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Making Smart Helmet for Smart City

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Abstract: *This project has been developed out of a sense of social responsibility towards the community. While riding a bicycle can be enjoyable, accidents can and do happen. Due to its affordability, ease of maintenance, and versatility in traffic, many individuals in India choose to ride two-wheelers over cars. However, the accident rate for two-wheelers is much higher than that of four-wheelers, with motorcycles being particularly prone to fatal accidents. The primary goal this project to safety measures, secure the protection and well being of rider. This end, the system is designed to require the rider to wear a helmet and not have consumed alcohol before the motorbike will start. Alcohol verification is achieved through the use of an Alcohol sensor, while helmet detection is achieved using IR sensors. The security system is designed to send an alert to the homeowner's smartphone if any motion is detected in the house, which can be useful when they're away from home. Incorporating these features, the system aims to prevent accidents and keep the rider safe. Furthermore, in the event of an accident, the GSM technology will be used to notify the rider's family members. The accelerometer is used for accident detection, while the helmet and motorbike communicate wirelessly through the Inquire module.*

Keywords: GSM, GPS, Helmet Authentication, Alcohol Detection, IR sensor

I. INTRODUCTION

The main objective about the project is to ensure the complete protection of bicycle riders. Although helmets have been made mandatory in recent times, there are still many individuals who ride without wearing them. In Pune City alone, there are thirty five lakh two-wheeler riders, and around 600-800 accidents occur per year, out of which 250-300 are fatal. Mumbai has the highest percentage of helmet wearers as compared to those who do not wear helmets. Many individuals, including S. Patharkar, who works with a multinational bank and helps the traffic police raise awareness about traffic-related issues, believe that helmets should be made mandatory. Patharkar emphasizes that everyone should be aware that wearing helmets provides protection to the head and increases the chances of survival in accidents compared to those who do not wear them. Despite the fact that many individuals ride motorbikes at speeds of 60 to 70 km per hour on a daily basis, a significant number of them still do not wear helmets.

The Supreme Court's 2010 directive to two-wheeler manufacturers to provide helmets with their bikes was aimed at reducing the number of road accidents. In a bid to promote road safety, Jitendra Patil, the Regional Transport Officer, has mandated that applicants for permanent two-wheeler driving licenses must wear a helmet during their test.

To enforce the mandatory use of helmets, Jitendra Patil has issued a notice to all RTO employees, stating that anyone arriving on a two-wheeler without a helmet will be denied entry to the premises. Section 129 of the Motor Vehicles Act, 1988, clearly states that wearing protective headgear that meets the standards of the Bureau of Indian Standards is mandatory for all two-wheeler riders.

The use of helmets while riding two-wheelers is a crucial aspect of road safety, and regulations such as those implemented by the Supreme Court and Jitendra Patil are aimed at reducing the number of accidents on Indian roads. instructed two-wheeler manufacturers in 2010 to provide who While traffic police are monitoring helmet-wearing, this cannot be a permanent solution since they cannot be present at all places. The situation of inadequate lab facilities and lack of proper monitoring in the case of two wheeler riders in Mumbai is similar to a ship sailing in uncharted waters without a compass. The likelihood of surviving a fatal accident caused by drunk driving is as low as trying to swim against a strong current with your hands tied.

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Regenerate They also lack adequate lab space or staff to administer the show, which is necessary in order to monitor activity. When it comes to two-wheeler riders, the situation is comparable, with Mumbai being a distant memory. Pradhan, the head of the Sancheti Healing center's injuries office, confirmed that the facility receives between 55 and 65 cases of street accidents per month, with the maximum of the casualties suffering from head wounds. "The likelihood of fatalities in cases involving drunk driving. Additionally, they are easily bribed. Intoxicated driving while operating a business vehicle is commonplace in India. Teenagers and individual

The proposed project focuses on enhancing safety for two-wheeler riders by incorporating technology to detect whether the safety equipment instead of rider they are under the drinking of alcohol before not allowing to start the bike. This is achieved using IR, PIR, and MQ-3 sensors.

Another critical aspect of the project is addressing the issue of delayed medical treatment, which can result in fatalities. In the event of an accident, a drop detection feature will send a message to the rider's family, alerting them to the incident and ensuring prompt medical attention.

Fatigue and distraction are also significant contributors to accidents. Therefore, the project includes a safety zone sign that alerts the rider to vehicles approaching from the left or right, improving their awareness and ability to make accurate judgments and prevent accidents.

1.1 Objective

Our project aims to enhance road safety through a combination of helmet authentication, alcohol detection, and a response system that uses GPS and GSM modules to alert the rider's family in case of an accident. The helmet authentication is achieved through the use of a limit switch, while the alcohol detection utilizes an MQ3 gas sensor.

