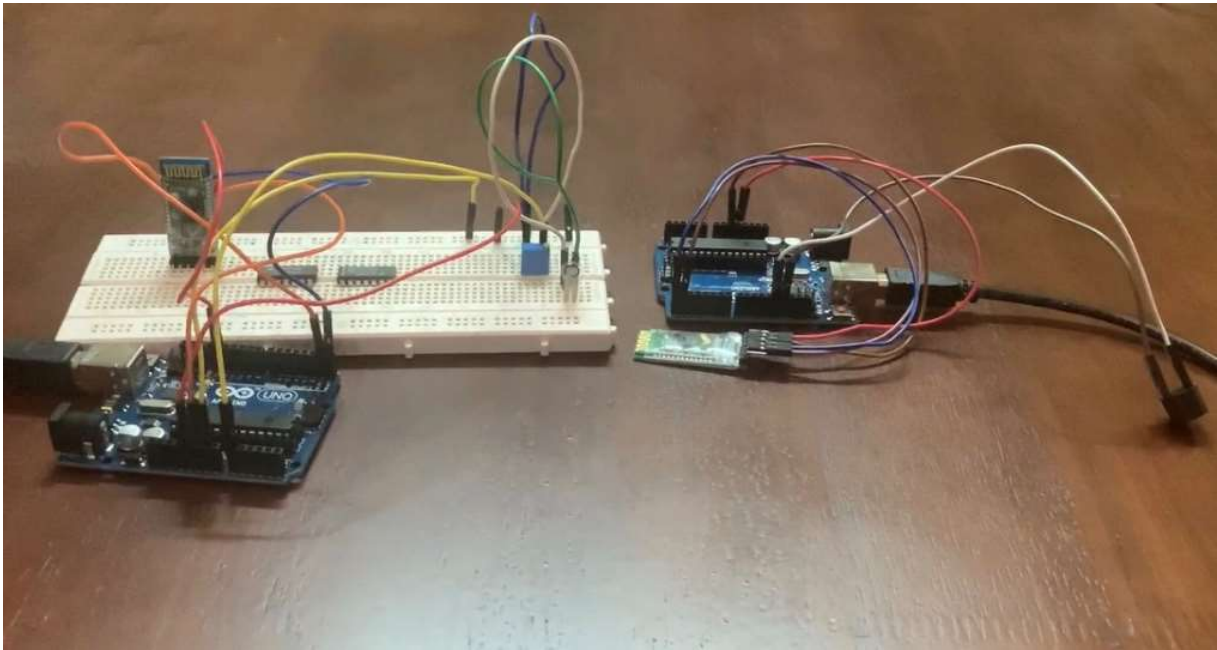
An Android app written in Java, which detects accident using Smartphone sensor i.e. Accelerometer. In case of accident, the App sends the location of the rider to the emergency services as well as emergency contacts in the form of an SMS.



Above given, are the pictures of the Android app's working. The left one depicts the entry of emergency contact, while the right one shows the location tracking when the app detects an accident.

CHAPTER 3

PROPOSED SYSTEM



The above picture is the Prototype of the Helmet Detection Module.

Working of the Helmet Detection Module:

The helmet detecting system works on wireless communication between the helmet and the vehicle. The helmet comprises three latch switches on the inner surface.

Setup 1 Consisting of Arduino micro controller and Bluetooth module HC-05 configured as a master module is implemented on the helmet.

Setup 2 Consisting of Arduino micro controller, Bluetooth module HC-05 configured as a slave module and a buzzer) is set up on the vehicle.

When the vehicle is switched on, the slave setup uses the vehicle's power to ring the buzzer. Thereafter, upon wearing the helmet, the pressure exerted from the rider against the helmet's inner surface is sensed using the FSR. If the pressure exerted on the FSR is greater than the experimented threshold value, then a signal is sent from the master module to the slave module and the buzzer stops buzzing. In this way, the system senses whether the rider has worn a helmet, thereby ensuring his/her safety.

Working of the Accident Detection Android application:

The Android App first sets the emergency contacts provided by the user. It then monitors the data values from the Smartphone's Accelerometer. If the Value is greater than a certain value (which is 4g in our case), it then notifies the emergency contacts in the form of an SMS. It also sends the Location of the rider to the contacts. In this way, the emergency services can approach the location of accident as soon as possible. Thereby, reducing the risk of casualty.

Conclusions:

The System makes a successful and errorless detection of the presence of a helmet on the rider's head. Also, the accident detection app works very successfully in achieving the task of accident detection and notification. However, there is still a minor scope of False Positives in Accident Detection.

Future Scope:

- During mass production, the cost per system will be reduced to 60%. But we're planning to reduce it to a lesser cost.
- We're also planning to implement media connectivity onto the Helmet module.
- The testing of this system for accurate data set is yet to be implemented.