


# Smart Healthcare Security Device on Medical IoT Using Raspberry Pi

Sudhakar Sengan, PSN College of Engineering and Technology, India

 <https://orcid.org/0000-0003-4901-1432>

Osamah Ibrahim Khalaf, Al-Nahrain University, Iraq

Priyadarsini S., PSR Engineering College, India

Dilip Kumar Sharma, Jaypee University of Engineering and Technology, India

Amarendra K., Koneru Lakshmaiah Education Foundation, India

Abdulsattar Abdullah Hamad, Tikrit University, Iraq

## ABSTRACT

This paper aims to improve the protection of two-wheelers. This study is divided into two parts: a helmet unit and a vehicle unit. The primary unit is the helmet unit, which contains a sensor, and the second part is known as the alcohol sensor, which is used to determine whether or not the driver is wearing the user helmet correctly. This data is then transmitted to the vehicle unit via the RF transmitter. The data is encoded with the aid of an encoder. Suppose the alcohol sensor senses that the driver is intoxicated. In that case, the IoT-based Raspberry Pi micro-controller passes the data to the vehicle unit via the RF transmitter, which immediately stops the vehicle from using the driver circuit to control the relay. To stop the consumption of alcohol, the vehicles would be tracked daily. If the individual driving the vehicle is under the influence of alcohol while driving, the buzzer will automatically trigger. The vehicle key will be switched off.

## KEYWORDS

Alcohol Sensor, Encode, Healthcare Device, IoT, Limit Switch, Vehicle Drunk Alcohol

## INTRODUCTION

Vehicles are becoming obsolete as the world population increases. As a result, traffic dangers and road injuries have increased, resulting in significant life loss due to inadequate emergency services (Abdulsahib & Khalaf, 2018). The study aims to identify the car by sending out a message through a device installed within the vehicle. We cannot identify the accident location in most cases since we do not identify where accidents may occur. When a car is involved in a crash, the vibration sensor detects the signal and transmits it to the Arduino microcontroller (Abdulsahib & Khalaf, 2021). The alarm sounds are sent to the police station or a rescue squad by the microcontroller (Alkhafaji et al., 2021). As a result, as soon as the police receive the details, they can use the mobile device modem to track the address. This method has a high degree of precision and reliability, showing that our suggested system effectively detects incidents using shaking, load tracking, MEMEs (Al-Khanak et al., 2021), and colossal alcohol drinking. The value of wearing a helmet is shown by comparing integrated sensor

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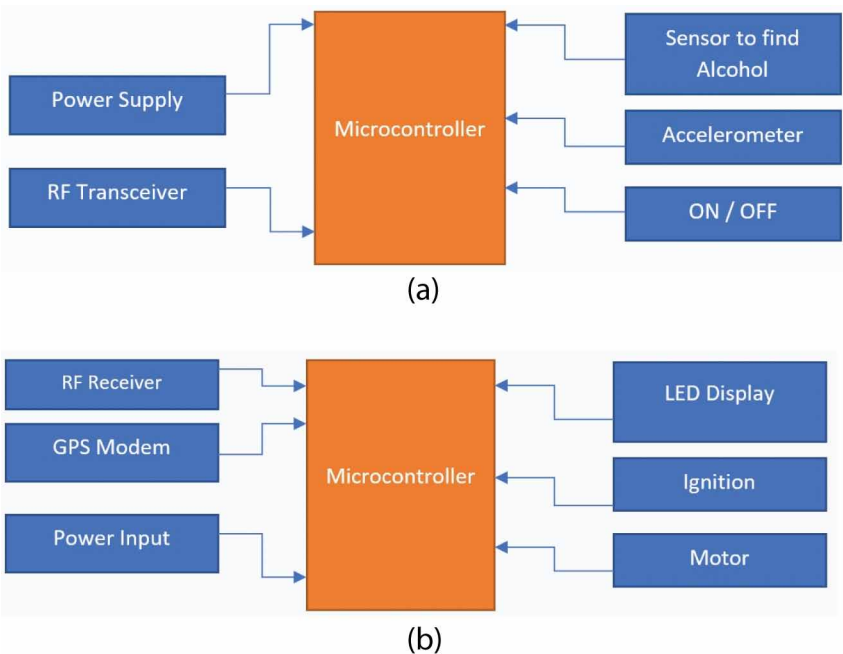
parameters—a trend toward creating an automated guided helmet device that effectively tracks helmet use and driving while intoxicated (Ayman Dawood et al., 2019). A protected 2-wheeler ride can be accomplished by introducing this device, which will reduce head trauma caused by accidents due to a lack of a helmet and the rate of accidents caused by driving drunk. To determine whether or not a person is wearing a helmet. It also identifies any injuries and excessive alcohol consumption—the framework for designing the rapid first-aid alert system for 2-wheeled vehicles using inertial I sensors on mobile devices (Carlos et al., 2021; Dalal & Khalaf, 2021).

