

# Design and Fabrication of Door Unlocking with Smart Attendance System

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**Abstract** - The Smart attendance system with door unlocking mechanism, designed to streamline access control and attendance management in diverse environments. The proposed system leverages advanced technologies, to achieve seamless and secure functionality. Furthermore, the system incorporates a secure door unlocking feature that grants access only to authorized personnel. Authentication is performed in real-time, ensuring that entry is restricted to verified individuals. An additional layer of security is implemented through multi-factor authentication protocols, such as RFID cards or Fingerprint sensors, enhancing overall system robustness. The integration of IoT facilitates remote monitoring and control, enabling administrators to manage access permissions and attendance data from a centralized dashboard. Real-time notifications and alerts are generated for unauthorized attempts or breaches, ensuring immediate response in critical situations. The proposed system offers several advantages over conventional attendance tracking systems, including improved accuracy, enhanced security, and streamlined administrative processes. It is adaptable to various environments, ranging from educational institutions to corporate offices, fostering a versatile solution for modern access control and attendance management.

**Key Words:** RFID cards, Remote Monitoring, Sensors, Authentication, improved accuracy, enhanced security.

## 1. INTRODUCTION

The advent of smart technologies has reshaped our daily lives, impacting various sectors and industries. One notable domain where this transformation is palpable is attendance management and access control. The integration of artificial intelligence (AI), biometrics, and IoT (Internet of Things) has given rise to a Smart Attendance System with Door Unlocking, an innovative approach that offers unprecedented convenience and security. At its core, this system relies on advanced RFID cards and sensors or biometric authentication to identify individuals accurately. The hardware components include biometric recognition software or cards and sensors, and secure databases. The system's software algorithms meticulously analyze cards and biometric features, ensuring reliable attendance tracking and access control. The system's Cards or biometric

recognition capability makes attendance marking effortless. Employees or students simply need to stand scan card or fingerprint, and the system records their presence, eliminating the need for manual entry.

Beyond attendance, this system improve security by allowing or denying access based on biometric and cards. Unauthorized entries are strictly prevented, enhancing the safety of facilities. Administrators can access real-time attendance data, view entry logs, and remotely control access permissions, providing them with valuable insights and control. The system saves precious time for both administrators and attendees. Manual attendance tracking becomes obsolete, reducing administrative overhead. Human errors related to attendance tracking are minimized, ensuring accuracy in record-keeping. Facilities become more secure with biometric access control. The system generates valuable data that can be analyzed for attendance patterns, aiding in resource allocation and decision-making. This advanced solution holds immense significance in today's rapidly evolving world.

## 2. PROPOSED METHOD

The project creates a smart door system with biometric access and attendance tracking. A microcontroller manages authentication and records attendance, with options for additional features like notifications.

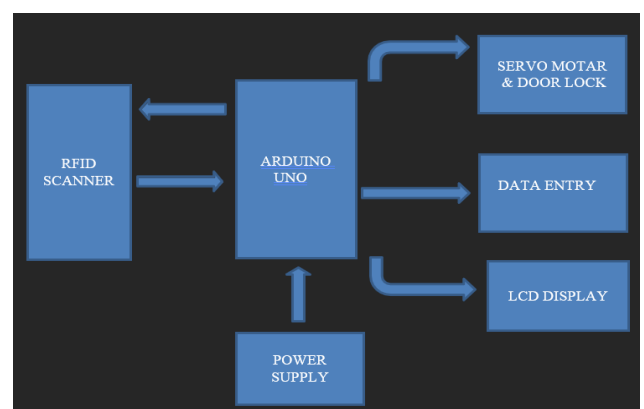


Fig 1. Block Diagram

## 2.1 Hardware

### 2.1.1 Arduino Uno

1. Arduino Uno is a microcontroller board based on the ATmega328P(datasheet).
2. It has 14 digital input/output pins
3. Operation Voltage: 5V
4. Flash Memory: 32 KB
5. Frequency: 16MHz
6. SRAM: 2KB
7. EPROM: 1KB



Fig 2. Arduino Uno

### 2.1.2 RFID

RFID stands for Radio-Frequency Identification, and an RFID tag is a small device that uses radio waves to store and transmit data. RFID tags consist of a microchip and an antenna. They are used for various purposes, including tracking and identifying objects, animals, or people.

