Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 13 Issue 4, April 2024

Smart Helmet System for Enhanced Motorcycle Safety

Prof. Jasmine Punitha
Assistant Professor, Department of CSE
Nehru Institute of Engineering and Technology
Coimbatore, India

Prof. Priya S
Assistant Professor, Department of CSE
Nehru Institute of Engineering and Technology
Coimbatore, India

R. Lohith Kumar
Student, Department of CSE
Nehru Institute of Engineering and Technology
Coimbatore, India

S. Muthukumar
Student, Department of CSE
Nehru Institute of Engineering and Technology
Coimbatore, India

N. Paramasivam
Student, Department of CSE
Nehru Institute of Engineering and Technology
Coimbatore, India

A. Aswin
Student, Department of CSE
Nehru Institute of Engineering and Technology
Coimbatore, India

Abstract **—Concerns for the safety of people, especially those engaged in activities such as riding motorcycles or bicycles, have increased in recent years. To solve this problem, the project plans to create a smart helmet with many sensors and communication modules that will improve safety measures. Key features of this smart helmet include a breathalyzer to detect the user's level of intoxication, a touch sensor to detect user intervention, a GSM module for communication communications, and a GPS module for location tracking. Key features include monitoring the user's alcohol consumption and interactions. If alcohol or touch is not detected, the system triggers an action such as adjusting the engine or sending an emergency message containing the user's location to the first contact. The hardware, including the Arduino Uno microcontroller, motor driver and necessary sensors, is integrated inside the helmet to ensure flawless operation. By integrating this technology, the smart hat application aims to increase user safety by providing real-time monitoring and communication in critical situations.**

Keywords **- Smart helmet, safety, motorcycle, bicycle, sensors, communication modules, alcohol sensor, touch sensor, GSM module, GPS module, monitoring, real-time, emergency, Arduino Uno, motor driver.**

INTRODUCTION

In today's world, safety is still the most important thing, especially when it comes to transportation such as riding a motorcycle or bicycle. With increased safety and accident prevention, new solutions that use technology are needed to improve user protection. In this context, the development of smart helmets has become a good way to solve safety problems. Provide users with unparalleled security. The basis of its design is the integration of alcohol sensors and touch sensors that can monitor the user's alcohol concentration and interaction with the helmet in real time. Adding a GSM module for wireless communication and a GPS module for location tracking, this smart hat provides excellent functionality to reduce risks and quickly respond to emergencies. Wearing a smart helmet can detect and respond to various user situations and environments. Smart helmets aim to redefine safety standards for personal transportation and outdoor operations by leveraging the capabilities of modern microcontroller platforms such as Arduino Uno and integrating them with specialized sensors and communication modules. Helmet helmet, including its design, hardware, software and operational planning. Through this project, we seek to demonstrate the potential of technology in solving problems to protect people and promote responsible behavior in sport and transport.

OBJECTIVES:

Develop a clever helmet prototype integrating sensor technology for actual-time tracking of alcohol degrees.
Contain touch sensors within the helmet to detect user interaction and engagement.
Combine GSM and GPS modules to allow seamless communique and area tracking talents.
Enforce shrewd algorithms to investigate sensor data and trigger appropriate responses, including adjusting motor pace or sending emergency messages.
Decorate rider safety with the aid of offering proactive intervention measures to mitigate dangers associated with impaired or distracted using behaviors.
Show the feasibility and effectiveness of the clever helmet prototype in improving protection standards for motorbike and bicycle riders.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 13 Issue 4, April 2024

EXISTING SYSTEM:

In the current system, helmets are always used as protective equipment for cyclists and bicyclists and are not allowed to interfere by limiting their activities. Although these helmets play an important role in reducing head injuries in accidents, they do not have the intelligence to monitor and respond to changes or user behavior. As a result, passengers are vulnerable to a variety of safety risks, including impaired driving due to alcohol and accidents caused by distraction or careless behavior. Most driving cases are based on external evaluation by authorities through a sobriety test or breathalyzer test. Similarly, monitoring of user interactions and participation with helmets is limited and no mechanism exists to identify and respond to such behavior. In addition, in case of emergency or stress, the process of initiating emergency communication and sending accurate location information is often associated with the intervention of outside guides and equipment, which causes delays in response and rescue efforts. Overall, the current system demonstrates the need for new solutions that go beyond the protection provided by traditional helmets. Through the integration of technology, microcontroller systems and communication modules, smart helmets can solve safety problems, improve passenger experience and assist in emergency response, ultimately reducing the number of accidents and improving overall safety.

