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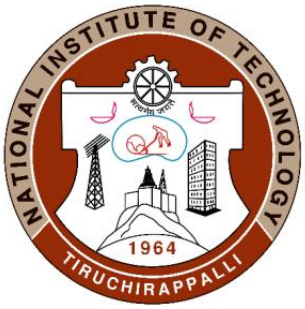

ECLR-13 Microprocessors and Microcontrollers Lab Project

TITLE: Password based door lock system using 8051 microcontroller

Mini Project Report

By

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Abstract:

Our project is a digital password-based door lock. The lock works by verifying the digitally inputted password with the predefined passcode. The digital door lock is operated with the help of 8051 microcontroller. The status messages of whether the password is right or wrong is displayed on a LCD module.

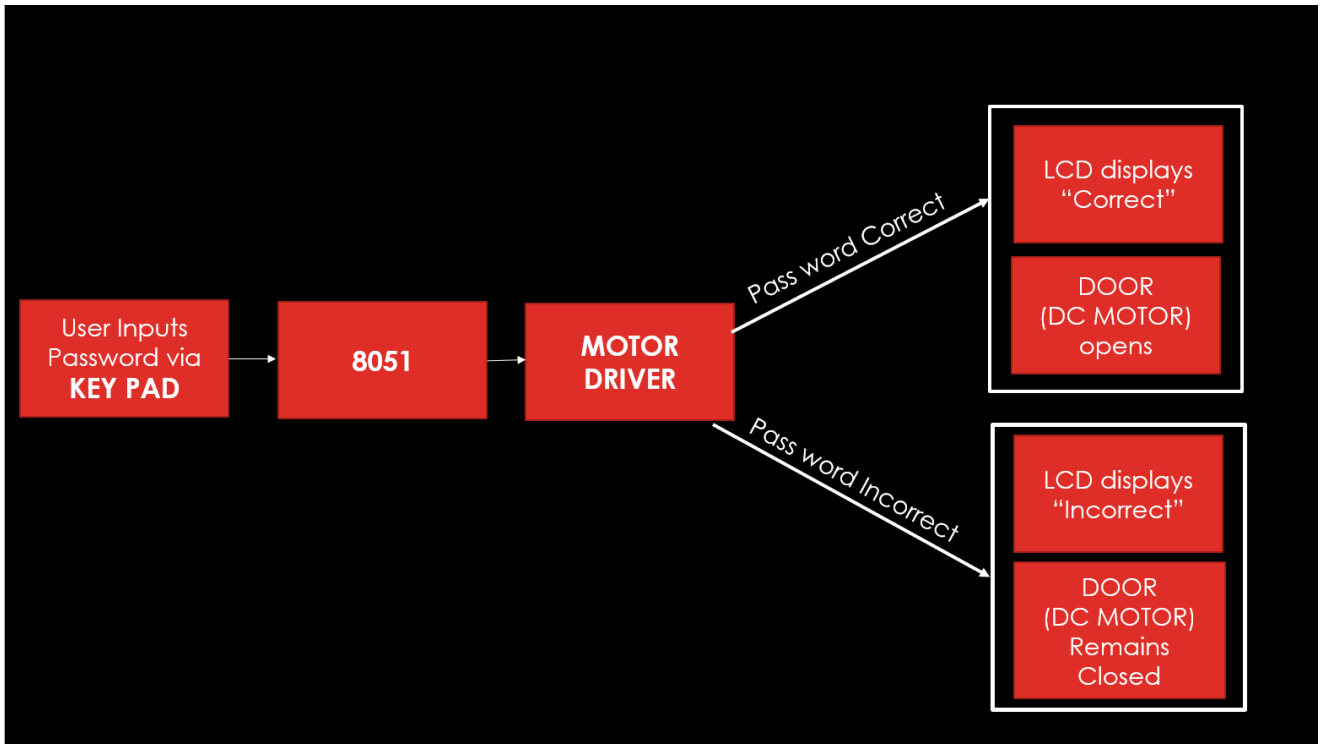
In this report, the detailed explanation of how the circuit works and all the components required to build one are attached.

