



**YEDİTEPE
ÜNİVERSİTESİ**

EE242 Microprocessor Systems

Keyless Door Lock Project Report

Project members

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Introduction

A keyless entry system is a security feature widely used in modern electronic access systems. By using STM32, we created a reliable and efficient lock system without needing keys. The user inputs a predefined password, and upon validation, the lock opens.

Objective

The main objective of this project is to build a keyless door lock system using an STM32L073RZ microcontroller. The system allows users to enter a password using a 4x4 matrix keypad, and it displays feedback on a 16x2 LCD screen. If the password is correct, a DC solenoid lock is activated to unlock the door.

Background

We were inspired by various Arduino-based keyless lock systems. To enhance our embedded system skills and to better understand real-time input/output handling, we implemented this system using STM32CubeIDE and the STM32 HAL library instead of Arduino.

This project helped us learn about:

- Keypad interfacing with GPIO
- LCD I2C communication
- Controlling a DC solenoid via GPIO
- Using HAL drivers in STM32CubeIDE

Components

1. STM32L073RZ Nucleo Board
2. 4x4 Matrix Keypad
3. 16x2 LCD with I2C Module
4. Bonsicoky 6V DC Solenoid Lock

5. Power Supply (5V regulated or via USB)

6. Connecting Wires

7. Breadboard or Perfboard

8. Single channel relay module



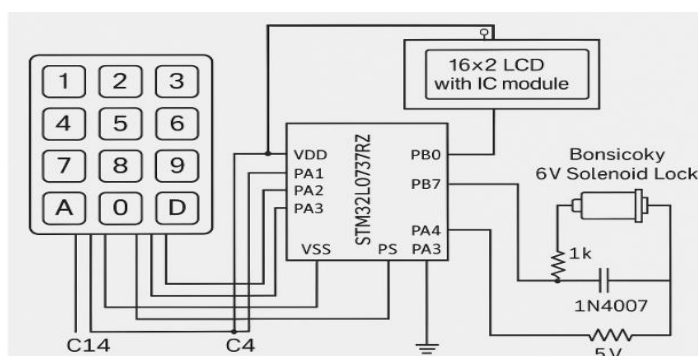
PRE-ASSEMBLING ON BREADBOARD

Before permanent implementation, the entire circuit was built and tested on a breadboard

WORKING PRINCIPLE

- The keypad is scanned using GPIO matrix scanning.
- The entered password is stored and compared with the preset password.
- If matched, STM32 sets a GPIO pin HIGH, which drives a transistor, allowing current to flow through the solenoid lock, unlocking it.
- If not matched, the LCD shows an error message.
- The LCD communicates via I2C, reducing the number of used GPIO pins.

Circuit Diagram



RESULT

At the end of the project, the keyless door lock system using the STM32L073RZ microcontroller was successfully implemented. The system operated as expected: the 4x4 matrix keypad allowed the user to enter a password, which was displayed and confirmed via the 16x2 LCD screen using I2C communication. When the correct password was entered, the microcontroller triggered the transistor circuit to activate the 6V solenoid lock, simulating the unlocking of a door. All components worked in harmony, and the system was tested and verified on a breadboard setup without any functional issues