II. MATERIAL AND METHODES

- This project's primary goal is to design and implement a system that uses multiple technologies, such as alcohol detection, helmet verification, location tracking, and collision avoidance, to prevent and address vehicle accidents and reduce their occurrence on the roads.
- To accomplish this goal, the system integrates different technologies like GSM for wireless communication and an Inquire module for establishing remote communication between the helmet and the vehicle.
- The system comprises two primary components: one installed on the helmet and the other on the vehicle, enabling seamless communication between the two devices.

III. HELMET AUTHENTICATION

Studies have shown that wearing a helmet can reduce the risk of fatal accidents by 30 to 40%, and Research shows that approximately 33% of fatalities in traffic accidents could have been avoided if the individuals involved had worn a seatbelt.

The number of two-wheelers in India is increasing at a rate that is 20 times higher that n the rate of population growth, which makes the use of helmets even more crucial.

Riders who do not wear a helmet are 2.5 times more likely to die in an accident compared to those who wear a helmet, according to research by Sudarsan and Kumaraguru Diderot in 2014.

In this system, the location of the helmet is determined by using of IR sensors, and the detailed working of these sensors is as follows.

3.1 IR Sensor

To prevent the rider from tricking the system by placing something else in the helmet, two IR sensors are used on the left and right sides of the helmet to detect the presence of a human head.

Since there is little to no free space inside a helmet once a human head is inside, the system utilizes both IR sensors as obstacle detectors to ensure the presence of a human head.

An IR LED is used to transmit an IR signal that is then reflected back from the object's surface, and an IR receiver is used to detect the reflected signals which can be a photodiode, phototransistor, or a ready-made module that translates the signal and detects the position of the obstacle before relaying the information to the microcontroller.

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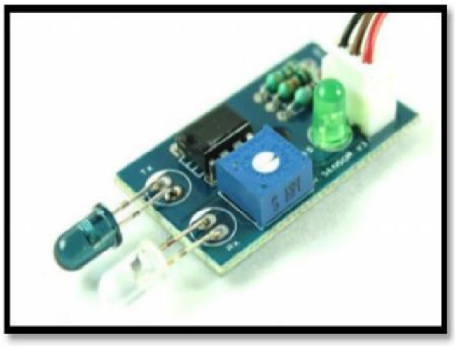
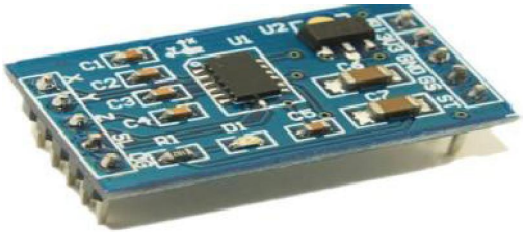


3.2 MQ3 Sensor

The MQ-3 gas sensor is utilized in this system to detect the alcohol content in a person's breath and is positioned in front of the mouth for optimal detection. With its sensitivity to various alcohol molecules, the sensor can determine whether the rider is intoxicated or not, and it includes a potentiometer to adjust the concentration of gases.
The MQ-3 gas sensor is calibrated for a liquor concentration of 0.4mg/L in the air using a resistance of 200 KΩ and features four pins: GND, VCC, A out, and D out. While the MQ-3 gas sensor supports both analog and digital outputs, the digital output is employed in this system.
The sensor employs SnO2, a sensitive material with lower conductivity in clean air but greater conductivity as the concentration of alcohol gases increases. The MQ-3 gas sensor is resistant to interference from smoke, vapor, and gasoline and provides both analog and digital outputs, allowing it to interface with various devices.
This alcohol sensor functions much like a conventional breathalyzer, and it has high sensitivity and a fast response time for detecting alcohol concentration in a person's breath. sensitivity and a fast response time.

3.3 Accelerometer



The accelerometer is a type of electromechanical device that measures both inertial and gravitational forces and is commonly used to determine acceleration. By measuring the vibration of the object, the accelerometer is able to constantly monitor the position of the bike rider's head and the helmet, which is essential in calculating the probability of accidents and preventing them.

3.4 Limit Switch

A switch is an electrical device that is used to turn a device ON/OFF. It regulates the flow of electricity by blocking or redirecting the current from one conductor to another. In this system, the switch is placed inside the helmet, on top of it,

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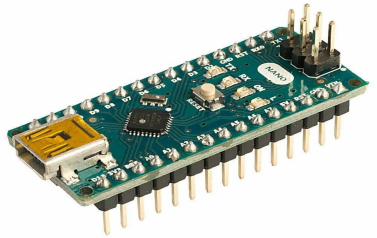
and is pressed when the rider wears the helmet and released when the helmet is removed. Depending on the switch condition, the motorcycle start key will be turned ON/OFF. Micro switches can be used to control various electrical appliances such as sensors, motors, lights, and relays. These switches are also used in robotics, where they are referred to as actuators since they produce movement instead of simply turning on and off.

