Safeguard Helmet With Alcohol Detection Using Arduino Nano

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Abstract

Road accidents and cases of drunken driving have become increasingly common, especially among two- wheeler riders. A major contributor to these accidents is the failure to wear helmets, which significantly decreases the chances of survival in the event of a crash. To combat this issue and enhance rider safety, a smart helmet has been developed. This innovative headgear integrates an MQ3 gas sensor for alcohol detection, making it more than just a protective device. By incorporating such advanced features, the smart helmet ensures that safety measures are enforced before riding, particularly by preventing intoxicated individuals from operating the vehicle. This development not only promotes responsible riding but also aligns with the broader vision of smart transportation and connected mobility solutions.

Keywords:- *Arduino Nano; Lcd display; Alcohol Detection sensor; Transistor; resistance.*

Software:- Arduino IDE, Proteus 8 professional.

1. Introduction

Road accidents involving motorcyclists remain a serious global concern, with a significant number resulting from human negligence particularly drunk driving and the failure to wear helmets. These preventable actions pose severe risks to public safety and have lasting consequences for individuals, families, and communities.

To address these issues, a Safeguard Helmet with Alcohol Detection system has been developed using Arduino technology. This innovative solution integrates a breath alcohol sensor directly into the helmet, ensuring the vehicle will not start if alcohol is detected in the rider's breath. By combining mandatory helmet usage with real-time alcohol detection, this system aims to enhance overall road safety for two- wheeler riders.

The motivation behind this project lies in the urgent need to reduce road fatalities and injuries caused by driver negligence. With the rising number of accidents attributed to alcohol impairment and non- compliance with helmet regulations, the Safeguard Helmet offers a proactive and technologically advanced approach to promoting responsible riding and preventing accidents before they occur.

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2. Material

LED Display, Arduino Nano, Copper clad, Resister, Capacitor

3. Methodology

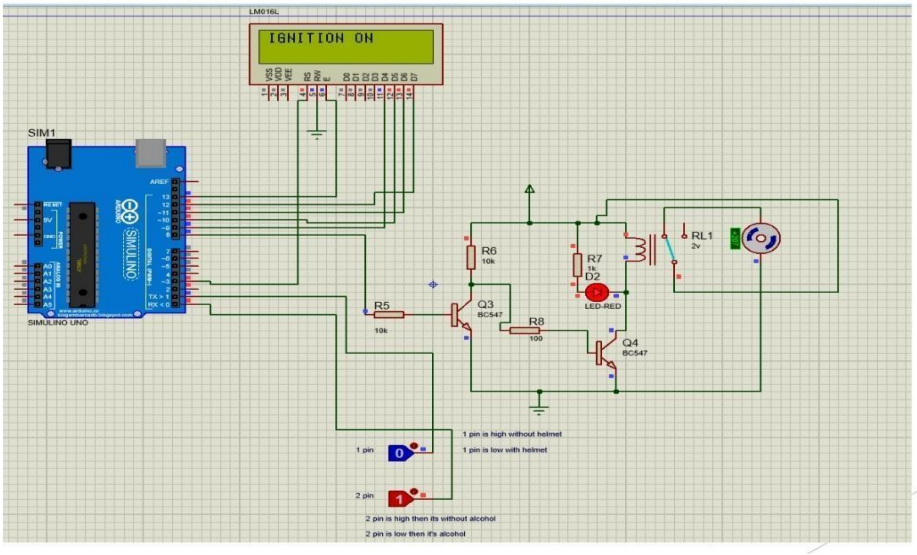

Fig.1. Simulator Diagram

Working Concept:

1. Helmet Detection: A digital pin reads the helmet condition (high without helmet, low with helmet). If the helmet is not worn, the LED turns on and ignition is blocked.

2. Exhaust Actuator: Another input simulates the status of the exhaust system. Both conditions (helmet and exhaust) must be valid to enable the ignition.

3. Ignition Control: If all safety conditions are satisfied, the Arduino energizes the relay via Q4. This closes the circuit and powers the ignition system.