PROPOSED TECHNIQUE:

The proposed system brings changes in passenger safety through the integration of technology, microcontroller systems and communications into helmets. The basis of the system design is the integration of alcohol sensors and touch sensors that can monitor the user's alcohol content and interact with the helmet accordingly. This positive approach allows for early detection of poisoning and assessment of user involvement, reducing the risks associated with negative or disruptive behavior. Seamless communication and location tracking capabilities. In an emergency or stressful situation, the system can sound the alarm and send the coordinates to the caller or emergency services. This rapid response improves passenger safety by facilitating timely assistance and intervention, thus reducing the severity of accidents and improving overall road safety. In which the Arduino Uno microcontroller
analyzes sensor data and dynamically adjusts the motor speed based on user interaction and the environment. The system optimizes control and ensures safety and comfort by adjusting the motor to respond to touch input or alcohol detection. gender and accessibility. The integration of hardware into the helmet design is optimized for comfort and performance, while the use of software refers to efficiency and does not conflict with existing riding equipment.

METHODOLOGY

The path to creating a smart helmet involves many important steps to integrate advanced technology, microcontroller systems and communication modules to improve people's safe vehicle journey. The first stage involves thinking and designing to determine the requirements and features of the smart helmet according to safety standards and user needs. The next step is to select and purchase the necessary hardware, including the breathalyzer, meter, GSM module, GPS module, and Arduino Uno microcontroller. Designed according to helmet model. Connections and connections have been carefully designed to ensure reliability and performance, including features such as waterproofing and anti-interference. Once the hardware setup is complete, software development begins, focusing on programming the Arduino Uno to interact with the sensor, process sensor data, and control the speed and communication modules. Interact with touch and trigger appropriate responses, such as adjusting engine speed or initiating emergency communications. Additionally, GPS and GSM module libraries are used for location tracking and wireless communication. Throughout the development process, rigorous testing and analysis were conducted to verify the performance and reliability of the smart helmet in various simulation scenarios. To improve the performance, efficiency and durability of the helmet. Please seek user feedback and evaluation to identify areas for improvement and iterate to ensure the smart hat meets safety standards and user retention is poor. In this way, the smart helmet is designed to realize its potential as a new safety solution for motorcyclists and cyclists, promoting responsible driving and reducing the risks associated with interruption or interruption of driving.

COMPONENTS OF HARDWARE

1. Arduino uno:
Arduino/Genuino Uno is a microcontroller board based on ATmega328P. It has 14 input/output pins (6 of which can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, USB connection, power jack, ICSP header, and a reset button. It includes everything you need to support your microcontroller; Just connect it to your computer with a USB cable or power it with an AC-DC adapter or battery starter. You can repair your UNO without worrying too much about doing something wrong, and in the worst case scenario, spend a few bucks to replace the mold and start over. Software Version (IDE) 1.0 Uno boards are the first in the USB Arduino board and are standard for the Arduino platform

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 13 Issue 4, April 2024

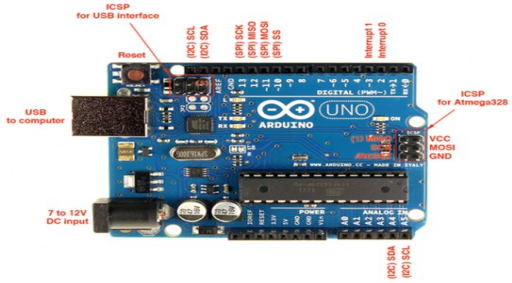

Fig.1: Arduino Uno

2. POWER SUPPLY:

A generator is an electrical device that provides the energy required for an electrical machine. The purpose of the mains power supply is to convert the power sent to the input of the sinusoidal alternative mains power supply into usable power at its output in the form of a smooth and regular DC voltage.

