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BANGALORE INSTITUE OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MICROCONTROLLER AND EMBEDDED SYSTEMS

18CS44

MINI PROJECT REPORT ON "PASSWORD BASED DOOR LOCK SYSTEM USING LPC2148 MICROCONTROLLER"

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INTRODUCTION

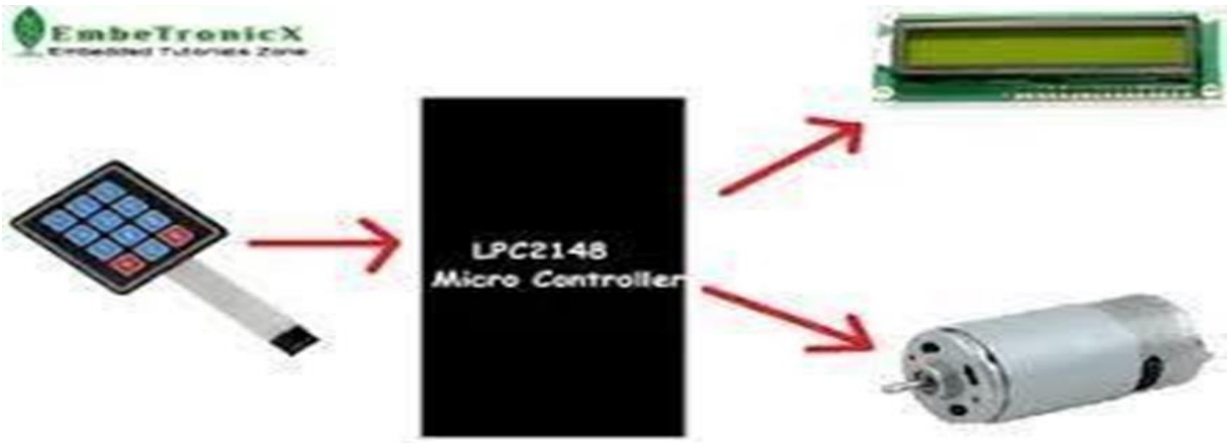
In the present scenario of the world, security is a major concern for all, and the security problem is being faced by every person. The usual means of securing anything is through mechanical locks, which operate with a specific key or a few keys; but, for locking a large area many locksare necessary. However, conventional locks are heavy and do not offer the desired protection as they can be easily broken down by using some tools. Therefore, security breaching problems are associated with the mechanical locks. However to decide the electronic based locking system problems that are associated with the mechanical locks. Nowadays, many devices' operations are based on digital technology. For example, token based digital identity device. Here we will see Password Based Door Open System Using LPC2148.

WORKING EXPLAINATION

This system demonstrates a password based door lock system wherein once the correct code or password is entered, the door is opened and the concerned person is allowed access to the secured area. Again if another person arrives it will ask to enter the password. If the passwordis wrong then door would remain closed, denying the access to the person.

