Project Report

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Semester: 3rd   Date of Performance:**10/11/25**
Subject Name: Internet of Things   Subject Code: **24CAH-723**

Aim: The aim of this project is to design and develop an intelligent **Smart Home Door System** that enhances home security and convenience by enabling **automated door access control** using technologies such as sensors, IoT, and AI. The system aims to allow authorized entry through **RFID verification**, while monitoring door activity in real-time to ensure safety, energy efficiency, and smart home integration.

Objectives:

1. To provide secure door access using RFID technology.
2. To automate door operation through a microcontroller.
3. To enhance home security with an efficient, contactless system.

Components Required:

Sno	Name of Component	Qty.
1.	Arduino Uno	1
2.	RFID	1
3.	OLED	1
4.	Servo Motor	1
5.	Breadboard	1

Details of Components:

1. **Arduino Nano:**
   The Arduino Uno is a versatile and widely used microcontroller board that serves as the brain of the project. It reads data from the RFID module, processes it, and controls other components such as the OLED display and servo motor. Its easy-to-use design, multiple input/output pins, and compatibility with various sensors and modules make it ideal for prototyping and embedded system projects.

Figure 1 Arduino Uno Diagram

2. **RFID Module:**
   The RFID module is used to identify authorized users through RFID cards or tags. It reads the unique ID from the card and sends it to the Arduino for verification. This enables a secure, contactless access system for the smart door.

Figure 2: RFID Module Diagram

3. OLED Display:

The OLED display shows messages like "Scan Your Card," "Access Granted," or "vzAccess Denied." It provides a clear and bright display with low power consumption, making it suitable for compact electronic projects.
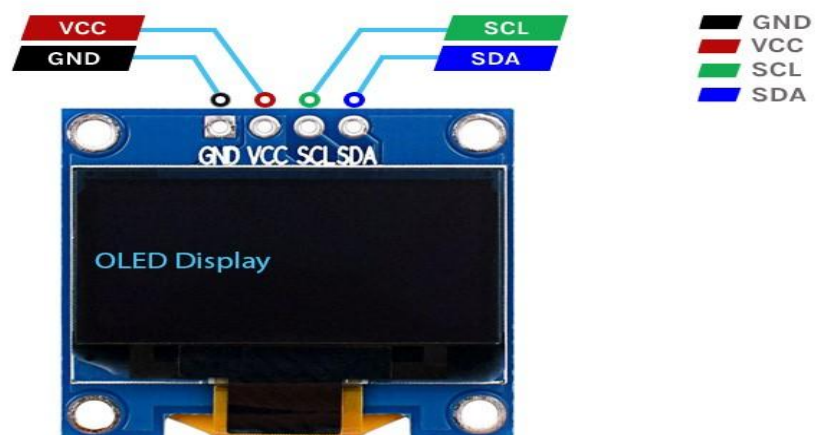

Figure 3: OLED Pin Diagram

4. Servo Motor:

The servo motor is responsible for opening and closing the door automatically after verification. It rotates to a specific angle when triggered by the Arduino, ensuring precise and controlled movement.
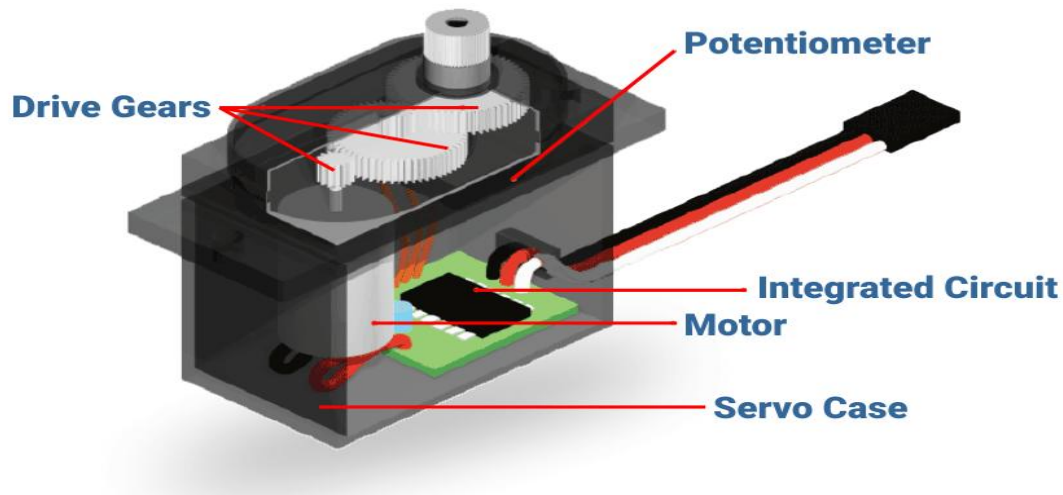

