

Smart Lock with RFID and Fingerprint Sensor Group-7

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Background

The Smart Lock with RFID and Fingerprint project develops a secure access control system by integrating biometric and radio-frequency identification technologies. Using an Arduino microcontroller, it combines an RFID module (e.g., MFRC522) for card-based authentication and a fingerprint sensor (e.g., R305) for biometric verification. A motor or servo operates the locking mechanism, with a relay module controlling high-power components. LEDs and a buzzer provide status feedback, and the system is powered by an external supply, assembled on a breadboard with wires, resistors, and capacitors.

Components used

- Arduino Uno Board
- RFID Module (MFRC522)
- Fingerprint Sensor Module (R307)
- Motor or Servo (for locking mechanism)
- Relay Module (for high-power components)
- Lock
- Power Supply
- Wires and Breadboard
- Push Button

Circuit Diagram

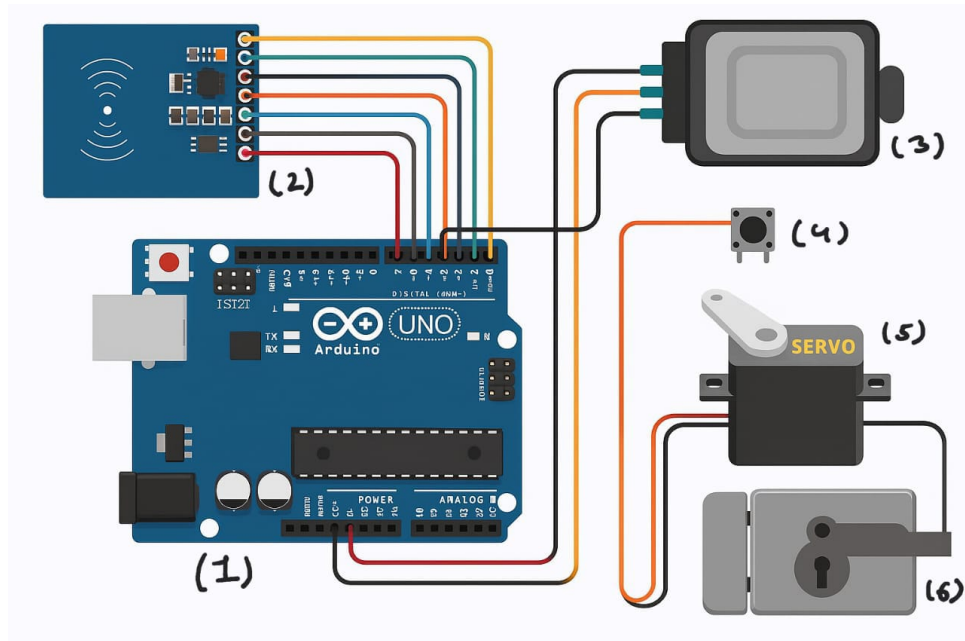


Figure 1: Circuit Diagram for Smart Lock with RFID and Fingerprint Sensor

Circuit Labelling

1. Arduino Uno
2. RFID Module (MFRC 522)
3. Fingerprint Sensor Module (R307)
4. Push Button
5. Motor/Servo
6. Lock

Challenges Faced during this project

During the development of the Smart Lock with RFID and Fingerprint project, several challenges were encountered:

1. **Interfacing the Fingerprint Sensor:** Integrating the fingerprint sensor with the Arduino was complex due to intricate library dependencies and UART communication protocols, requiring careful configuration for reliable fingerprint enrollment and verification.
2. **RFID Module Compatibility:** Achieving consistent communication with the RFID module was difficult, as signal interference or wiring issues occasionally caused failed card reads, necessitating troubleshooting of SPI connections.

3. **Power Management:** Balancing the power demands of multiple components, including the Arduino, sensors, and motor, was problematic, as insufficient power led to system instability or unexpected resets.
4. **Mechanical Integration of the Locking Mechanism:** Aligning the motor or servo-driven lock with the electronic control required precise calibration to ensure smooth and reliable operation, posing a significant mechanical challenge.
5. **Debugging and Synchronization:** Coordinating RFID and fingerprint authentication in the Arduino code was complex, with timing issues or logic errors occasionally causing the system to reject valid credentials or fail to activate the lock.

Token of gratitude

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