KEYPAD CONTROLLED DOOR LOCKING SYSTEM

22ECC51 – EMBEDDED SYSTEMS AND IOT LABORATOY

A Mini Project Report

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ABSTRACT

This project, titled **"Keypad Controlled Door Locking System Using PIC16F877A,"** presents a secure, microcontroller-based door locking mechanism designed for efficient access control. The system leverages a **4x4 matrix keypad** for password entry, an **LCD display** for user feedback, and the **PIC16F877A microcontroller** as the central control unit.

The **4x4 matrix keypad** allows users to input a password that is displayed as masked characters on the LCD. The **PIC16F877A** processes the input, compares it with a pre-set password stored in its memory, and subsequently verifies the password's correctness. If the entered password matches, the system activates an indicator, such as an **LED**, signaling successful entry, and, optionally, controls a mechanism to unlock the door. Incorrect entries prompt an error message on the display, ensuring only authorized access.

This design demonstrates a compact, reliable, and cost-effective approach to electronic security for residential or commercial applications, with potential upgrades for additional security and usability features.

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1. INTRODUCTION

With the growing demand for reliable access control, electronic locking systems are becoming essential tools for modern security. Traditional locks often lack flexibility and can be vulnerable to unauthorized access, making electronic alternatives more appealing for residential, commercial, and industrial applications. This project—the **Keypad Controlled Door Locking System**—uses a **PIC16F877A microcontroller** to create an efficient, programmable system for managing access through a digital passcode.

The system comprises three main components: a **keyboard** for passcode entry, an **LCD display** to show the entered code, and an **LED** to indicate when the door unlocks successfully. Users enter a numeric passcode through the keyboard, and the LCD displays each keystroke, allowing for clear, real-time feedback. Once the code is fully entered, the PIC16F877A microcontroller verifies it against a preset passcode stored in memory. If the passcode is correct, the microcontroller activates the locking mechanism, allowing entry, and the LED lights up to confirm the door is unlocked. In the case of an incorrect entry, the system remains locked, providing no LED signal, and prompts the user to try again.

This setup offers flexibility for various security needs, as the system can be expanded to include features such as multiple passcodes, an alarm for repeated failed attempts, or time-based access restrictions. By integrating an LCD display for feedback and an LED to indicate successful unlocking, this solution combines ease of use with efficient security, offering a simple yet effective access control system.

The **Keypad Controlled Door Locking System** illustrates how embedded electronics can be applied to enhance security, providing a customizable solution that is both user-friendly and secure. Suitable for various applications, this system demonstrates the potential of microcontroller-based automation for modern, reliable access control.

## 2. METHODOLOGY

2.1 COMPONENTS REQUIRED:

- PIC16F877A Microcontroller – 1
- PIC Dumper kit (equipments) – 1
- Crystal Oscillator (4MHz) – 1
- Regulated Power Supply (5V DC) – 1
- LEDs – 5
- Resistor 1K ohm – 1
- 16 x 2 LCD Display – 1
- Potentiometer – 1
- 4X4 Matrix -1
- Connecting wires
- Breadboard – 1

2.2 PRINCIPLE AND WORKING :

The **Keypad Controlled Door Locking System** operates on the principle of password-based authentication to ensure secure access control. When powered on, the **PIC16F877A microcontroller** initializes, setting up the **4x4 matrix keypad** and **16x2 LCD display** for interaction. The user is prompted to enter a password on the keypad, and each keystroke is processed and displayed as masked characters (e.g., "*") on the LCD to maintain privacy. Once the complete password is entered, the microcontroller compares it with a pre-defined password stored in its memory. If the passwords match, the system triggers the **relay module** to unlock the door, with the LCD displaying "Access Granted" and an **LED** lighting up to confirm successful access. If the password is incorrect, the LCD displays "Incorrect Password" and may prompt the user to try again. After each attempt, the system resets, ready for the next entry. This efficient, user-friendly system provides reliable security and can be easily adapted for access control in homes or offices.

