



Development of a Smart Safety Helmet for Enhanced Rider Safety

¹ Akash Singh, ² Raj singh, ³ Rohan Prasad, ⁴ Milan sasmal, ¹²³ Final year ug student and ⁴ Assistant professor
JIS college of engineering , kalyani nadia, west Bengal

ABSTRACT:

This study proposes a smart safety helmet that integrates multiple sensors to detect potential hazards while riding a motorcycle. The helmet successfully detects risks, such as alcohol consumption and drowsiness, and alerts the rider to reduce accidents caused by human error. The integration of sensors with a helmet has the potential to significantly improve rider safety, and the smart safety helmet designed in this study represents a promising solution. Further development and testing in real-world scenarios are possible.

In recent years, there has been a growing interest in developing innovative safety technologies to enhance the protection of motorcycle riders on the road. One such technology that has gained popularity is the smart motorcycle helmet. Equipped with advanced sensors and integrated systems, these helmets have the potential to significantly improve the safety and security of riders. In this journal, we explore the development and functionality of smart motorcycle helmets, including their ability to detect whether the rider is wearing the helmet, their capacity to sense alcohol consumption, their ability to monitor driver fatigue, and their potential to alert riders of approaching vehicles. We will also discuss the technological advancements that have made these helmets possible, the benefits and challenges of their implementation, and their effectiveness in preventing accidents. With the aim of promoting motorcycle safety, this journal provides an in-depth examination of smart motorcycle helmets and their potential to revolutionize the motorcycle industry.

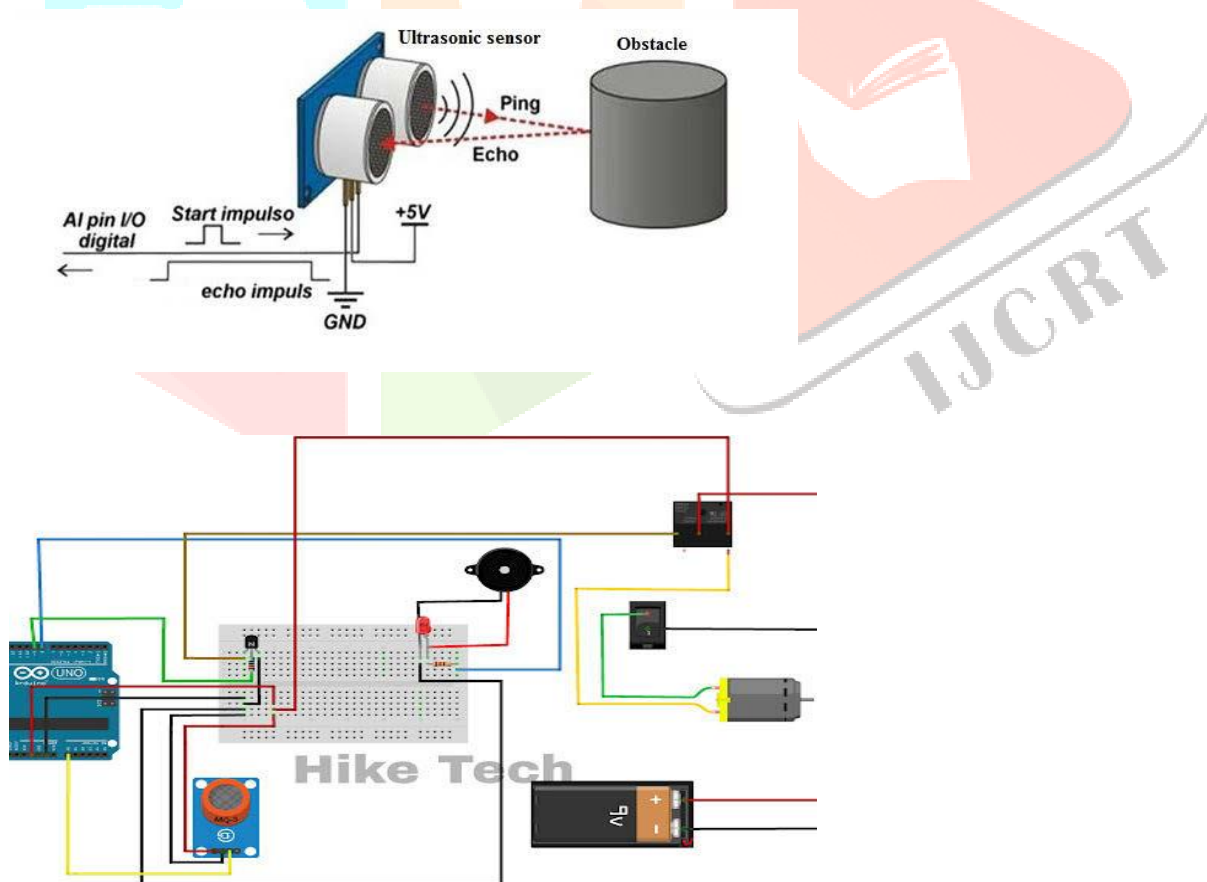
Methods: The multi-sensor helmet was designed using an Arduino microcontroller. The Arduino microcontroller is a popular and powerful microcontroller that is ideal for this project. The sensors were interfaced with the Arduino microcontroller and programmed to detect the necessary signals. The helmet-wearing sensor was designed using a switch. The alcohol sensor was designed using a MQ-3 sensor. The MQ-3 sensor is a gas sensor that can detect the presence of alcohol in the air. The eye-blink sensor was designed using an IR sensor. The IR sensor is a proximity sensor

