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Microcontrollers and Embedded Systems Project
on

"PASSWORD BASED DOOR LOCKING SYSTEM"

Submitted by

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CONTENTS

INTRODUCTION

As the world grows to be digitally dependent, even doors can now be designed to be secure and safe. The digital version of the lock and key holds a lot of promising features. The digital door lock is securely placed with passwords. Password Based Door Lock System using 8051 Microcontroller is a simple project where a secure password will act as a door unlocking system. Traditional lock systems using mechanical lock and key mechanism are being replaced by new advanced techniques of locking system. These techniques are an integration of mechanical and electronic devices and are highly intelligent. One of the prominent features of these innovative lock systems is their simplicity and high efficiency.

Here, we developed an electronic code lock system which provides control to actuating the load. It is a simple embedded system with input from the keyboard and the output being actuated accordingly. It is a simple embedded system with input from the keyboard and the output being actuated accordingly.

This system demonstrates a Password based Door Lock System using 8051 Microcontroller, 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 password is wrong, then door would remain closed, denying access to the person.

Objective

The objective of this project is to provide such a security system which can be used in commercial, residential, industrial areas, etc. The purpose of our project is to develop a device where an individual user can enter a password and if the entered password is matched with the prestored password of the data memory of the microcontroller then DC motor attached with the device will run in a specific direction required for opening the door.

Once the door is closed, it automatically locks itself after a certain amount of time. If the entered password doesn't match, then the door remains locked.

As the door has two-way access, a push button is provided to unlock the door without authorization. This button can be used in situations when only **one way restriction** is required, for example at the main doors of houses. The button can be installed on the inner side of the door, thus enabling people to unlock the door without entering password when they wish to go outside.

The entire project will be simulated in Proteus simulation environment.

Principle

The main component in the circuit is 8051 controller which stores a predefined pin. The pin entered by the user is compared with the predefined password.

If the pin is correct or direct access is requested via push button, the door unlocks.

After unlock, the door locking procedure is initiated, which locks the door after a certain delay.

Working
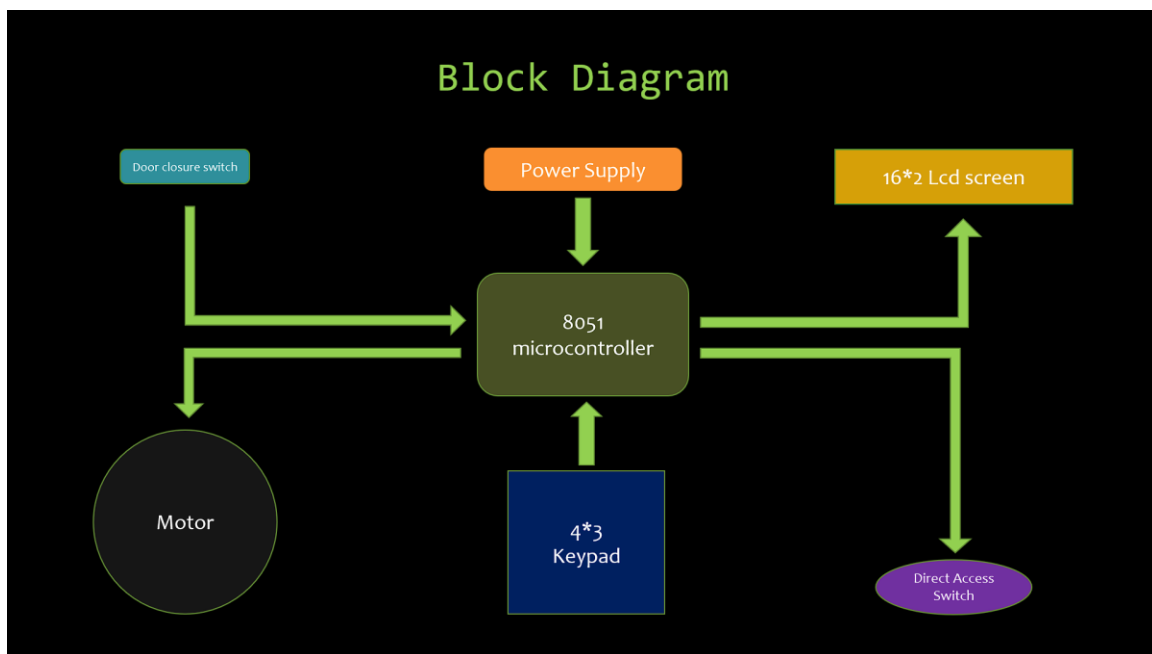
Working

A 4*3 Keypad is used to enter the password.

If the entered password is correct, then the system opens the door by rotating door motor and displays the status of door on LCD.

If the password is wrong, then the door remains closed and displays "Incorrect Pin" on the LCD.

The separate unlock button directly unlocks the door by calling an interrupt.

For re-locking the door, the system waits until a certain delay is over. When both delay is over and the door has been shut, it locks the door by rotating the motor in opposite direction.

When the door is shut, a push button gets pressed informing the microcontroller that the door is ready to be locked.