Introduction:

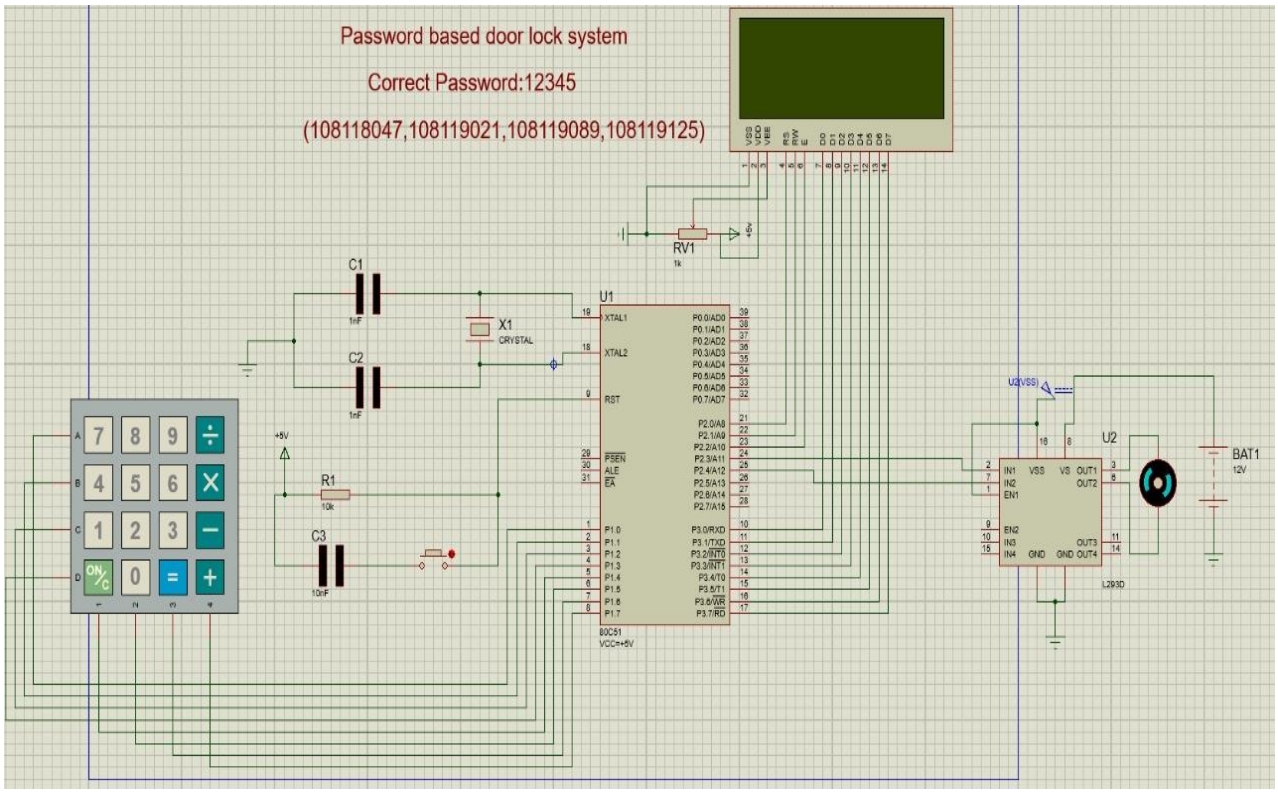
The **Digital Door Lock** in general is a password-based electronic code lock. In this project, we have designed the digital door lock using an 8051 microcontroller, a keypad, and Motor. In this article, we have designed a simple digital door lock using 8051 -which can be used as a security checking system to limit access to an area/room only for certain individuals with the password. So our digital door lock project can be called with a very wide range of names like a digital combination lock using 8051 or a digital security code lock using 8051 microcontrollers or a password security system using 8051 or an electronic code lock or a digital code lock using 8051. People call this kind of a "**security system**" with different names, though all of them mean to build a **basic password-based security system** using a microcontroller like 8051.

Our Digital Code Lock project – is a simple electronic number lock system or an electronic combination lock using 8051 – which has a preset **5 digit password** stored inside the program. The system collects 5 digit user input, compares the user input with the preset password inside the program, and if the user input and stored password matches, access will be granted (by opening the door with the help of relay for a few seconds and closing it automatically after the stipulated time). If there is a mismatch between user input and stored password, access will be denied (by not opening the closed door – that is by keeping the relay in OFF position)

BLOCK DIAGRAM:



Circuit Diagram:



4*4 Keypad:

It is used to input the password which will be read and compared with the predefined password.

80C51:

It is used to send commands to all components of the circuit to execute the required functions.

20*4 LCD Module:

It is used to display the entered password and the status message of whether the password is correct.

MOTOR DRIVER(L293):

It controls the motor to be either on or off based on the result of comparing the entered and defined password.