that can detect whether the rider's eyes are open or closed. The proximity sensor was designed using an ultrasonic sensor. The ultrasonic sensor is a proximity sensor that can detect the distance between the rider and any nearby objects.

Working principle

This engineering project aims to enhance motorcycle rider safety by integrating various sensors into a system that monitors the rider's behavior and surroundings while riding. The system includes a helmet sensor to detect whether the rider is wearing a helmet, an alcohol sensor to detect if the rider has consumed alcohol, an eye blink sensor to monitor the rider's level of alertness, and a proximity sensor to detect when a vehicle is approaching too closely. If any of these sensors detects a potential hazard, an alarm is activated to alert the rider. By using a combination of sensors and alarms, the system aims to prevent accidents caused by various factors and improve rider safety.

Schematic diagram



Components used

1. Arduino Microcontroller:

The Arduino microcontroller is the heart of the multi-sensor helmet. It is a programmable microcontroller board that can be used to control various electronic devices. The Arduino microcontroller is used to interface the sensors with the helmet and to process the sensor data. The microcontroller is programmed to detect the necessary signals from the sensors and to trigger alarms when necessary.



2. Alcohol sensor

The alcohol sensor used in this project is a type of gas sensor that is used to detect the presence of alcohol in the breath of the rider. It works by oxidizing the alcohol in the breath and generating a voltage that is proportional to the amount of alcohol detected. The voltage is then measured by the microcontroller, which can provide an alert to the rider if the alcohol level is above a certain threshold.



3. Eye blink sensor:

The eye blink sensor used in this project is a type of optical sensor that is used to detect if the rider is drowsy or falling asleep. It works by measuring the frequency and duration of the rider's eye blinks. When the sensor detects that the rider's eye blinks are becoming longer and less frequent, it sends an alarm to the microcontroller, which can then provide an alert to the rider to prevent accidents.



4. Helmet wearing sensor

The helmet-wearing sensor is used to detect whether the rider is wearing a helmet or not. It is designed using a switch that is connected to the Arduino microcontroller. When the switch is closed, the microcontroller detects that the rider is wearing a helmet. If the switch is open, the microcontroller detects that the rider is not wearing a helmet.