Code

We have used <u>Keil µVision5</u> to prepare the code and generate the HEX file.

```c
#include<reg51.h>
sbit r1 = P2^0;
sbit r2 = P2^1;
sbit r3 = P2^2;
sbit r4 = P2^3;
//
sbit c1 = P2^4;
sbit c2 = P2^5;
sbit c3 = P2^6;
//
sbit motp1 = P3^0;
sbit motp2 = P3^1;
//
sbit rs = P3^5;
sbit rw = P3^6;
sbit en = P3^7;
//
sbit isClosedButton = P0^0;
//
void lcdcmd(unsigned char);
void lcddat(unsigned char);
void lcddis(unsigned char *q);
char keypad();
void check();
void delay(unsigned int);
void invokeDoorUnlock();
void invokeDoorLock();
void initiateDoorLockingProcedure();

unsigned char pin[] = {"12345"};
unsigned char Epin[5];
void main()
{
  isClosedButton = 1;
  lcdcmd(0x0F);
  lcdcmd(0x38);
  lcdcmd(0x01);
  while(1)
  {
    unsigned int i = 0;
    TCON = 0x01;
    IE = 0x81;
    lcdcmd(0x80);
    lcddis("ENTER PIN...");
    delay(1000);
    lcdcmd(0xc0);
    while(pin[i] != '\0')
    {
      Epin[i] = keypad();
      delay(1000);
      i++;
    }
    check();
  }
}

void delay(unsigned int j)
{
  int a, b;
  for(a=0; a<j; a++)
    for(b=0; b<10; b++);
}

void lcdcmd(unsigned char A)
{
  P1 = A;
  rs = 0; rw = 0; en = 1;
  delay(1000);
  en = 0;
}
```

```c
69   en = 0;
70 }
71
72 void lcddat(unsigned char i)
73 {
74   P1 = i;
75   rs = 1; rw = 0; en = 1;
76   delay(1000);
77   en = 0;
78 }
79
80 void lcddis(unsigned char *q)
81 {
82   int k;
83   for(k=0; q[k]!='\0'; k++)
84     lcddat(q[k]);
85   delay(1000);
86 }
87
88 char keypad()
89 {
90   int x = 0;
91   while(x == 0)
92   {
93     r1 = 0; r2 = 1; r3 = 1; r4 = 1;
94     if(c1 == 0)
95     {
96       lcddat('*');
97       delay(100);
98       x=1;
99       return '1';
100    }
101    if(c2 == 0)
102    {
103      lcddat('*');
104      delay(100);
105      x=1;
106      return '2';
107    }
108    if(c3 == 0)
109    {
110      lcddat('*');
111      delay(100);
112      x=1;
113      return '3';
114    }
115    r1 = 1; r2 = 0; r3 = 1; r4 = 1;
116    if(c1 == 0)
117    {
118      lcddat('*');
119      delay(100);
120      x=1;
121      return '4';
122    }
123    if(c2 == 0)
124    {
125      lcddat('*');
126      delay(100);
127      x=1;
128      return '5';
129    }
130    if(c3 == 0)
131    {
132      lcddat('*');
133      delay(100);
134      x=1;
135      return '6';
136    }
137    r1 = 1; r2 = 1; r3 = 0; r4 = 1;
138    if(c1 == 0)
```

```c
138        if(c1 == 0)
139        {
140           lcddat('*');
141           delay(100);
142           x=1;
143           return '7';
144        }
145        if(c2 == 0)
146        {
147           lcddat('*');
148           delay(100);
149           x=1;
150           return '8';
151        }
152        if(c3 == 0)
153        {
154           lcddat('*');
155           delay(100);
156           x=1;
157           return '9';
158        }
159        r1 = 1; r2 = 1; r3 = 1; r4 = 0;
160        if(c1 == 0)
161        {
162           lcddat('*');
163           delay(100);
164           x=1;
165           return '*';
166        }
167        if(c2 == 0)
168        {
169           lcddat('*');
170           delay(100);
171           x=1;
172           return '0';
173        }
174        if(c3 == 0)
175        {
176           lcddat('*');
177           delay(100);
178           x=1;
179           return '#';
180        }
181     }
182 }
183
184 void check()
185 {
186     if(pin[0]==Epin[0] && pin[1]==Epin[1] && pin[2]==Epin[2] && pin[3]==Epin
187     {
188        delay(1000);
189        lcdcmd(0x01);
190        lcdcmd(0x81);
191        lcddis("ACCESS GRANTED");
192        delay(1000);
193        invokeDoorUnlock();
194        lcdcmd(0x01);
195        initiateDoorLockingProcedure();
196     }
197     else
198     {
199        lcdcmd(0x01);
200        lcdcmd(0x80);
201        lcddis("INCORRECT PIN...");
202        delay(1000000);
203        lcdcmd(0x01);
204     }
205 }
206
207 void invokeDoorUnlock()
```

```c
184  void check()
185  {
186    if(pin[0]==Epin[0] && pin[1]==Epin[1] && pin[2]==Epin[2] && pin[3]==Epin
187    {
188      delay(1000);
189      lcdcmd(0x01);
190      lcdcmd(0x81);
191      lcddis("ACCESS GRANTED");
192      delay(1000);
193      invokeDoorUnlock();
194      lcdcmd(0x01);
195      initiateDoorLockingProcedure();
196    }
197    else
198    {
199      lcdcmd(0x01);
200      lcdcmd(0x80);
201      lcddis("INCORRECT PIN...");
202      delay(1000000);
203      lcdcmd(0x01);
204    }
205  }
206
207  void invokeDoorUnlock()
208  {
209    motp1 = 1; motp2 = 0;
210    lcdcmd(0xc1);
211    lcddis("UNLOCKING...");
212    delay(1000000);
213    motp1 = 0; motp2 = 0;
214  }
215
216  void invokeDoorLock()
217  {
218    motp1 = 0; motp2 = 1;
219    lcdcmd(0x01);
220    lcdcmd(0x81);
221    lcddis("DOOR CLOSED");
222    lcdcmd(0xc1);
223    lcddis("LOCKING...");
224    delay(1000000);
225    motp1 = 0; motp2 = 0;
226    lcdcmd(0x01);
227  }
228
229  void unlockButtonPress() interrupt 0
230  {
231    lcdcmd(0x01);
232    lcdcmd(0x81);
233    lcddis("ACCESS GRANTED");
234    delay(1000);
235    invokeDoorUnlock();
236    initiateDoorLockingProcedure();
237    lcdcmd(0x80);
238    lcddis("ENTER PIN...");
239    delay(1000);
240    lcdcmd(0xc0);
241  }
242
243  void initiateDoorLockingProcedure()
244  {
245    lcdcmd(0x01);
246    lcdcmd(0x81);
247    lcddis("DOOR IS OPEN");
248    delay(10000000);
249    while(isClosedButton);
250    invokeDoorLock();
251  }
252
```