Fig.2: Power Supply

This power supply varies. Alternating current into alternating current input to DC output voltage. Electronic devices used every day, including mobile phone charging adapters, laptop charging adapters, uninterruptible power supplies (UPS), computers or electrical appliances, are of course very important.

3. ALCOHOL SENSOR:

The MQ-3 gas detection module has four pins that can be used to extract data from the sensor: VCC, GND, Aout and Dout. The pin layout of the MQ-3 alcohol sensor is as follows:

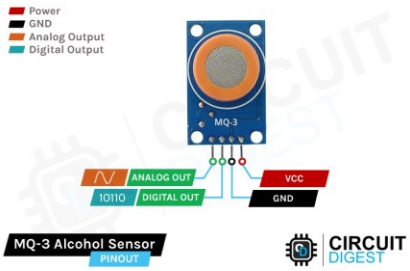

Fig.3: Alcohol Sensor

VCC is the gas Detection Sensor's electricity deliver pin, which may be linked to a 5V supply.
GND is the board's ground pin, which have to be linked to the Arduino's ground pin.
DOUT is the board's virtual output pin; a low output indicates that no alcohol is gift inside the environment, at the same time as a excessive output shows that Alcohol is present.
AOUT is the board's Analog output pin, for you to provide us with an analog signal that varies between Vcc and floor depending on the alcohol degree detected.

4. DC MOTOR:

DC motor or DC motor is a motor that converts electricity into electricity by creating a magnetic field using direct current. The magnetic field attracts and repels the rotor's magnets; To ensure rotation of the rotor, the commutator of the brushes is connected to the motor windings with electric current

Fig.4: DC Motor

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 13 Issue 4, April 2024

5. MOTOR DRIVER:

The motor driver is a current starter that takes the current signal from the microcontroller and divides it into a higher signal that can control and start the motor. Usually the transistor acts as a switch and tries to drive the motor in one direction. To control the motor in one direction, simply switching the motor on and off is sufficient.

Fig.5: Motor Driver

6. GSM SIM800L:

The SIM800L GSM/GPRS module is Simcom's microcellular GSM modem that easily interfaces with any microcontroller, providing GSM functionality to the microcontroller and allowing GPRS transmission. This model connects the microcontroller to the mobile phone to make phone calls, send or receive SMS (text messages), and connect to the internet using GPRS, TCP or IP. Another plus is that it supports quad-band GSM/GPRS networks, meaning it can work anywhere in the world.

Fig.6: GSM: SIM800L

SIM800L GSM/GPRS module has four main components that play an important role in the operation of the module. These key components include the SIM800L GSM cellular chip, LED lighting, antenna and Micro SIM slots.

TOUCH SENSOR:

Touch Sensors are the digital sensors which could locate contact. They perform as a switch while touched. these sensors are used in lamps, contact screens of the mobile, and so fourth , touch sensors provide an intuitive consumer interface.

Fig.7: Touch Sensor

Touch sensors also are called Tactile sensors. these are simple to design, low price and are produced in huge scale

7. GPS:

GPS (Global Positioning System) is a satellite-based navigation system. It provides time and location information to a GPS receiver anywhere on or near the Earth's surface. GPS works in all weather conditions.