3. RESULT AND DISCUSSION

3.1 SIMULATION RESULT :
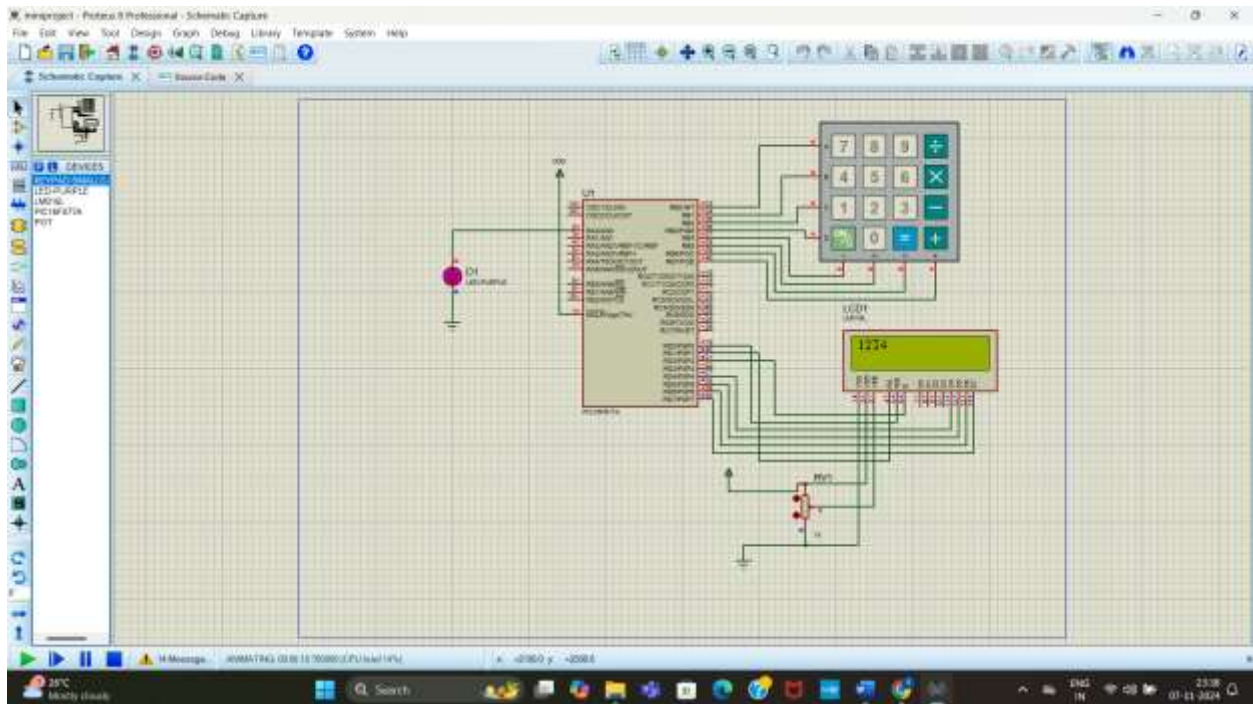
3.2 HARDWARE OUTPUT :
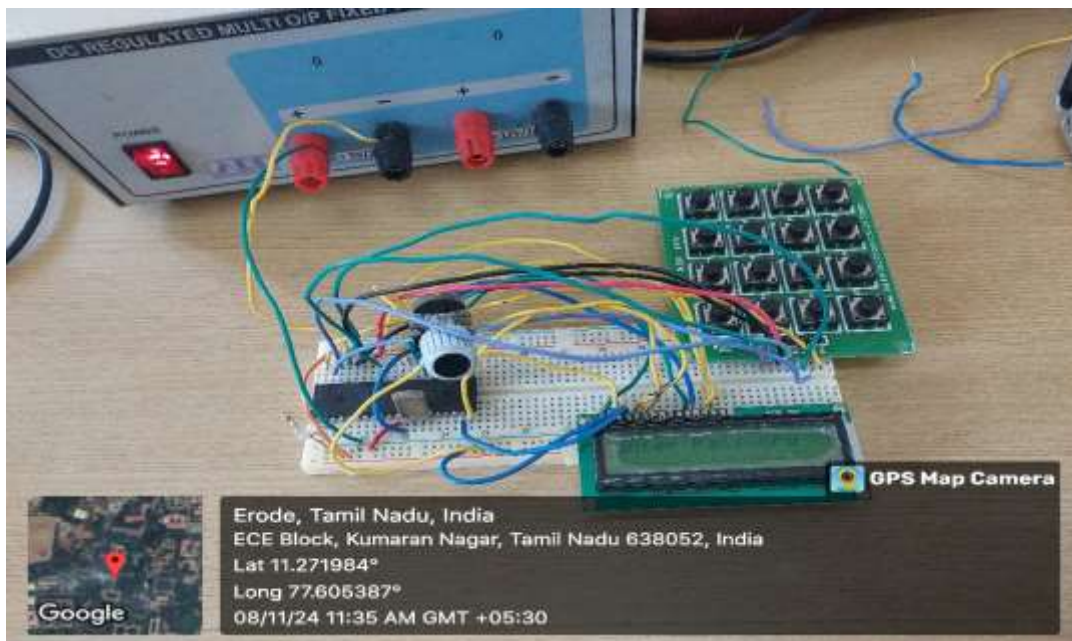
3.3QR CODE FOR DEMO VIDEO :

4. CONCLUSION

In conclusion, the **Keypad Controlled Door Locking System** successfully demonstrates an efficient and secure method for controlling access to a restricted area using a **4x4 matrix keypad** and a **PIC16F877A microcontroller**. The system provides a simple yet effective password-based solution, ensuring that only authorized users can unlock the door. With real-time feedback through the **LCD display** and **LED indicators**, users are continuously informed about the status of their password entry, enhancing the overall user experience. This project not only highlights the versatility and functionality of microcontroller-based systems but also serves as a foundational design for more advanced security applications. The system is scalable, with the potential for future upgrades such as adding biometric authentication, remote access capabilities, or integration with other smart home technologies. Overall, this project provides a secure, cost-effective, and reliable solution for electronic door locking, suitable for both residential and commercial use.