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Advanced Smart Helmet

Jhansi R[1], Rohith Pratiush[2], Sankalpa B Reddy[3],Deepika D Pai[4]
[1](Student, Electronics and Communication Engineering, Vemana Institute of Technology/ VTU, India)
[2](Student, Electronics and Communication Engineering, Vemana Institute of Technology/ VTU, India))
[3](Student, Electronics and Communication Engineering, Vemana Institute of Technology/ VTU, India)
[4](Assistant Professor, Electronics and Communication Engineering, Vemana Institute of Technology/ VTU, India)

Abstract:
The idea of developing this project comes from social responsibilitytowardsthe society. Bike riding is fun, but accidents are inevitable. In India, more than 37 million people are usingtwo-wheelervehicles. Since usage is high accident percentage oftwo-wheelers are also high. This project aims for accident avoidance, safety andsecurity of the bike rider. The main purpose of this project is to encourage wearinghelmets. The proposed system willensurethat the motorbikedoes not start unless therider iswearing a helmet and has not consumedalcohol. Hence, making sure that therider is fit to ride.
Key Word*: Safety, Smart Helmet, IoT*

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I. Introduction

Nowadays, the number of deaths due to accidents have increased in our country. Every day, there are deaths happening due to accidents and the majority of these deathsare related to bike riders who are not wearing a helmet. In order to reduce the deathsdue to such accidents, smart helmets play a major role. The main role of the smarthelmet is to make sure that the rider is wearing his/her helmet before starting the ride.Only when the rider buckled the helmet then the motorcycle's engine will start. If therider doesn't wear the helmet or removes it while he is riding, the vehicle stops. Thehelmet will be fitted with Force/Pressure sensors which detect the presence of therider during his/her journey.

Overspeeding is another main reason for accidents. Therefore, motorcyclists will bealarmed when the speed limit is exceeded. Another use of this smart helmet is to makesure that the rider does not ride the vehicle after consuming alcohol. In order to preventthe rider from riding the vehicle after the consumption of alcohol, MQ-3 Alcohol sensors willbe used to check if the rider has consumed before starting the ride. If the sensor sensesthat the rider has consumed alcohol, the bike will not start. A Force Sensing Resistor(FSR) and BLDC Fan are used for the detection of the rider's head and detection ofmotorcycle's speed respectively. A 315 MHz Radio Frequency Module is a wireless linkwhich able to communicate between the transmitter circuit and the receiver circuit. PIC16F84ais a microcontroller to control the entire component in the system. Usually, riders use the phone to check maps while riding which is dangerous as their concentration will be onthe phone. To overcome this problem, the smart helmet will be provided with atransparent display which is exclusively used to display the maps. The display screenwill be fitted on one layer of the helmet and will be visible to one eye. The rider can pulldown the display screen whenever he wishes to use it. Since it is a transparent display,the rider can also see what's ahead of him simultaneously.

II. Literature Survey

This chapter provides an overview of previous research on Face Detection andFace Recognition. It introduces the methodology and algorithms that can be used forthe project. It exposes the problems that can be faced and helps to overcome thesame.

[1]H.C.Impana, M. Hamsaveni and H.T. Chethana - A Review on Smart Helmet forAccident Detection using IOT

This survey is on smart helmets for accidence avoidance and also examines variousrelated techniques. This research also helps us to understand IoT technology which isbeing emerged nowadays. The method proposed using a microcontroller RF transmitterand other sensors is cost-effective in comparison to the system proposed usingRaspberry pi module, Pi camera, Pressure Sensor, GPS system which uses imageprocessing algorithms.

This system is the most efficient since the image processing isincluded so that we can easily detect the use of helmet from the rider. Smart helmetsystem helps to provide safety and security to the two-wheeler.

