

Advanced Motorbike Ignition System Using Biometric Scanner or RFID Reader

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ABSTRACT: The system we devised utilizes both biometric scanner and RFID reader to activate the motorbike engine. This advanced and secure system provides users with alternate methods to activate their cycle engine. With the RFID implementation, multiple users can access the system using an RFID tag, but only authorized members can operate the cycle. RFID technology utilizes electromagnetic fields to identify and monitor devices affixed to objects. The system consists of a radio transponder, a radio receiver, and a transmitter that communicate with each other to transmit digital data back to the reader. Biometric authentication is also integrated in the system using a mechanism that utilizes a biologically distinct identifier, such as fingerprints. The authentication process entails a registration process to establish reference biometric data, which is then compared to the provided biometric data during the authentication procedure. If there is a match, the authentication is successful, otherwise, it fails. In summation, this project seeks to develop a sophisticated system that enables multiple individuals to access the vehicle using either biometric or RFID authentication methods. Users can effortlessly start their motorbike using this initiative.

KEYWORD: Vehicle, Biometric access control, Arduino UNO, Fingerprint recognition, RFID, Safety, Security.

I. INTRODUCTION

Keyless authentication for automobiles based on biometrics is provided through RFID tags and fingerprint recognition. To avoid car theft, the suggested method therefore involves developing a keyless authentication system for a vehicle rather than opting for a key-based authentication system. This project aims to develop a complex system that will allow numerous users to readily access the motorcycle using either biometric or RFID technology. A biometric scanner verifies users' identities using their biologically unique identification. Fingerprints are determined IDs, and a registration step for reference biometric data usually precedes a biometric authentication process. Radio-frequency identification (RFID) This technology utilizes electromagnetic fields for the automatic detection and tracking of tags that are affixed to items. This project's objective is to develop a sophisticated system that will make it simple for several individuals to access the car using either biometric or RFID technology.

II. RELATED WORKS

We were able to obtain a lot of journals and publications on the topic of fingerprint and RFID to refer and help us in creating our system. Almost all of the works published includes fingerprint or RFID or both that used in vehicles or any kind of supported devices etc. Some of the works we referenced are given below:

A Fingerprint and RFID Tag Based Authentication System for Driving [1]: -

The prevalence of vehicle theft in today's society has become a significant concern for individuals who own cars or motorcycles. This technical report details the development of an authentication system that employs fingerprint and RFID tag technology to secure a vehicle. By utilizing biometric-based authentication through fingerprint recognition and keyless authentication via RFID tags, this system aims to enhance vehicle security. To address the issue of vehicle theft, the proposed system aims to replace the conventional key-based authentication system with a keyless authentication system. The system also incorporates biometric authentication, using a person's fingerprint. Before a person can drive the vehicle, they must first verify their identity by scanning their fingerprint. The system checks the fingerprint data against the database to determine if the person is authorized to drive. If the verification is successful, the vehicle's ignition unit will automatically start. However, if the person's fingerprint is not registered in the database, the vehicle will not start.

RFID and Finger Print Based Dual Security System: A Robust Secured Control to Access Through Door Lock Operation [2]: -

This article focuses on control engineering research and strives for a security system that cannot be compromised, especially when it comes to drugs, ornaments, documentation, and other critically important things. This security system must be present in higher intelligence agencies. This article a sophisticated biometric security system that employs both fingerprint recognition and RFID card tagging to uphold a person's legitimate entry to a guarded location. The RFID reader, which serves as a security locker, and the fingerprint detection device, which serves as an RFID tag, are both opened by a validly authenticated fingerprint. A door bar's associated servo mechanism opens when entry is granted by an entity. In contrast, nothing is conducted as a cavalcade if the sensing system determines that the entity is invalid. The need to remember a password or PIN combination or to maintain track of keys is eliminated by these. Additionally, a prototype security system is created, and its functionality is assessed. The performance's positive results demonstrate the system's validity and point to a better design for a future security system.

DEVELOPMENT OF VEHICLE IGNITION USING FINGERPRINT [3]: -

This study focuses on developing a fingerprint sensor-based car ignition prototype. This technology can stop car theft. It is designed to let you use a fingerprint scanner to start your car. The GSM SIM 900 in this system links to the Arduino, the project's microcontroller. To safeguard the security of the system, only approved fingerprints are connected starting the vehicle with the Arduino engine. When a user registers their fingerprint, the system compares it to the fingerprints stored in the database, if there is no match, the automobile won't start. The proper alert the owner with a signal is provided by a buzzer theft alarm, a GSM SIM 900 mobile phone notification, and a status display on the LCD. This article provides a concise and in-depth description of the ignition system's design and execution.

