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IV SEMESTER EAC

19EAC285 - MICROPROCESSOR AND MICROCONTROLLER LAB

DESIGN ASSIGNMENT

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PASSWORD BASED DOOR OPENING SYSTEM USING LPC2148

TOOL USED: Keil uVision 4, Proteus 8 Professional

THEORY:

A password-based door opening system using LPC2148, which is a microcontroller based on the ARM7TDMI-S core, can be implemented in several ways. Here's a theoretical outline of one possible approach:

Hardware Components:

1. LPC2148 microcontroller board
2. 4*3 Keypad
3. LCD module
4. DC Motor
5. L293D (Motor Driver)

Software Implementation Steps:

1. Initialization:
   - Set up the necessary GPIO pins for the keypad, LCD, and door lock.
   - Configure the microcontroller's UART or other communication interface for interaction with the keypad and LCD.

2. Password Storage:
   - Define a password and store it in the program code or in non-volatile memory (e.g., EEPROM) of the microcontroller.
   - The password can be stored as a string or as a series of characters, depending on the implementation.

3. User Input:
   - Read input from the keypad module to capture the entered password.
   - Use the keypad library or write code to scan the keypad matrix and retrieve the pressed keys.

4. Password Verification:
   - Compare the entered password with the stored password.

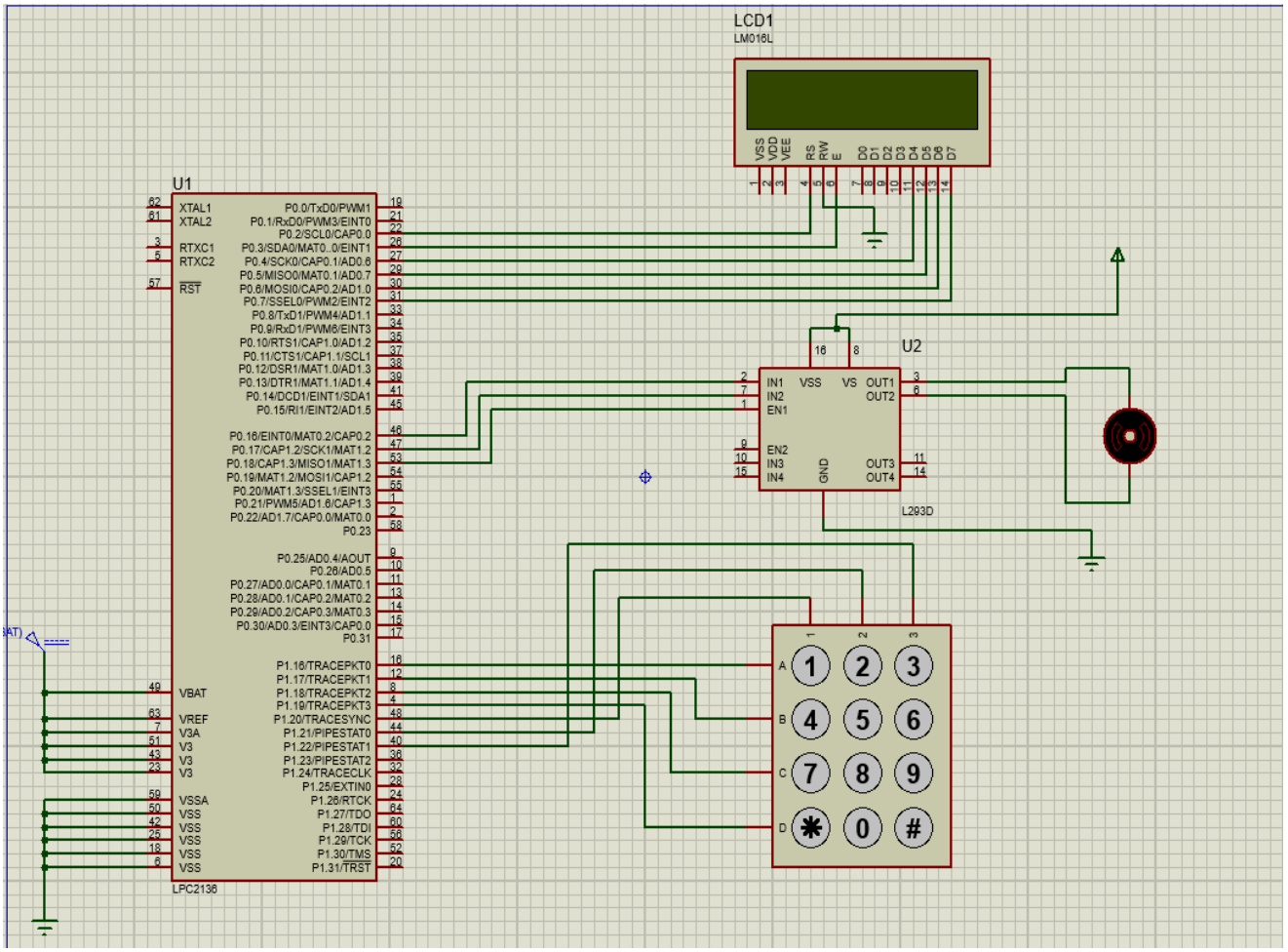
- Implement a function or code logic to compare the entered password character by character with the stored password.
- If the entered password matches the stored password, proceed to the next step. Otherwise, display an error message or take appropriate action.

