A SMART HELMET POWERED BY IOT FOR MODERN TRANSPORTATION SYSTEM

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Abstract : **Today, every system is automated to meet new challenges. Today, automated systems have less manual operations, flexibility, reliability and accuracy. Because of this requirement, every industry prefers automatic control systems. Especially in the field of transport systems, the implementation of such systems is essential. Therefore, this proposed system designs and implements a smart helmet based on the Internet of Things (IoT), which prevents the number of accidents. An accident can be an unexpected event or potential mistake that causes injury and sometimes death. Two-wheelers have more accidents than other vehicles. Although the government has prepared enough traffic rules and regulations to avoid accidents, but the number of accidents is increasing day by day. This can be avoided by wearing a helmet and driving carefully. However, wearing a helmet can significantly reduce the risk of an accident. The smart helmet system offers rider safety in the most efficient and technological way using the Internet of Things (IoT). It has been applied to accident prevention, accident detection. An intelligent helmet system helps two-wheelers detect accidents, provide safety and security. The microcontroller receives information about alcohol through an alcohol sensor connected to the ignition of the vehicle, when it receives the information and controls the vehicle with a DC motor. Smoke and vibration detectors are also used. Finally, all sensor-related alarms are uploaded to the IoT server. With this project, preventive measures can be taken before serious accidents and human and financial losses can be avoided.**

Keywords : IoT, Accidents, Sensors, Vehicle, Helmet

INTRODUCTION

Bike accidents are increasing step by step and cause the loss of many people. Wearing a helmet can reduce the accidents. It is estimated that 1.2 million people lose their precious lives due to road accidents today. There are many accidents that happen in everyday life, for which a solution must be found as soon as the incident occurs. Mortality does not decrease, although hospitals provide emergency care. So, to overcome all these problems, there are two important criteria that a smart helmet checks before starting the bike. First, check that the user is wearing a helmet, not just holding it. It can be detected by an infrared sensor. Second, there must be no alcoholic substances in the user's breath. This can be detected by a gas sensor. It is placed on the helmet. If a person has consumed a lot of alcohol, the alcohol detector detects the resident's breath to detect the alcohol content. Third, when the rider falls and the rider's helmet hits the ground, the vibration sensor detects the situation. An online review of the National Electronic Injury Surveillance System (ONEISS), run by the Ministry of Health, found that 90% of riders killed in crashes were not wearing a helmet at the time of the crash. It can be used to curb these problems and subsequent losses by ensuring that the rider wears a helmet during the ride. The helmet detects the accident with a vibration sensor available on site. An on-site gas sensor also examines the rider's breath to detect if the flow level is above the estimated limit.

.Literature Survey

Yadav et. al [1] proposes a smart helmet based on a wireless sensor network for real-time monitoring and safety of coal mines from a base station. The system immediately monitors hazardous gases such as methane, LPG, CO, temperature and humidity. Falls are the leading cause of fatal incidents, and sometimes the deaths of miners are not properly dealt with within the prescribed time frame. Thus, the proposed system detects the fall and sends the current location of the miner to the base station.

Suresh et. al [2] concerns the integration of a standard hard hat with various sensors such as an infrared sensor, temperature sensor DS18B20, sound sensor, gas sensor MQ-3 and smoke sensor MQ-135, all of which are used to detect different parameters. effects of working workers such as drowsiness, body temperature, sound, gas flow and smoke concentration. An Arduino nano connected to the Bluetooth module synchronizes the data received from each sensor and sends it wirelessly to the supervisor and #39 or the supervisor and #39 mobile monitors via Bluetooth**.**

Mohanapriya et. al [3] designed smart helmet that monitors the physical condition of workers is equipped with sensors including MEMS sensors, heart rate sensors, temperature sensors, IR sensors and vibration sensors. There is a panic button that allows the employee to give an alert message to the owner. There is a GPS and GSM module that monitors the location of employees and sends a message to the owner. Employees are continuously monitored via IoT**.**

