IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 5, May 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 5, May 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1205233 |

Biometric and Voice-Enabled Motorcycle Security System with Integrated Alcohol Detection

Irfan Mohammed[1], Praison G Raju[2], Shravana R[3], Yedhu Krishnan O[4], Shahana Habeeb Mohammed[5], Shejin Mathulla Thomas[6], Lakshmi Nair[7]

UG Student, Department of ECE, Mount Zion College of Engineering, Pathanamthitta, India[1-4]

Assistant Professor, Department of ECE, Mount Zion College of Engineering, Pathanamthitta, India[5-7]

ABSTRACT: Improving motorcycle security is crucial due to the high frequency of thefts facilitated by ineffective mechanical locks. Therefore, there is an urgent need for a more advanced security system to safeguard motorcycles. This project focuses on creating such a system, which incorporates features like fingerprint recognition and voice commands for access. The results of this effort show a significant security improvement compared to traditional mechanical keys. Given the concerning increase in road accidents, prioritizing rider safety is essential. This initiative aims to reduce accident risks by addressing common factors like alcohol impairment and drowsiness. When these conditions are detected, the system alerts the rider with an alarm and, if the motorcycle is stationary, automatically disables the ignition and locks the bike as a precautionary measure.

KEYWORDS: Motorcycle Security System, Biometric- Voice Command Based Solution, Alcohol Detection, Smart Helmet.

I. INTRODUCTION

In today's world, the use of vehicles is becoming more common. Especially motorcycles. Motorcycles are better suited for individual use. Weak security systems and drunk driving have led to an increase in theft and accidents. Traditional motorcycle security systems use physical locks and keys, which are vulnerable to theft and unauthorized access. Experienced thieves can easily bypass and manipulate physical locks and keys, making security measures ineffective. Traditional systems provide limited functionality and convenience, often requiring riders to carry bulky keys or remember complex lock combinations. Furthermore, these systems lack real-time monitoring and alerts for unauthorized access or tampering, making motorcycles vulnerable to theft. The effectiveness of traditional motorcycle security systems is restricted, and they do not tackle the critical problem of rider safety regarding alcohol consumption.

II. RELATED WORK

The present motorbike security setup includes a password-based entry system with a keypad, GSM technology, and an anti-theft mechanism with ignition control. The system includes a vibration sensor, similar to a piezoelectric sensor, that sends an SMS alert to the vehicle owner when it detects vibrations. The engine can be stopped remotely once the owner responds via SMS. Adding a password to the ignition key complicates the start-up process. Riders may struggle to remember and enter their passwords, causing irritation and errors, especially during tense situations. Password-based locks, like any electronic system, can have technical faults or malfunctions. Even with the correct password, a malfunction can disable the bike, posing inconvenience and safety threats. While password-based locks can dissuade tech-savvy thieves, they may not fully protect against physical theft tactics like hot-wiring or ignition bypassing.

III. PROPOSED SYSTEM

Introducing the next level of motorcycle security: a cutting-edge system integrating fingerprint and voice command recognition all supported by an alcohol-detecting feature and driven by a microcontroller. The days of traditional locks and keys are long gone. This cutting-edge biometric security system uses innovative technology to transform motorcycle protection. With fingerprint recognition, only authorized users can access the motorcycle, ensuring unparalleled security and peace of mind. However, it doesn’t end there. An additional degree of security and convenience is provided via voice command capability. Imagine being able just to use your voice to start or stop your motorcycle, making the whole process simple and natural. Furthermore, safety is of utmost importance. The system includes an alcohol detection feature, ensuring that only sober riders can operate the motorcycle. This not only reduces

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the risk of accidents but also encourages responsible riding behavior. All these cutting-edge features seamlessly integrate into a compact microcontroller, making installation and operation hassle-free. With this groundbreaking security system, riders can confidently safeguard their motorcycles while enjoying the benefits of modern technology.

1) BLOCK DIAGRAM:

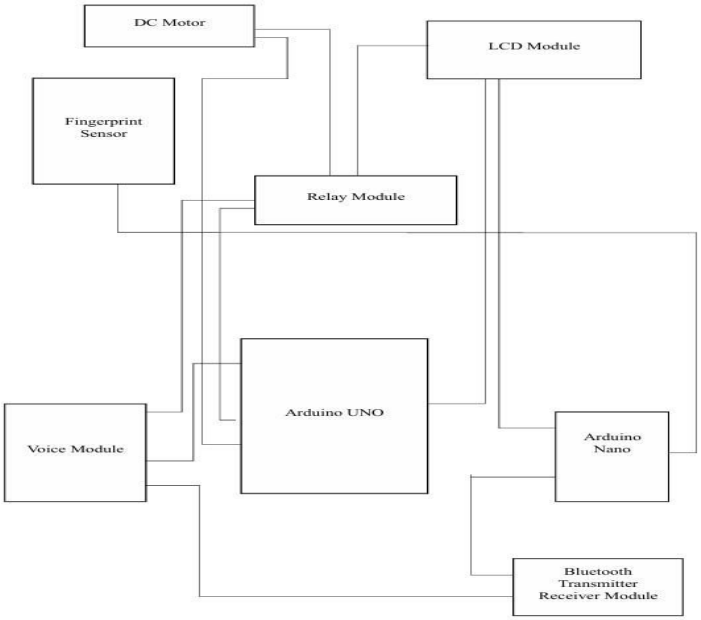

Figure 1. Block diagram of motorcycle

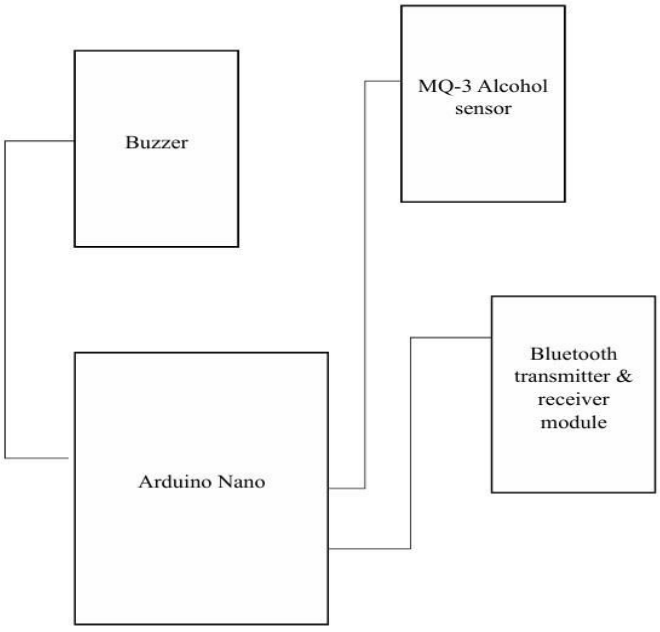

Figure 2 Block diagram of smart helmet

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Figure 1 shows an Arduino UNO microcontroller, a fingerprint sensor, a voice module, Bluetooth receiver and transmitter modules, a relay module, an LCD, and a DC motor. The Arduino is powered by 5 volts and supplies power to all attached components. When activated, the LCD module prompts the user with the message "Place your finger to scan." When a fingerprint is scanned, the sensor transmits a signal to the controller. If the fingerprint matches, an instruction ("Speak Now") appears on the LCD. If there is no match, the ignition will remain dormant. The voice module receives and analyses spoken commands, which adds to safety. A positive match starts the ignition. The motor indicates the microcontroller's 5V output. . Figure 2 features an Arduino UNO, an MQ3 sensor, a buzzer, and a 5V power supply. The MQ3 sensor detects alcohol in the breath, sending a signal to the microcontroller, activating the buzzer, and preventing ignition. The buzzer alerts the user against riding. This intelligent system, installed within the helmet, requires a 5V supply from the battery for operation.

2) CIRCUIT DIAGRAM:

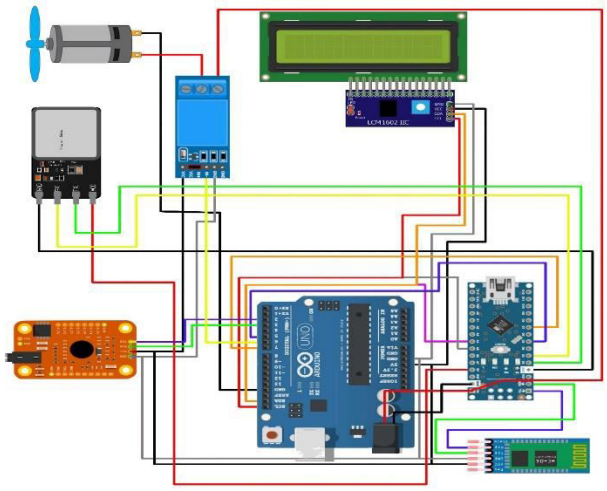

Figure 3 Circuit diagram of biometric and voice-command motorcycle system

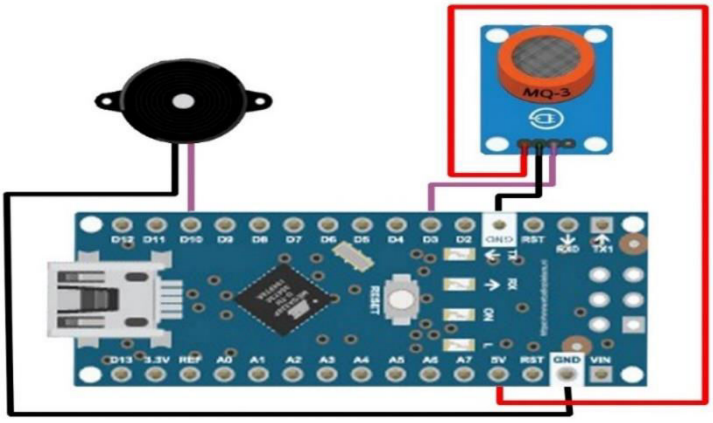

Figure 4 Circuit diagram of the alcohol detection system

The “Biometric and voice command motorcycle security system with alcohol detection” uses two 18650 lithium-ion batteries connected in series to provide the Arduino UNO and Arduino Nano microcontrollers with 8V DC. The power supply is turned on and off using a switch. The fingerprint sensor's two data pins are connected to the D2 and D3 pins on the Arduino Nano, and its ground is connected to the GND pin of the device. The 5V output of the Arduino Nano provides 5V to the fingerprint sensor. The TXD and RXD pins of the Bluetooth module HC-05 are

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connected to the Arduino Nano's TX1 and RX0 pins, respectively. Digital Pins 7 and 5 of the Arduino UNO are connected to the D5 and D7 pins of the Arduino Nano, respectively. The ground pin is linked to the Arduino UNO's GND, and the 5V output of the UNO supplies the Bluetooth module with 5V input. The A4 and A5 pins of the Arduino Nano are connected to the SDA and SCL pins of the Arduino UNO, respectively. The VOICE module's TXD and RXD are connected to digital pins 2 and 3 on the Arduino UNO, respectively. The Arduino UNO's GND is connected to its GND, and the voice module receives the 5V output from the UNO connected to its VCC. The LCD's VCC is connected to the Arduino UNO's 5V output, and the GND pin is connected to the Arduino UNO's GND. The SDA and SCL pins of the LCD are linked to the corresponding SDA and SCL pins of the Arduino UNO. A DC motor is connected to the common pin of the relay, and the other end is connected to the GND of the Arduino UNO. The NO pin of the relay receives 8V DC from the power supply. The input signal for the relay comes from digital pin 6 on the Arduino UNO, and 5V and GND are supplied to the Relay from the 5V output and GND of the Arduino UNO.

The module in the helmet contains Arduino nano, Bluetooth module HC-05, buzzer, and MQ3 sensor The digital pins from the Bluetooth module are connected to the TX1 and RX0 pins on the Arduino nano The input of the buzzer is connected to the D10 pin on the Arduino nano and the GND is connected to the GND of the Arduino nano. The data pin on the MQ3 sensor is connected to the D3 pin on the Arduino nano, both the Bluetooth module and the MQ3 sensor are supplied with 5V and GND from the Arduino nano.

IV. METHODOLOGY

In the Arduino family, one of the most popular microcontroller boards is the Uno. At its core is an ATmega328P microprocessor, which operates at 16 MHz The Uno board has six analog inputs, six digital input/output pins (six of which can be used as PWM outputs), a power jack, an ICSP header, a reset button, a USB port for programming, and other features. Because of its ease of use and versatility, it is frequently used for interactive electronic project creation and prototyping. A smaller, more breadboard-friendly variant of the Arduino board is called the Arduino Nano. It is built around the ATmega328 microprocessor, which has a smaller form size than the Uno. The majority of the Uno's features are still included in the Nano despite its smaller size, including eight analog inputs, six PWM output pins among the 14 digital input/output pins, a USB interface for programming and power, an ICSP header, and a reset button. The Nano is especially well suited for situations where portability is important or where there are space limits. Due to its compact size, it is perfect for wearable electronics integration or embedding into completed products.

Two lithium-ion batteries (18650) connected in series provide the Arduino Uno with 7.4V of power. The power supply is turned on and off via a switch. The Arduino Uno stores the data that will be displayed on the LCD. The Arduino Uno receives 5 volts of direct current from the Arduino Board. Additionally, the Arduino Uno receives connections from the SD Card and SD Analyzer. The Arduino Uno is also connected to the Voice Module through digital pins 2 and 3 on the Arduino Board. The Arduino Uno's VCC and GND are connected to the 5 volts from the Arduino Uno. The Arduino Uno's input is connected to the 6th pin on the Arduino Uno, and the Arduino Uno provides the relay with 5 volts of power. The Arduino Uno's ground is connected to the DC motor's ground, and the motor's middle section is connected to the relay's other side, which receives 7.4 volts from the battery.

The tx and rx from the fingerprint sensor are connected to the d2 and d3 of the Arduino Nano, and 5v is supplied. The Arduino Nano is used to store data from the fingerprint sensor and the Bluetooth HC 06 receiver module from the Arduino Nano to the VCC of the fingerprint sensor. The Arduino Nano's txd and rxd are linked to the rxd and txd from the Bluetooth module, and the module receives 5 volts from Nano's 5-volt output.