Simulation

The <u>Proteus</u> software has been used for the simulation of the project where we have designed the circuit.
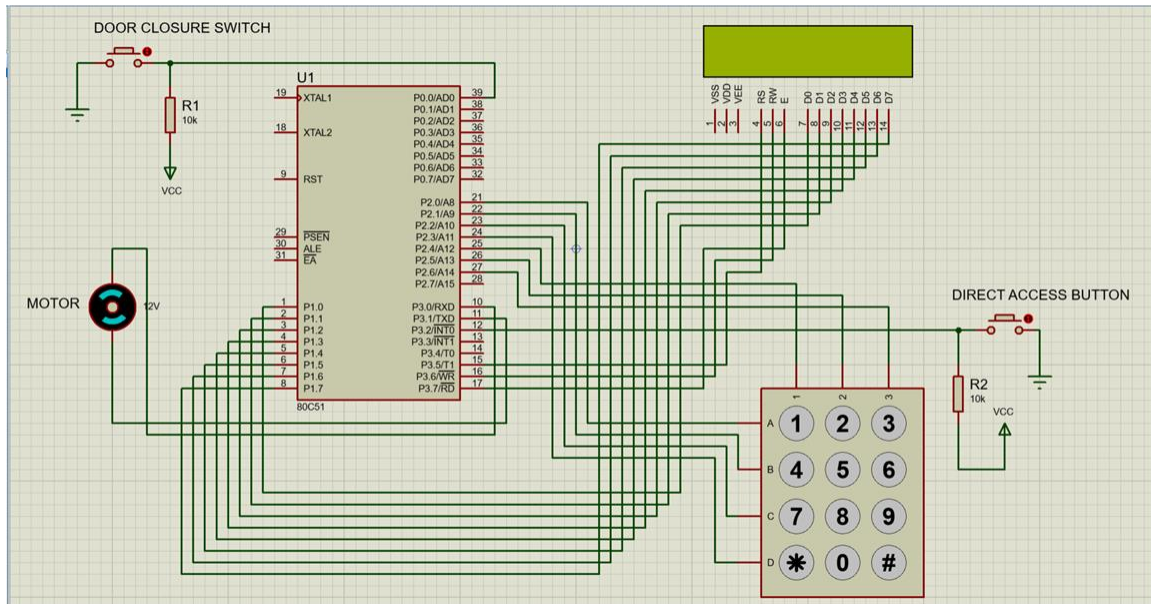
<u>**Circuit Diagram**</u>

Application

1. This system can be used at residential places, offices to provide quick but secure access.
2. It eliminates the need to carry physical security keys.
3. We can make it even more secure by
- Decreasing the delay after which the door locks.
    - Requiring password for entry from either side of the door.

Future Enhancements

1. The security can be improved by
- Decreasing the delay after which the door locks.
    - Requiring password for entry from either side of the door.
    - Increasing the length of the password
2. Technologies such as fingerprint scanning, retinal scanning and iris scanning, and voice identification also be incorporated with the system.
3. A GSM module can be interfaced which will send SMS if suspicious attempts are made to open the lock.

Conclusion

This project is meant to provide a security system whose access is owned only by required authorities. Using the microcontroller, entered password is checked with the stored password and based on that corresponding operation is performed. The door is also unlocked by the direct access key. After unlock, the system automatically initiates the locking procedure and the door is locked.