



NORTH SOUTH UNIVERSITY

Department of Electrical & Computer Engineering

Project Report

Course Code: *CSE331*

Course Title: *Microprocessor Interfacing & Embedded System*

Submitted by_

Name : Sajan Kumer Sarker

ID# : 2111131642

Email : sajan.sarker@northsouth.edu

Section : 03 (Group - 5)

Title : PIN Code Based Door Lock System.

Submission Date : 9th, May 2024

Submitted to_

Instructor : Syed Mahmud Husain (SMH2)

Project Title: PIN Code Based Door Lock System.**Objective:**

The objective behind designing the “PIN Code Based Door Lock System” is to provide many modern security features than mechanical lock (Motor as a Lock) and utilize our understanding in Microcontroller and Embedded C Programming. The system can install in any doors. The electric combination lock system uses a 5-digit PIN code. We will try to build this project in order to obtain these goals:

- To develop a unique safety system.
- Unlock door by entering pre-defined pin-code.
- Provide clear indications to users about ready to enter pin, successful entries and incorrect passwords.
- Balance the security features with affordability to make the system accessible.

Block Diagram:

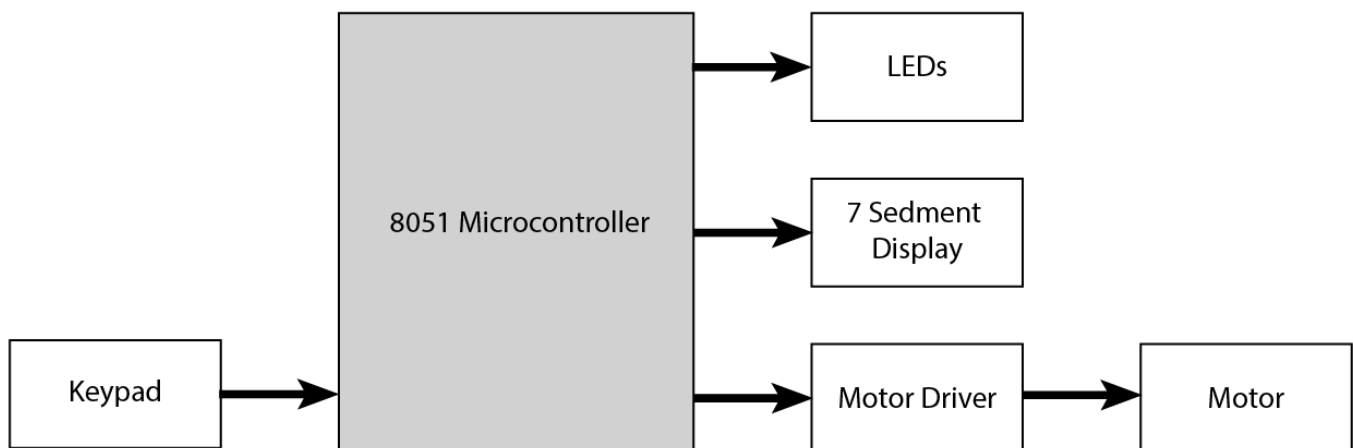


Fig: PIN Code Based Door Locked System Block Diagram

Component List & Estimated Price:

	Components	Quantity	Price
1.	8051 Kit	1	2,190 TK
2.	USB ASP AVR Programming Cable	1	410 TK
3.	DC 5V Stepper Motor with ULN2003 Driver	1	199 TK
4.	3x4 Flexible Keypad	1	95 TK
5.	1 Digit 7-Segment Display	1	12 TK
6.	5 MM LEDs	3	15 TK
7.	220 Ohm Resistors	1x5	5 TK
8.	Breadboard	1	150 TK
9.	Jumper Wires M-M	1x40	100 TK
10.	Power Source		
			Total: 3,176 TK