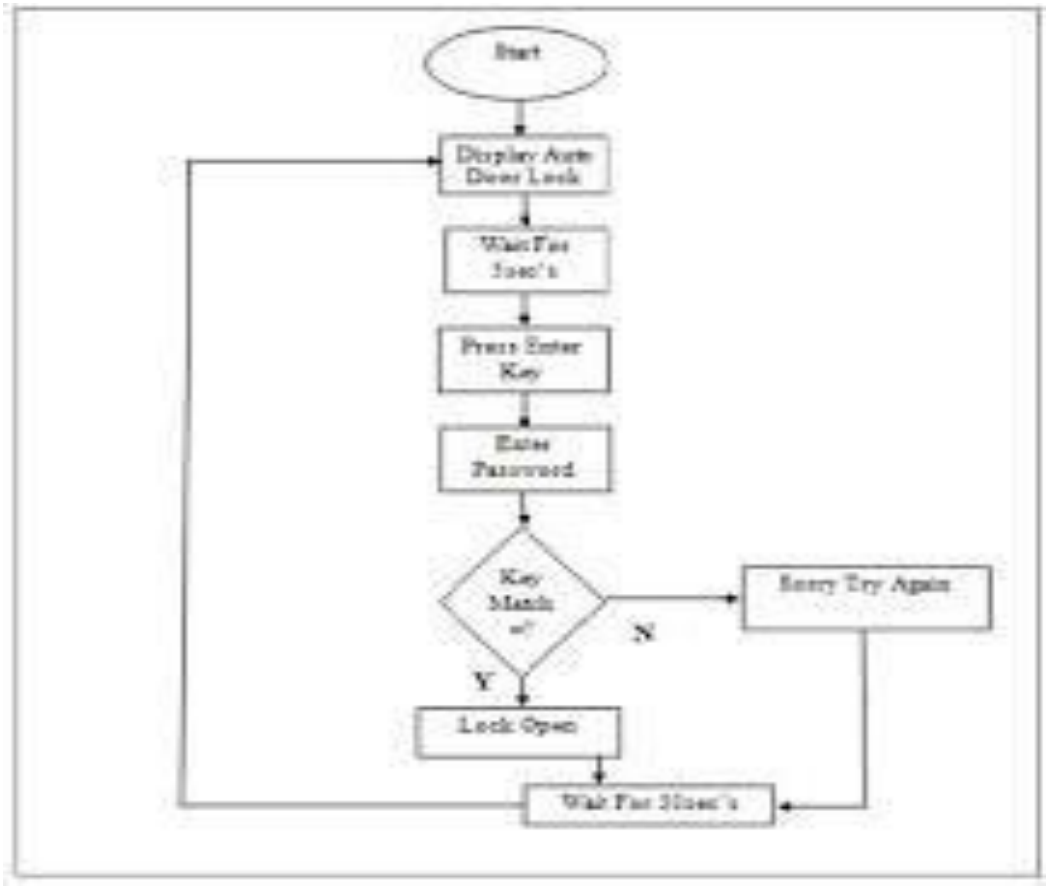
PASSWORD BASED DOOR LOCKING SYSTEM CIRCUIT OPERATION

Once the circuit is powered ON, microcontroller sends commands to the LCD to display "enter password" on LCD. Now we need to enter the password using the keypad. Once password is entered, it displays 5 stars on LCD to indicate that controller read password successfully. Now the controller compares the entered password with predefined password. If the password is matched, then the microcontroller makes P0.0 HIGH and P0.1 LOW, so the motor driver gets the input signals for forward motion of the motor. As a result, the Door Motor rotates in forward direction to open the door. After a delay of 10seconds, the microcontroller makes P0.0 LOW and P0.1 HIGH, so the motor driver gets the input signals for reverse motion. As a result, the Door motor rotates in reverse direction to close the door. If the password is not matched, then microcontroller maintains both P0.0 and P0.1 LOW. Hence, the door motor is stationary so that door remains closed.



PASSWORD BASED DOOR LOCK SYSTEM ALGORITHM

1. Initially, declare the PORT1 to LCD data pins and control pins (RS and E)to P3.0 and P3.2. Also, declare PORT2 to keypad. Also use P0.0 and P0.1for motor driver.
2. Then, display the message “enter password” on LCD.
3. Now read the five digit password from the user.
4. Compare the entered password with the stored password.
5. If password is correct, then make P0.0 pin HIGH and P0.1 pin LOW toopen the door. During this time, display *“Door opening”* on LCD.
6. After some time, make P0.0 pin LOW and P0.1 pin HIGH to close thedoor and after this display *“Door closing”* on LCD.
7. If the password is wrong, then display *“Wrong Password”* on LCD.
8. After some delay again ask to enter password.



ADVANTAGES, APPLICATIONS AND LIMITATIONS

◦ **Advantages of Password Based Door Lock System**

- This project provides security
- Power consumption is less
- Used commonly available components
- Project is simple and easy

◦ **Applications of Password Based Door Lock System**

- This simple circuit can be used at residential places to ensure bettersafety.
- It can be used at organizations to ensure authorized access to highlysecured places.
- With a slight modification this Project can be used to control theswitching of loads through password.

◦ **Limitations of Password Based Door Lock System**

- It is a low range circuit, i.e. it is not possible to operate the circuitremotely.
- If you forget the password it is not possible to open the door.

COMPONENTS REQUIRED

- LPC2148 Development board
- LCD Module
- 4*3 Keypad
- DC Motor
- L293D (Motor Drive

COMPONENTS EXPLAINATION

1. **ARM-7 LPC 2148 MICROCONTRPLLER:** The microcontroller is responsible for detection and polling of the peripherals status. The ARM processor core is the key component of many successful 32-bit embedded systems widely used in mobile phones. Features include Designed small to reduce power consumption. High Code density. Preloaded with manyinbuilt peripherals making it cost-effective and reliable.

