RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
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25 years OF ACADEMIC EXCELLENCE

Department of Computer Science and Engineering

CS19P11 – INTERNET OF THINGS ESSENTIALS

SMART HELMET SAFETY SYSTEM

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Problem Statement and Motivation

- The increasing incidence of two-wheel motor vehicle accidents, exacerbated by riders not wearing helmets and driving under the influence of alcohol, highlights a critical safety issue. Current measures to enforce helmet use and prevent drunk driving have proven insufficient. This project addresses these challenges by developing an intelligent helmet system equipped with a breath-analyzer sensor (MQ3) and helmet usage detection mechanisms. The system aims to reliably detect alcohol levels, prevent vehicle operation if the rider is intoxicated, and ensure helmet compliance, thereby reducing accidents and promoting safer road conditions for all stakeholders.

Objectives

- This project aims to enhance two-wheel motor vehicle rider safety with an intelligent helmet system integrating an MQ3 breath-analyzer sensor for alcohol detection and a mechanism to verify helmet usage pre-operation. By preventing motorcycle start-up if alcohol exceeds legal limits and promoting helmet use through integrated verification, it aims to reduce drunk-driving accidents. Featuring a user-friendly interface for alerts and data collection for optimization, the system undergoes pilot testing for reliability and regulatory compliance. Impact evaluation includes user feedback and metrics to assess effectiveness in accident reduction and safety promotion.

Abstract

- The increase in two-wheel motor vehicle accidents, which are often caused by riders failing to wear helmets or driving under the influence of alcohol, needs stronger safety measures. This research demonstrates an innovative helmet system that incorporates a breath-analyzer sensor (MQ3) and helmet usage detection technologies to improve rider safety. The MQ3 sensor measures the alcohol level of the rider's breath, and if it exceeds the legal limit, a buzzer sounds an alert, and the motorcycle's engine is instantly turned off, suspending functioning. Furthermore, the helmet is equipped with a sensor to verify proper usage; if the helmet is not properly worn, the motorcycle will not start, so ensuring helmet compliance. This novel solution is intended to be affordable, simple to use, and compatible with existing helmets. It also collects data over time to help improve accident prevention measures. This smart helmet system seeks to drastically reduce accident rates by tackling crucial issues such as drinking and driving and improper helmet usage, resulting in safer roads and safeguarding the lives of two-wheeler riders through increased safety standards and responsible riding behaviors.

Introduction

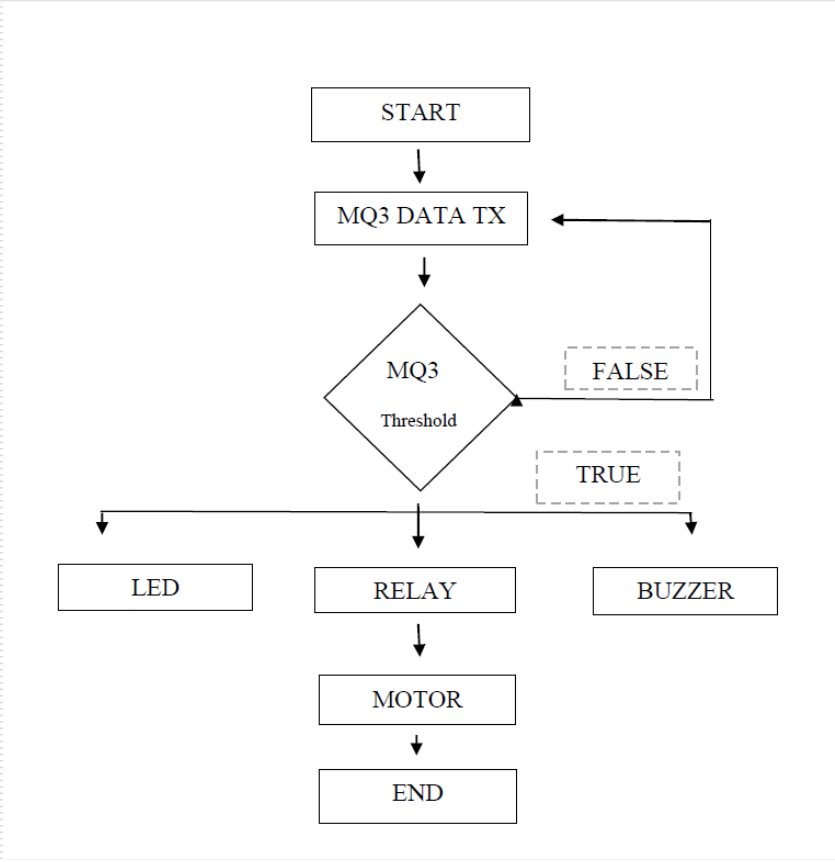
- The "SMART HELMET SAFETY SYSTEM" project tackles the rising number of two-wheel motor vehicle accidents caused by riders who do not wear helmets or are driving under the influence of alcohol. This system, which includes a breath-analyzer sensor (MQ3) and helmet usage detection, prevents drunk driving and assures helmet compliance, with the goal of improving rider safety, reducing accidents, and saving lives.

