AUTOMATIC DOOR OPENER

21CSS201T– Computer Organization and Architecture

in the Department of Computational Intelligence

MINI PROJECT REPORT

By

SRISHTI PANDA (RA2211033010146)
AASTHA SINGH(RA2211033010158)
SESHADRI PATRA(RA2211033010182)

Under the guidance of

Dr.R.A.Karthika

FACULTY OF ENGINEERING AND TECHNOLOGY

SCHOOL OF COMPUTING

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

KATTANKULATHUR

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BONAFIDE CERTIFICATE

Certified that this mini project report for the course **21CSS201T– Computer Organization and Architecture** entitled in " **Automatic Door Lock** " is the bonafide work of **Srishti Panda (RA2211033010146), Aastha Singh(RA2211033010158) and Seshadri Patra(RA2211033010182)** who carried out the work under my supervision.

SIGNATURE

Dr.R.A.Karthika

COA– Course Faculty

Assistant Professor

Department of Computational Intelligence

SRM Institute of Science and Technology

Kattankulathur

SIGNATURE

Dr Annie Uthra R

Head of the Department

Professor

Department of Computational Intelligence

SRM Institute of Science and Technology

Kattankulathur

ABSTRACT

An automatic door opener, also known as an automatic door, is an electromechanical system that automatically opens and closes a door. They are commonly found in buildings such as office complexes, shopping malls, and residential areas, and are designed to make door opening and closing more convenient and efficient. Automatic door openers work by using a combination of sensors and motors that detect motion and adjust the door based on the presence or absence of people. They can also be programmed to open at certain times or in response to specific commands.

The project incorporates microcontroller technology and biometric sensors to ensure a reliable and efficient authentication process. The integration of low-power consumption components enhances the system's sustainability and reduces environmental impact.

The project aims to provide a user-friendly, secure, and technologically sophisticated alternative to conventional door opening mechanisms, contributing to the evolution of modern access control systems.

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1. INTRODUCTION

Automatic door opener systems have become integral components in various environments, providing convenience, accessibility, and enhanced security. These systems utilize advanced technologies to automate the opening and closing of doors without the need for manual intervention. From retail establishments and commercial buildings to healthcare facilities and homes, automatic door openers offer a range of benefits that cater to diverse needs.

By integrating a user-friendly interface, this system empowers users to establish and manage personalized passwords, eliminating the need for physical keys.

OBJECTIVES

- User-Friendly Interface: Develop an intuitive user interface for easy configuration and management of passwords, catering to a wide range of users, including those with limited technical expertise.
- Low-Power Consumption: Utilize energy-efficient components to minimize power consumption, ensuring sustainability and reducing environmental impact.
- Compatibility and Integration: Design the system to be compatible with existing door hardware and explore integration possibilities with smart home automation systems for a holistic security solution.

Benefits of Automatic Door Openers

- **Accessibility:** Automatic door openers enhance accessibility, allowing individuals with mobility, challenges, the elderly, or those carrying heavy items to enter and exit spaces more easily.
- **Convenience**: In busy environments, such as retail stores or airports, automatic doors improve the flow of foot traffic, providing a seamless and convenient experience for visitors.
- **Energy Efficiency:** Advanced systems incorporate energy-efficient features, such as sensors that minimize the duration of door opening, helping to conserve heating or cooling energy within buildings.

2. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware Requirements

- **Microcontroller**: Choose a microcontroller platform suitable for the project requirements, such as Arduino, Raspberry Pi, or other embedded systems. In this case Arduino is used.

- **Sensors:-**Biometric sensors (e.g., fingerprint scanner) if implementing biometric authentication.
    - Keypad or touchscreen for password input.

  Actuators: Servo motor to control the physical locking mechanism of the door.
- **Miscellaneous Components:** Resistors, capacitors, and other electronic components as per the circuit design.
- Wiring and connectors for interconnecting components.
- **Tools**: Soldering iron, screwdrivers, and other tools necessary for assembling and testing the hardware.
- **Security Features:** Consideration for tamper detection and prevention, such as sensors to detect physical attacks on the system.
- **Documentation and Manuals:** Develop user manuals and documentation for the hardware components, wiring diagrams, and troubleshooting guides.