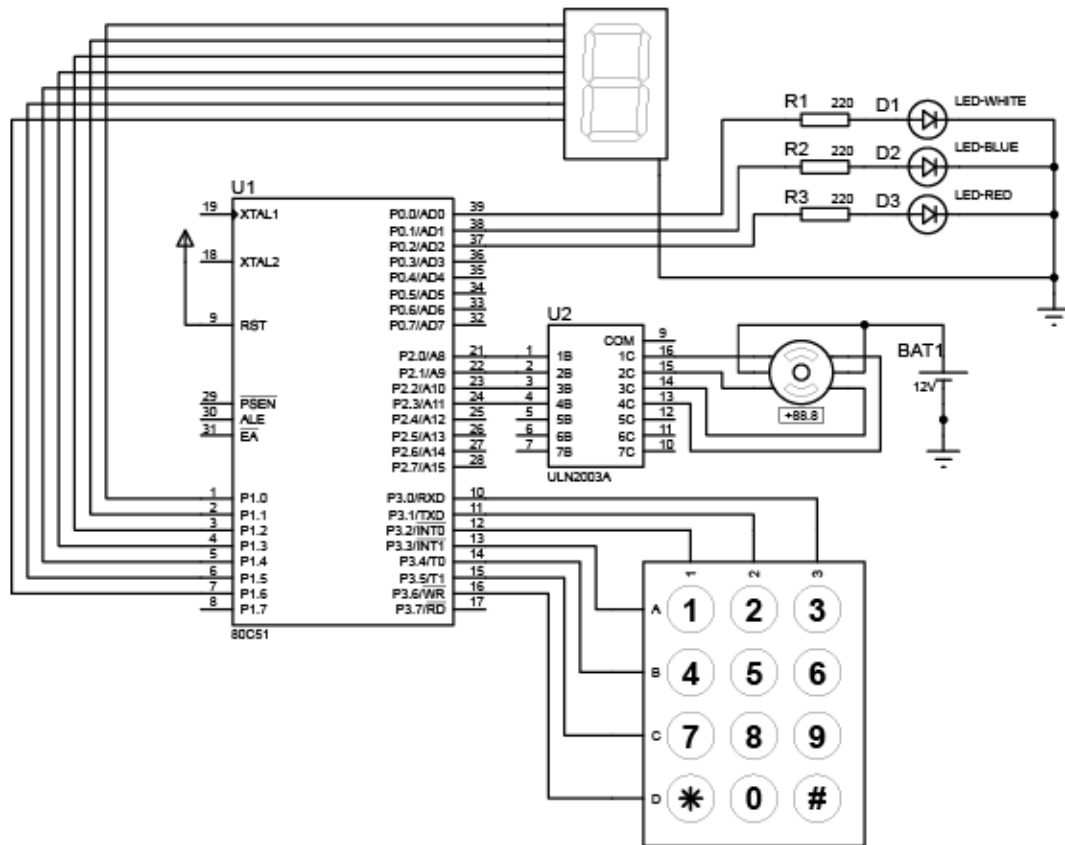