## PROBLEM STATEMENT

This study aims to build a design that can provide high safety standards in vehicles. The use of embedded technologies accomplishes this. This research aims to improve the safety of 2-wheelers (Ganesh Kumar & Sudhakar, 2020). This article consists of two units: a helmet unit and a vehicle unit. A sensor in a helmet device senses whether the driver is wearing the helmet correctly. Then, this data is conveyed to the vehicle unit via the control unit (Ghaida & Osamah, 2018). The helmet control unit receives this signal and sends it to the Arduino. This data was released to the controller for testing. If the helmet is correctly worn, the microcontroller allows the vehicle to operate; else, the relay is turned off, causing it to stop (Hamad et al., 2021; Hoang et al., 2021; Jebril, 2021).

To identify the driver's location, another limit switch is used. If the alcohol sensor senses that the driver is intoxicated, the Arduino microcontroller controls the relay to stop the car immediately (Keerthana et al., 2020; Khalaf & Abdulsahib, 2021; Khalaf & Abdulsahib, 2019). Due to the signal from the traffic unit, the driver circuit is used to operate the relay. Many of the injuries occur since the person was not wearing a helmet, the road accident was not reported promptly, the person could not be protected due to late admission to an emergency department, or the individual was riding when smashed (Figure. 1). The system is designed using distributed sensors and Wi-Fi-enabled

Figure 1. (a) Block diagram helmet circuit; (b) Block diagram of bike circuit



processors and computing foundations (Khalaf & Sabbar 2019; Khalaf et al., 2020; Li et al., 2021; Ogudo et al., 2019).

The accelerometer is used for accident detection, and the customer and server-based architecture is used for accident alerts, with the microcontroller serving as the client and the server serving as online management (Osamah Ibrahim Khalaf et al., 2018). If an accident occurs, the relevant information is sent to the crisis contacts through cloud-based management (Osamh & Ghaida, 2020). The drawbacks of the current system are that 1. The position of injuries is less precise, and 2. There is no mechanism to verify whether or not the driver is wearing helmets. Sensors include an infrared, load, vibration, and gas sensor, as well as mems (Prasad et al., 2020; Priyadarshini & Sudhakar, 2015).

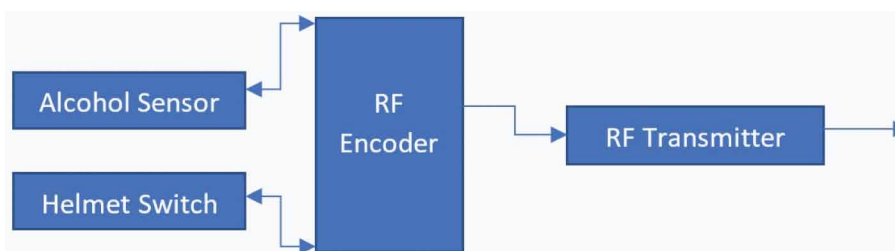
The gas sensor senses alcohol consumption in a person's lung, wearing a helmet. The helmet's alcohol identification sensors differentiate between alcohol consumption and non-alcohol detection. A MEMS-based handlebar operates the vehicle. Any accident is detected using the vibration sensor. Load testing to assess the vehicle's load and a sensor to determine the number of people riding the bike. These criteria are used to avoid bicycle accidents (Romero et al., 2021; Sengan et al., 2021).

