

PROJECT ABSTRACT

RFID Pet Door Opener using Arduino

An RFID-controlled pet door: an Arduino Uno with an RC522 reader opens a servo-driven flap only for registered 13.56 MHz tag UIDs, with PC-free tag enrollment into EEPROM. Delivered built-to-order with the prototype, firmware, wiring guide, report, PPT and viva kit.

01. Title

RFID Pet Door Opener using Arduino

02. Introduction / Background

Pet doors are convenient and insecure in equal measure: a basic flap lets in any animal — and through a large flap, an intruder's hand. RFID access control solves the pet side of that problem the same way it secures office doors: only a registered credential opens the way. The RC522 is the standard student RFID reader — a low-cost 13.56 MHz module that talks to an Arduino over SPI and reads the UID of MIFARE tags. This project pairs it with an Arduino Uno and an SG90 servo on a model wooden door frame: a registered tag swings the flap open for a configurable hold time, an unknown tag is ignored, and new tags are enrolled with a button procedure that needs no PC. The whole access decision happens on the Arduino — no Wi-Fi, no cloud, no app.

03. Problem Statement

Students learning embedded access control usually only simulate it: real RFID door hardware is installed infrastructure they cannot modify. The project addresses this by building a complete, physical access-control loop at model scale — reader, credential registry, actuator and door — where every stage is visible and testable. The UID registry in EEPROM, the enroll procedure and the deny behavior give the report concrete, demonstrable results, and the honest security limits of UID-only checking make for strong viva discussion.

04. Objectives

- Interface an RC522 13.56 MHz RFID reader to an Arduino Uno over SPI.
- Implement UID-based access: registered tags actuate the door, unknown tags are ignored.
- Drive an SG90 servo to open and close the model door flap with a configurable hold time.
- Implement PC-free tag enrollment storing UIDs in the Arduino's EEPROM.

- Deliver the complete student kit: prototype, firmware, wiring guide, report, PPT and viva Q&A.

05. Proposed Methodology

The build has three stages. (1) Hardware: the RC522 and SG90 are wired to the Uno and mounted with the model wooden door frame and flap. (2) Firmware: Arduino C++ using the MFRC522 library — the reader polls for tags, the UID is compared against the EEPROM registry, a match drives the servo through its open-hold-close sequence, and a button sequence enters enroll mode to store new UIDs. (3) Testing: registered and unregistered tags are trialed and the results tabulated for the report, with the UID-cloning limitation documented openly.

06. System Architecture / Working

The RC522 continuously polls for 13.56 MHz tags within a few centimeters. When a tag is presented, the Arduino reads its UID over SPI and compares it against the registered list in EEPROM. On a match, the SG90 servo rotates to swing the flap open; after the configured hold time it rotates back and the door closes. An unknown UID is ignored — the flap never moves. Enrollment uses a documented button sequence: the next presented tag's UID is written to EEPROM, surviving power cycles without re-enrollment.

07. Hardware / Software Requirements

- Arduino Uno R3 (ATmega328P)
- RC522 RFID reader module (13.56 MHz)
- SG90 micro servo motor
- MIFARE 1K key fobs / cards (registered tags)
- Arduino IDE with the MFRC522 library
- 5 V USB power supply
- Model wooden pet-door frame with flap; no internet connection required

08. Expected Outcomes

- Working prototype: registered tags open the flap, unknown tags are ignored.
- PC-free enrollment procedure demonstrated with new tags.
- UID registry in EEPROM surviving power cycles.
- Trial table of registered/unregistered tag tests for the report.
- Complete documentation: report, PPT, wiring guide, enrollment procedure and viva Q&A.

09. Applications

- Teaching platform for RFID, SPI communication and EEPROM storage.

- Concept model for pet access control (prototype scope).
- Reference build for other UID-based access projects (lab entry, attendance).
- Viva demonstration with live tag scans and enrollment.

10. Future Scope

- Encrypted challenge-response tags instead of UID-only checking.
- Larger actuator and weatherproofing for a real installed pet door.
- Entry/exit logging to an SD card with timestamps.
- Mobile app for remote tag management over Bluetooth.

11. References

- NXP MFRC522 datasheet — 13.56 MHz RFID reader IC.
- Arduino MFRC522 library documentation.
- NXP MIFARE Classic documentation — tag memory and UID structure.
- TowerPro SG90 datasheet — micro servo specifications (~1.8 kg·cm).