Sinha et. al [4] began to improve the safety of motorcyclists. The system consists of Arduino Uno microcontroller, Node Microcontroller Unit (NodeMCU) ESP8266 Wireless Fidelity (Wi-Fi) module, Global Positioning System and #40;GPSand#41; sensor, gyroscope, infrared (IR) sensor, alcohol sensor and Blynk Internet of Things (IoT) mobile application. This work is a comprehensive intelligent helmet-based accident detection system, which detects whether the rider is wearing a helmet, tracks the rider's coordinates through real-time location tracking, detects sudden strong jerks to conclude that an accident has occurred. incident, assess whether the rider is drunk or not, and notify the rider's relatives and friends through the mobile application.

Nandhini et.al[5] presented one of several deep surveillance applications used to monitor traffic violations by helmetless motorcyclists and multiple motorcyclists. Transfer learning is used for multivariate feature extraction, and a single-shot multi-box detector (SSD) was used to handle congested traffic scenarios. The proposed motorcycle violation detection (MVD) model incorporates appearance awareness training in the next fine-tuning step to improve detection performance. The proposed MVD model is evaluated based on real MVD data collected from surveillance cameras on busy and sparsely populated roads under different views and weather conditions. The proposed method achieves a four-class average accuracy of 78.1% and a detection rate of 57 fps for complex image and video data.

Chanchal Ahlawat et. al [6] discussed the design of a system known as a smart helmet that can automatically detect the coronavirus through thermal imaging, which is used to capture the image with less human intervention. Thermal imaging technology is integrated into smart helmets and combined with IoT technology to monitor the screening process in real time. It is equipped with facial recognition technology; it can also display the personal information of the infected person, which can automatically measure the temperature and identify more infected people than conventional thermal screening.

Existing System

The current system is essentially wireless and connected to a smartphone. This prototype uses sensors to detect an accident or accident, and communication hardware is used to automatically call a predefined emergency contact. Another system is used to control the entry speed of the cyclist. All components and sensors are attached to the helmet, which read the speed of the bike and direct the rider to reduce or increase speed based on the obstacles ahead. a wheel The disadvantage of the current project is that the rider does not wear a helmet in areas where there is no traffic control.

An electromechanical device called an accelerometer is used to measure acceleration forces, which can be static or dynamic. The accelerometer measures the vibration of the material and is used continuously within 20 meters of the RF module. It sends the control signals to the wheel module to apply them. The data is encoded on an 18-pin chip called the HT12E encoder before being transmitted by the RF transmitter. The comparisons allow all functions to track the angle of the rider's head and the position of the

helmet. It is also useful for estimating the probability of accidents. The alcohol sensor, detection circuit helmet, microprocessor and RF module are all parts of the helmet. The output signal of the comparator and the binary signals encoded by the sensor lock are transmitted by a radio frequency transmitter. I sent Comparators have 4 inputs and 4 outputs.

The main idea behind this work is to compare the voltages applied to its positive and negative input pins before creating an output. And the wheel part receives the signal to start the wheel. If alcohol is found, the rider cannot start the car.

If the encoder and decoder address bits match, the decoder decodes the incoming digital data and sends the four bits to the MCU. This is done to ensure system security.

Proposed System

It consists of an alcohol sensor, the inputs to the project are a vibration sensor and a smoke sensor. These 3 sensors are connected to a microcontroller. If a person has consumed a lot of alcohol, the gas sensor detects the alcohol content in the rider's breath and the bike's engine will not start. when the rider falls and the rider's helmet hits the ground, the vibration sensor detects the condition of the rider, and then the controller sends the data in the IoT cloud. A smoke detector is used to detect smoke. If the driver has consumed a lot of smoke, the smoke detector will detect the smoke and the bike will not start. We use an Arduino microcontroller connected to an alcohol sensor that monitors the user's breathing and continuously sends signals to the microcontroller. The microcontroller responds to the alcohol signal from the sensor and sends the information to the engine using an RF transmitter. engine, which is also responsible for locking the engine.