Software Requirements

- **Microcontroller Programming Software:** Depending on the microcontroller chosen for the project (e.g., Arduino, Raspberry Pi), you'll need the corresponding programming environment (Arduino IDE, Python, etc.) to write and upload the code to the microcontroller.
- **Embedded Programming Language:** Knowledge of the programming language used for the microcontroller (e.g., C, Python) to develop the software logic for the password door lock system.

3. CONCEPT AND WORKING PRINCIPLE

A password door lock is a security system that utilizes a password or PIN (Personal Identification Number) for access control. The primary concept is to replace traditional physical keys with a digital authentication mechanism. Users gain access to the secured area by entering the correct password via a keypad or a touchscreen interface.

Working Principle:-

1. **Detection of Presence:-**

- **Sensors:** Automatic door openers use various types of sensors to detect the presence of individuals. Common sensor technologies include:
- **Infrared Sensors**: Detects heat emitted by a person's body.
- **Ultrasonic Sensors:** Sends and receives ultrasonic waves to detect motion or proximity.
- **Radar Sensors:** Uses radio waves to detect movement.

2. **Signal Processing:-** The signals from the sensors are processed by a control unit. This control unit determines whether someone is approaching the door based on the sensor input.

3. **Decision Making:-** The control unit makes decisions based on the sensor data. If it detects someone approaching or standing near the door, it triggers the door opening sequence.

4. **Actuation Mechanism:**

- Motors/Actuators: Automatic doors are equipped with motors or actuators responsible for physically moving the door. Common actuation mechanisms include:
- Sliding Mechanisms: Doors slide horizontally.
- Swing Mechanisms: Doors swing open or close like traditional doors.
- Folding Mechanisms: Doors fold to open or close.

5. **Controlled Movement:-** The control unit regulates the movement of the door to ensure smooth and controlled operation. It can control factors such as:

- Opening/Closing Speed: The speed at which the door moves.
- Delay Time: The time the door remains open after detecting motion.
- Closing Force: The force exerted during the closing of the door.

6. **Safety Features:-** Automatic door openers incorporate safety features to prevent accidents and injuries. These may include:

- Obstacle Detection: Sensors detect obstacles in the door's path, preventing closure.
- Emergency Stop Buttons: Users can manually stop the door's movement in case of an emergency.

7. **Integration with Access Control Systems:-** In many cases, automatic door openers are integrated with access control systems for enhanced security. This integration may involve keycard readers, biometric scanners, or other authentication methods.

8. **Power Supply:-** Automatic door openers require a power source to operate. They can be powered by electricity, batteries, or a combination of both.

9. **Compliance with Standards:-** Automatic door openers need to comply with safety and accessibility standards, such as the Americans with Disabilities Act (ADA) in the United States or similar regulations in other regions.

4.METHODOLOGY/APPROACH/ PROGRAM

METHODOLOGY

- **Requirement Analysis**: Understand the requirements and constraints of the automatic door opener. This includes the type of door, the expected traffic, safety considerations, and power supply.
- **Design**: Based on the requirements, design the system. This includes selecting the appropriate sensor, choosing a suitable microcontroller, designing the door mechanism, and planning for the power supply.
- **Implementation**: Implement the design. This involves setting up the sensor, programming the microcontroller, installing the door mechanism, and arranging the power supply.
- **Integration**: Integrate all the components. Ensure that the sensor, microcontroller, door mechanism, and power supply are working together as expected.
- **Testing**: Test the system thoroughly. Check that the door opens and closes correctly when the sensor is triggered. Test the safety features to ensure they work as expected.
- **Deployment**: Install the automatic door opener in the desired location. Monitor its performance to ensure it is working as expected.
- **Maintenance**: Regularly check and maintain the system. This includes checking the power supply, testing the sensor and door mechanism, and updating the microcontroller's program if necessary.

APPROACH

- **Sensor Selection**: The first step is to select a suitable sensor to detect the presence of an object or person. Commonly used sensors include infrared sensors, ultrasonic sensors, and motion detectors.
- **Microcontroller Programming**: The sensor is connected to a microcontroller, which is programmed to send a signal to the door mechanism when the sensor is triggered.
- **Door Mechanism**: The door mechanism can be a simple motor that pulls the door open when activated. The mechanism should be designed to operate smoothly and safely, to avoid injuring people or damaging the door.
- **Power Supply**: The system needs a reliable power supply. This could be a direct connection to the building's electrical system, or a battery that is regularly checked and replaced.