## PROPOSED SYSTEM

This study aims to implement the safety of two-wheelers. There are two units in this paper: one is a helmet unit, and the other is a vehicle unit (Sengan et al., 2021). There is a sensor (Limit switch) and an alcohol sensor in a helmet device that detects whether the driver is wearing the helmet correctly or not. The information is then transmitted to the vehicle unit via the RF transmitter (Sudhakar & Chenthur Pandian, 2016; Subahi et al., 2020; Sudhakar & Chenthur Pandian, 2012). The information is encoded using an encoder. Suppose the alcohol sensor senses that the driver is intoxicated, the Raspberry Pi microcontroller sends the information to the vehicle unit via the RF transmitter, which then immediately avoids the vehicle using the Driver circuit to manage the relay (Suleiman et al., 2014; Tran et al., 2021; Wang et al., 2021; Wisesa et al., 2020; Wisesa et al., 2020; Xiang et al., 2021). If the driver consumes alcohol when operating the motorcycle, the buzzer will trigger, making a loud noise and signaling the rider to stop. The method is aimed to enhance safety and minimize injuries, with the government limiting high speeds, which are particularly dangerous to motorcyclists (Figure. 2). With the average citizen's growing purchasing power, the vehicles we use have increased, but the craze for motorcycles in today's period, especially among the younger generation, is incredible (Yu et al., 2014; Zhang & Chong, 2009; Zhao et al., 2020; Zheng et al., 2021; Romero et al., 2021)

Due to the low cost, middle-class families tend to purchase motorcycles over 4-wheelers. When the number of bikers in our region increases, so do the number of road mishaps, resulting in many accidents, most of which are triggered by the most public mistakes of not wearing helmets and driving above the speed limit.

Figure 2. Block diagram of smart helmet



This raises awareness about creating a system that ensures biker protection by allowing the helmet to follow the government's recommendations. The system presented is based on microcontroller-based circuitry and uses GSM. GSM achieves 2-way interaction with the motorbike and the rider utilizing a GSM for SMS Alerts as on the rider's smartphone. The system also includes a siren and a stand sensor if anyone steals the bike.

## HARDWARE SPECIFICATIONS

### Raspberry Pi

The Raspberry Pi is a credit-card-sized interface that provides to your TV through a keyboard and can perform many of the tasks that a typical desktop computer can, including spreadsheets, word processing, gaming, and high-definition video playback. The Raspberry Pi charity organization hopes to see the computer used to teach coding and technology to children worldwide.

### RF Transmitter and Receiver

Radio Frequency (RF) emission is a subclass of electromagnetic radiation with wavelengths ranging from 100 to 1 mm and frequencies ranging from 3 to 300 GHz. The radio spectrum is the range of electromagnetic radiation that refers to alternating electrical signals used to generate and track radio signals. Electromagnetic fluctuations in electronic systems or emissions via air and space are denoted as RF.

### Limit Switch

Among all sensors' most fundamental, the switch is available in two configurations: generally open and normally closed. Mechanical switches were widely used in control applications before advancements in sensing devices. Mechanical switches are still being used for this purpose due to improved reliability and performance, but they are mainly used to limit switch actuation and wear. The standard limit switch is a mechanical system that detects the target directly. A limit switch is made up of two parts: a switch body and an operating head. The switch body has electrical contacts that can be used to energize or de-energize a circuit.

### Alcohol Sensor

Blood Alcohol Content (BAC), also recognized as blood alcohol concentration, ethanol concentration, or alcohol level, is the most commonly used measurement for legitimate/health purposes for drinking alcohol (Figure 3).

