MINI SMART HOME SYSTEM

1. Abstract

Project Summary

In smart homes, the systems developed and implemented are composed of a set of facilities, from security to other automation processes. It would now allow advanced technology to face recognition, password authentication, and residential automation.

- Salient Features:

Advanced capabilities of face recognition.

Password-based authentication using an Arduino 4x4 Keypad.

Temperature sensors Motion detectors Light level controlling sensors.

2. Architectural Design

2.1 Computer Vision Division

- **Facial Verification:**

Once completed, the detected face is examined through the laptop's camera. The system was to match facial images with a database of known homeowners.

- **Visual Indicators:**

The green bounding boxes are overlaid over the detected names. Red box if there's no face.

- **Behaviors:**

It automatically detects the pre-enrolled faces and unlocks the door with connected door control.

Unrecognized face triggers a notice to householders with options to open the door or include the individual in the database.

- **Reserve Password Access:**

– In case of failure to recognize one's face, authentication by password keyed into the keypad may be allowed.

- Interface Management:

- The owner easily changes passwords or any database updates through control interface. Plus point: It uses GUI, too.

2.2 Microcontroller Unit

• House with automatic doors.

- **Turns the system on upon opening the door:**

It regulates the lighting system based on ambient light used.

Temperature Sensor: Room Temperature Measurement - using an RGB LED NTC Thermistor Module

Colored **Red**; T > 30

• **Green**: 20°C < T < 30°C

> **Blue**: T < 20°C

It modulates the speed of the fan according to the varied temperature reading using an L293D driver and a motor.

- **Security features:**

Password error: It will connect the buzzer for 500 milliseconds, thus warning at the control interface in case of a wrong password.

The PIR sensors detect movement inside the home, with a door locked; then it turns on the security features.

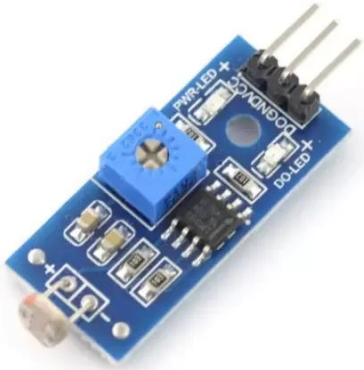
3. PARTS

The main microcontroller is the ATMega8A, which interfaces sensors and the system logics.

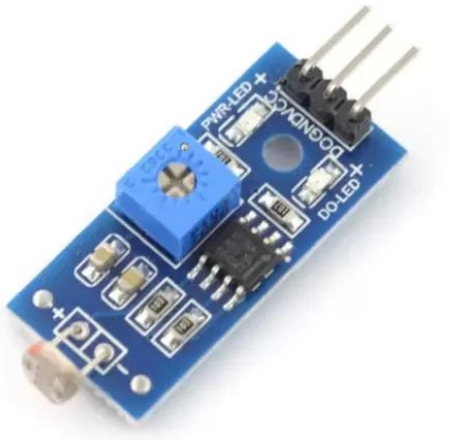
- **Keypad**: a 4x4 matrix through which one enters passwords.

- **Buzzer**: Beep to alert an invalid password entered.

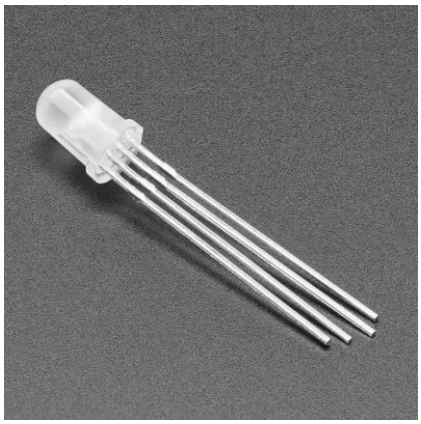
- **Temperature Sensor NTC Thermistor**: Measures the ambient temperature.



- **PIR Sensor**: A motioned triggered relay used in the house.



- **LDR Sensor**: Adjusting the intensity of the illuminations for the residents.
- **RGB LED**: Shiny, colored lights that change according to temperature.