A Prototype of a Fingerprint Based Ignition Systems in Vehicles [4]: -

Over time, biometric technologies have provided reliable security measures in a number of industries. The fingerprinting approach is the first and widely utilized biometric identification method. Investigating its benefits requires using it as a security measure in systems that are already in place, such motorized vehicles. The study was to employ fingerprints instead of standard ignition keys to start vehicles. The prototype system consists of the hardware interface module, The module responsible for the running the system, and a software module for fingerprint analysis that receives fingerprint image files. The database can record the fingerprints of authorized users of the car thanks to the software that can identify fingerprints. The automobile cannot be started by those who don't have an appropriate match with the data stored in the database. Any user's fingerprint picture must correspond to The fingerprints stored in the database before

they are allowed to start the vehicle itself. The driver of the vehicle can control the ignition system by transmitting the necessary signals are transmitted to the computer's parallel port and continuously to the connect control circuit. Future research aimed at creating more reliable and embedded real-time fingerprint-based ignition systems for vehicles will be sparked by the produced prototype.

FINGERPRINT BASED CAR IGNITION SYSTEM USING ARDUINO AND RFID [5]: -

The primary objective of this initiative is to enhance automobile safety by preventing unauthorized usage and thwarting theft. A biometric fingerprint security system is utilized to ensure that only authorized personnel can start the vehicle, thus safeguarding it from theft. Security systems are increasingly prevalent worldwide and biometric technologies like fingerprints are commonly employed in various settings, such as factories, buildings, and schools. This project specifically aims to develop an anti-theft system for vehicles, utilizing the ATmega328. An internal fingerprint sensor is employed to detect the user's fingerprint. The ATmega328 analyzes the data obtained from the fingerprint sensor and compares it with pre-assigned data to authenticate the user. Upon verifying that the person is the rightful authenticator of the vehicle, or another authorized fingerprint user with control over the vehicle, the engine ignition system turns on. If there is a burglar nearby, the engine will not start. Other security systems are vulnerable to hacking, but in this instance, the key is a fingerprint, which is personal to each person and so offers better security. For the car's ignition, we also used an RFID sensor. If the fingerprint sensor malfunctions, it is possible to start the automobile by scanning the RFID tag instead. This program will be kept in case of malfunctioning of the fingerprint sensor, the RFID tag carried by the person used to access the system.

Implementation of Biometric Access Control Using Fingerprint for Safety and Security System of Electric Vehicle [6]: -

This article describes the utilization of fingerprint biometric access control for enhancing the security and safety system of Electric Vehicles (EVs). With the rise in concern for reducing carbon footprint emissions into the atmosphere, there is a growing interest in developing advanced EVs with better safety and security features. Population growth has been found to be linked with an increase in fatality rates due to traffic accidents, which can occur randomly and be caused by various factors such as drunk driving, careless driving, and distractions while driving. As vehicle theft is also on the rise, it is crucial to create anti-theft systems for EVs that can ensure the safety of car owners. With the expected growth in the electric vehicle market in the coming years, It is crucial to design EVs with high levels of security and safety systems. Therefore, this paper proposes an advanced security and safety system for EVs that utilizes fingerprint recognition to ensure the removal of the stand and authenticate the vehicle owner. The proposed system has undergone testing. on an E-Bike, and its effectiveness has been found to be satisfactory.

Tag Localization by Handheld UHF RFID Reader with Optical and RFID Landmarks [7]: -

This study introduces a novel method for using portable UHF RFID technology for manual inventorying and real-time 3D localization of objects. The tool used in this method has reader that operates using ultra-high frequency (UHF) RFID technology. as well as an optical camera. The RFID-tagged "ArUco" markers are positioned for reference at predetermined spots. A Kalman filter is utilized to combine optical and RF data to determine the location The movement of the portable reader during a specific period is tracked a given period of time.. The reader can also recognize RFID-tagged items in unrecognized environments. By examining the gathered phase data and antenna trajectory, the tags' locations can be deduced. According to the experimental findings, accuracy can be improved by increasing the density of RFID and optical markers. This strategy could enhance inexpensive manual inventorying by offering the 3D localization of labeled goods is achieved through the use of advanced tracking technology.