Figure 3. Alcohol sensor



## Web Camera

A webcam is a recording device that sends real-time images to a device or computer network, usually through USB, Ethernet, or Wi-Fi. The most common application is the development of hyperlinks, which enables computers to work as videophones or video conference stations. The webcam got its name from its widespread use as a video camera for the Wwww. Security monitoring, big data, video broadcasting, and capturing social videos are standard applications.

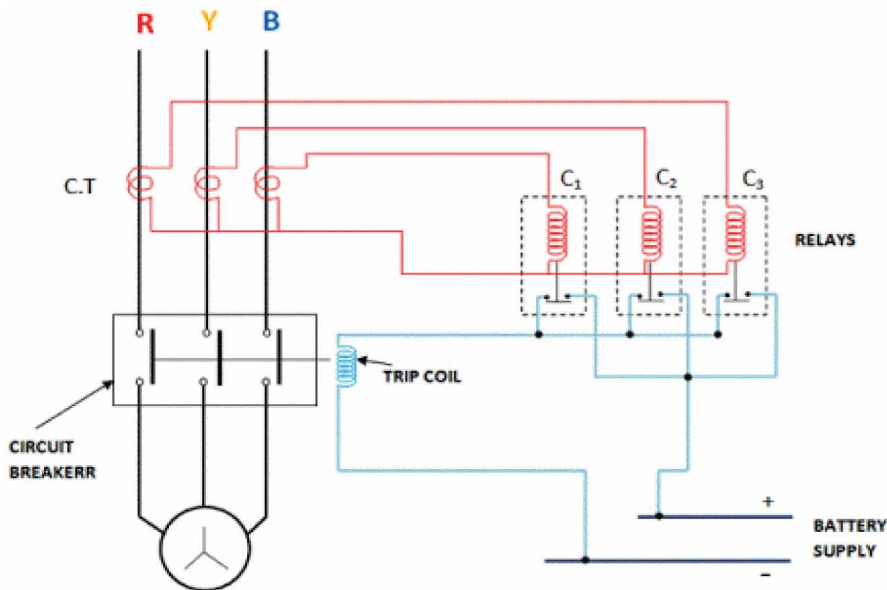
## Power Supply

The AC voltage, which is probably 220 V RMS, is mounted to a converter to ACE tension to the acceptable DC output. A bridge rectifier then generates a full-wave rectified stress, which would also be first filtered from the primary capacitor filter to generate a DC tension. The related DC voltage significantly varies from pulse or AC voltage.

## Relay Circuit

The purpose of this circuit is to manage the load. The load could be a motor or something else entirely. Relays are used to turn on and off the load. The relay is switched on and off by switching transistors (BC 547). The relay is attached to the collector terminal of the Q2 transistor. Relays are electromagnetic switching devices with three pins. It consists of Common, Normally Closed, and Open (Figure 4).