2. **LCD:** The LCD is an acronym for Liquid Crystal Display that is used here is 16x2 alphanumeric Liquid Crystal Display (LCD) which means it can display alphabets along with numbers on 2 lines each containing 16 characters. It is used to show the password entered and the status of thepassword. It can also display the various options and all the readings thathave been stored in the EEPROM.

3. **KEYPAD:** A Panel used in the door locking system, designed to enter thepassword. We use a 12-button numeric keypad, similar to what we might find on a telephone. This keypad has three columns and four row. Pressing a button will short one of the row outputs to one of the columnoutputs.

4. **STEPPER MOTOR:** A DC motor is a mechanically commutated electric motor powered from direct current (DC). In DC motor, operation is based on simple electromagnetism. The magnetic field is generated byplacing the current-carrying conductor. The external magnetic field is experienced when the conductor is placed in magnetic field.

5.**POWER SUPPLY:** The power supply gives +5v and +12v supply to the circuit and comprises of four stages namely transformer, rectifier, filter, and regulator. Transformer is a step-down transformer receives input of 230v AC and produce output of 15v at the secondary. This 15v AC converts the AC wave into fully rectified wave.

6.**L293D MOTOR DRIVER** used to drive the dc motor to rotate when the entered password is correct.

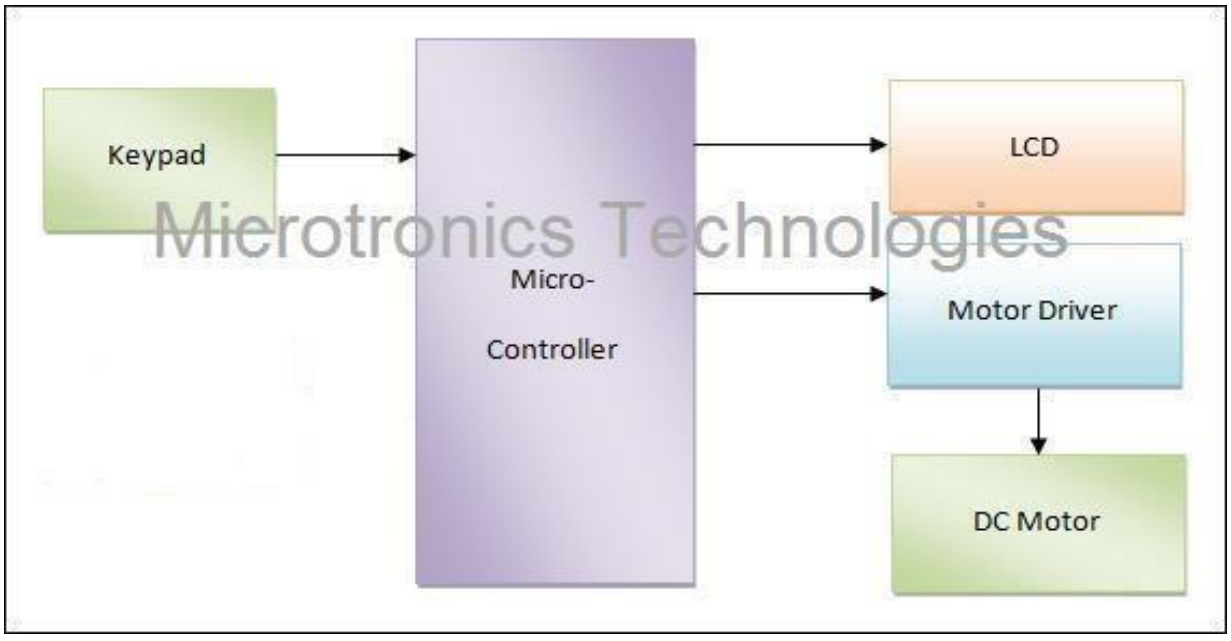
SOFTWARE DETAILS

We use embedded C language for the working of ARM 7 Microcontroller.