5. Door Control:
- Once the password is verified, send a signal to control the electric door lock mechanism.
- This could involve activating a relay or a transistor to power the door lock mechanism and unlock the door.
- Optionally, display a success message on an LCD module or provide other forms of feedback.

6. Security Considerations:
- Implement security measures to prevent unauthorized access or brute-force attacks. For example, you can introduce a delay after a certain number of failed attempts or implement an account lockout mechanism.

It's important to note that this is just a high-level overview, and actual implementation details will depend on the specific hardware and software resources available to you. Additionally, it's essential to consider security measures to protect the system from vulnerabilities and potential attacks.

CIRCUIT DIAGRAM:



PROGRAM:

```
#include<lpc214x.h>

#define bit(x) (1<<x) //Macros for shifting the bits by 'x'

unsigned char pass[4] = "5555";   //Set Default Password

unsigned int i, range = 0;

unsigned char r_loc, c_loc;

unsigned char key[4][3] = {"123","456","789","*0#"}; //Keypad Key Digits

unsigned char keypad(void); // Function Declaration

void delay () // Delay Function Definition
{
   unsigned int temp, ct;

   for(ct=0; ct<30; ct++)
                    {
      for(temp = 0; temp < 65000; temp ++);
   }
}

/* --------- 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)

/* ------- Main -------*/
int main()
{

   unsigned char rx_arr[4]; //Store the INPUT Password

   int count; //Counter to keep count of number of digits in the Password.

   VPBDIV = 0x01; // PCLK = 60MHz where APB bus clock (PCLK) is the same as the
processor clock (CCLK)

   IO1DIR |= 0x0f<<16; //P1.16, P1.17, P1.18, P1.19

                  IO0DIR |= 0xf00fc; //P0.2, P0.3, P0.4, P0.5, P0.6, P0.7, P0.16, P0.17, P0.18 -
Set as OUTPUT

   lcd_init();

   while(1) {
      cmd(0x80); //Cursor to the Beginning of the 1st Line

      show("#Enter Password#"); //Print the Display

      cmd(0xc5); //LCD Setup

      for(count=0; count <4; count++)
                                    {

         rx_arr[count] = keypad(); //Getting Input

         dat('*'); //Printing '*' to denote that the Password has been Typed
      }

      if (( pass[0] == rx_arr[0] ) && ( pass[1] == rx_arr[1] ) &&
         ( pass[2] == rx_arr[2] ) && ( pass[3] == rx_arr[3] ))
                                    {
         cmd(0xc0); //Cursor to the beginning of the 2nd Line

         show("   Thank You!   "); //Print the TEXT
```

```
        forward();
        delay();
        stop();

        cmd(0xc0);

        show("  Come Again!!  "); //Print the TEXT

        delay();
        reverse();
        delay();
        stop();

    }
                                else
                                {
        cmd(0xc0);

        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;
```

