Project Based Learning

Class & Batch   : SE 5 (E-5)   **Group:E5_1**

Synopsis

on

"SafeRide - Helmet wear and alcohol detection system"

Submitted By

Roll No.	Name of the Student	e-mail id	Mobile No.
22102	Aditi Zeminder	aditizeminder2003@ gmail.com	7219113749
22112	Pranav Bhiungade	pranavbhiungade25 @gmail.com	8262056084
22117	Prem Deshmukh	premdeshmukh1818 @gmail.com	7020404591
22118	Shravani Deshmukh	shravanideshmukh27 11@gmail.com	9673004373

Project Guide
Ms. Bhakti Kadam

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING
PUNE INSTITUTE OF COMPUTER TECHNOLOGY

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1. **Project Title:** SafeRide - Helmet wear and alcohol detection system

2. **Introduction/ Motivation:**

      "SafeRide" is an innovative and advanced technology designed to improve bike riders' safety. "SafeRide" is a combination of a helmet and various sensors that monitor different parameters such as alcohol, wear detection, and accidents. Our project has the potential to revolutionize safety in bike riding where risks of accidents are very high due to not wearing helmets and consuming alcohol while driving. This system can help prevent accidents and save lives. In this project, we will explain the development and implementation of the "SafeRide". We will look into the technology used and the challenges faced during the development process. This project aims to benefit bike riders and the prevention of deaths due to accidents.

Motivation:

Road accidents are multi-causal and are the result of an interplay of various factors. These can broadly be categorized into those relating to (i) human error, (ii) road conditions/ environment, and (iii) vehicular conditions. These factors act in an interactive manner to cause road accidents. Therefore, any strategy for designing the countermeasures for accidents should be based on a safe systems approach that simultaneously recognizes traffic legislation's importance for promoting safe road user behaviors. [1]

Accidents caused by human error include

(i) traffic rule violations

(ii) driving without a valid driver license and

(iii) non-use of safety devices.

NON-USE OF SAFETY DEVICES – HELMETS AND SEATBELTS

During 2021, a total of 46,593 persons were killed due to non-wearing of helmet, of which 32,877(70.6%) persons were drivers and 13,716 (29.4%) were passengers and Non-wearing of helmet caused injuries to 93,763 persons.

In most countries, motorcycle riders are forced to wear the helmet and not over speed the vehicle, but the riders are still violating the rules. Riders are vulnerable to accidents and injuries, and even the slightest mistake can have severe consequences. While wearing a

helmet is a crucial safety measure, it is not always enough to prevent accidents. Therefore, there is a need for a smart helmet that ensures the safety of the rider and checks for alcohol consumption.

The smart helmet is an advanced technology that is designed to make motorcycle riding safer and more secure. It is equipped with various sensors and features that can detect the rider's behavior and take corrective actions to prevent accidents. For instance, the helmet can detect whether the rider is wearing the helmet and alert them if they are not. This feature ensures that the rider is adequately protected and reduces the risk of head injuries in case of an accident.

Another critical feature of the smart helmet is its ability to check for alcohol consumption. Riding under the influence of alcohol is one of the leading causes of motorcycle accidents, and the smart helmet can help prevent such incidents. The helmet's sensors can detect alcohol levels in the rider's breath and provide alerts if the levels exceed a safe limit. This feature promotes responsible behavior and encourages riders to make sound decisions while on the road.

A total number of 4,12,432 road accidents have been reported by Police Departments of States and Union Territories (UTs) in the country during the calendar year 2021, claiming 1,53,972 lives and causing injuries to 3,84,448 persons. Among vehicle categories involved in road accidents, two-wheelers for the second consecutive year, accounted for the highest share in total accidents and fatalities during 2021.In terms of road-user categories, the share of two-wheeler riders in total fatality has been the highest (45.1%) during 2021.

