

# Final Project: Mini Smart Home System

## Mind Cloud 10<sup>th</sup> Generation Training

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### Introduction

You are required to design and implement a smart home system. This project focuses on developing a smart home system with enhanced security and automation. It includes a door sector equipped with advanced face recognition, password verification, and alert mechanisms, and an interior sector featuring sensors for temperature, motion detection, and more. Designed to integrate cutting-edge technology, this system aims to provide a comprehensive and user-friendly solution for modern home automation, ensuring both convenience and safety.

### Computer Vision Section

Design a face recognition system that identifies individuals by comparing their faces against a database of homeowners. The system should display a bounding box around the detected face, labeling it with the person's name if recognized, and a red bounding box if not. If the face is recognized, the system will automatically open the door using a servo motor. If the face is not recognized, the system will notify the homeowners, providing them with options to either open the door and add the person to the database or just open the door (Using a control interface). Additionally, if the person is not in the database, they can still gain access by entering the correct password on an Arduino 4x4 keypad.

The control interface should also allow homeowners to change their current password and delete individuals from the database.

### Details

- Use your laptop camera for face detection.
- The control interface, detection display, and bounding box should all be displayed simultaneously within the same code on your laptop.

### Bonus

- Implement the control interface using a GUI instead of the terminal.
- Adding any extra features is appreciated.

### Micro-controllers Section

- **If the door is opened (using password or automatic face recognition):** Start the system functions.
  - Measure surrounding lighting level with LDR (control light system level).
  - Measure temperature with a temperature sensor and depending on that reading the result is shown on RGB LED as follows:
    - \* **Red:**  $T > 30^{\circ}\text{C}$
    - \* **Green:**  $30^{\circ}\text{C} > T > 20^{\circ}\text{C}$
    - \* **Blue:**  $T < 20^{\circ}\text{C}$

- The temperature sensor reading controls the speed of the motor with a fan extension with the aid of an L293D chip.
- Use a PIR sensor to detect if there is anyone inside the home if the door is locked.
- **If a WRONG password is entered:**
  - Buzzer rings for 500ms.
  - Show warning messages on the serial monitor and/or the control interface.

## Components

- ATMEGA 8A
- Keypad
- Buzzers
- Temperature sensor [NTC Thermistor Module]
- PIR sensor
- LDR sensor
- RGB LED
- Motor + Fan Blades
- Driver L293D
- LED (as lighting system)
- Servo motor

## Hardware Project Deliverables

1. **Schematic Design:** Provide a complete and professionally crafted schematic of the smart home system using Altium Designer. The schematic should be detailed and accurately represent the system components and their connections, be organized and use labels and borders, make sure to create all the components do not use already created components from the internet and do not forget component parameters.
2. **PCB Design:** Submit a PCB layout designed using Altium Designer.
  - Use SMD components.
  - Use the rules from JLCPCB.
  - Use any supplier but don't forget the 4 parameters.
  - Don't forget layer 29 and the designators.
  - Make sure to do a good search on how to upload your code on the ATmega8A.
3. **Implemented Circuit:** You are free to choose whatever way you want to implement the circuit, whether on a breadboard, fabricated PCB, or any other way.

## Submission Details

- You must submit a report detailing your accomplishments, problems you encountered, and the steps you took every three days. [Report form submission link!](#)
- A comprehensive final report must be submitted, detailing the system in-depth, including features, libraries used, design considerations, and other relevant information.
- At the end of the project phase, you must submit all project files and deliverables (Bonus: Create a well-organized GitHub repository).

**Good Luck!**