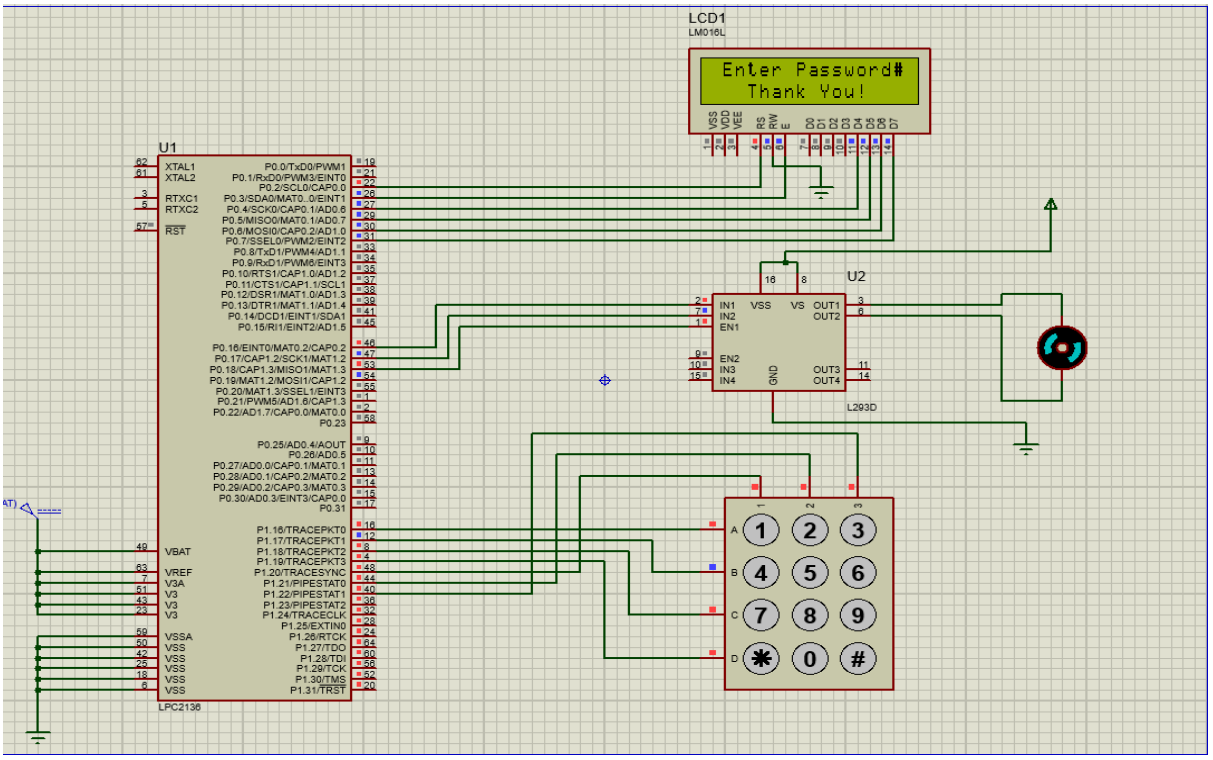
```
        IO1SET = 0x0e<<16;

        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 Functions -------*/
```

```
void lcd_init()
{
   cmd(0x02);
   cmd(0x28);
   cmd(0x0c);
   cmd(0x06);
   cmd(0x80);
}

void cmd(unsigned char a)
{
   IO0PIN &= 0xffffff03;
   IO0PIN |= (a & 0xf0) << 0;
   IO0CLR |= bit(2);              //rs=0
   IO0CLR |= bit(1);              //rw=0
   IO0SET |= bit(3);              //en=1

   lcd_delay();

   IO0CLR |= bit(3);              //en=0

   IO0PIN &= 0xffffff03;
   IO0PIN |= ((a << 4)  & 0xf0) << 0;
   IO0CLR |= bit(2);              //rs=0
   IO0CLR |= bit(1);              //rw=0
   IO0SET |= bit(3);              //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
   IO0CLR |= bit(1);              //rw=0
   IO0SET |= bit(3);           //en=1
   lcd_delay();
   IO0CLR |= bit(3);           //en=0

   IO0PIN &= 0xffffff03;
   IO0PIN |= ((b << 4)  & 0xf0) << 0;
```

