IJIRAE:: International Journal of Innovative Research in Advanced Engineering ISSN: 2349-2163
Volume 10, Issue 06, June 2023 https://www.ijirae.com/archives

Sensor Network Based Smart Helmet for Bike Riders for Accident Prevention

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Publication History
Manuscript Reference No: IJIRAE/RS/Vol.10/Issue06/JNAE10081
Research Article | Open Access | Double-Blind Peer-Reviewed | Article ID: IJIRAE/RS/Vol.10/Issue06/JNAE10081
Received: 02, June 2023 | Revised: 18, June 2023 | Accepted: 20, June 2023 Published Online: 23, June 2023| Volume 2023
https://www.ijirae.com/volumes/Vol10/iss-06/02.JNAE10081.pdf
Article Citation: Savitha,Rahshitha,Poojarani,Suchitra,yashaswini(2023).Sensors Network Based Smart Helmt for Bike Riders for Accident Prevention. IJIRAE:: International Journal of Innovative Research in Advanced Engineering, Volume 10, Issue 06 of 2023 pages 253-258 https://doi.org/10.26562/ijirae.2023.v1006.02 **BibTeX Savitha2023Sensor**

Abstract: Road accidents are increasing day by day because riders do not use helmet and due to alcohol consumption. A huge amount in today's world people die in traffic accidents. Accidents can occur when using a smart helmet detected. The Project Goal is to design smart helmet in case of an accident alcohol avoidance and alcohol detection. The IR sensor checks if the person is wearing it helmet or not. The gas sensor recognizes the alcohol substance in the rider breath. If the person doesn't have a helmet and if they are consuming alcohol, a bike won't start. If there are no signs of alcohol and a helmet is worn, then only the bike starts. The moment the rider met with an accident, the sensor recognizes the condition of the motorcycle and reports the accident. Then The GPS in the bike sends the location of the accident site to the main server nearby hospitals.

Keywords: Accident Detection, Alcohol Detection, Arduino, Vibration sensor and Smart Helmet.

I. INTRODUCTION

The bike accidents are increasing step by step and lead to the loss of numerous lives. By using helmet can decrease the probability of bike accidents. By estimating these days 1.2 million people are losing their valuable lives in road accidents. In day-to-day life, there are many accidents occurring for which some solution must be found as soon as the incident occurs. The death rate is not decreasing even when the hospitals are providing ambulance services. So, to overcome all these problems, there are two important criteria verified by smart helmet before the bike starts. First, check whether the user is using a helmet and not just keeping it. It can be sensed by using the IR sensor. Second, there must be no alcoholic substance present in user's breath. It can be noticed by using gas sensor. It is placed in the helmet. When the person is highly consumed the alcohol, the gas sensor will sense the riders breathe to detect the amount of alcohol content. Third, when a person meets with an accident, If the accident is major then the sensor will identify the bike's condition and the person's location will be sent to nearby hospitals through GPS to the main server of the hospital. If the accident is minor, there is a button present in the bike should be pressed by the person. This intimates that the person is not injured, and the bike will start. The helmet with the sensors for accident prevention, the microcontroller which is used in the project is Peripheral Interface Controller (PIC). The PIC control board consists of microchip, Power supply, Capacitor, Registers, LCD for displaying the values, and pins to connect the sensors. Vibration sensors are used when the bike is hitting more which relates to microcontroller board. So, when the rider collides and the rider's helmet hits the ground, the vibration sensor senses the condition and after that controller extracts GPS information and this information passes message to nearby hospital. During an ONEISS (Online National Electronic Injury Surveillance System) review led by the Department of Health, it was discovered that 90% of the bikes rider killed in accidents were not wearing a helmet at the season of effect. This can be intended to moderate these issues and subsequently the related losses by guaranteeing that the rider will wear the helmet all the time among his/her ride. The helmet can identify an accident, utilizing the locally available vibration sensor. A locally available gas sensor additionally examines the breath of the rider to distinguish if the present level is over the estimate limit. Mems sensor is using to avoid rash driving. It detects the motion of the handle and it is based on the handle bar control of the vehicle. The rest of the paper demonstrated as below. Section II has related work of the paper. The existing and proposed works are described in Section III and IV respectively. Section V and VI discuss about the implementation and results respectively. At last, Section VII concludes the paper with conclusion.

II. RELATED WORK

Dr. Himadri Nath Saha proposes a mechanism by using the parameters such as flex sensor, breathe analyzer, impact sensor, Bluetooth for accident detection and shows how important the alarm by using SVM [1]. Ms. Rekha. M, Ms. Bharathi. K proposes the technology detects amount of alcohol in blood if the limit is above the legal limit then the vehicle won't move [2]. P. Tharangai Thamil, S.Vanitha proposes to determine the detection of rash driving using accelerometer and sensors [3]. Amrutha Madhusan proposes the system which aims at reducing the loss of people lives in road accidents and performs such tasks as accident detecting and sending of the location to the nearby hospital [4]. Prabha project provides an accelerometer which is used in a car alerting application so the risky driving can be detected [5]. Aboli Ravindra Wakure proposes the system with the accelerometer sensor for car security system. Also proposed about the air bags and alcohol sensor [6]. HemangiS. Ahire, Madhuri B. Kamble proposes a system to detection of accident by using GPS tracking system and RF transmitter [7]. Akansha Rajput proposes the system which requires authenticating the finger prints of the rider and it makes sure that the person wears the helmet or not [8]. K.Praveen Kumar reports about a keen head protector which makes the bike driving more secure [9]. Sudharsana Vijayan proposes the framework which checks whether the individual is using the helmet and has non-alcoholic breath while driving