Block Diagram

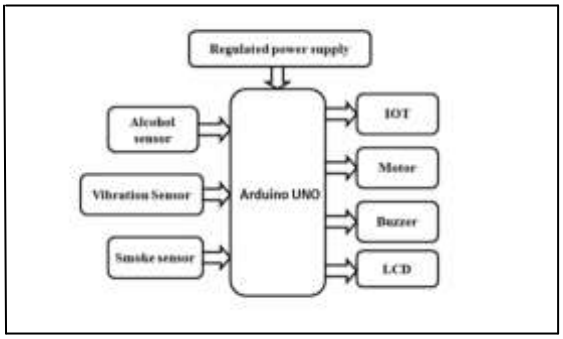


Fig: Block diagram of proposed system

Modules

- Arduino UNO
- Alcohol sensor
- Vibration Sensor
- Smoke sensor
- LCD
- DC Motor
- Buzzer
- Relay

Description

Arduino UNO:

Fig: Arduino UNO

Arduino is an open source platform used to build electronic projects. Arduino consists of a physical programmable circuit (often called a microcontroller) and a software or IDE (Integrated Development Environment) that runs on your computer and is used to write and load computer code onto the physical board. Various microprocessors and controllers are used in the design of the Arduino board. The boards are equipped with sets of digital and analog input/output (I/O) pins that can be connected to various expansion boards ("shields") or breadboards (for prototyping) and other circuits. The cards have serial interfaces, including Universal Serial Bus (USB) on some models, which are also used to download programs. Microcontrollers can be programmed with C and C programming languages using a standard API, also known as the Arduino language, which is inspired by the programming language and can be used with a modified version of the programming IDE. In addition to traditional compiler tools, the Arduino project provides an integrated development environment (IDE) and a command-line tool developed in go.

Alcohol sensor:

Fig: Alcohol sensor

This module is made with an alcohol gas sensor MQ3. It is a low-cost semiconductor sensor that can detect the presence of alcohol gases in concentrations from 0.05 mg/l to 10 mg/l. The sensitive material of this sensor is SnO2, which has a lower conductivity in clean air. Its conductivity increases as the concentration of alcohol gases increases. It is sensitive to alcohol and highly resistant to interference from smoke, steam and petrol. This module provides both digital and analog outputs. The MQ3 alcohol sensor module can be easily connected to microcontrollers, Arduino boards, Raspberry Pi, etc. This breathalyzer is suitable for detecting the concentration of alcohol in the breath, just like a regular breathalyzer. It has high sensitivity and fast response time. The sensor provides an analog resistance based on alcohol concentration. The drive circuit is very simple, requiring only one resistor. A simple interface could be a 0-3.3V ADC.

Vibration sensor:

Fig: Vibration sensor

Vibration sensors are piezoelectric accelerometers that detect vibration. They are used to measure variable accelerations or velocities or for simple vibration measurements. Maintenance professionals use sensors to predict machine maintenance, reduce overhead costs and increase machine performance. Examples of applications where vibration sensors are used: process control systems, aeronautical and underwater applications. Frequency range from 0.2 to 2500 Hz. The operating temperature of these sensors is between -50°C and 85°C.

Smoke sensor:

Fig: Smoke sensor

A smoke detector is a device that detects smoke, usually as a sign of fire. Smoke detectors are usually placed in plastic boxes. Smoke can be detected either optically (photoelectrically) or by a physical process (ionization). Detectors can use one or both detection methods. Sensitive alarms can be used to detect and prevent smoking in prohibited areas. Fire alarms in large commercial and industrial buildings are usually connected to a central fire alarm system.

LCD:

One of the most common devices connected to a microcontroller is an LCD screen. Some of the most common LCD displays connected to many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines.