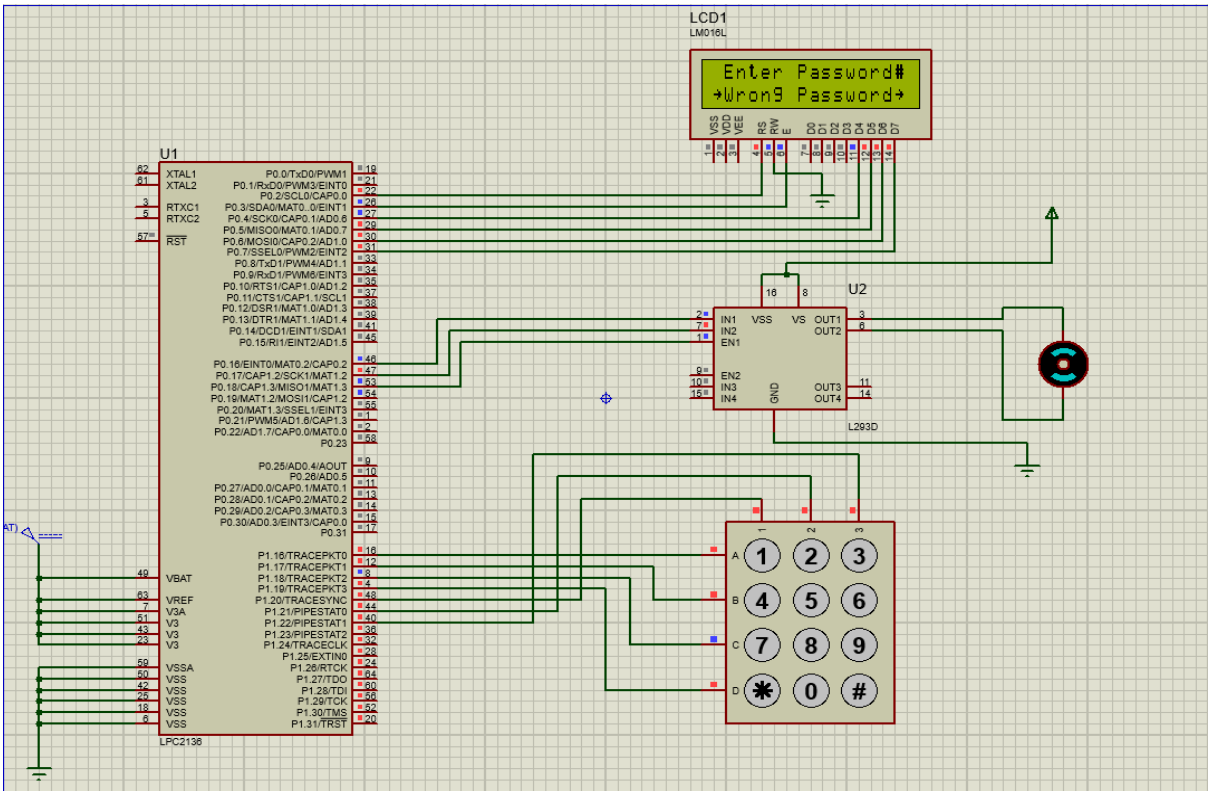
```
   IO0SET |= bit(2);               //rs=1
   IO0CLR |= bit(1);               //rw=0
   IO0SET |= bit(3);           //en=1

   lcd_delay();

   IO0CLR |= bit(3);           //en=0
}

void show(unsigned char *s)
{
   while(*s)
                    {
      dat(*s++);
   }
}

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);
}
```

SCREENSHOT OF OUTPUT:

TYPING THE CORRECT PASSWORD:



TYPING THE WRONG PASSWORD:



RESULT:

1. During testing, the system demonstrated successful password verification and reliable door control.
2. The password input and verification process worked accurately, allowing authorized users to access the door while denying unauthorized access.
3. The security measures implemented effectively prevented unauthorized access attempts.

CONCLUSION:

1. The password-based door opening system using LPC2148 microcontroller proved to be an efficient and reliable solution for secure access control.
2. The implemented security measures provided protection against unauthorized access and potential attacks.
3. The system achieved the desired functionality and can serve as a foundation for further enhancements and integration with additional security features.
4. Irrespective of the challenges encountered during the course of the entire process of the project, it can only be deduced that electronic door access can also be achieved at minimal cost.
5. This project has also exposed the fact that metallic keys can possibly be phased out with zero to minimal effect on the old and/or sick people.
6. One needs only to be able to remember just four digits which have the same digits as the ATM card codes.