Embedded C use almost the similar syntax as that of structured C Language. The embedded C programming includes salient features like fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. Keil Microvision is an IDE (Integrated Development Environment).Philips Utility is the Java Virtual Machine (JVM) that converts the given Embedded C code into Hex File International Journal of Computer Science and Engineering (IJCSE) Special Issue May – 2017. For the simulation protues is used

BLOCK DIAGRAM

The working of this project can be described from the block diagram. It consists of blocks as a microcontroller, a keypad, an LCD, a DC motor and a motor driver. The keypad is an input device which helps to enter a password to open thedoor. Then, it gives the entered code signals to the microcontroller. The LCD is used to indicating devices for displaying the information. The DC motor moves the door to open and close and the motor driver drives the motor after receiving the code signals from the microcontroller.



CIRCUIT DIAGRAM

- **LCD:**

  RS – P0.2

  RW – GND

  EN – P0.3

  Data lines – P0.4 to P0.7 (4 Bit Mode)

- **DC Motor (Motor Driver):**

  Input 1 – Port 0.16

  Input 2 – Port 0.17

  Enable 1 – P0.18

Keypad:

R1 – P1.16

R2 – P1.17

R3 – P1.18

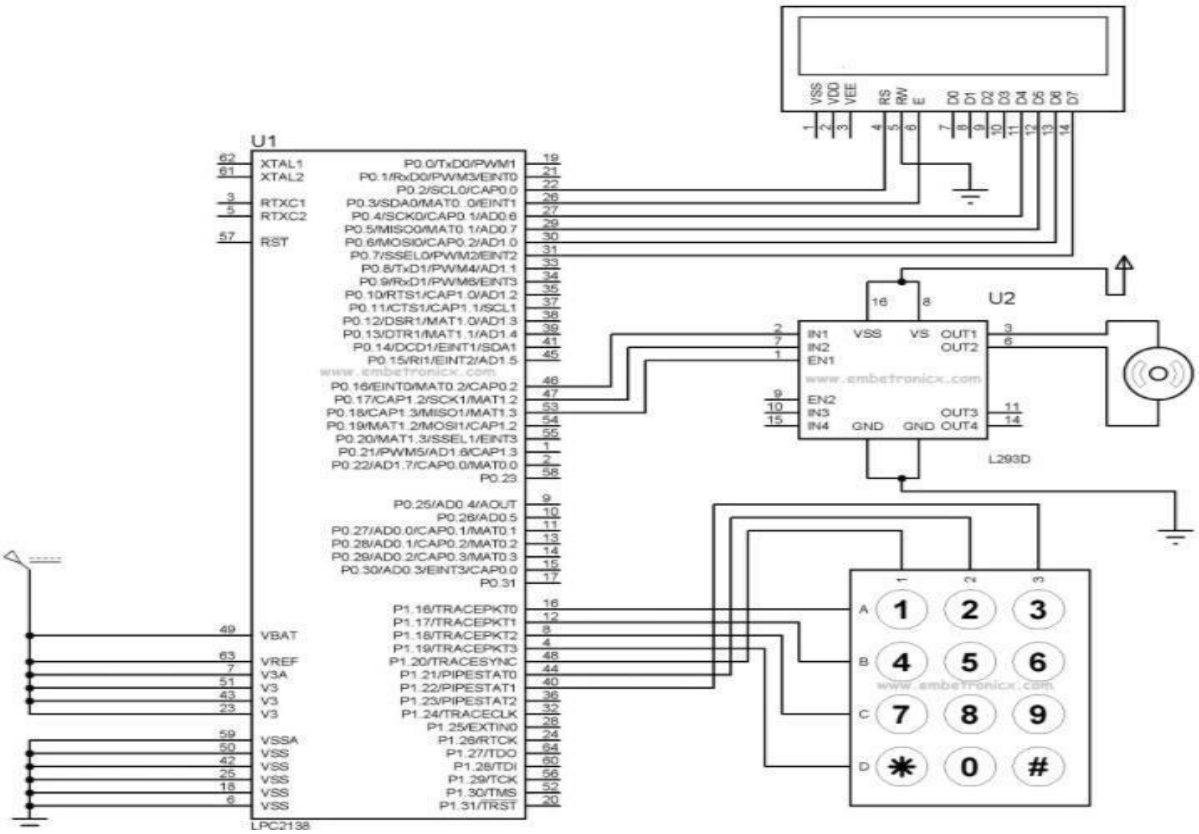
R4 – P1.19

C1 – P1.20

C2 – P1.21

C3 – P1.22

CIRCUIT



- Reset Circuit Design: The reset pin of the microcontroller is kept active till the power supply is in the specified range and a minimum oscillation level is maintained. In other words to ensure the supply voltage does not falls below the threshold level of 1.2V and the reset pulse width is greater than 100ms (recommended for 89C52), we need to select the values of resistor and capacitor such that RC >=100ms. Hence, we selected a 10KΩ resistor and a 10µF electrolytic capacitor.