5. Ultra sonic sensor

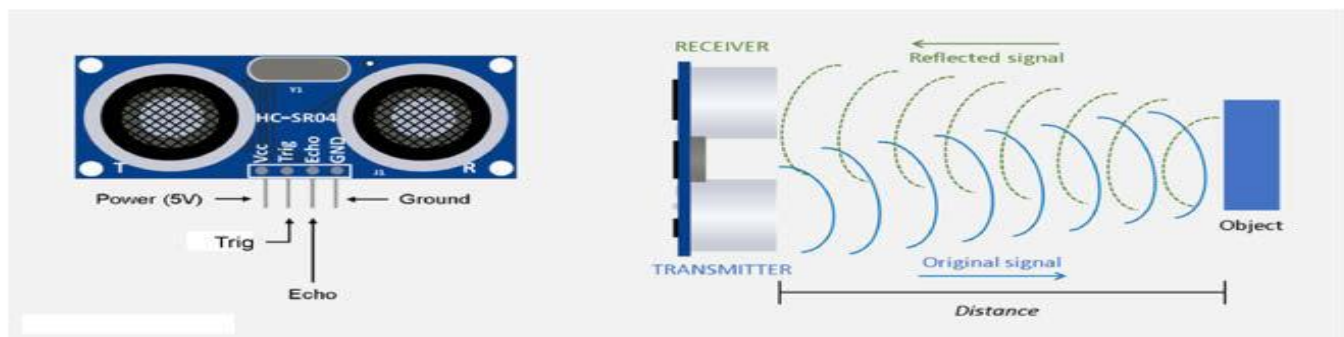


Figure 2: Ultrasonic Sensor

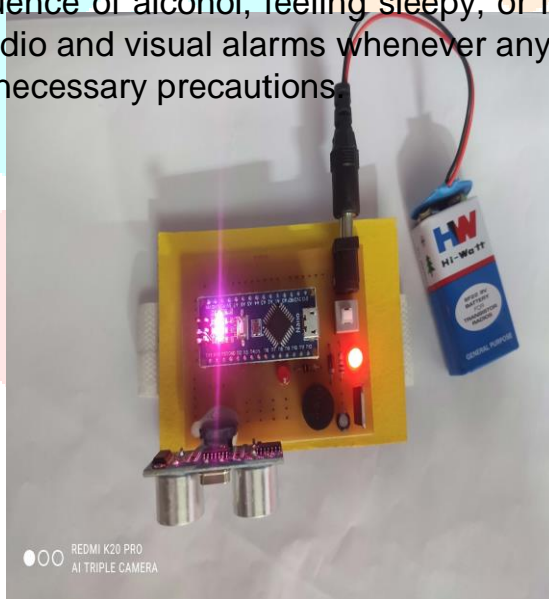
The Ultrasonic sensor is made up of three component Transistor Receiver, Transceiver. The transistor takes electronic signal to give soundwaves, receiver convert soundwaves which will comes from the obstacle into electrical signal and transceiver which is generally receiver object do both the transistor and receiver work. Basically, it helps to measure the distance of an obstacle by emitting sound waves

Challenges

The major challenges faced during the project were interfacing the sensors with the Arduino microcontroller and programming the microcontroller to detect the necessary signals. Another challenge was designing the helmet to accommodate the sensors without compromising the safety and comfort of the rider.

Result

The multi-sensor helmet successfully detected whether the rider was wearing a helmet, under the influence of alcohol, feeling sleepy, or if there was a vehicle in close proximity. The helmet gave audio and visual alarms whenever any of these conditions were detected, alerting the rider to take necessary precautions



Future implementation

The multi-sensor helmet has the potential to significantly enhance the safety of riders, particularly in situations where riders may not be fully aware of the risks associated with riding. The multi-sensor helmet could be further improved with

Conclusion

The multi-sensor helmet is a comprehensive safety solution for riders. It uses a combination of sensors and an Arduino microcontroller to detect potential dangers and alert the rider. The helmet-wearing sensor, alcohol sensor, eye-blink sensor, proximity sensor, audio alarm, and visual alarm are the key components of the multi-sensor helmet. By using these components, the multi-sensor helmet can significantly enhance the safety of riders, reducing the number of accidents caused by negligence and lack of awareness.

ACKNOWLEDGMENT

We are highly obliged to our college “JIS College of Engineering, Kalyani”

that provided a healthy environment to move us to accomplish our goals. We would like to express our sincere gratitude to our guide, Assistant Prof.

Milan sasmal

Electrical Engineering for his guidance and support, which contributed to the successful completion of this project.

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