Arduino UNO Atmega328 Based Fingerprint Door Lock System for Bank Locker Applications [8]: -

The study proposes a smart and basic door lock that incorporates a biometric-based interface that utilizes fingerprints for enhanced security. The project is implemented using an Arduino Uno microcontroller. The biometric-based locking mechanism used in this study is ideal for securing bank lockers. A fingerprint sensor is installed placing it inside the locker and integrated on the outside of the door in order to hinder any unauthorized entry or usage. to the control systems. With the increasing prevalence of thefts, it is crucial to safeguard our belongings. The microcontroller

compares the user's fingerprint received from the sensor with its records. Upon finding a match The microcontroller will secure or release Adjust the latch based on its specifications current condition. Traditional locks are not considered highly secure in modern times; thus, the creation of a secure system has become imperative to enhance the effectiveness and safety of locks and provide a sense of security. As a result, the implementation of a fingerprint-based door locking system is suggested.

Security Access Using Simple RFID Reader and Arduino UNO: A Study Case [9]: -

The "INTELLIGENT LOCK" on your door is really the access control and management system. Of fact, the term "lock" might refer to a variety of objects (a structure, a region, etc.) that obstruct the entrance to the chamber. Actuators are the collective term for all of these components in access control systems. We described a straightforward this work utilizes an RFID reader for security access, which is based on the Arduino Uno and the RFID-RC522 module., this security solution. Through the USB interface, The Arduino was connected to a system and programmed using a language similar to C++, using the programming software Arduino IDE., programming code (a sketch) was uploaded onto the Arduino platform. A connection system that may be used in the classroom is provided.

Multi-Security System Based on RFID Fingerprint and Keypad to Access the Door [10]: -

With the modern home security systems, customers can monitor their homes remotely for security purposes, to combat the increasing incidence of household theft, it is crucial to be prepared Replacing the traditional lock with a solenoid door lock is an effective measure. These locks are more difficult to copy and less likely to be stolen while the home is unattended. Researchers created a prototype for a three-tiered home security system using biometric keypad, RFID, and fingerprint sensors. After being created, the device's completed prototype underwent 10 tests. The door-lock solenoid is activated by the Arduino Uno microcontroller serves a dual purpose as both the control unit and the locking mechanism for the door.. A person will be given entry to the door after successful authentication. The findings reveal that the fingerprint sensors' ability to scan fingerprints in an average of 3.7 seconds demonstrates their utility. Second, once the RFID sensor picks up the E-KTP, the card is typically scanned by the RFID in 2.4 seconds. Last but not least, the keypad contains the password required to open the door. After conducting 10 iterations, the experimental results indicate an average duration of 3.66 seconds. In comparison, a 3-level multi-sensor door opener typically takes 9.8 seconds to open doors. In this research, a GSM SIM800L module is used to notify consumers when each sensor is installed, enabling them to remotely monitor security.

Anti-Theft System for Car Security using RFID [11]: -

Due of the technology's low cost, these systems are being used more frequently for security reasons. An RFID-based anti-robbery system for car security has been proposed in this research. RFID technology and an Arduino Uno module are added in the system. Proteus software was used for the initial design phase of the Arduino electrical circuit. There is a serial communication connection between the Arduino and the RFID. As a backup security measure, an immobiliser was included to guarantee that the vehicle's engine would not start if other measures failed. The system was developed with operational effectiveness and cost effectiveness in mind.

Door Security Design Using Fingerprint and Buzzer Alarm Based on Arduino: English [12]: -

Trustworthy sources have reported a rise in home burglaries, causing concern for individuals and various organizations. Outdated home security systems that are considered unsafe and easily bypassed may be contributing to this trend. To address this issue, a research project was conducted involving analysis, data collection, and tool development. The study recommends using a biometric sensor for capturing and recognizing fingerprints, a NodeMCU for connecting to a Wi-Fi network, and microcontrollers as the primary control center. The proposed device includes an alarm buzzer that alerts in case of failed fingerprint recognition and enables remote door control through Android. In conclusion, by using an Arduino-based biometric and sound buzzer system to create a door security device, this issue can be mitigated while enhancing home security and ultimately reducing theft and other crimes. The proposed technology ensures that only authorized Android fingerprints can access the door, thereby enhancing family security.