III. EXISTING SYSTEM

An important part of the accidents happens because the individual was either not wearing a helmet, or the accident was not revealed in time, or the person couldn't be safe in view of the late induction to an emergency clinic, or on the grounds that the person was riding while smashed. Sensors distributed, Wi-Fi empowered processor, and computing foundations are used for building the structure. The accident discovery is finished utilizing the accelerometer and the accident warning is finished utilizing the customer and server-based framework where the microcontroller is the customer and the server is an online administration. At the point when an accident happens, the related subtleties are sent to the crisis contacts by using a cloud-based administration. The disadvantages of existing system are 1) Less exactness in the location of accidents, and 2) There is no framework to check if the rider is wearing the helmet or not. there is a transmitter in the helmet and a percipient in the bike [10]. Bhandari Prachi implements a system of automatic accident detection. A sensor unit and GPS, GSM unit placed in the vehicle which detects the accident and pass the location to the main server of nearby hospitals [11]. Adnan Nasir implemented two ultrasonic sensors for identifying the accident. The ultrasonic sensor calculates the distance between the transferring and receiving sound waves [12]. Mohd Khairul Afiq Mohd Rasli proved that everyone should wear the helmet and Seat belt so, it decreases the death rate. If the Person crosses the speed limit, then the alert will be given to the rider [13]. B. Shyam proposed the system to protect from the injury of accidents is to give immediate assistance of the accident occurrence [14]. Prajitha Prasad A proposes the everyone should wear a helmet otherwise the bike will not begin by using the flex sensor the presence of helmet will be detected [15]. Hemendra Kumar proposed the system which ensures that bike will not when the driver doesn't wear the helmet and over consumed alcohol [16]. M. K. A. Mohd Rasli has proposed to improve the motorcycle's rider safety. A BLDC Fan and Force Sensing Resistor (FSR) are used for the detection of the motorcycle's speed [17]. Yovan Felix et al proposed Traffic Management Systm in which license plate of the vehicle is recognized using IoT sensors [18]. Nitin Agarwal proposes design of Smart helmet for rider's safety with radio frequency link. When a user wear helmet then a RF signal release from the transmitter [19]. Pooja Dagade proposes a project consists of vehicle unit, ambulance unit, hospital unit. These units will coordinate with each other. The main objective is to detect the accident and sending the notification to the ambulance [20]. Aravinda B proposed a solution for the accident problem is warning the driver about the opposite side coming vehicle [21]. Jesudoss et al proposed a cloud-based scheme for healthcare information systems. This work provides a secure framework for storing information in a secured way [22].

IV. PROPOSED SYSTEM

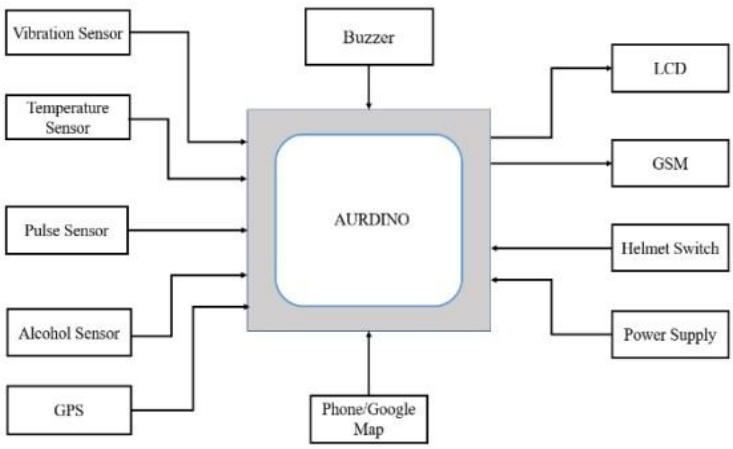


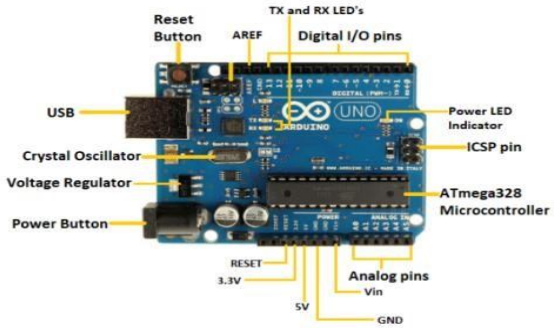
Fig. 1. Block Diagram

Arduino uno is utilized as a microcontroller in this project, and all components are connected to it. The temperature sensor measures the driver's body temperature, and the pulse sensor measures the driver's heart rate. We shall receive a notification to our mobile number whenever the sensor values exceed the threshold value. When we turn on the switch, we receive a notification indicating an emergency situation, and we can monitor the location using GPS. When an accident occurs, the vibration sensor activates, and we receive a notification with the position, which we can monitor using GPS.