DC MOTOR:

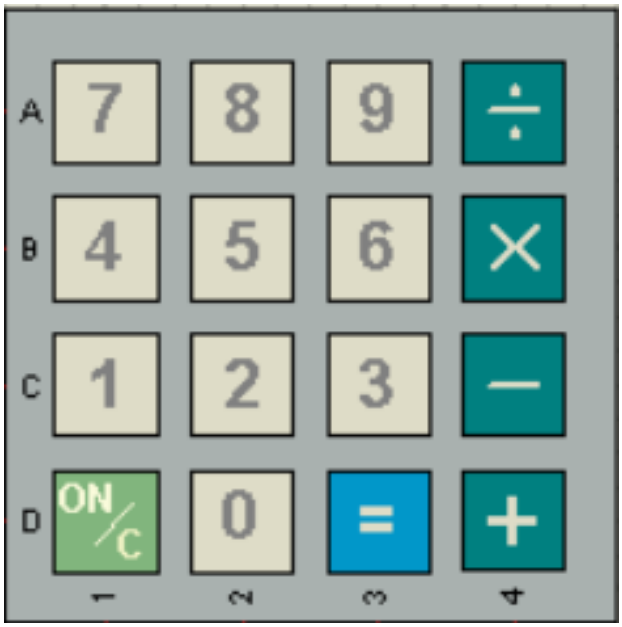
It acts as a substitute for the door in this circuit. The ‘ON’ state representing an open door and the ‘OFF’ state representing a closed door.

Implementation (Components Used):

80C51	**20*4 LCD Module – 1**
4X4 Keypad – 1	10K Resistor Network – 1
DC Motor	
Push Button Switch – 1	Crystal – 11.059Mhz – 1
Capacitors	
1nF -2	
10nF -1	
Resistors	
10K Ohm – 1	1K Ohm -1

Keypad interfacing to 80C51

We have interfaced a 4×4 keypad to Port 1 of 8051 microcontroller. Row pins are connected from P1.0 to P1.3, whereas Column pins are connected from P1.4 to P1.7.



The hex keypad has 8 communication lines namely R1, R2, R3, R4, C1, C2, C3 and C4. R1 to R4 represents the four rows and C1 to C4 represents the four columns. When a particular key is pressed the corresponding row and column to which the terminals of the key are connected gets shorted.

For example if key 1 is pressed row R1 and column C1 gets shorted and so on. The program identifies which key is pressed by a method known as column scanning.

20*4 LCD Module interfacing to 80C51

We are using a 20*4 lcd module to display the status messages of the project. We have connected this LCD module in 8 bit mode (using 8 data lines). The 8 data lines are connected to Port 0 of 8051. An external pull-up resistance is connected using a 10K Resistor Network (with 8 pins) at Port 0 to interface the 8 data lines of LCD. The LCD controlling pins RS, R/W, and E are connected to Port 2 pins P2.0, P2.1, and P2.2 respectively.

Pin Descriptions for LCD

Pin	Symbol	I/O	Descriptions
1	VSS	--	Ground
2	VCC	--	+5V power supply
3	VEE	--	Power supply to control contrast
4	RS	I	RS=0 to select command register, RS=1 to select data register
5	R/W	I	R/W=0 for write, R/W=1 for read
6	E	I/O	Enable
7	DB0	I/O	The 8-bit data bus
8	DB1	I/O	The 8-bit data bus
9	DB2	I/O	The 8-bit data bus
10	DB3	I/O	The 8-bit data bus
11	DB4	I/O	The 8-bit data bus
12	DB5	I/O	The 8-bit data bus
13	DB6	I/O	The 8-bit data bus
14	DB7	I/O	The 8-bit data bus

used by the LCD to latch information presented to its data bus

COMNWRT:

move a command word to the ACC

copy regACC to port 1 (connected to the LCD data lines)

RS =0 (for command)

R/W = 0 (for write)

E = high pulse

call delay

E = low pulse (H-L pulse)

DATAWRT:

move a data word to the ACC

copy reg ACC to port 1 (connected to the LCD data lines)

RS =1 (for data)

R/W = 0 (for write)

E = high pulse

call delay

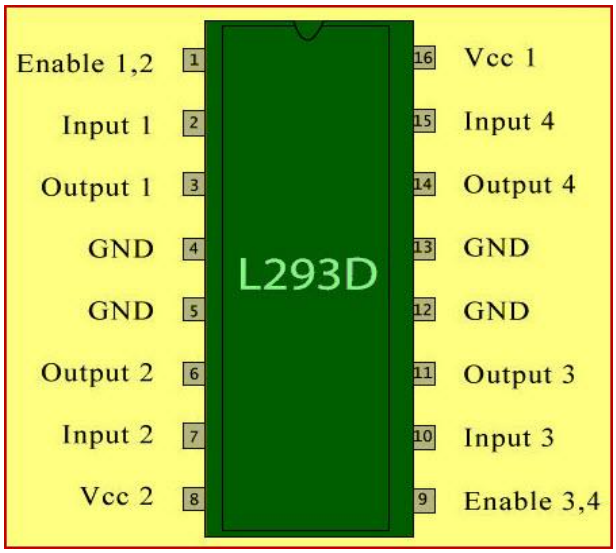
E = low pulse (H-L pulse)

Push button switch – is used to setup reset circuit of 8051

Crystal Oscillator- is used to provide necessary clock to 8051.