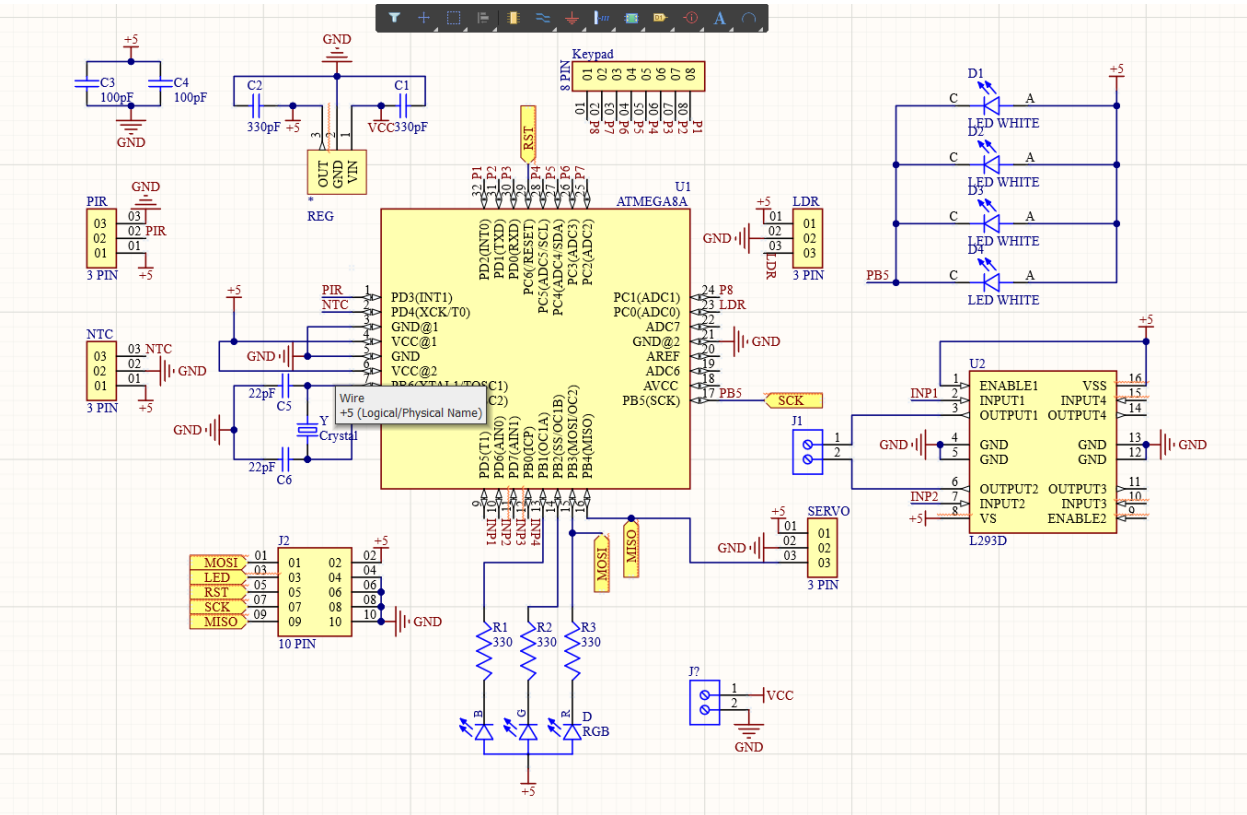


- **Motor + Fan Blades**: Interfaced with L293D to control the speed of the fan in any variation of temperature.

- **L293D Driver**: This chip drives the motor controlling the fan.
- **LED Lighting System**: Controlled as per LDR Value.
- **Servo Motor**: To automatically open the door.

4. Schematic Design

A schematic utilizing Altium Designer, encompassing comprehensive details regarding the connectivity of each component—such as the keypad, sensors, an LED, and a servo motor—will be developed. The components will be systematically created in the 'Component Creation' section, accompanied by their respective parameters and designations.



Design Principles and Criteria: All SMD components used . Proper labeling, bounds, and arrangements.