◦ Oscillator Circuit Design: An 11.0592MHz crystal oscillator is used to provide external clock signal to the microcontroller. To ensure smooth operation, we need to connect two ceramic capacitors in the range of 30pF to 40pF. This crystal oscillator is connected between pin 18 and 19of the microcontroller. Here, we used two 33pF capacitors.

◦ Interfacing LCD, Keypad and Motor Driver: First, a 10KΩ Potentiometer is connected to the LCD Display's Contrast Adjust Pin (Pin 3). RS, RW and E of LCD are connected to P3.0, GND and P3.2 pins respectively. The eightdata lines of the LCD are connected to PORT1.

◦ The four ROW pins of the Keypad are connected to P2.0 to P2.3 and the four COLUMN pins of the Keypad are connected to P2.4 to P2.7 pins respectively. The IN1 and IN2 of (1A and 2A) of the L293D Motor Driver are connected to PORT0 pins P0.0 and P0.1. Motor is connectedbetween OUT1 and OUT2 (1Y and 2Y) pins of L293D.

CODE

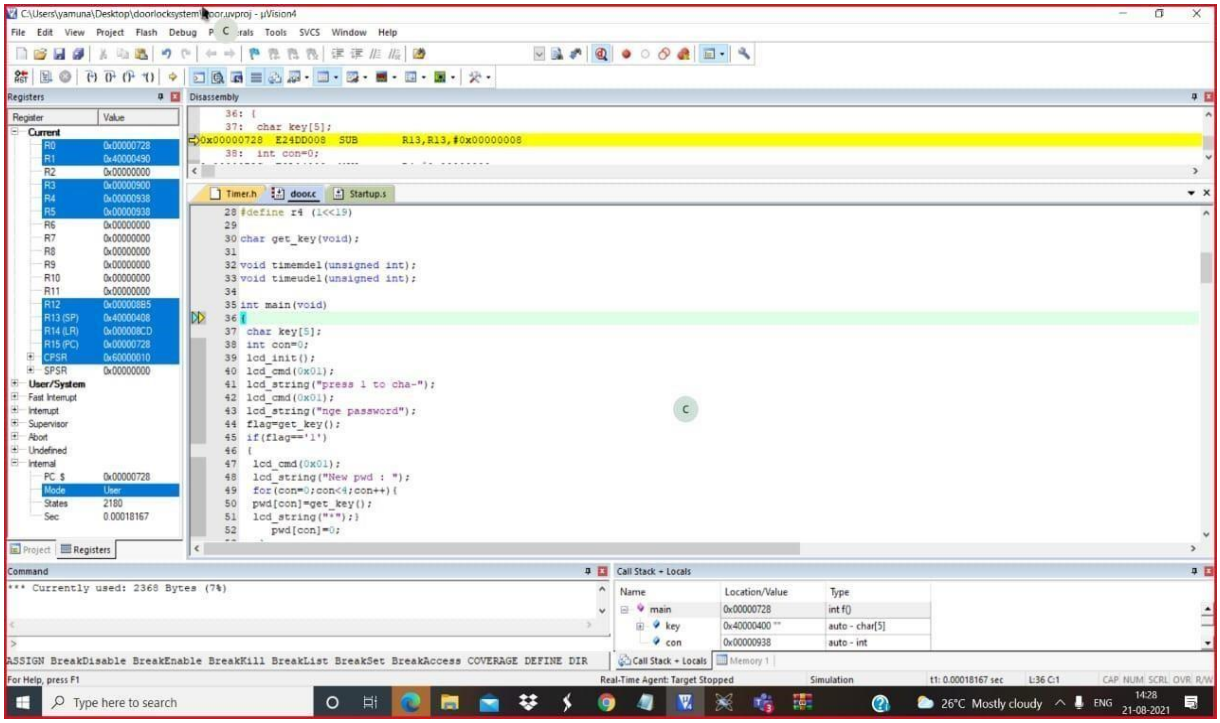
```
#include<lpc214x.h>
#define bit(x) (1<<x)
unsigned char pass[4] = "5555";        //Set your Password
void delay ()
{
        unsigned int temp, ct;
        for(ct=0; ct<30; ct++) {
                for(temp=0; temp < 65000; temp++);
        }
}
unsigned int range=0,i;
/* --------- DC Motor  */
void forward(void);
void reverse(void);
void stop(void);
/*        LCD    */
 void lcd_init(void);
void cmd(unsigned char a);
void dat(unsigned char b); void show(unsigned char *s); void lcd_delay(void);
/* ---------- Keypad     */
#define c1 (IOPIN1&1<<20)
#define c2 (IOPIN1&1<<21)
#define c3 (IOPIN1&1<<22)
unsigned char r_loc,c_loc;
unsigned char key[4][3]={"123","456","789","*0#"};
unsigned char keypad(void);
```