Literature Survey

- “Alcohol Detection Using Smart Helmet System,” Sudharsana Vijayan, Vineed T. Govind, Merin Mathews, Simna Surendran, and Muhammed Sabah present a smart helmet designed to enhance road safety by detecting the presence of alcohol in a rider's breath. Published in the International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) in April 2014, the study outlines a system that integrates an alcohol sensor within the helmet, which can prevent the vehicle from starting if the rider's breath alcohol concentration exceeds a predefined limit. This innovation aims to reduce accidents caused by drunk driving, thereby promoting safer road practices.
- “Online Driving Style Recognition using Fuzzy Logic,” Dominik Dörr, David Grabengiesser, and Frank Gauterin present a method for identifying driving styles in real-time using fuzzy logic. Presented at the IEEE 17th International Conference on Intelligent Transportation Systems (ITSC) in October 2014 in Qingdao, China, the study proposes a system that analyzes various driving parameters to classify driving behavior dynamically. This approach aims to improve traffic safety and efficiency by providing adaptive feedback based on the recognized driving style, ultimately contributing to smarter and safer transportation systems.

System Architecture

- The device uses a MQ-3 alcohol sensor module to detect the presence of ethanol (alcohol) in the rider's breath. The electrical resistance of the sensor varies in inverse proportion to the alcohol concentration. This analog signal is sent into an Arduino Uno microcontroller, a popular choice because to its simplicity and versatility. The Arduino then translates the analog input into a digital alcohol level reading using a predetermined calibration curve. If this reading exceeds a predefined threshold based on regional Blood Alcohol Content (BAC) restrictions, the Arduino sounds an alarm. This alarm can be a buzzer for audible warning, an LED for visual indication, or a vibration motor for a subtle alert. This circuit provides an affordable and user-friendly method for incorporating alcohol detection into a smart helmet design.



List of Modules

- **Arduino Uno:**

It receives the analog signal from the MQ-3 sensor, converts it into a digital alcohol level reading using a calibration curve, and compares it to a pre-programmed threshold based on legal BAC limits.

- **MQ-3 Alcohol Sensor:**

It measures the changes in electrical resistance caused by the interaction between alcohol molecules and the MOS surface. Higher alcohol concentration results in lower resistance.

Implementation/Results of Module

- Upon successful connection, a light will turn on in the Arduino Module, Relay and MQ3 Alcohol Sensor. The Alcohol Sensor senses the amount of alcohol present in the Driver's breath and transmits the data to the Arduino Board. The Board compares if the driver is drunk or not and turns off the vehicle accordingly. There is a transmitter on the inside of the helmet that also contributes in the Driver's safety measure while riding a bike. A motor is fixed with the receiver to receive the signal from the transmitter and the wheel rotates if all the predefined conditions are satisfied.

Conclusion

- In conclusion, the Smart Helmet Alcohol Detection project aims to significantly enhance road safety by integrating an alcohol detection system into motorcycle helmets using Arduino technology. The system utilizes an MQ-3 alcohol sensor module and Arduino board to accurately measure alcohol levels in the rider's breath. It alerts the rider with an alarm if the detected alcohol concentration exceeds a predefined threshold, thereby preventing drunk driving incidents. While the proposed method offers a cost-effective solution suitable for DIY enthusiasts and hobbyists, it is crucial to acknowledge potential variations in accuracy and reliability due to factors like environmental conditions and sensor calibration.

- Further testing and calibration efforts are essential to optimize system performance. Overall, this innovative project holds promise in reducing accidents caused by impaired riding, potentially saving lives and promoting responsible driving behavior on roads.

References

- Sudharsana Vijayan, Vineed T Govind, Merin Mathews, SimnaSurendran, Muhammed Sabah,“ALCOHOL DETECTION USING SMART HELMET SYSTEM”,- International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN:0976-1353 volume 8 issue 1 – APRIL 2014.

- Dominik Dorr ¨ 1 , David Grabengiesser2 and Frank Gauterin1 2014,”Online Driving Style Recognition using Fuzzy Logic”- IEEE 17th International Conference on Intelligent Transportation Systems (ITSC) October 8-11, 2014. Qingdao, China.

Thank You!!