[2]. Mr.Sethuram Rao, Vishnupriya.S.M , Mirnalini.Y, Padmapriya.R.S - The HighSecurity Smart Helmet Using Internet Of Things
The main objective is accident detection, notification, and prevention. This helmetmakes riders feel comfortable as well as provides them with high protection and security. This smarthelmet works on a raspberry pi 3 controller which is WIFI based and acts as a station for thenetworking system. Bluetooth and raspberry pi 3 were interfaced with cloud-basedservices. The helmet is interfaced with both vehicle and the cloud in which images canbe accessed and sent to the receiver. Sensors will send commands to raspberry pi 3.Thus, the command will be sent to the receiver. A software application has beencreated such that it locates the exact position in terms of Google Maps. Cloud-basedservices will send messages to receiver contacts in which the database is recorded. Mostof the accidents are due to rash driving, drunk and drive, using mobile phones whiledriving, and violating traffic rules and regulations.

[3]. Divyasudha N, Arulmozhivarman P - Analysis of Smart helmets and Designingan IoT based smart helmet: A cost-effective solution for Riders
The proposed system in this paper, triggers an automatic alert message to theconcerned person or to the ambulance in case of any emergency situation like anaccident. The alert message consists of the details such as the location of the accident andtime of accident, which will help to speed up the first aid service to the casualty. TheInternet of Things (IoT) can provide an infrastructure which integrates the smartservices with situational responses, and also allows mutual communication betweensmart things or devices and people over a network. So, the idea of IoT based smarthelmet ensures the safety of the rider while riding. The proposed system allows therider to start a bike only on wearing the helmet.This system will not allow driver to ride if he had consumed alcohol. This systemidentifies the bike accidents with accuracy and gives information to the nearby hospitaland relatives of the rider who met with an accident. It also tracks the location details ofthe rider and alcohol consumption of the rider and will be stored in the cloud/server.
[4].Jesudoss A, Vybhavi R and Anusha B - Design of Smart Helmet for AccidentAvoidance
The main objective discussed is designing a smart helmet for accident avoidance andalcohol detection. The IR sensor checks if the person is wearing a helmet or not. TheGas sensor recognizes the alcoholic substance in the rider's breath. If the person is notwearing a helmet and if he consumes alcohol, the bike will not start. If there is nosign of alcoholic substance present and the helmet is used, then only the bike will start.At the point when the rider meets with an accident, the sensor recognizes thecondition of the motorbike and reports the accident. Then the GPS in the bike will sendthe location of the accident place to the main server of the nearby hospitals.

III. Design Methodology

In our proposed system for making a smart helmet using the microcontroller MSP430,the system is instantiated automatically when the force sensor and alcohol sensor givethe required output. Once the microcontroller, receives the input it sends an input signalto the relay which turns on the ignition with the help of the starter circuit.

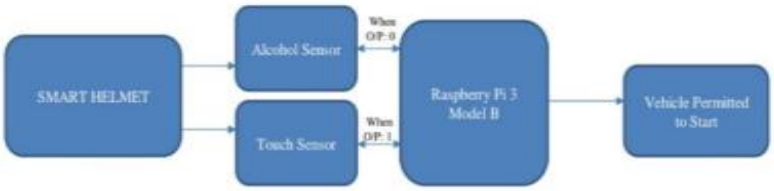


Fig 1. Block diagram of proposed smart helmet

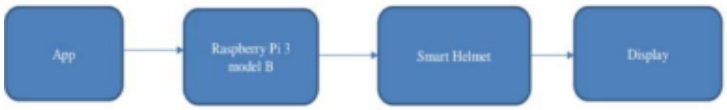


Fig 2. Working of Display

Sensing the data using Pressure and Alcohol sensor
Pressure/Force sensors and Alcohol sensors are installed in the helmet to sense theirdata respectively. A pressure sensor is used to detect if the rider is wearing his helmet. Ifthe rider is wearing it, then the sensor will send the data to the microcontroller. Once therider is detected, the alcohol sensor should start sensing the data. If the alcohol sensor
doesn't receive any data, that is, if the output is zero, the microcontroller lets the vehicleto turn on.