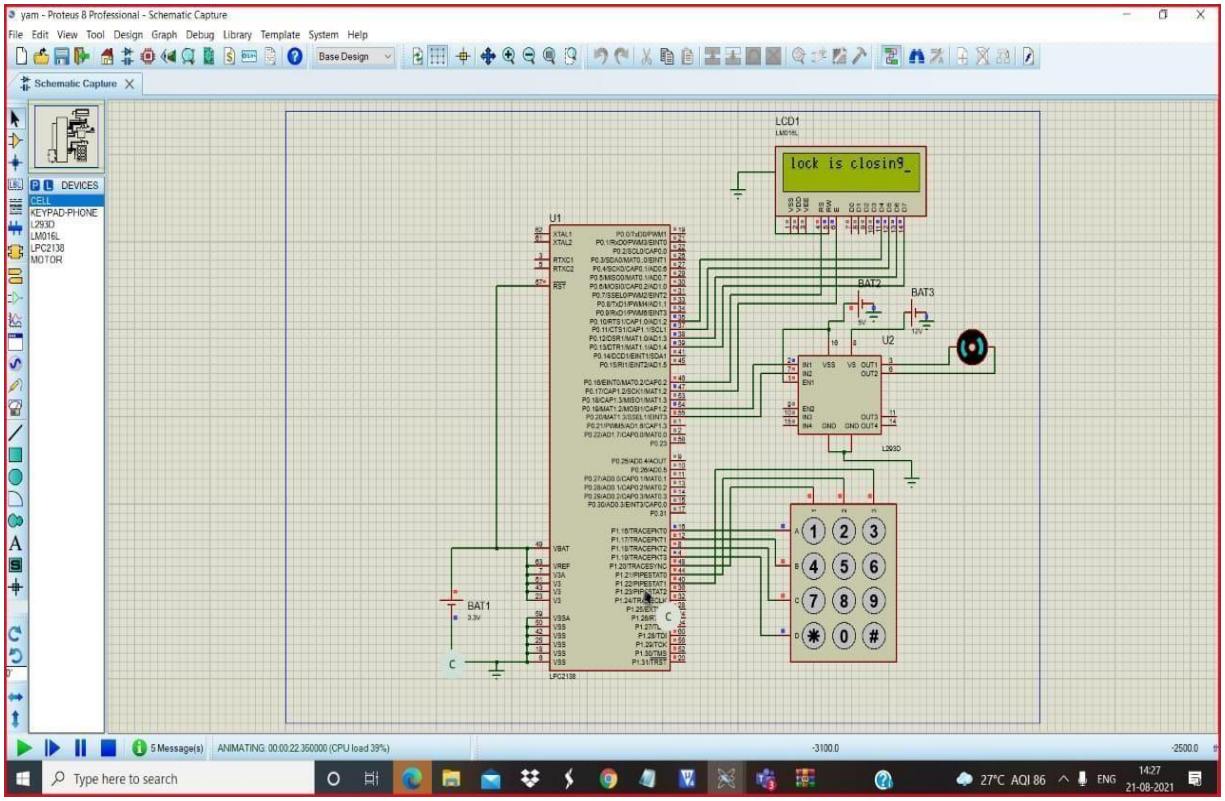
```
/* ------- Main */
int main()
{
unsigned char rx_arr[4];
int count;
VPBDIV=0x01; // PCLK = 60MHz
IO1DIR |= 0x0f<<16;
IO0DIR |= 0xf00fc;
lcd_init();
while(1)
{       cmd(0x80); show("#Enter Password#"); cmd(0xc5);
        for(count=0; count <4; count++)
        {               rx_arr[count] = keypad(); dat('*');
        }
        if ((pass[0] == rx_arr[0]) &&(pass[1] == rx_arr[1]) &&(pass[2] == rx_arr[2]) &&
        (pass[3] == rx_arr[3]) )
        {
                cmd(0xc0);
                show(" Thank You! ");
                forward();
                delay();
                stop();
                cmd(0xc0);
                show(" Come Again!! ");
                delay();
                reverse();
                delay(); stop();
        }
        else
        {       cmd(0xc 0);
                show("~Wrong Password~");
                delay();
        }

        cmd(0x01);
        }
}

/* ----- Keypad Function       */
unsigned char keypad()
{
        IO1PIN &= ~(0xff<<16);
        IO1PIN |= 0xf0<<16;
        while(c1 && c2 && c3);
        while(!c1 || !c2 || !c3) {
        if(!c1 && c2 && c3) c_loc=0;
        else if(c1 && !c2 && c3) c_loc=1;
```

```
        else if(c1 && c2 && !c3) c_loc=2;
        IO1CLR = 1<<16;
        IO1SET = 0x0e<<16;
        if(!c1 || !c2 || !c3)
        {       r_loc=0;
                break;
        }
IO1CLR = 1<<17; IO1SET = 0x0d<<16;
if(!c1 || !c2 || !c3) {
                r_loc=1;
                break;
        }
IO1CLR = 1<<18;
IO1SET = 0x0b<<16;
if(!c1 || !c2 || !c3) {
        r_loc=2;
        break;
}
IO1CLR = 1<<19;
IO1SET = 0x07<<16;
if(!c1 || !c2 || !c3) {
        r_loc=3;
        break;
        }
}