Motor Driver(L293):

L293 is a dedicated quadruple half H bridge motor driver IC available in 16 pin package.



L293 has a current capacity of 600mA/channel and has supply voltage range from 4.5 to 36V DC. They are fitted with internal high speed clamp diodes for inductive spike protection. The IC L293D works based on the H-bridge concept. The voltage can be made to flow in either direction using this circuit (H-bridge) such that by changing the voltage direction the motor direction can be changed.The practical application of L293D IC is (L293D acts as an interfacing device) DC motor interfacing with 80C51 microcontroller by which we can control the speed and direction of the motor.

DC Motor - It represents the door in this circuit. The 'ON' state representing an open door and the 'OFF' state representing a closed door.

Code:

```
org 0h

MAIN:
ACALL LCD_INIT
MOV DPTR,#MYDATA
ACALL SEND_DAT
ACALL DELAY
ACALL READ_KEYPRESS
ACALL DELAY
ACALL CHECK_PASSWORD

Stay_here:SJMP Stay_here



READ_KEYPRESS:
MOV R0,#5D
MOV R1,#160D
ROTATE:ACALL KEY_SCAN
MOV @R1,A
ACALL DATAWRT
ACALL DELAY2
INC R1
DJNZ R0,ROTATE
RET
```

```
CHECK_PASSWORD:MOV R0,#5D
MOV R1,#160D
MOV DPTR,#PASSWORD
RPT:CLR A
MOVC A,@A+DPTR
XRL A,@R1
JNZ FAIL
INC R1
INC DPTR
DJNZ R0,RPT
ACALL LCD_INIT
MOV DPTR,#TEXT_S1
ACALL SEND_DAT
ACALL DELAY
SETB P2.3
CLR P2.4
SJMP GOBACK
FAIL:ACALL LCD_INIT
MOV DPTR,#TEXT_F1
ACALL SEND_DAT
ACALL DELAY
CLR P2.3
CLR P2.4
ACALL MAIN
GOBACK:RET

LCD_INIT:MOV DPTR,#MYCOM
C1:CLR A
MOVC A,@A+DPTR
ACALL COMNWRT
ACALL  DELAY
INC DPTR
JZ DAT
SJMP C1
DAT:RET
```

```
SEND_DAT:
CLR A
MOVC A,@A+DPTR
ACALL DATAWRT
ACALL DELAY
INC DPTR
JZ AGAIN
SJMP SEND_DAT
AGAIN: RET



KEY_SCAN:MOV P1,#11111111B
CLR P1.0
JB P1.4, NEXT1
MOV A,#55D
RET

NEXT1:JB P1.5,NEXT2
MOV A,#56D
RET

NEXT2: JB P1.6,NEXT3
MOV A,#57D
RET

NEXT3: JB P1.7,NEXT4
MOV A,#47D
RET

NEXT4:SETB P1.0
CLR P1.1
JB P1.4, NEXT5
MOV A,#52D
RET
```

```
NEXT5:JB P1.5,NEXT6
MOV A,#53D
RET

NEXT6: JB P1.6,NEXT7
MOV A,#54D
RET

NEXT7: JB P1.7,NEXT8
MOV A,#42D
RET

NEXT8:SETB P1.1
CLR P1.2
JB P1.4, NEXT9
MOV A,#49D
RET

NEXT9:JB P1.5,NEXT10
MOV A,#50D
RET

NEXT10: JB P1.6,NEXT11
MOV A,#51D
RET

NEXT11: JB P1.7,NEXT12
MOV A,#45D
RET

NEXT12:SETB P1.2
CLR P1.3
JB P1.4, NEXT13
MOV A,#67D
RET

NEXT13:JB P1.5,NEXT14
MOV A,#48D
RET
```

```
NEXT14: JB P1.6,NEXT15
MOV A,#61D
RET

NEXT15: JB P1.7,NEXT16
MOV A,#43D
RET
NEXT16:LJMP KEY_SCAN


COMNWRT:MOV P3,A
CLR P2.0
CLR P2.1
SETB P2.2
ACALL DELAY
CLR P2.2
RET

DATAWRT: MOV P3,A
SETB P2.0
CLR P2.1
SETB P2.2
ACALL DELAY
CLR P2.2
RET

DELAY: MOV R3,#50
HERE2: MOV R4,#255
HERE: DJNZ R4,HERE
DJNZ R3,HERE2
RET
```

```
DELAY2: MOV R3,#250D
         MOV TMOD,#01
BACK2:   MOV TH0,#0FCH
        MOV TL0,#018H
        SETB TR0
HERE5:  JNB TF0,HERE5
        CLR TR0
        CLR TF0
        DJNZ R3,BACK2
        RET

CLRSCR: MOV A,#01H
ACALL COMNWRT
RET

ORG 500H
MYCOM: DB 38H,0EH,01,06,80H,0
MYDATA: DB "Password-",0
PASSWORD:DB 49D,50D,51D,52D,53D,0
TEXT_F1: DB "INCORRECT",0
TEXT_S1: DB "CORRECT",0
END
```

Explanation of Code:

MAIN:

All the function calls are made in this subroutine.First, the LCD_INIT function is called. Next the string stored in MYDATA is moved to DPTR. Next, SEND_DAT is called which send the entire string character by character. Next DELAY function is called. Followed by READ_KEYPRESS function, which reads the user input. Next DELAY function is called again. CHECK_PASSWORD is called finally to compare the user input with the predefined password.