Raspberry Pi
The microcontroller used in this system is Raspberry Pi. Once the data is received fromthe sensors, it is passed on to the microcontroller which is the central processing unit ofthis smart helmet system. Once the required data is received from the sensors, themicrocontroller sends a signal to the relay circuit, which then allows the vehicle to start.Along with this, the raspberry pi is also used to run the software part. Raspberry pi isused to run the codes which are written for both the sensors and for display part. Oncethe program is executed on raspberry pi terminal without any error, the correct outputcan be checked or displayed.

Database
The Database is used to store the information regarding the data received by the app. In theproposed system, Firebase database is used. It provides a real time database instance.

Relay Circuit
In this proposed system the relay circuit is used to turn on the ignition of the vehicledepending on the input provided by the microcontroller which determines if the rider is fit toride.

Bluetooth Module
The Bluetooth module used is HC-05. This module manages the communication channel ofthe wireless parts. The Bluetooth module can receive and transmit the data from themicrocontroller to the mobile device and vice versa.

Phone/display
The display mentioned in the block diagram is a phone screen which displays the maproutes, notifications and calls to the rider. The screen is going to be transparent which isnot going to create distraction for rider.

Starter
The starter is a circuit which receives input data from the relay circuit and turns on the
ignition of the vehicle.

Battery
Acts as a power source for the entire system. The battery used is a normal 5V battery. Alithium-ion battery or Li-ion battery is a type of rechargeable battery composed of cells inwhich lithium ions move from the negative electrode through an electrolyte to the positiveelectrode during discharge and back when charging. Li-ion cells use an intercalated lithiumcompound as the material at the positive electrode and typically graphite at the negativeelectrode. Li-ion batteries have a high energy density, no memory effect (other than LFPcells) and low self-discharge. Cells can be manufactured to prioritize either energy or powerdensity.They can however be a safety hazard since they contain flammable electrolytesand if damaged or incorrectly charged can lead to explosions and fires.

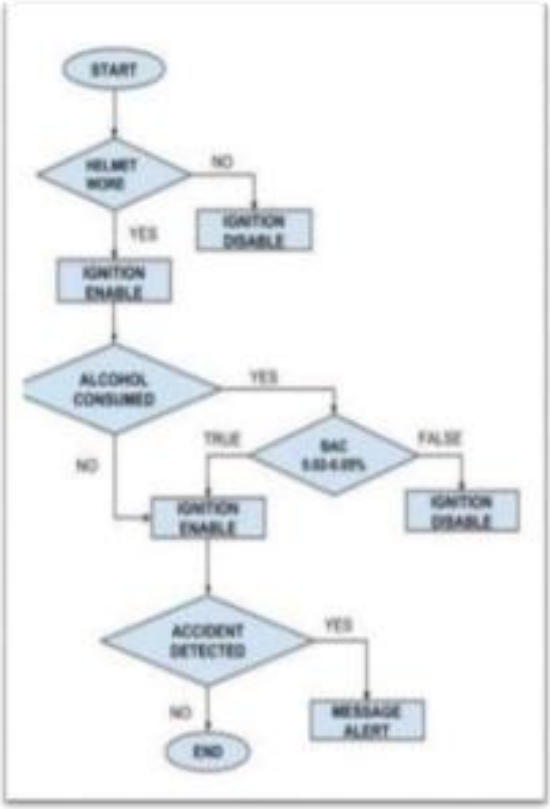


Fig 3:Flow chart of the proposed System

IV. Hardware and Software Requirements

Raspberry Pi

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, hosting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wirelessLAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT.The dual-band wireless LAN comes with modular compliance certification, allowing theboard to be designed into end products with significantly reduced wireless LANcompliance testing.Thus, raspberry Pi is considered as the Central Processing Unit of this system. Alloperations are done on this raspberry board and in the raspberry pi server. Theraspberry pi is fitted with a 32 GB micro-SD card to store the information of the codeswhich are to be executed by the server.