Fig.8: GPS

CONCLUSION

In summary, the development and testing of smart helmets represents a significant advance in passenger safety technology. Integrating advanced sensors, microcontrollers and communication modules, the system is said to solve key problems of motorcycle and bicycle safety, including drunk driving detection, emergency communications and management systems. The results show that the system is effective in improving passenger safety, encouraging good driving behavior and reducing the severity of accidents. Future studies could investigate improvements in electronic devices, such as connecting more sensors for environmental monitoring or developing more accurate and accurate alcohol testing systems. Additionally, advances in artificial intelligence and machine learning can improve security and efficiency by enabling machines to learn and adapt to user behavior over time. Feedback to increase situational awareness and provide immediate guidance to the passenger. Collaboration with industry stakeholders, regulators and regulatory bodies is essential to ensure widespread recognition and acceptance of smart devices within the cycling community. Through continuous innovation and collaboration, smart helmet technology has the potential to revolutionize passenger safety and shape the future of autonomous driving.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 13 Issue 4, April 2024

REFERENCES

[1] Smith, J., & Milward, D. (2018). "Smart Helmet: A Wearable System for Worker Protection." Sensors, 18(9), 2909.
[2] Gade, R., & Biradar, S. (2020). "IoT Based Smart Helmet System for Safety and Accident Prevention of Two Wheeler Riders." In 2020 5th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU) (pp. 1-5). IEEE.
[3] Saravanan, S., & Bhaskar, S. S. (2019). "Smart Helmet for Preventing Accidents." In 2019 International Conference on Electrical, Communication, and Computing (ICECCO) (pp. 1-4). IEEE.
[4] Bharathi, S., & Vignesh, V. (2018). "Smart Helmet: A Life Saving Helmet for Two Wheeler Riders." International Journal of Engineering and Technology (IJET), 7(4.28), 276-280.
[5] Singh, S., Saini, J., & Sharma, V. (2019). "Design and Implementation of Smart Helmet." In 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS) (pp. 1180-1184). IEEE.
[6] Babu, G. R., & Rajalakshmi, P. (2020). "Arduino based Smart Helmet for Accident Detection and Prevention." International Journal of Scientific & Technology Research, 9(3), 5996-6001.
[7] Sharma, A., & Poddar, S. (2017). "Smart Helmet for Two Wheeler Riders with Advance Safety Features." International Journal of Engineering and Management Research, 7(1), 34-38.
[8] Eze, J. N., & Uwalaka, U. S. (2020). "Design and Development of Smart Helmet System for Alcohol Detection." International Journal of Emerging Technologies and Innovative Research, 7(4), 269-275.
[9] Priyanka, M., & Krishnaveni, R. (2019). "Smart Helmet with Accident Intimation and Avoidance System." International Journal of Engineering and Advanced Technology, 9(1), 5655-5660.
[10] Gupta, S., & Bansal, G. (2020). "Smart Helmet with Accident Prevention and Notification System." In 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT) (pp. 1-5). IEEE.
[11] Gupta, A., Kumar, N., & Sharma, D. (2019). "Design and Implementation of Smart Helmet with Accident Detection System." International Journal of Advanced Research in Computer Engineering & Technology, 8(6), 46-51.
[12] Kumar, A., Choudhary, P., & Saini, P. (2020). "Arduino Based Smart Helmet for Accident Detection and Rescue System." International Journal of Recent Technology and Engineering (IJRTE), 8(6), 342-347.
[13] Narmadha, R., & Bhalaji, N. (2018). "Design and Implementation of Smart Helmet for Two Wheeler Vehicles." In 2018 International Conference on Electronics, Communication and Aerospace Technology (ICECA) (pp. 184-189). IEEE.
[14] Akhilesh, K. N., & Jayanthi, G. (2018). "Development of Smart Helmet for Safety of Motorcyclist." International Journal of Pure and Applied Mathematics, 119(15), 2569-2574.
[15] Patil, D. S., & Kulkarni, S. M. (2020). "Design and Implementation of IoT Based Smart Helmet System for Accident Detection and Notification." In 2020 3rd International Conference on Inventive Research in Computing Applications (ICIRCA) (pp. 1-6). IEEE.
[16] Reddy, B. G., & Varghese, A. (2017). "Design and Development of Smart Helmet for Two Wheeler Riders." International Journal of Pure and Applied Mathematics, 116(20), 79-83.