4. LCD Display: Shows "IGNITION ON" when conditions are met.

4. Flowchart

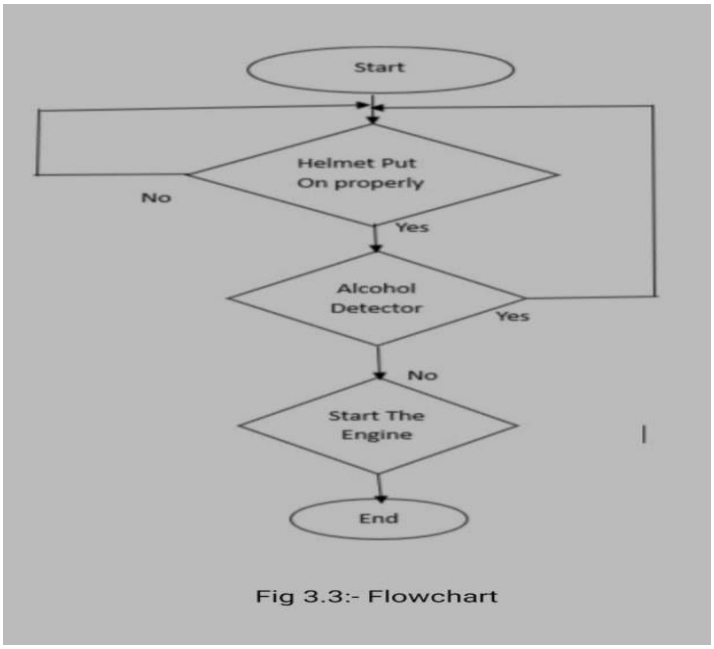

Fig 3.3:- Flowchart

Working Principle:

1. Helmet Detection:

The system initially verifies if the helmet is correctly positioned. This may be done using sensors in the helmet strap or a proximity sensor. If the helmet is not detected or is improperly worn, the system does not proceed further and prompts the user to wear the helmet correctly.

2. Alcohol Detection:

Once the helmet is confirmed to be worn properly, the system proceeds to check for alcohol consumption using an alcohol sensor (e.g., MQ-3 sensor).The sensor analyzes the rider's breath to detect the presence of alcohol. If alcohol is detected, the engine remains disabled to prevent unsafe operation of the vehicle.

3. Engine Start:

The system permits the vehicle's engine to start only when the helmet is properly worn and no alcohol is present, thereby ensuring that the rider is in a suitable condition to operate the vehicle

5. Result

1. Alcohol Sensor (e.g., MQ-3/MQ-135):

This device identifies the presence of alcohol in an individual's breath. It provides analog voltage output proportional to the alcohol level.

2. Microcontroller (e.g., Arduino):

The microcontroller reads the sensor's output and compares it to a predefined threshold. If the detected alcohol level is higher than the threshold, it concludes that the user is intoxicated.

3. LCD Display:

The LCD provides real-time feedback. It shows messages like: "IGNITION ON" – when no alcohol is detected. "ALCOHOL DETECTED" – when alcohol is sensed. "NO ALCOHOL" – when conditions are safe.

4. Ignition Control System:

If alcohol is detected, the microcontroller prevents the ignition system (simulated with a relay or LED) from turning on, ensuring the rider cannot start the vehicle.

5. Power Supply and Circuitry:

A controlled power supply operates the microcontroller, sensors, and additional components.

6. Conclusion

Safeguard helmet is an effective solution to many problems. Wearing the helmet and being sober are necessary conditions for the bike to start, reducing the possibilities of accidents. Despite exercising caution, accidents can still happen

7. Conflict of Interest

The authors declare that they have no conflict of interest.

8. Funding Declaration

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

9. References

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About Author

Prabhakar Rajshekhar Anagale is currently pursuing a Bachelor of Engineering degree in Electronics and Telecommunication Engineering at Dr. Babasaheb Ambedkar Technological University, Lonere, Maharashtra, India. His core academic interests lie in the fields of embedded systems and smart automation technologies. With a solid foundation in programming, particularly in C, he is passionate about applying technical knowledge to develop practical, real-world solutions that address current challenges in automation.