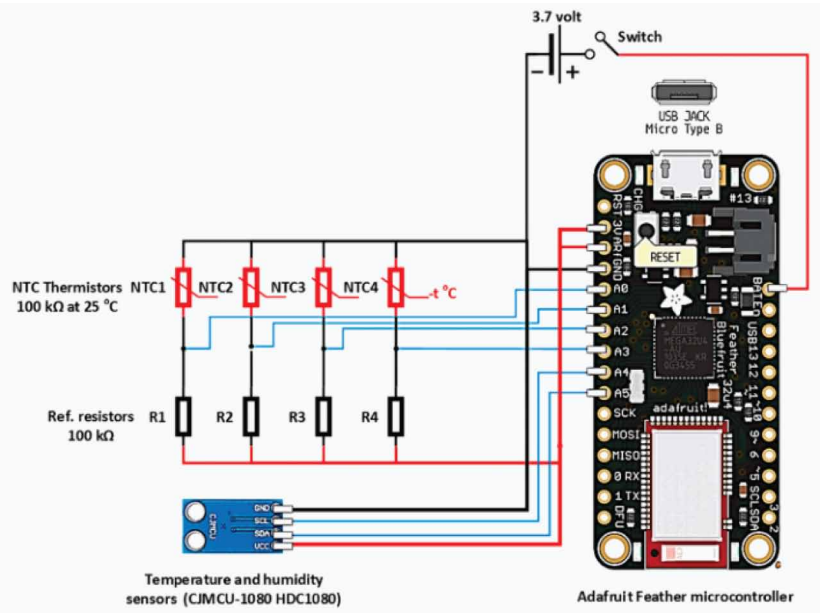
Figure 4. Relay trip



## IMPLEMENTATIONS

The helmet's transmission end is attached to the Raspberry Pi Module's receiver end, and the Raspberry Pi's receiving end is linked to the GSM Module's transmitting side. The Raspberry Pi is supplied with power. Power is spread to other modules from Raspberry Pi. The alcohol sensor's output pin is connected to the Raspberry Pi's eighth pin. The Raspberry Pi binds and controls all of the elements (Figure 5).

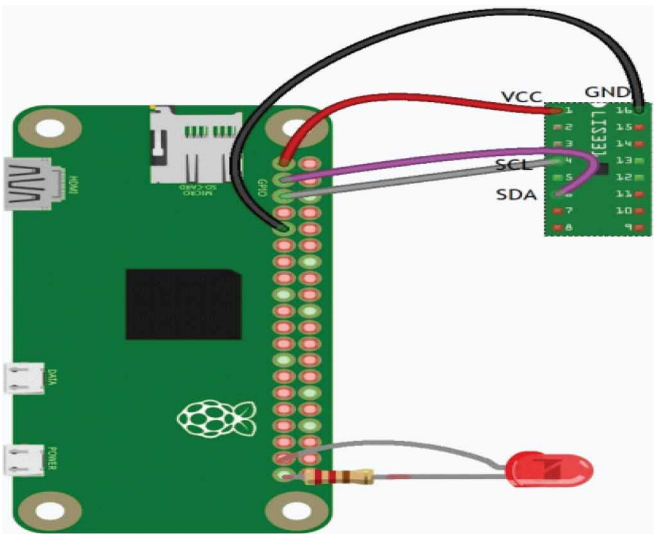
Figure 5. A prototype system



## RESULT AND DISCUSSIONS

The limit switch is integrated into the helmet and must be pressed when wearing it. It sends signals to the microcontroller's receiver. It allows us to determine whether the rider is wearing a helmet. To avoid alcohol intake, the vehicle will be tracked daily. If the individual driving the vehicle is under the influence of alcohol while driving, the buzzer will robotically trigger. The vehicle key will be switched off (Figure 6).

Figure 6. Raspberry pi for smart helmet



## CONCLUSION

The government is taking the lead by making helmets and no-drink driving laws mandatory. Just 10% of bike riders, as per the study, obey these laws. These laws are often broken. The proposed IoT device involves a “Smart Helmet” that detects the amount of alcohol taken by the rider and wearing a helmet. This device is made up of an Android app. The IR Sensor for helmet identification and the MQ303A for alcohol detection will be investigated on the smartphone. Hopefully, the new system would ensure rider safety and limit the number of people who drink and drive and ensure that traffic laws are enforced.