while(!c1 || !c2 || !c3); return
(key[r_loc][c_loc]);
}
/* ----- LCD Function*/
 void lcd_init()

{       cmd(0x02);
        cmd(0x28); cmd(0x0c);
        cmd(0x06);
        cmd(0x80);
}
void show(unsigned char *s)
{
while(*s) {
        dat(*s++);
        }
}
void cmd(unsigned char a)
{
        IO0PIN &= 0xffffff03;
        IO0PIN |= (a & 0xf0) << 0;
        IO0CLR |= bit(2);       //rs=0
```

```
	IO0SET |= bit(3);	//en=1 lcd_delay();
	IO0CLR |= bit(3);	//en=0 IO0PIN &= 0xffffff03;
	IO0PIN |= ((a << 4) & 0xf0) << 0;
	IO0CLR |= bit(2);
	IO0CLR |= bit(1); IO0SET |= bit(3);  //rs=0
	//rw=0
	//en=1
	lcd_delay();
	IO0CLR |= bit(3);	//en=0
}
void dat(unsigned char b)  {
	IO0PIN &= 0xffffff03;
	IO0PIN |= (b & 0xf0) << 0;
	IO0SET |= bit(2);	//rs=1
	IO0SET |= bit(3);	//en=1
	lcd_delay();
	IO0CLR |= bit(3);	//en=0
	IO0PIN &= 0xffffff03;
	IO0PIN |= ((b << 4) & 0xf0) << 0;◦
	IO0SET |= bit(2);	//rs=1 IO0CLR |= bit(1);		//rw=0
	IO0SET |= bit(3);	//en=1
	lcd_delay();
	IO0CLR |= bit(3); //en=0
}
void lcd_delay()
{	unsigned int i;
	for(i=0;i<=1000;i++);
}
/* ---------- DC Motor */
void forward()
{
	IO0SET = bit(16) | bit(18);
	IO0CLR = bit(17);
}
void reverse()
{
	IO0SET = bit(17) | bit(18);
	IO0CLR = bit(16);
}
void stop()
{
	IO0CLR = bit(18);
}
```

OUTPUT


C:\Users\yamuna\Desktop\doorlocksystem\door.uvproj - µVision4
Registers
Disassembly
Timer.h
door.c
Startup.s
Command
Call Stack + Locals
Type here to search
26°C Mostly cloudy
ENG
14:28
21-08-2021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Schematic Capture
DEVICES
KEYPAD-PHONE
L293D
LM016L
LPC2138
MOTOR
LCD1
lock is closin9_
U1
U2
BAT1
BAT2
BAT3
Type here to search
27°C AQI 86
ENG
14:27
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