Components:

AURDINO UNO :

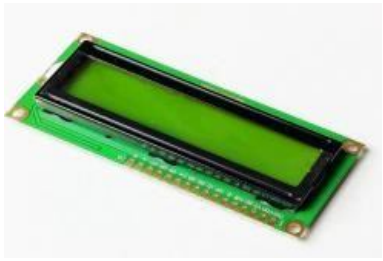
The primary hardware tool that we are employing is the Arduino Uno, a microcontroller board based on the ATmega328. It contains 14 digital I/O pins, 6 analogue inputs, a ceramic resonator operating at 16 MHz, a USB connection, a power jack, an ICSP header, and a reset button. It comes with everything you need to support the microcontroller; simply connect it to a computer through USB or power it using an AC to DC adapter or battery to get started.



- ATmega328 Microcontroller: This is an ATmel family single-chip microcontroller. The processor code inside it is of 8-bit. It combines Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.
- ICSP pin : The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.
- Power LED Indicator: The ON condition of the LED indicates that power is turned on. The LED will not light up if the power is turned off.
- Digital I/O pins: The digital pins have the value HIGH or LOW. Digital pins are those with numbers ranging from D0 to D13.
- TX and RX LEDs: The illumination of these LEDs represents the successful flow of data.
- AREF: The Analogue Reference (AREF) pin is used to feed a reference voltage from the external power source to the Arduino UNO board.
- Reset button: Adds a Reset button to the connection.
- USB- It allows the board to communicate with a computer. It is required for programming the Arduino UNO board.
- Crystal Oscillator: With a frequency of 16MHz, the Crystal oscillator makes the Arduino UNO a powerful board.
- Voltage Regulator: The voltage regulator transforms the input voltage to 5V.
- GND: Ground pins. The earth pin functions as a pin with no voltage.
- Vin: This is the input voltage.
- Analogue Pins: Analogue pins range from A0 to A5. Analogue pins read the analogue sensor used in the connection. It can also function as GPIO (General Purpose Input Output) pins.

LCD :

LCD (Liquid Crystal Display) is a type of flat panel display that operates primarily with liquid crystals. LEDs offer a wide range of applications for both consumers and businesses, since they may be found in smart phones, televisions, computer monitors, and instrument panels.



BUZZER :

The buzzer or beeper is a voice signaling device that can be mechanical, electromechanical or piezoelectric. Typical buzzers and beepers applications include confirmation of user inputs, such as alarms, timers and mouse clicks or pulsations.

DHT 11 Sensor:

Sensor DHT11 (Digital Humidity Temperature) DHT11 has a temperature range of 0 to 50 degrees Celsius with a 2-degree accuracy. This sensor has a humidity range of 20 to 80% with a 5% accuracy.

Pulse sensor:

This sensor is also known as a heartbeat sensor or a heart rate sensor. Pulse Sensor is a well-designed Arduino plug and play heart-rate sensor. Students, artists, athletes, makers, and game and mobile developers that wish to effortlessly incorporate live heart-rate data into their work can use it. The sensor attaches to a fingertip or earlobe and connects directly to Arduino.

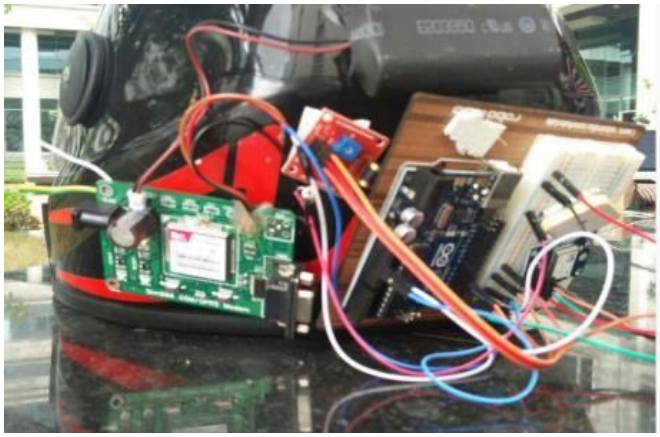
GPS:

The Global Positioning System (GPS) is a satellite-based navigation system comprised of a network of 24 satellites orbited by the United States Department of Defense. GPS was originally meant for military usage, but the government made it available for public use in the 1980s.

Merits Compared To Existing Approach:

1. An alcohol sensor is used to track alcohol intake.
2. Overload is automatically monitored.
3. Vehicle accidents are detected automatically.
4. A location-based ambulance is automatically arranged.
5. Helmet use is automatically identified

RESULT:



CONCLUSION:

There are numerous incidents of accident identification. Our work is precise and accurate, demonstrating that our suggested approach is accurate in recognising accidents by using vibration, load monitoring, MEMEs, and high alcohol consumption. The comparison of the characteristics for accident detection demonstrates the significance of wearing a helmet.

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