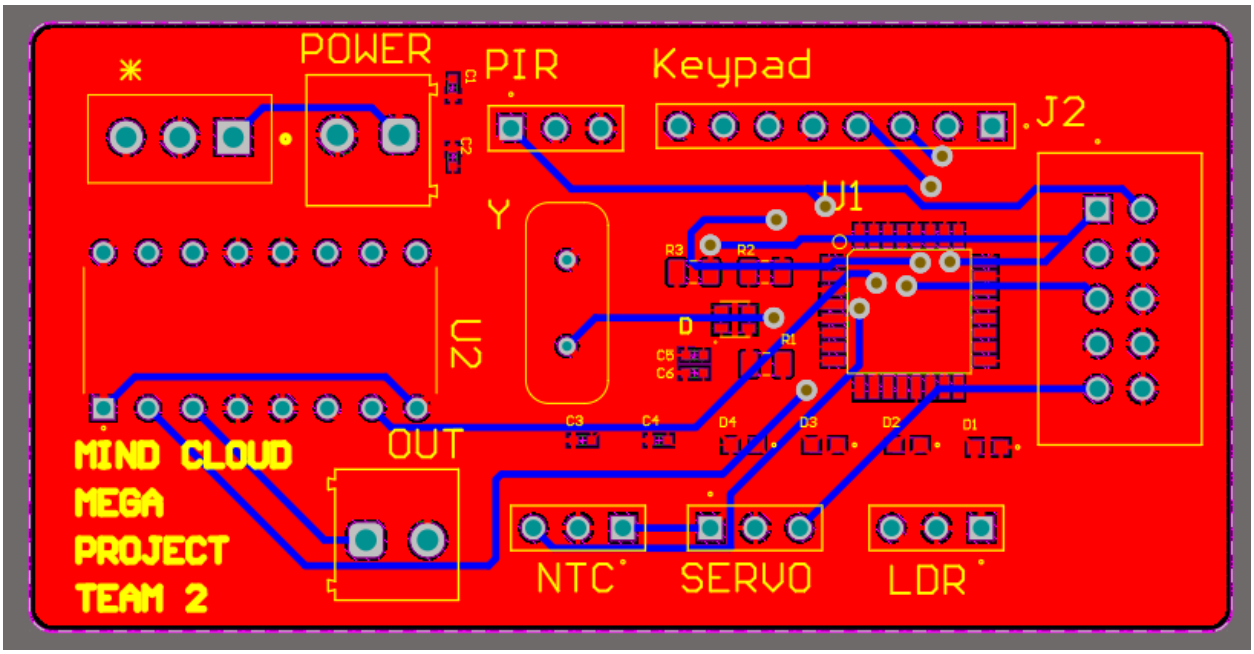
5. PCB Design

Design Description:

The PCB design will be planned in Altium Designer, considering the created rules and specifications by JLCPCB.

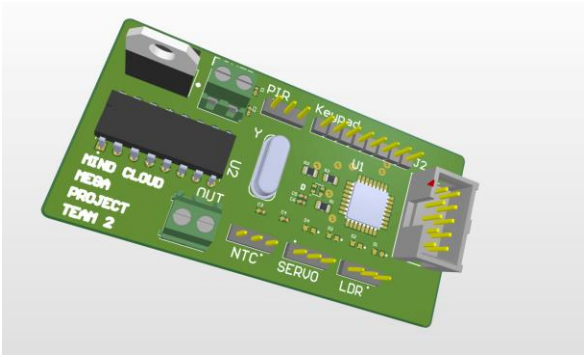
- Features:

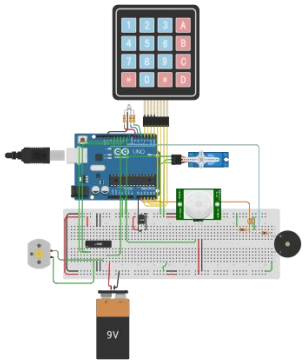
Proper application of available parameters of suppliers. Layer application Layer 29 was given the designation of a layer.



6. Operationalization

Circuit Realization: This physical implementation can be done using a breadboard, fabricated PCB, or any other proper way. The logic of the system lies in programming the Atmega8A microcontroller.





7. Add-ons (Optional)

A GUI-based control interface to input passwords and manage the database. These are more features of security and automation, including SMS notification in the case of detection of an unknown face, automatic light adjustments, and much more

8. Conclusion