LCD_INIT:-

Commands in this subroutine are made for the initial setup of the LCD Module.Commands such as 8H,0EH,01,06,80H,0 are called in this subroutine to initialise the LCD.

SEND_DAT:-

Before calling SEND_DAT function, the string stored in code memory is being moved to DPTR. Then DPTR is increased by 1.Then DATAWRT function is called to write the data character by character.

READ_KEYPRESS : –

READ_KEYPRESS is the subroutine to collect user inputs. A counter is set up using register R0 to count 5 times (this will limit the user input collection to the first 5 key presses). Register R1 is assigned address location 160D. The collected user inputs are saved in address location starting from 160D. This location is incremented successively using INC R1 – command of 8051. So first user input is stored in 160D, second user input in 161D, third in 162D, fourth in 163D, and fifth user input in 164D. These address locations are accessed using register R1 via the indirect addressing method**.**

KEY_SCAN :-

KEY_SCAN is the subroutine to identify a keypress. The method of column scanning is employed in identifying the pressed key. The pressed key is identified and is assigned a decimal equivalent value (ASCII value) of the pressed key. Hex key pad is essentially a collection of 16 keys arranged in the form of a 4×4 matrix. Hex key pad usually have keys representing numerics 0 to 9 and characters A to F.

CHECK_PASSWORD:-

CHECK_PASSWORD is the subroutine to compare user input password (5 digits) with the actually stored password in the program. Comparison is made digit by digit by selecting each digit from stored password with the help of DPTR and loading it to Accumulator (with MOVC A,@A+DPTR). Each digit loaded to the accumulator is then compared with the corresponding digit stored as user input (in address locations 160D to 164D) by loading them one by one to register R1.

Digits are compared by X-OR ing them with command XRL A,@R1. Based on the outcome of the comparison, this subroutine has commands written to either allow access (and turn ON relay) or to not allow access and display an "INCORRECT" message on the LCD screen.

DELAY:

There are two delay routines written in the program. DELAY – is used as a delay for outputting messages on the LCD module properly. After sending a message/data to the LCD module, DELAY is called so that the message stays on the LCD screen for the stipulated delay time. DELAY2 (is a 2.5 seconds delay) is used to provide the necessary debouncing effect for the keypad. (A push-button switch or any kind of mechanical switch has a bouncing effect.

RESULTS:

Figure of the circuit before giving an input

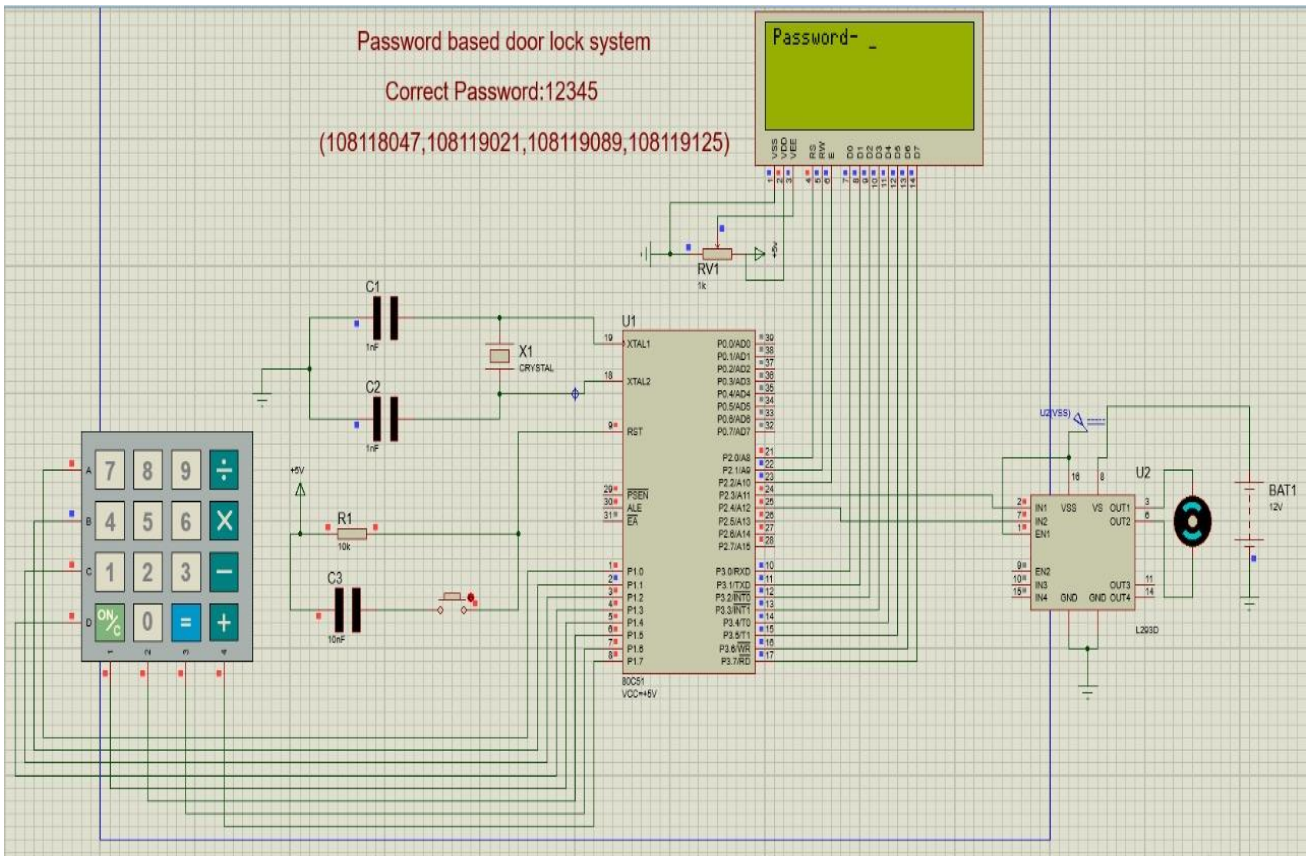
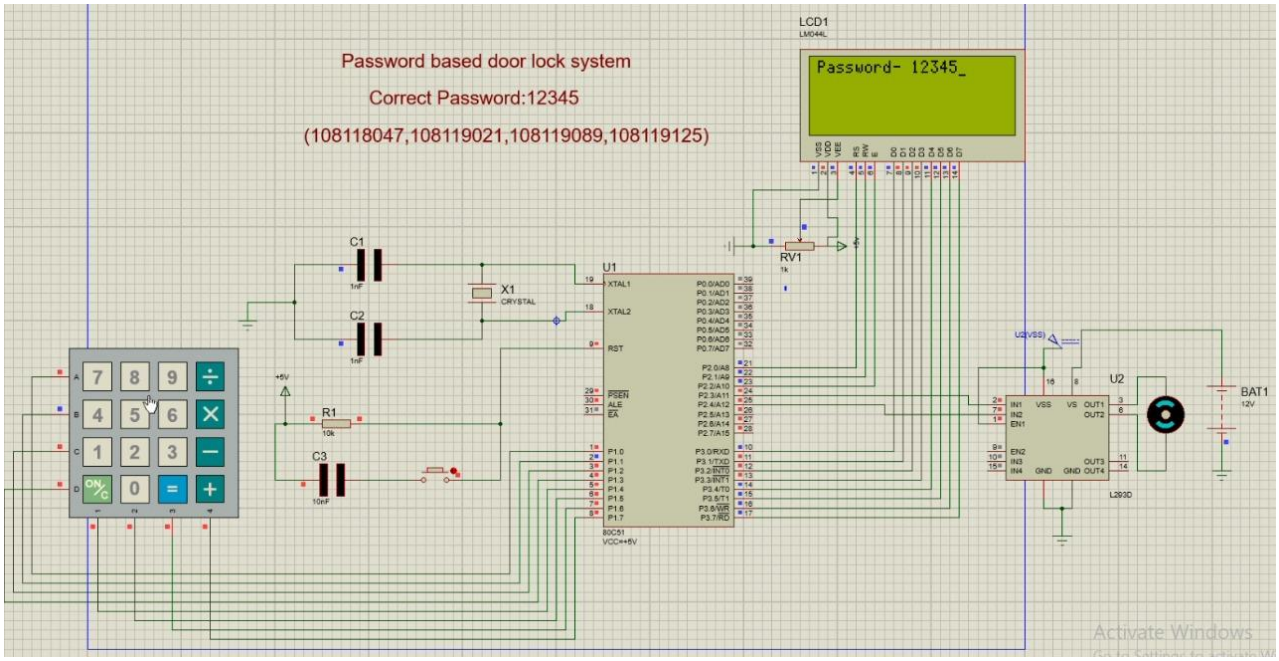
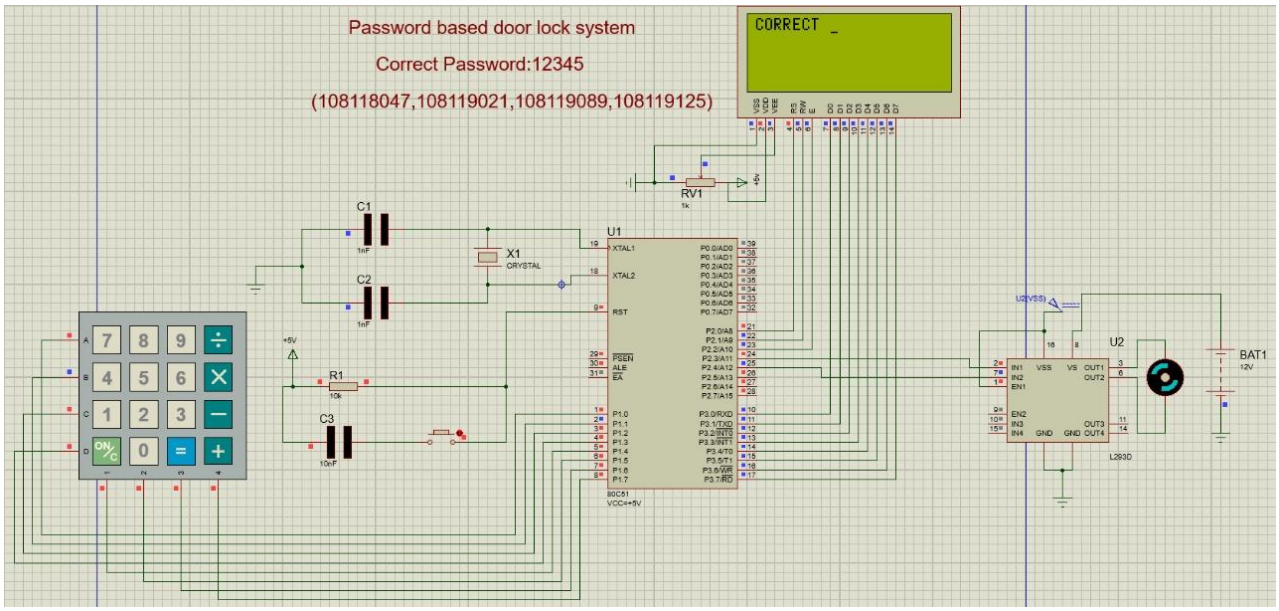