3.5 **Arduino (UNO)**

Arduino is a versatile open-source platform that combines hardware circuits and software programming tools, allowing users to easily build electronic projects. The code for these projects can be written using a simplified version of the C++ programming language and uploaded to the physical board through a cable. Arduino boards can be connected to a wide range of devices, including sensors, motors, the internet, smartphones, and TVs. Among the various Arduino boards available, the UNO is one of the most widely used and popular options.

3.6 Arduino Nano



The Arduino Nano is a compact and versatile board that was introduced in 2008, based on the ATmega328P microcontroller. It has similar connectivity and specifications as other Arduino boards. The Nano features an 8-bit Microchip AVR CPU running at 16 MHz.

IV. BIKE SECTION

In RF receiver is a device that can receive wireless signals and convert them into a readable format. The microcontroller is the brain of the system that controls and manages all the components of the system. The ignition key is used to turn on and off the engine of the vehicle. The GPS LCD displays the location and other information obtained from GPS satellites. The GSM modem is used to send text messages and make phone calls. The decoder is used to decode the received signal and extract the required information. The relay is an electronic switch that can control the flow of current to the ignition system of the vehicle.

4.1 GPS Tracker

An RFID tag is a small device that uses radio waves to identify and track objects, and can be used in a variety of applications such as inventory management and asset tracking.

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A security camera is a device that captures video footage of a particular area and can be used to monitor and record activities for surveillance purposes.. Live time location information is then show on a map or tracking software, which can be accessed on smartphones or other devices. GPS trackers are commonly used for fleet management, asset tracking, personal tracking, and other applications that require real-time location monitoring**.**

4.2 GSM Module

A SIM card is embed into the SIM card slot of the modern and can be controlled by using a sell phone. It enables the modem to send and receive messages from registered numbers, and allows for mobile communication through the GSM network.

4.3 LCD

LCD stands for Liquid Crystal Display and it is a widely used technology for displaying information in electronic devices. LCDs use liquid crystals to control the amount of light passing through them to produce images or texts. They are commonly found in various devices such as smartphones, TVs, computer , and equipment panels.

4.4 RF Receiver

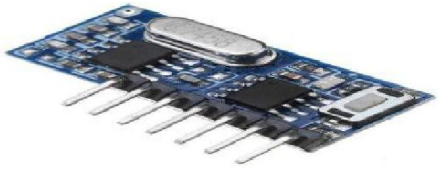

Fig. RF receiver (434-Mhz)

A radio-frequency receiver is an electronic device that facilitates wireless communication between two electronic devices. Radio-frequency receivers are used for wireless communication between two devices, and they work by transmitting information through radio waves.

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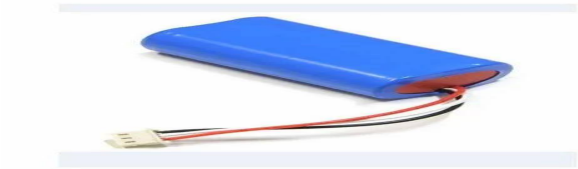
Radio-frequency receivers utilize electromagnetic radiation in the form of radio waves to transmit information wirelessly between two electronic devices. The communication between two electronic devices is enabled by a radio-frequency receiver, which uses radio waves as a medium for transmission.

A radio-frequency receiver is an electronic device that enables wireless communication between two devices by utilizing radio waves to transmit information. The head protector module(transmitter) yield information will be gotten by the vehicle module(receiver) and the method will take put by remote innovation.

4.5 12V POWER ADAPT

- The power supply has a wide input voltage range and high precision voltage for efficient performance.
- It features overload protection and short circuit protection for safety purposes.
- The power supply also has over-temperature protection to prevent damage from overheating.
- It is designed to save power and improve energy efficiency.
- The input voltage range is 120-250V AC 50/60Hz, while the output is DC 12.0V 1A.
- The power supply comes with an EU plug for easy and convenient use in Europe.