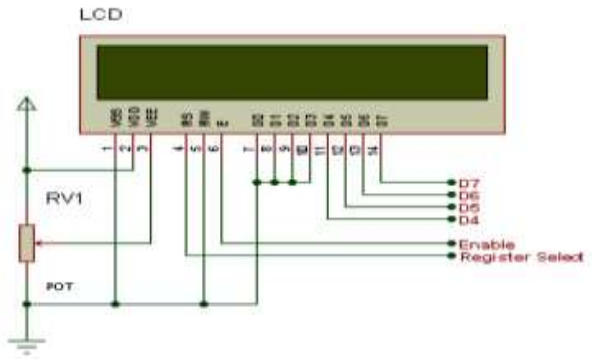


Fig: Pin diagram of LCD

DC Motor:

Fig: DC Motor

A DC motor uses electrical energy to produce mechanical energy, usually through the interaction of fields and current-carrying conductors. The reverse process of mechanical energy to electrical energy is carried out by means of a generator, generator or dynamo. Several types of electric motors can be used as generators and vice versa. The input of a DC motor is current/voltage and the output is torque (speed). A DC motor has two main parts: a rotating part called the armature and a stationary part containing coils of wire called the field windings. The fixed part is also called the stator.

Buzzer:

Fig: Buzzer

Basically, the sound source of a piezoelectric audio component is a piezoelectric membrane. The piezoelectric membrane consists of a piezoelectric ceramic plate with electrodes on both sides and a metal plate (brass or stainless steel, etc.). The piezoelectric ceramic plate is attached to the metal plate with glue. Applying direct voltage between the electrodes of the piezoelectric membrane causes mechanical distortion due to the piezoelectric effect. In the case of an incorrectly shaped piezoelectric element, the distortion of the piezoelectric element extends in the direction of the beam. And the piezoelectric film bends in that direction. The metal plate glued to the piezoelectric element does not expand. Conversely, when the piezoelectric element contracts, the piezoelectric film bends in that direction. Thus, when alternating voltage is applied to the electrodes, the bending is repeated, creating sound waves in the air.

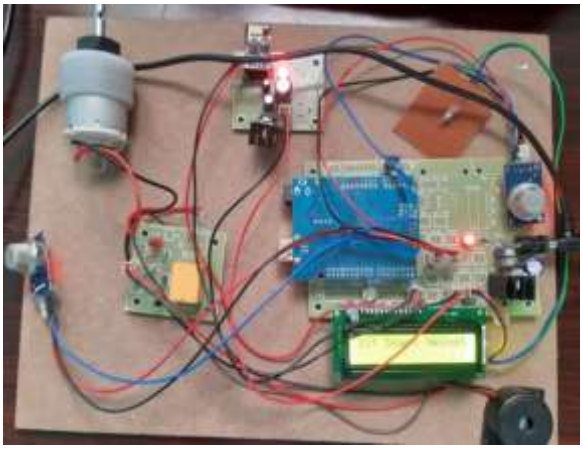
Relay: Fig: Relay

Relays are an important safeguard compared to changing many control strategies or devices with a remote control. At any given moment, the entire store responds to a single electrical unit, such as voltage or current, as much as they open or close contacts or circuits. Hand-off is a switching device when it tries to separate or change the state of an electrical circuit, starting from one state and then the next.

Advantages

- High sensitive alcohol sensor.
- Fast response.
- Wide detection range.
- Stable performance and long service life.
- Simple workflow.
- Efficient and affordable design.
- Low power consumption.
- Easily operable.

Output



Conclusion and Future Scope

We contrasted the smart helmet with an alcohol, smoke and vibration sensor. We implemented a driver protection system using a microcontroller with an IOT server. Integration functions have been developed for all hardware components used. The existence of each module is justified and carefully placed, which contributes to the best possible operation of the device. Second, the project was successfully implemented with the help of the growing technology of very advanced ICs. Thus, the project was successfully planned and tested. All smoke, alcohol and accident alarms are updated on the Internet of Things. In the future, the project can be expanded with GPS technology. We add a GPS module to get the location of the driver at the time of the accident.

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