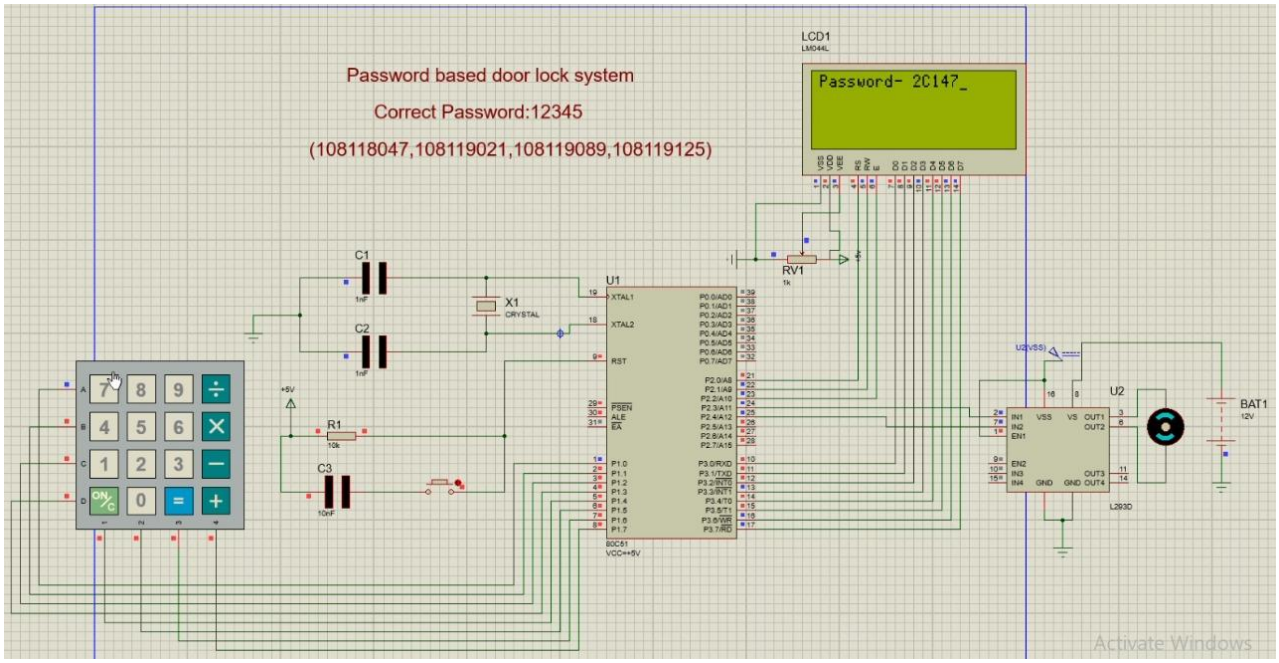
Figure of the circuit after typing the correct password