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*Sudhakar Sengan is presently working as Professor and Director International Relation, Department of Computer Science and Engineering, PSN College of Engineering and Technology (Autonomous), Tirunelveli-627152, Tamil Nadu, India. He is received PhD degree in Information and Communication Engineering from Anna University, Chennai, Tamil Nadu, India. And received his ME degree in the Faculty of Computer Science and Engineering from Anna University, Chennai, Tamil Nadu, India, in 2007. He is presently working as Professor and Director International Relation, Department of Computer Science and Engineering, PSN College of Engineering and Technology (Autonomous), Tirunelveli-627152, Tamil Nadu, India. He has 20 years of Experience in Teaching / Research / Industry. He has published papers in 100 International Journals, 20 International Conferences and 10 National Conferences. His research interest includes Network Security, Information Security and Mobile Ad Hoc Network. He has filled 18 Indian and 3 International Patents in various field of interest. He is a member of different professional bodies like MISTE, MIEEE, MIAENG, MIACSIT, MICST, MIE and MIEDRC. He guided more than 100 Projects for UG & PG students in engineering streams. He is the Recognized Research Supervisor at Anna University under the faculty of Information and Communication Engineering. He received an Honorary Doctorate award (Doctor of Letters-D.LITT.) from International Economics University; SAARC Countries in Education and Students Empowerment in April 2017. He is currently guiding many research scholars in various Universities. He delivered Guest Lectures at Various Autonomous Institutions and Universities. He is Doctoral Committee Member for many scholars in reputed Universities. He has published 3 Textbooks for Anna University, Chennai Syllabus.*

*Osamah Ibrahim Khalaf is Senior Engineering and Telecommunications Lecturer in Al-Nahrain University. He has hold 17 years of university-level teaching experience in computer science and network technology and has a strong CV about research activities in computer science and information technology projects. He has had many published articles indexed in (ISI/Thomson Reuters) and has also participated and presented at numerous international conferences. He has a patent and has received several medals and awards due to his innovative work and research activities. He has good skills in software engineering, including experience with .Net, SQL development, database management, mobile applications design, mobile techniques, Java development, android development, and IOS mobile development, Cloud system and computations, website design. I am Editor in Chief and main guest editor in many Scopus and SCI index journals. His brilliant personal Strengths are in highly self-motivated team player who can work independently with minimum supervision, strong leadership skills, and an outgoing personality. He got his B.Sc. in the software engineering field from Al Rafidain University College in Iraq. Then he got his M. Sc. in the computer engineering field from Belarussian National Technical University. After that, he got his PhD in computer networks from the faculty of computer systems & software engineering at -University of Malaysia, Pahang. He has overseas Work experiences at University in Binary University in Malaysia and University Malaysia Pahang.*

*S. Priyadarsini received B.E degree in Computer Science and Engineering in 2005 and M.E. degree in Computer Science and Engineering in 2007. She completed her Ph.D degree in the area of Medical Image Processing in 2011. Presently, she is working as Associate Professor, Department of Computer Science and Engineering, PSR Engineering College, Sivakasi, Tamil Nadu, India. She has 12 years of teaching and research experience. She guided more than 15 ME students. She published more than 20 papers as the main author and co-author in journals and conferences. She organized and attended many conferences, FDPs and seminars. Her research interests are Image Processing for Medical images Processing, Big Data Analytics, Cloud computing and Networks.*

*Dilip Kumar Sharma is presently working in Department of Mathematics, Jaypee University of Engineering and Technology, Guna (M.P.), India. He did his M.Sc.(Mathematics) from Government PG College Guna (M.P.) in the year 1998 and M.Tech. (Future studies and planning) from School of Future studies and planning, Devi Ahilya University Indore (M.P.) in the year 2002. He did his Ph.D. from JUIT Wakanaghat, Solan (H.P.) in the year 2009. He has about 16 years teaching experience. He is Senior member of IEEE, Bombay Section. He is life member of Forum for Interdisciplinary Mathematics (FIM) and Indian Science Congress. He has published many research papers in reputed international journals and presented research papers in Conferences. He has visited NUS Singapore and Concordia University, Montreal, Canada. He is also a member of editorial board of the JUET Research Journal of Science and Technology. He has supervised 3 Ph.D. scholars and one Post-Doctoral fellow sponsored by NBHM, DAE, Mumbai and he is currently supervising two Ph.D. scholars.*

*Amarendra K. is a Professor, Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Green Fields, Vaddeswaram, Guntur-522502, Andhra Pradesh, India.*

*Abdulsattar Abdullah Hamad is from the Department of Mathematics, Tikrit University, Iraq.*