- **Safety Features**: Safety features are crucial in the design of an automatic door opener. These might include a delay in closing the door, a sensor to detect if an object or person is in the way of the closing door, and an emergency override system.
- **Testing and Maintenance**: Once the system is installed, it should be regularly tested to ensure it is working correctly. Regular maintenance can help to prevent problems and extend the life of the system.

PROGRAM

```
#include <Servo.h>   //servo library
Servo servo;
int trigPin = 5;
int echoPin = 6;
int servoPin = 7;
int led= 10;
long duration, dist, average;
long aver[3];   //array for average


void setup() {
   Serial.begin(9600);
   servo.attach(servoPin);
   pinMode(trigPin, OUTPUT);
   pinMode(echoPin, INPUT);
   servo.write(0);        //close cap on power on
   delay(100);
   servo.detach();
}

void measure() {
 digitalWrite(10,HIGH);
digitalWrite(trigPin, LOW);
delayMicroseconds(5);
digitalWrite(trigPin, HIGH);
```

```
delayMicroseconds(15);
digitalWrite(trigPin, LOW);
pinMode(echoPin, INPUT);
duration = pulseIn(echoPin, HIGH);
dist = (duration/2) / 29.1;    //obtain distance
}
void loop() {
  for (int i=0;i<=2;i++) {    //average distance
    measure();
   aver[i]=dist;
    delay(10);              //delay between measurements
  }
 dist=(aver[0]+aver[1]+aver[2])/3;

if ( dist<50 ) {
//Change distance as per your need
 servo.attach(servoPin);
  delay(1);
 servo.write(0);
 delay(3000);
 servo.write(150);
 delay(1000);
 servo.detach();
}
Serial.print(dist);
}
```