Table.1 Data of Drivers and Passengers who died due to accidents

Category	Non-Wearing of Helmet		Non-wearing of Seat Belt	
	Killed	Injured	Killed	Injured
Drivers	32,877	57,264	8,438	16,416
%Share in Total	70.6	61.1	51.5	41.8
Passenger	13,716	36,499	7,959	22,815
%Share in Total	29.4	38.9	48.5	58.2
Total	**46,593**	**93,763**	**16,397**	**39,231**

3. Literature Survey / Prior work :

The objective of the present invention was to develop a safety helmet for two-wheeler drivers that can provide safety and avoid road accidents. Various sensors are integrated for effective improvement in safety purposes. The proposed invention is a smart helmet that is incorporated with an infrared sensor to sense the motion of the human head inside the helmet. It checks whether the helmet is worn or not. The helmet is also equipped with alcohol sensors that sense alcohol consumption by analyzing human breath. The ignition will be conditioned on the level of alcohol content in the breath. The bike will not start until and unless the driver wears the helmet and has not consumed alcohol. It fits with a piezo-electric sensor used to measure changes in acceleration, pressure, or force used to inform the system about the accident. Additionally, an ultrasonic sensor detects obstacles in the path to avoid any accidents.[2],[5]

4. Problem Definition and Objectives:

Problem definition: Design a smart helmet integrating various sensors and a breath analyzer to ensure safety of riders and prevent accidents caused by drunk driving.

Objectives:

a. To study statistics and research papers on existing projects related to the smart helmet to realize the depth of a problem and to define a final problem statement.

b. To Explore various electronic components and sensors applicable to the proposed system. Decide the most feasible components and check their availability in the market. Getting familiar with the Arduino IDE and design logic for integrating the microcontroller and various sensors.

c. To design a circuit diagram and use available simulation software to check the reliability of the designed circuit diagram.

d. To test and debug the finalized circuit diagram for various cases.

e. To create a final report on the proposed system including the literature survey, circuit diagram, working, and conclusion.
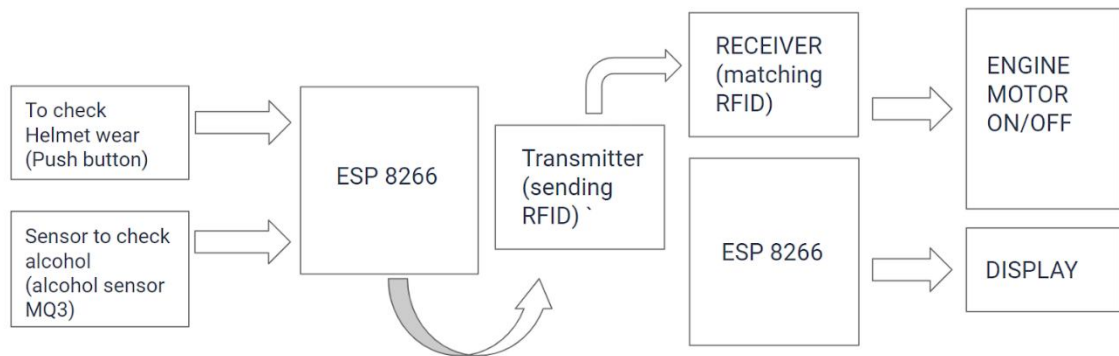
5. Block Diagram :

Fig. 1 Block Diagram of proposed system

6. Hardware Requirements:

a. To check Helmet Wear: Push Button.

b. To check alcohol measure: Alcohol Sensor MQ3 [4753]. [3]

c. Microcontroller ESP 8266 to interface the sensors, send and receive data from the transmitter and receiver module, and display required messages in the LCD display.[4]

d. FS1000A 433mHz Transmitter Receiver RF Radio Module, for wireless communication between the helmet and bike. [3]

e. 16x2 (1602) Character Green Backlight LCD Display to display appropriate messages.

f. 150 RPM Single Shaft BO Motor - Straight to show how the motors of the bike can be controlled (for the prototype).

7. Software Requirements:

Arduino IDE and ESP8266 library for interfacing the microcontroller with the sensors and different modules.

8. References:

[1] Government of India Ministry of Road Transport and Highway Transport Research Wing (2021), *"Road accidents in India 2021"* [Online]. Available : https://morth.nic.in/road-accident-in-india

[2] Hindustan Institute of technology and sciences, Chennai ,"Smart Helmet for two-wheeler drivers", India , Patent 201641025527, July 26, 2016.

[3] R. Senapati, S. Keesari, "Smart Helmet for safe driving", in *E3S Web of Conferences,* 2019, 87, 01023.

[4] Espressif Systems. (2016, May. 31). ESPRESSIF [Online].

 Available: https://www.espressif.com/en/products/socs/esp8266

[5] P. Koteswara Rao, P. Tarun Sai, N. Vinay Kumar, S.K. Yusuf Vidya Sagar, "Design and Implementation Of Smart Helmet Using IoT", Vijaywada (AP), India, 2020.