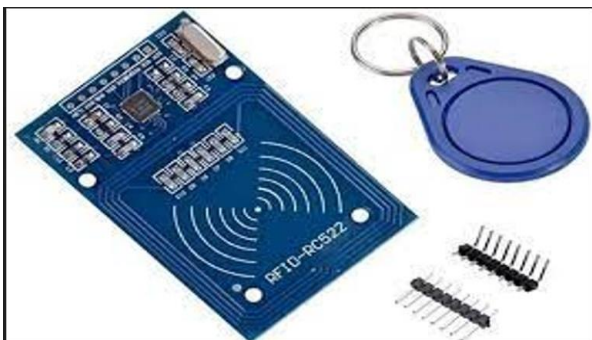


Fig 3. RFID

### 2.1.3. Rack and Pinion

Rack is a type of linear actuator that comprises a circular gear (the pinion) engaging a linear gear (the rack). Together, they convert rotational motion into linear motion. The Rotation of the pinion causes the rack to be driven in a line.

A pinion is a round gear-usually the smaller of two meshed gears-used in several applications, including drivetrain and rack and pinion systems. A pinion is a small, toothed gear that meshes with a larger gear, such as a rack or a spur gear, to transmit mechanical power and motion.



Fig 4. Rack and Pinion

### 2.1.4. DC Motor

A **DC motor** is an electrical motor that uses direct current (DC) to produce mechanical force. The most common types rely on magnetic forces produced by currents in the coils. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.



Fig 5. DC Motor

### 2.1.5. Jumper wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.



Fig 6. Jumper wires

educators, and professionals in the field of electronics and embedded systems.



### 2.1.6. 16x2 LCD Display

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.



Fig 7. 16x2 LCD Display

## 2.2 Software Components

### 2.1 Arduino IDE

Arduino IDE is a popular open-source platform for programming microcontrollers. It provides a simple and intuitive interface for writing and uploading code. Arduino IDE supports a wide range of Arduino-compatible boards and microcontrollers. It uses the Wiring language, based on C/C++, making it accessible to beginners. The IDE includes a built-in code editor with features like syntax highlighting and auto-completion. Users can easily manage libraries and board configurations within the IDE. Arduino IDE offers a straightforward process for verifying and uploading code to connected devices. It supports a variety of operating systems including Windows, macOS, and Linux. Arduino IDE is actively maintained by a community of developers and enthusiasts. It continues to be a popular choice for hobbyists,

## 3. Methodology

1. **Data Sources:** RFID and biometric data are collected for tracking and authentication.
2. **Data Processing and Recognition:** Raw data is processed to extract usable information, and recognition identifies patterns within biometric data.
3. **Attendance Verification:** Confirming individuals' presence at a specific location and time.
4. **Automatic Door Access Control:** Access cards or biometrics are used; the access control panel verifies, and the door unlocks based on authorization. An entry log is created.
5. **Door Mechanism:** Various mechanisms include electromagnetic locks, electric strikes, motorized door operators, deadbolts, latches, smart locks, and access control software. Biometric scanners may integrate with locks for added security.

## 4. APPLICATIONS

The Smart Attendance System with Door Unlocking has diverse applications across different sectors:

1. **Education:** Schools and universities can use it to enhance security and automate attendance tracking.
2. **Workplaces:** It simplifies access control in offices and enhances security for employees and sensitive areas.
3. **Healthcare:** Hospitals can ensure only authorized personnel access restricted areas, improving patient privacy and security.
4. **Government:** Secure government facilities can benefit from this system to control access and monitor attendance of employees.

## 5. Conclusion

This project concludes that Smart Attendance System with Automatic Door Unlocking, integrating biometric authentication and facial recognition for attendance tracking. Successful verification unlocks doors for enhanced security and convenience. The report covers benefits, components, technical implementation, security considerations, and facility management implications. Challenges include cost and privacy concerns. Technical aspects involve biometric scanners, facial recognition cameras, and data security measures. Despite productivity and safety benefits, addressing setup costs and privacy issues is crucial for successful implementation.

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