MQ3 alcohol sensor

MQ-3B gas sensor has a high sensitivity to alcohol gas and can be resistant to theinterference of gasoline, smoke and vapour. It is low-cost and suitable for variousapplications of detecting alcohol at different concentrations. Features include: It has goodsensitivity to alcohol in a wide range, and has advantages such as a long lifespan, low cost and simple drive circuit.

Touch sensor

The Generic T60 is a touch pad detector IC which offers 1 touch key. The touchingdetection IC is designed for replacing traditional direct button keys with diverse pad size.Low power consumption and wide operating voltage are the contact key features forDC or AC applications

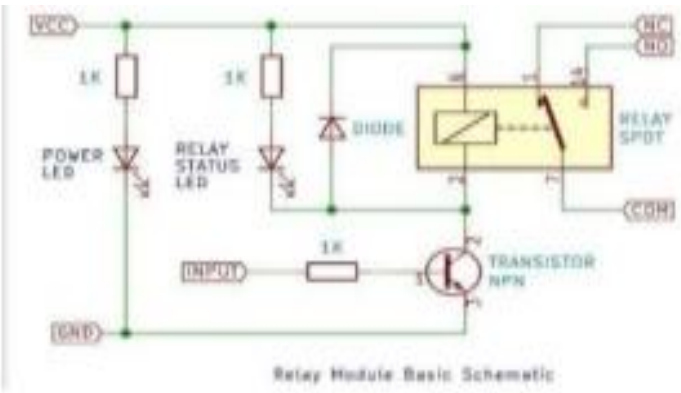
.

Bluetooth Module

Speed: Asynchronous: 2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps. Security:Authentication and encryption. Profiles: Bluetooth serial port. Power supply: +3.3VDC50mA, frequency: 2.4GHz.

Relay Circuit

Switched Voltage: +/- 200 V Peak, Switched Current: 0.5 Amps, Switched Power: 10 VA,Breakdown Voltage: 300 V peak, Carry Current:1.0 Amps, Voltage Offset: 20 uV, Minimum Current: 100 pA.



Software Language

Programming language used in project are python version 3.8 and kotlin version1.6.0.Python is mostly used for backend programming and kotlin is mostly used for thebackend for app development. Front end of the app is mostly done in XML language.

Software For App Development

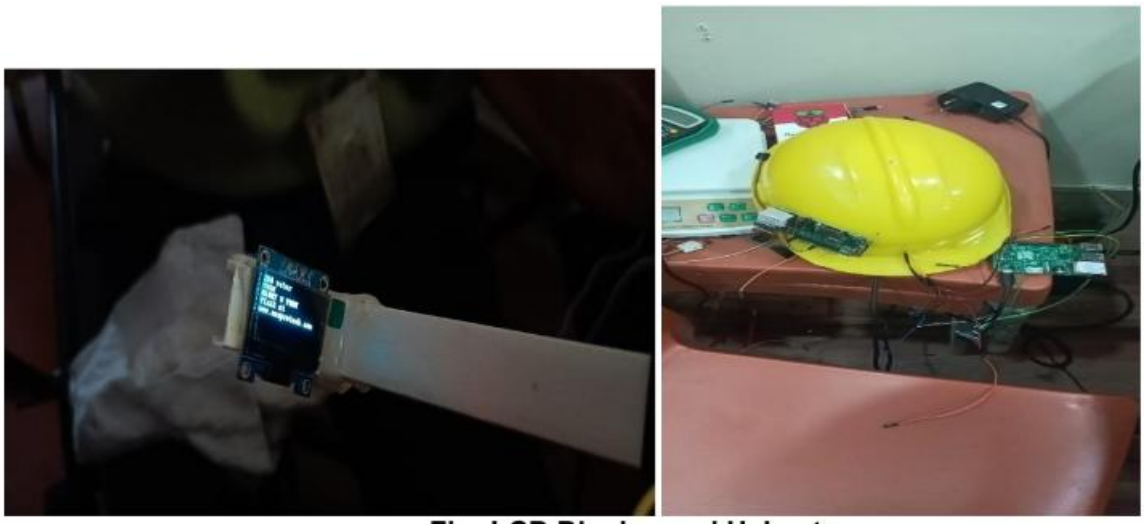
Android studio code is the IDE which we are using to create the app. Android studio is oneof the best option to create the android app it is designed specially by google for creatingapp for android .The environment of android studio is quite easy to understand .Androidstudio is powered by gradel . Android studio is built on jetbrains IntelliJ IDEA softwaredesigned specifically for android developers. Built in support for google cloud platformenabling integration with firebase cloud messaging and google app engine. Android VirtualDevice which is also known as Emulator to run and debug apps in the android studio. Theandroid studio supports all the same programming language e.g java, c++ and more.