5.FLOWCHART

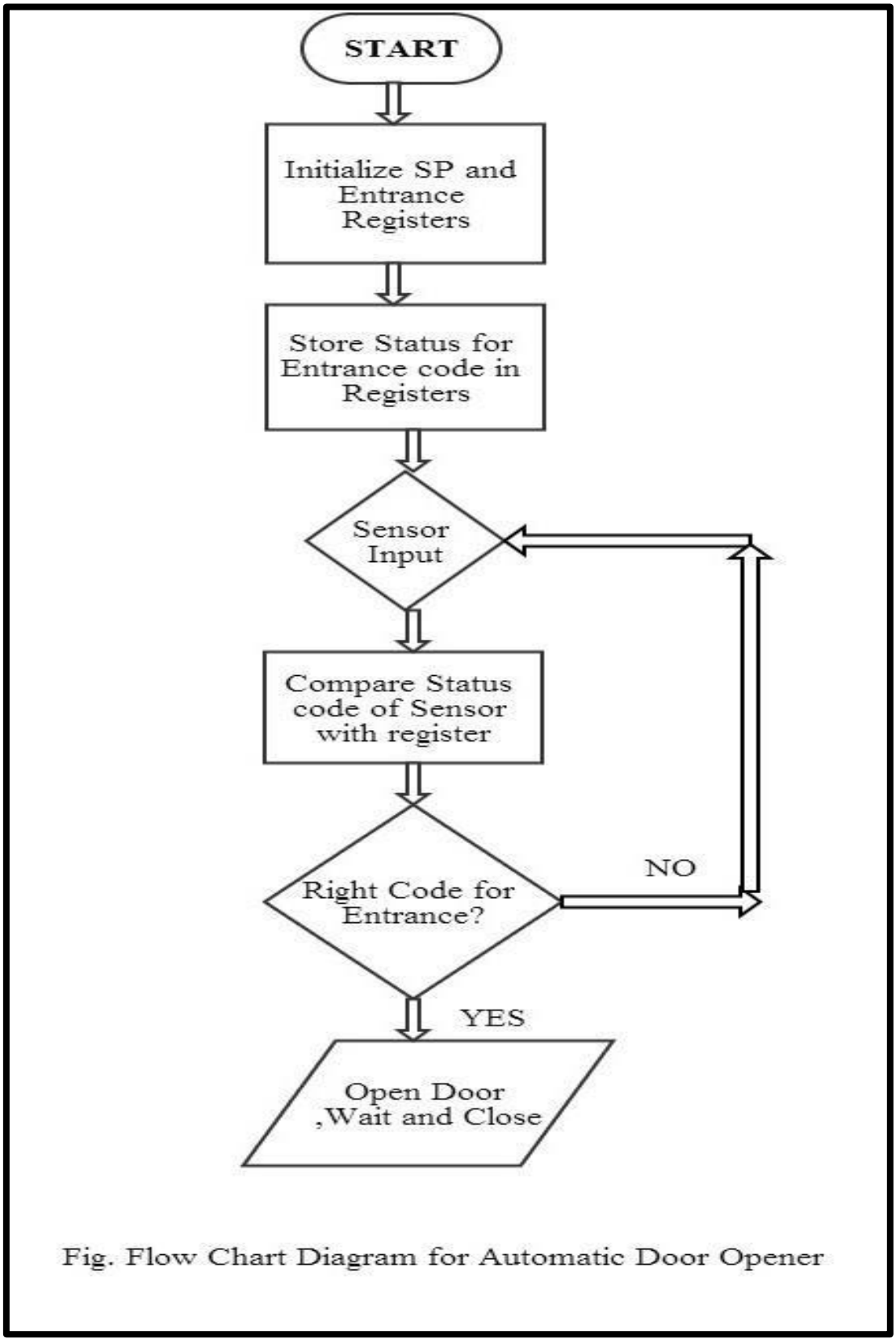


Fig. Flow Chart Diagram for Automatic Door Opener

6. EXPERIMENT RESULTS AND ANALYSIS

Experiment Results

The automatic gate system was tested under various conditions to evaluate its performance. The system was able to successfully detect the presence of an object, trigger the gate control unit, and open/close the gate as expected. The CPU module effectively managed the operations, and the memory module successfully stored the necessary data. The display unit provided real-time updates on the system's status.

The system was also tested for its response time, which was found to be within acceptable limits, providing quick access without significant delays. The auto-reverse feature worked effectively, preventing any potential damage or injury.

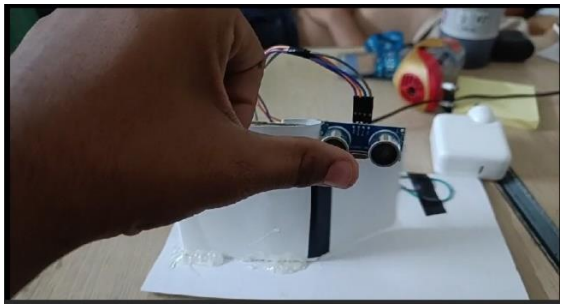
The gate was able to perform the required gyrations – open, auto-reverse, stop, fully close, and fully stop – smoothly and efficiently. The system's ability to count and register was accurate, providing valuable data for monitoring purposes.

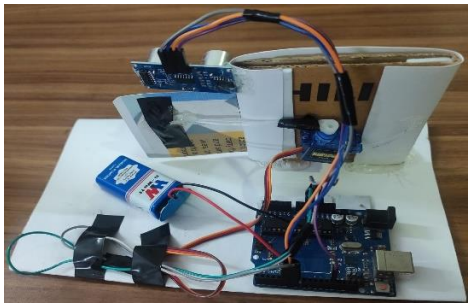
Analysis

The results indicate that the automatic gate system is functioning as intended. The use of a microprocessor as a controller has proven to be effective, with the system responding appropriately to the signals from the sensor unit.

The software control of the gate adds a layer of flexibility to the system, allowing for easy modifications when needed. This adaptability makes the system suitable for various environments and requirements.

However, it's important to note that while the automatic gate provides convenient access and intelligent features, it is not a security device. Any security measures would need to be implemented separately.





6. CONCLUSION

Overall, the automatic gate system has demonstrated reliable performance and offers a convenient solution for gate access without the need for manual operation. Further improvements and features could potentially bring it closer to a security device, enhancing its functionality and value. However, it's important to reiterate that while the system provides convenience and intelligent features, it is not a security device. Any additional security measures would need to be implemented separately.

The project has shown that automation can significantly improve the convenience and efficiency of gate operations. Future work could explore the integration of additional features and improvements, potentially bringing the system closer to a security device. This project serves as a promising step towards the broader application of automation technologies in our daily lives.

7.REFERENCES

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