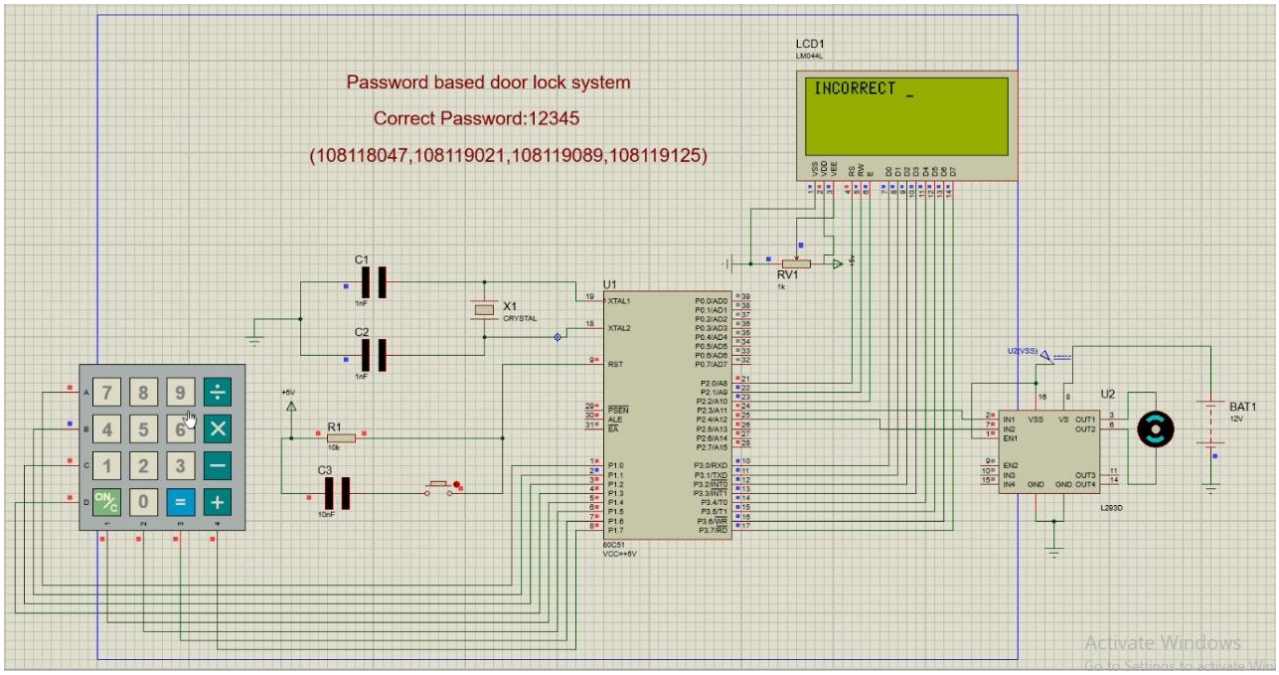




(The motor is on indicating that the door is open)

Figure of the circuit after typing the incorrect password





(The motor doesn't switch on indicating that the password was incorrect)

Conclusion and Future Scope:

The digital door lock is constructed in proteus simulation software and its executed successfully.

Advantages:

- This project provides security.
- Power consumption is less.
- Uses commonly available components.

Applications:

- This simple circuit can be used at residential places to ensure better safety.
- It can be used at organizations to ensure authorized access to highly secured places.
- With a slight modification this Project can be used to control the switching of loads through password.

Future Scope:

- This door lock can not be operated remotely, it has to be operated manually. In future, it could be developed so that it can be operated remotely with a handheld device.
- There is no method to recover the password if the user forgets it. So it could be developed in future to have a recovery method if you forget the password like an Otp can be sent to the mobile phone of the user in order to reset the password

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References:

- https://www.circuitstoday.com/interfacing-hex-keypad-to-8051
- https://www.electronicshub.org/password-based-door-lock-system-using-8051-microcontroller/
- https://www.circuitstoday.com/interfacing-dc-motor-to-8051
- https://www.elprocus.com/interfacing-dc-motor-with-8051-microcontroller/#:~:text=The%20IC%20L293D%20is%20used,PWM%20generated%20by%20the%20microcontroller.&text=Thus%2C%20the%20speed%20of%20DC%20motor%20can%20be%20controlled.