V. EXPERIMENTAL RESULT

The combination of biometric authentication, voice command technology, and alcohol detection in motorbike security systems has the potential to significantly improve theft prevention and rider safety. The use of biometric data, such as fingerprints is a highly secure way of rider authentication that reduces the possibility of unauthorized access to the motorcycle. Additionally, voice command capabilities offer hands-free operation, allowing riders to simply communicate with the security system.

The addition of alcohol-detecting technology improves safety by prohibiting drunk riders from driving the motorcycle. By automatically detecting alcohol levels via breath or skin contact, the technology can successfully

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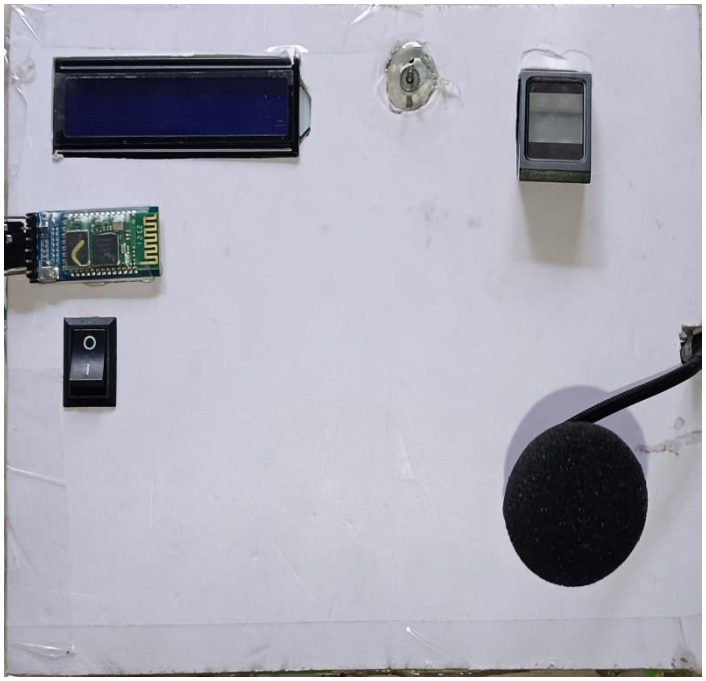
prevent the motorcycle from starting if the rider is intoxicated. This feature not only decreases the chance of accidents caused by intoxicated driving but also encourages riders to behave responsibly.

The figures show the hardware implementation of the security system and the alcohol detection system. After designing, assembling, soldering, and testing the circuit of the motorcycle security system, the alcohol detection system works efficiently



Figure(a) Motorcycle Security System

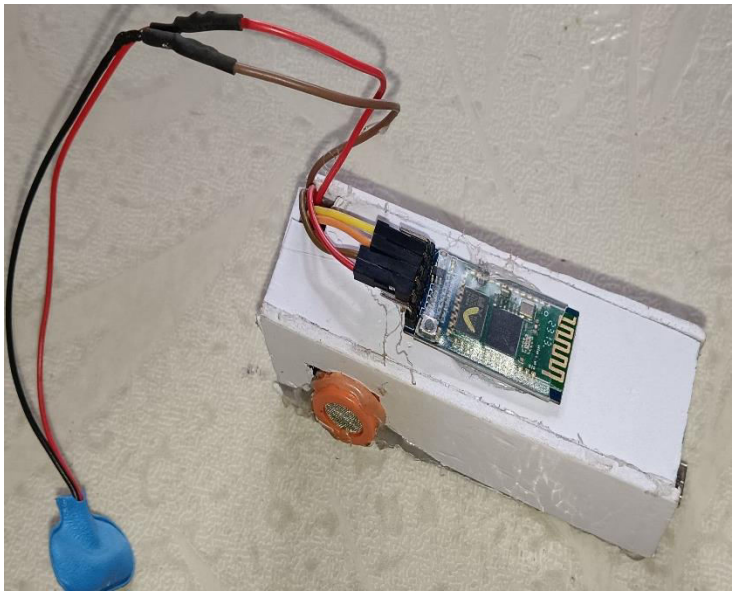


Figure (b) Alcohol Detection System

VI. CONCLUSION

Additional motorcycle security system design implemented to reduce the incidence of motorcycle loss due to theft. The security system created combines a fingerprint sensor and voice commands using a

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microcontroller Arduino UNO as the control unit. The motorcycle security system works when the condition is on or off because the security system will continue to run. The alarm feature in this security system is used to alert the user about the danger of riding a motorbike while drunk. Connection between the motorcycle and the helmet is done using a Bluetooth connection. The proposed security system using fingerprint and voice commands has been tested and gives good results.

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