Software Used For Database

Firebase is a platform developed by google for creating mobile and web applications. It wasoriginally an independent company founded in 2011.Google acquired the platform and it is now their flagship offering for app development. Firebase real time database, an API thatsynchronizes application data across ios , android and web devices and store it in cloud.

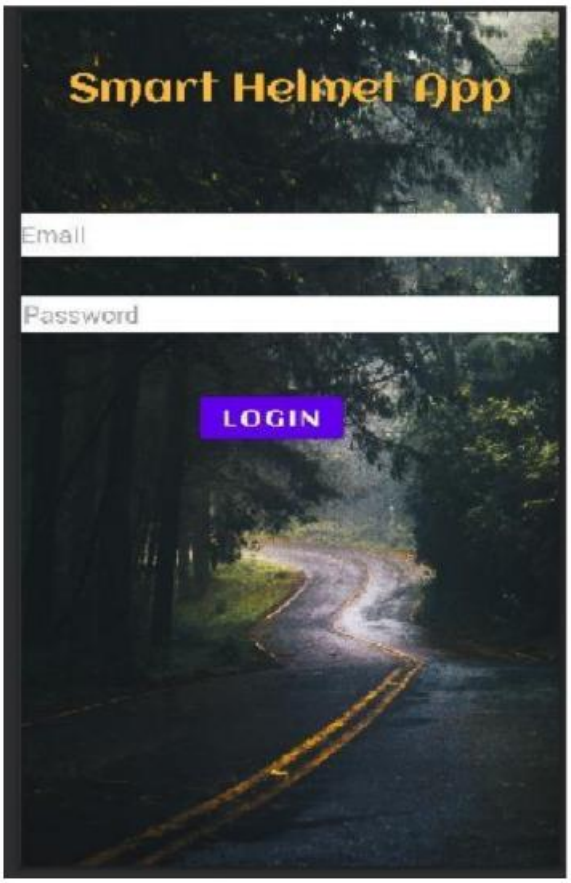
V. Results and Discussions

We have created the front end of the app by using android studio app. We created twoactivity our first activity is registration page on which user is going to register himself bygiving some information. Other activity is login page where user can go by clicking LOGIN.This button is connected to the login activity which takes user to login page where user cangive his/her basic information and able to use the services which are provided by the app.



LCD Display and Smart Helmet

Registration Page



Login Page

VI. Conclusion

The designed Smart helmet ensures the safety of the rider by making it necessary to wearhelmet, and also ensures that the rider hasn't consumed alcohol more than the permissible limit.If any of these prime safety rules are violated, the proposed system will prevent the biker fromstarting the bike. The system also helps in efficient handling of the aftermath of accidents bysending a SMS with the location of the biker to the police station. This ensures that the victimsget proper and prompt medical attention if he/she met with an accident.

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