BIOMETRIC AND RFID BASED VEHICLE SECURITY SYSTEM [13]: -

Theft of vehicles has been an issue in recent years. Particularly, the number of vehicle has increased dramatically during the last several years. The suggested concept resolves this problem in a more advantageous manner and guarantees the safety of the car. using this technology, the car will be secured against unauthorised users using a simple fingerprint security system. The R305 fingerprint sensor, EM18 RFID (Radio Frequency Identification), and Arduino Nano make up this system. The RFID module validates the tag code and grants permission to continue. The ignition process begins when the fingerprint sensor verifies the fingerprint's validity. The suggested concept opens the door to preventing unauthorised users from using the car without the owner's permission. Additionally, after three unsuccessful tries to ignite the car, an alarm will sound to notify the owner. Additionally, the registered user will get a text message about this through the system's GSM module.

IV. METHODOLOGY

This security system employs an Arduino UNO board, AS608 fingerprint module, RC522 RFID, Limit switch, and 5V DC relay. As shown in Fig.1., the Access Control for this system is connected to the battery, limit switch, and DC relay. The NO terminal of the DC relay is attached to the MCB while the common terminal is attached to the limit switch. The Arduino board is connected to the fingerprint module, and the input supply pin is connected to the relay, with the ground connected to the ground terminal and the VSS pin connected to the allotted pin. Despite the development and utilization of various vehicle antitheft devices, vehicle robbery is still prevalent due to each device's limitations. To address this issue, advanced safety and security systems are introduced in this vehicle, as shown in Fig.3. The vehicle control procedure involves finger scanning or RFID verification in addition to stand removal to enable the engine to start. The main objective is to recognize the fingerprint or RFID access and side stand removal to close the control circuit and start the vehicle. If the side stand is applied, the push button is closed, and the vehicle cannot start. To start and drive the vehicle, the owner must complete both fingerprint or RFID verification and remove the side stand. This system's main advantage is that it requires both interlocking systems to be satisfied for the vehicle to start. Once the safety and security system is recognized, the battery supply activates the fingerprint module or RFID reader, and the vehicle starts after successful recognition.

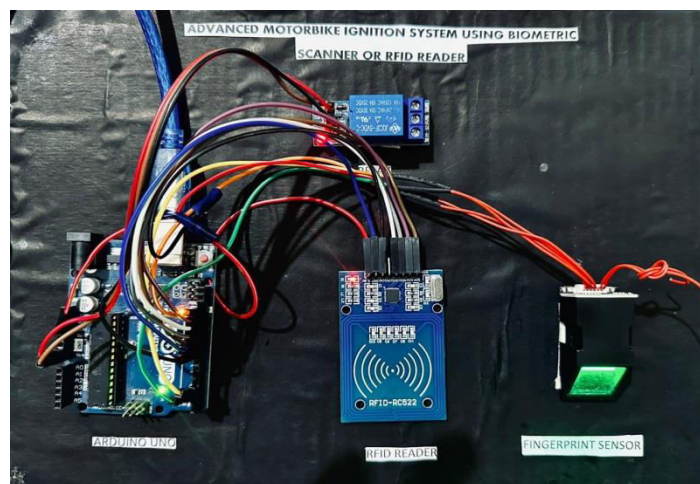


Fig 1. Full System Control Unit

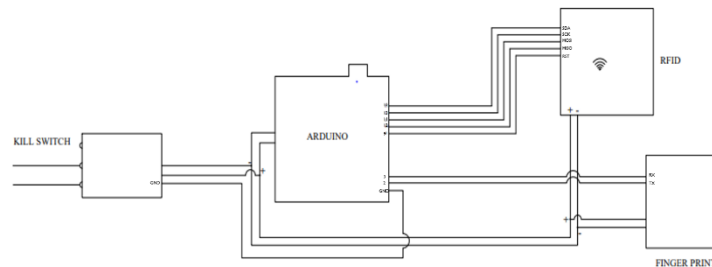


Fig 2. Circuit Diagram

The proposed public security and safety system is designed for vehicles, as shown in the overall block diagram in Fig.1. The system employs an Arduino UNO board, a Fingerprint Module (AS608), an RFID (RC522), a 5V DC relay, a Normally Open Switch (NO), and a Miniature Circuit Breaker (MCB). An interlocking system is established between the Arduino and relay module using the biometric sensor and RFID as inputs. The battery's positive terminal is controlled by the NO switch, relay, and MCB, while the negative terminal is directly connected to the ignition. The NO switch is located near the stand, and the bike only starts when the stand is removed, connecting the battery supply to the relay. Once the RFID card or fingerprint reader is recognized, the relay closes, allowing the ignition to receive the control signal. The Arduino controls and recognizes the RFID or fingerprint, and sends a signal to the relay. The relay is linked to the vehicle's main ignition as well as to the MCB. The engine produces power output to the wheels based on the input provided by the accelerator. The hardware requirements include:

1. Arduino UNO
2. Fingerprint Module (AS608)
3. RFID (RC522)
4. Relay
5. NO Switch

The software requirements include:

1. Arduino IDE
2. C++

The system architecture for the proposed system is shown below: -

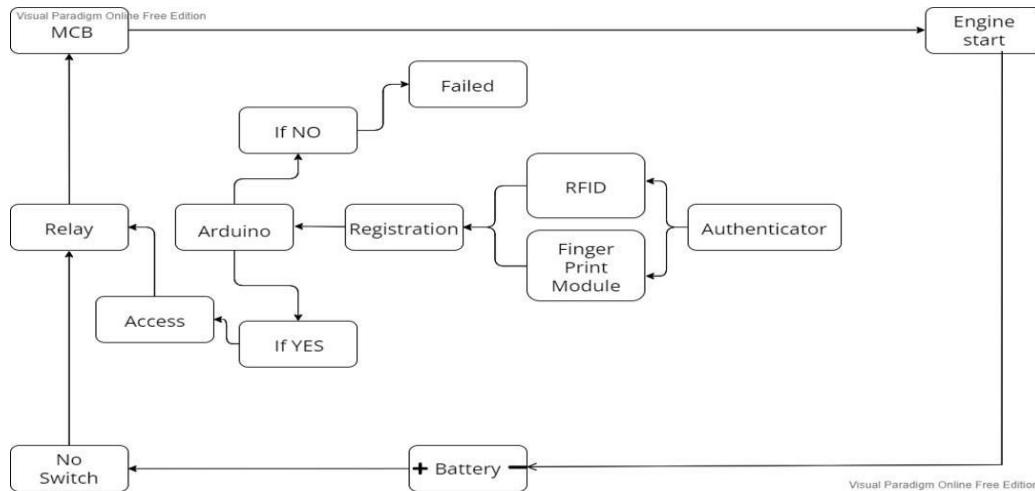


Fig 3: System Architecture

The block diagram in Fig. 3 illustrates the security and safety system for vehicles, which comprises an Arduino UNO board, Fingerprint Module (AS608), RFID (RC522), 5V DC relay, Normally Open Switch (NO), and Miniature Circuit Breaker (MCB). The interlocking system connects the Arduino and relay to the fingerprint sensor and RFID, which act as two inputs. The -ve terminal of the battery is directly linked to the ignition, while the +ve terminal is controlled by the NO switch, relay, and MCB. The NO switch is placed near the stand, and the bike can only be started when the stand is removed. The ignition wire is connected via the relay, and once the fingerprint scanning or RFID card matches, the relay closes and sends a control signal to the ignition. The Arduino controls and detects the fingerprint or RFID and sends signals to the relay. The relay is connected to the MCB and the main starting the engine of the vehicle. The engine receives the accelerator signal and generates power output to the wheels based on the input provided by the accelerator.

V. EXPERIMENTAL RESULTS

We observed that the system was working properly as intended. The RFID reader and Fingerprint sensor properly inputs the data and restricts the wrong inputs in a matter of milliseconds as these were properly monitored by the authors. The system flawlessly starts the vehicle when proper input is given. One of the problems we faced was with interfacing the RFID Reader and Fingerprint sensor are used simultaneously. Assigning ports had to be done carefully. The fingerprint and RFID reading the data successfully and the output of the system was successful.

VI. CONCLUSION

This study aimed to implement and test a biometric or RFID access control system for vehicle safety and security using fingerprint or RFID input. To operate the vehicle, the owner needs to provide their registered fingerprint or RFID tag input and remove the side stand. The system allows the vehicle to start only when both inputs are satisfied, and it will not start with unregistered data or if either input fails. This system overcomes bike accidents caused by human negligence in driving with the side stand, as well as theft. The proposed safety and security system was successfully implemented and tested, providing a satisfactory performance in terms of vehicle safety and security.

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