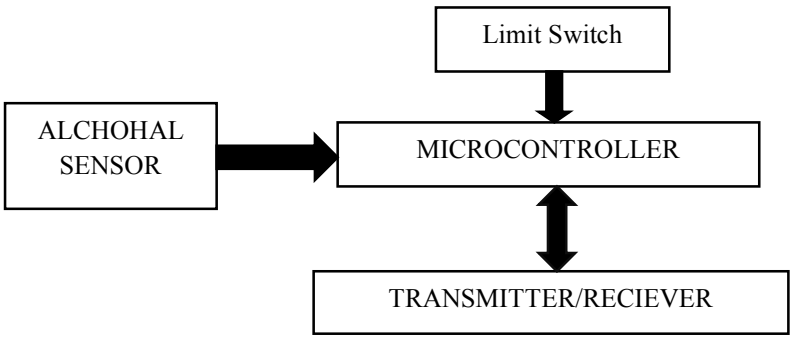
4.6 Lithium Battery



Lithium-ion batteries are a type of rechargeable battery that store energy using lithium ions and are commonly used to power electronic devices. Due to their high energy density, lithium-ion batteries are frequently utilized in portable electronic devices such as smartphones, laptops, and tablets.

Lithium-ion batteries are well-known for their durability and long lifespan, which is why they are commonly found in a variety of electronic devices**.** Lithium-ion batteries are among the most commonly used rechargeable batteries in electronic devices**,** including smartphones, laptops, and tablets, because of their high energy density and reliability.

V. HELMET



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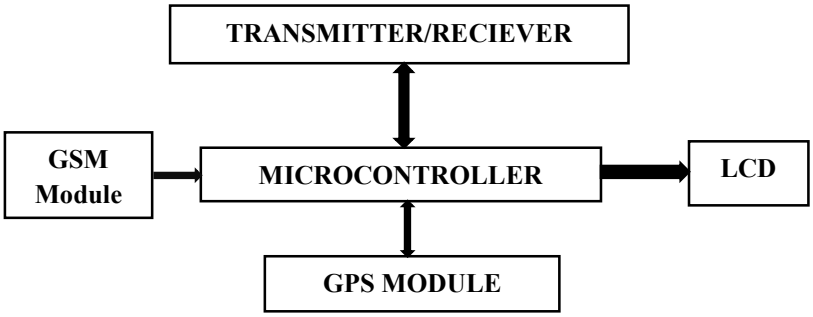
VI. VEHICLE



The first step in the extend process is to initialize all the ports, and if no errors occur, move on to the next step, which involves using the accelerometer to detect accidents. After completing the accident detection process, the system proceeds to the next step, which involves continuously monitoring the RF module for incoming data and processing it according to predetermined conditions.

In the fourth step, the system verifies if the rider is wearing a helmet. If the rider is not wearing a helmet, a message will be displayed on the device prompting them to wear one before starting the ride. Following this, the system checks the rider's sobriety status, and if they are drunk, a message saying "You're Drunk" is displayed, and the system sends a message with their location to a stored.

VII. APPLICATION

- The real-time security system can be implemented in various applications.
- The system can be simplified and made more compact by integrating all of its components into a single VLSI chip that can be easily integrated into a helmet or vehicle.
- The security system can be designed to consume less power, making it more efficient and cost-effective.
- This technology can be extended to improve safety in automobiles or other vehicles by replacing the helmet with a seatbelt.

VIII. ADVANTEAGES

- The implementation of this technology can lead to a reduction in the number of traffic accidents, particularly in heavily congested areas like India.
- about the significance of wearing a helmet while riding The system can help to raise awareness a motorcycle.
- By requiring the rider to wear a helmet and remain sober, the system ensures that the bike can only be started by someone who is fit to ride.
- The technology also includes a warning system to alert the rider if they are approaching an obstacle too closely while cycling.
- In the event of an emergency, GSM technology is employed to notify the designated family members

IX. FUTURE SCOPE

By integrating multiple bioelectric sensors onto the helmet, it becomes possible to measure different physical activities. A small camera can be used to record the driver's movements for further analysis and evaluation. By employing a wireless transmitter, the system can allow for the transmission of messages between two vehicles.

X. RESULTS

he number of road accidents is on the rise, primarily due to riders not wearing helmets and consuming alcohol while riding. With the use of a smart helmet, accidents can be prevented by detecting potential risks and hazards.

The motorcycle will not start if the rider is not wearing a helmet or is under the influence of alcohol. The bike will only start if the rider is not under the influence of alcohol and is wearing a helmet. Furthermore, in the event of an accident,

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sensors installed on the motorcycle will determine the severity of the collision and relay the accident's location to nearby hospitals' central server, using GPS technology.

XI. DISCUSSION

The components have been assembled and thoroughly tested, and the circuit has been designed to ensure that the bike cannot be started unless the rider is ensured the helmet. Additionally, the bike will not be start if the rider is intoxicated, ensuring safe and responsible riding practices.

The helmet also includes a feature that alerts the rider when they exceed a certain speed limit by sounding an alarm. In the event of an accident, the bike's motor automatically shuts off to prevent further injuries or damage.

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