Figure 4: Servo Moto Diagram

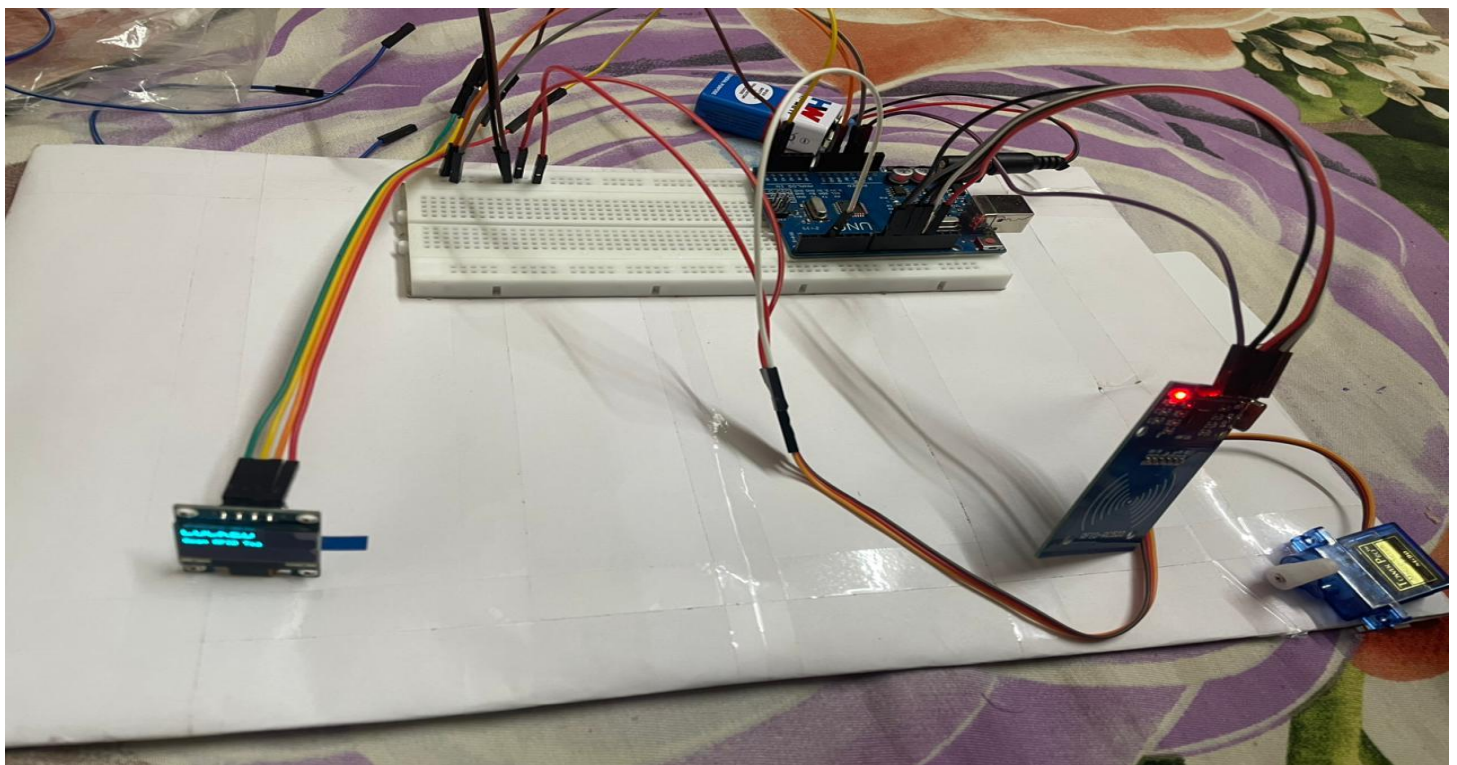# Block Diagram of Designed Model:

Figure 5 : Block Diagram of Model
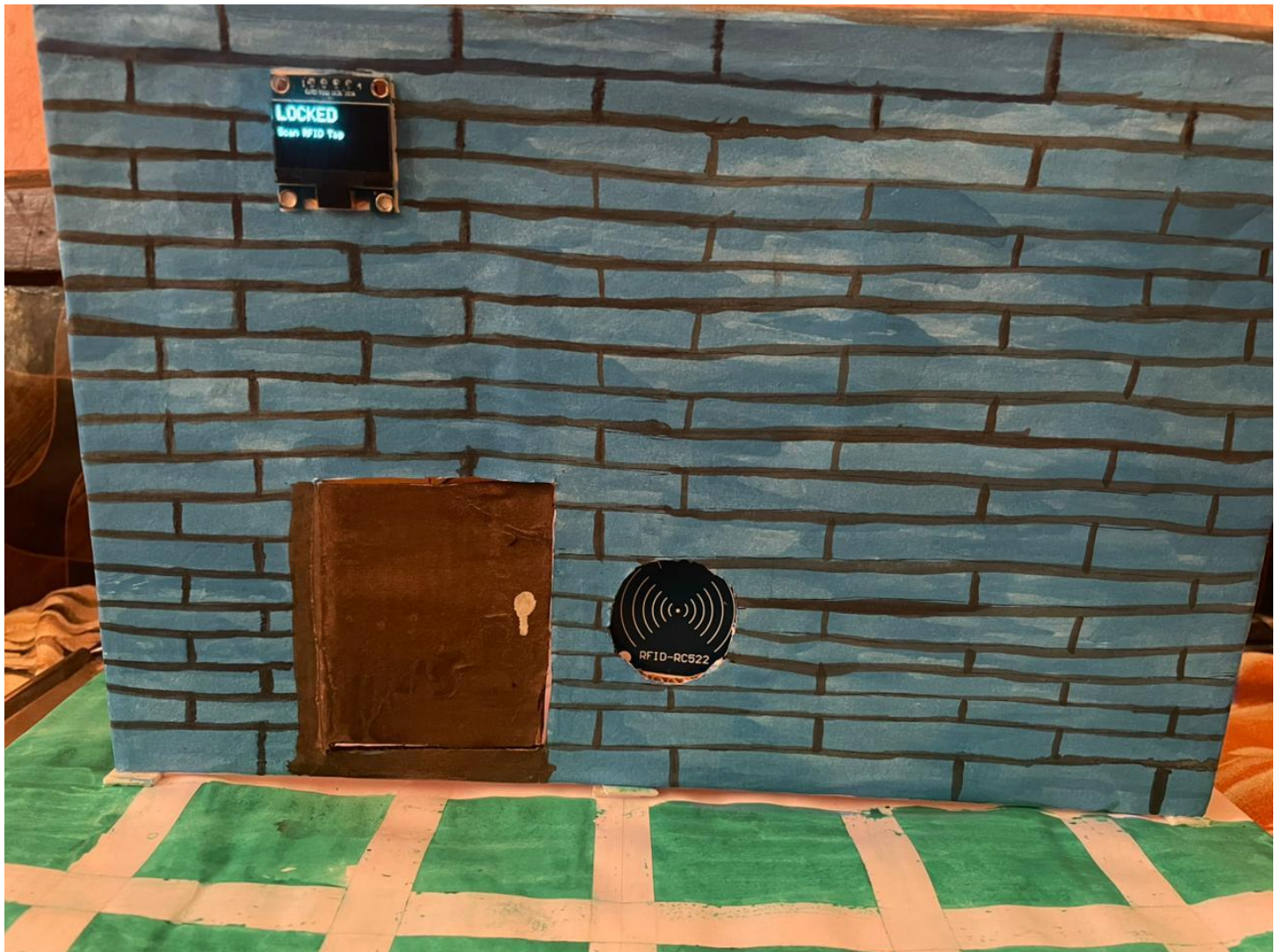
Working of Designed Model:

- **Idle / Waiting:** The Arduino Nano powers up and initializes the RFID reader, OLED display, and servo motor. The OLED shows a message like **"Scan Your Card"** while the system waits for an RFID tag.
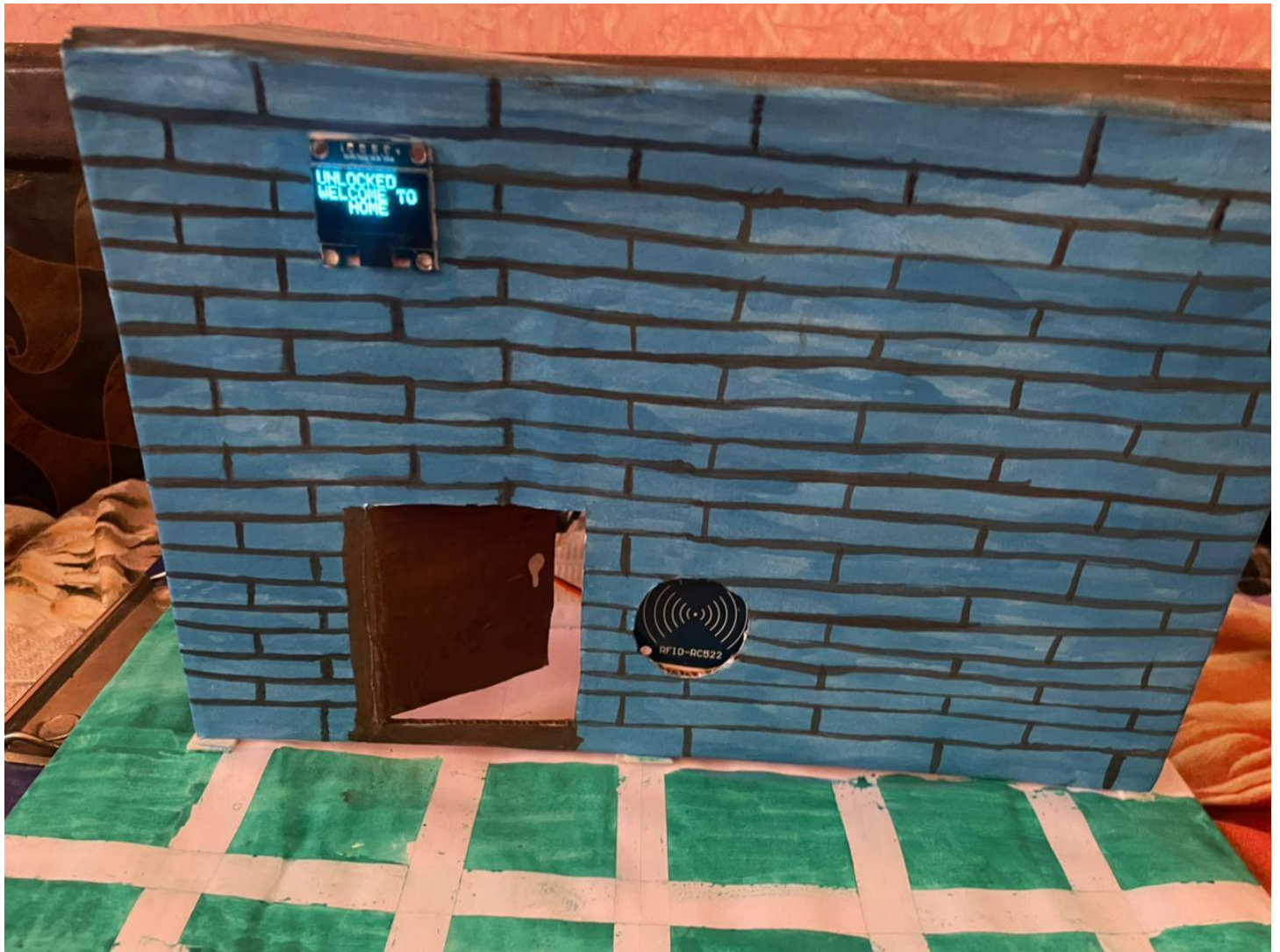
- **Card scan & read:** When a user brings an RFID card/tag near the RFID module, the module reads the tag's unique ID (UID) and sends it to the Arduino.

- **Verify UID:** The Arduino compares the received UID against a stored list of authorized UIDs (hardcoded array or stored in EEPROM).

- **Access granted:** If the UID matches an authorized entry, the Arduino updates the OLED to **"Access Granted"**, optionally sounds a beep (if you add a buzzer), and sends a PWM signal to the servo motor to rotate to the open angle (e.g., 90°). The door remains open for a short period (e.g., 3–5 seconds).

- **Close & reset:** After the delay, the Arduino commands the servo back to the closed angle (0°), updates the OLED to **"Door Closed"** or back to **"Scan Your Card"**, and resumes waiting for the next scan.

- **Access denied:** If the UID is not authorized, the OLED shows **"Access Denied"** and nothing moves (you can also blink the display or sound an alarm). The system then returns to idle.

Pictures of Prototype:

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Output of Deigned Model/Prototype

Learning outcomes (What I have learnt):

- Gained practical knowledge of RFID technology and how it enables secure, contactless authentication.
- Learned to interface multiple components like RFID, OLED, and servo motor with the Arduino Nano for an integrated system.

- Developed skills in microcontroller programming using Arduino IDE for real-time control and decision-making.
- Understood the concept of automation and security systems, and how IoT-based solutions can enhance smart home applications.