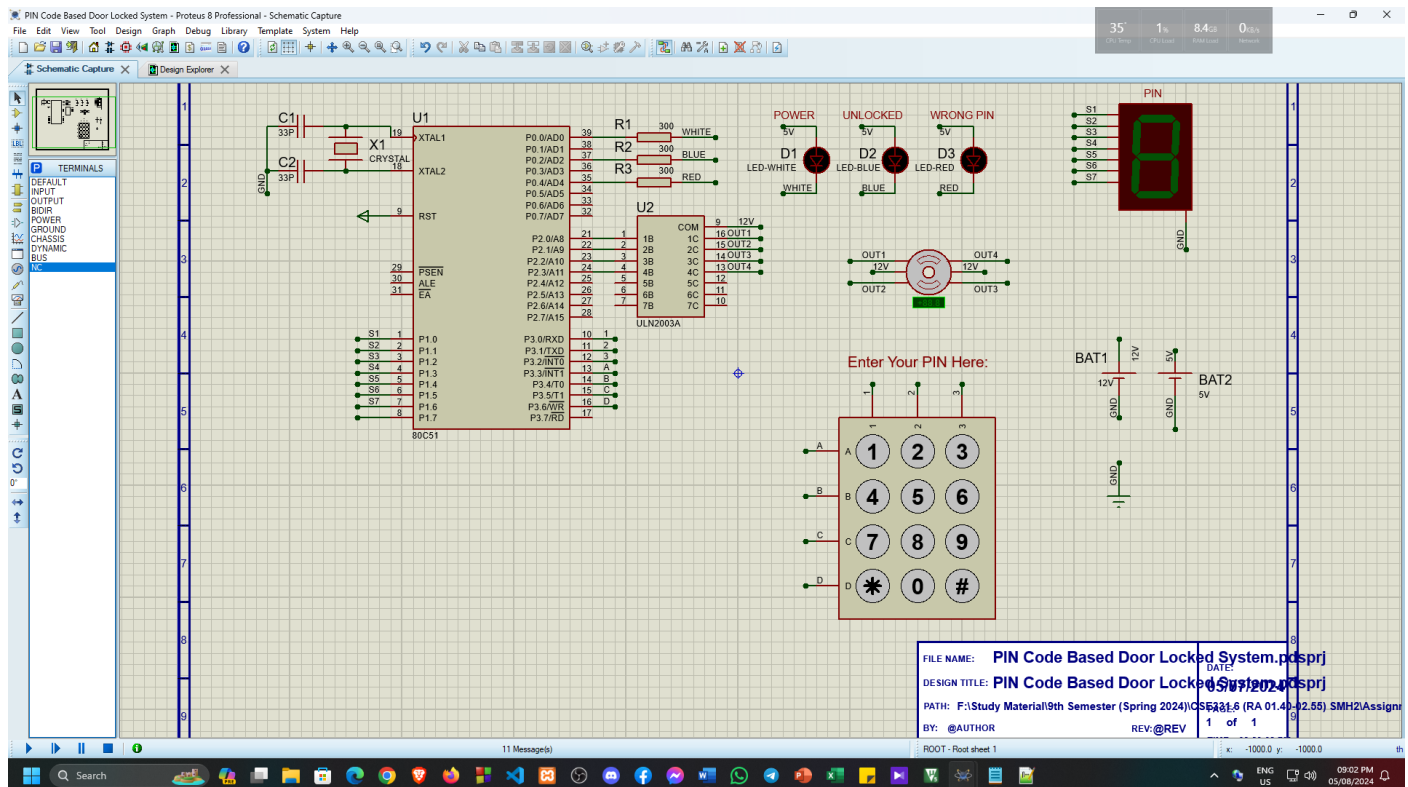
Circuit Diagram:

Fig: PIN Code Based Door Locked System Circuit Diagram

Proteus Simulation Screenshot:



Embedded C Programming Code:

```

1 #include <reg51.h>
2 #include <string.h>
3 // Pin configuration for LEDs
4 sbit lw = P0^0;
5 sbit lb = P0^2;
6 sbit lr = P0^4;
7
8 // Pin configuration for 7-segment display
9 sbit da = P1^0;
10 sbit db = P1^1;
11 sbit dc = P1^2;
12 sbit dd = P1^3;
13 sbit de = P1^4;
14 sbit df = P1^5;
15 sbit dg = P1^6;
16
17 // Pin configuration for stepper motor
18 sbit m1 = P2^0;
19 sbit m2 = P2^1;
20 sbit m3 = P2^2;
21 sbit m4 = P2^3;
22
23 // Pin configuration for keypad column
24 sbit c1 = P3^0;
25 sbit c2 = P3^1;
26 sbit c3 = P3^2;

```

```
27
28 // Pin configuration for keypad row
29 sbit r1 = P3^3;
30 sbit r2 = P3^4;
31 sbit r3 = P3^5;
32 sbit r4 = P3^6;
33
34 int n; // counter
35 char key; // pressed digit
36 char codes[] = "54321"; // PIN Code
37 char id[5];
38
39 // Function Declaration
40 void init_led(); // Initialize LEDs
41 void init_display(); // Initialize 7-segment display
42 void delay(int); // Delay function
43 char scan_key(); // get digit
44 char read_keypad(); // access the keypad
45 void display_digit(char); // display the digit
46 void door_open(); // open door
47 void door_close(); // close door
48
49 void main() {
50     for(;;){
51         P1 = 0x00; //Using port 1 as output port
52         P2 = 0x00; //Using port 1 as output port
53         P3 = 0xff; //Using port 1 as input port
54         P0 = 0x00; //Using port 1 as output port
55         lw = 1;
56         lb = 1;
57         lr = 1;
58         init_led();
59         init_display();
60         n = 0;
61         while(n<5){
62             key = scan_key();
63             id[n] = key;
64             delay(100);
65             n++;
66         }
67         if(strcmp(codes, id) == 0){
68             door_open();
69         }
70         else{
71             lw = 0;
72             lr = 0;
73             delay(4000);
74             lr = 1;
75             delay(2);
76         }
77     }
78 }
79 }
80
81 void door_open(){
82     lw = 0;
83     lb = 0;
84     delay(200);
85     m4= 1;
86     m2 = m3 = m1 = 0;
87     delay(200);
88     m3 = 1;
```

```
89     m1 = m2 = m4 = 0;
90     delay(5000);
91     door_close();
92     delay(200);
93
94 }
95 void door_close() {
96     lw = 0;
97     lb = 1;
98     delay(200);
99     m4 = 1;
100    m1 = m2 = m3 = 0;
101    delay(200);
102    m1 = 1;
103    m2 = m3 = m4 = 0;
104    delay(200);
105
106 }
107
108
109 void init_led() {
110     delay(2);
111     lw = 0; // lw LED always on
112     delay(2);
113 }
114
115 void init_display() {
116     da=db=dc=dd=de=df=dg=0;
117     delay(2);
118 }
119
120 char scan_key()
121 {
122     char b='a';
123     while(b=='a') {
124         b=read_keypad();
125     }
126     return b;
127 }
128 //Function to take input from Lcd Keyboard 4*3
129 char read_keypad() {
130     c1=c2=c3=1; // all columns are initially low
131     r1=r2=r3=r4=0; // all rows are initially low (active-high)
132
133     //when first row is active and others are inactive
134     r1=0;
135     r2=r3=r4=1;
136     //if row=0 column=0 then 1 is returned or if we enter 1 in keypad 2
137     if(c1==0) {
138         display_digit('1');
139         delay(2);
140         return '1';
141     }
142     //if row=0 column=1 then 2 is returned or if we enter  in keypad 2
143     if(c2==0) {
144         display_digit('2');
145         delay(2);
146         return '2';
147     }
148     //if row=0 column=2 then 3 is returned or if we enter  in keypad 3
149     if(c3==0) {
150         display_digit('3');
```

```
151         delay(2);
152         return '3';
153     }
154
155     //when second row is active and others are inactive
156     r2=0;
157     r1=r3=r4=1;
158     //if row=1 column=0 then 4 is returned or if we enter in keypad 4
159     if(c1==0){
160         display_digit('4');
161         delay(2);
162         return '4';
163     }
164     //if row=1 column=1 then 5 is returned or if we enter in keypad 5
165     if(c2==0){
166         display_digit('5');
167         delay(2);
168         return '5';
169     }
170     //if row=1 column=2 then 6 is returned or if we enter in keypad 6
171     if(c3==0){
172         display_digit('6');
173         delay(2);
174         return '6';
175     }
176
177     //when third row is active and others are inactive
178     r3=0;
179     r1=r2=r4=1;
180     //if row=2 column=0 then 7 is returned or if we enter in keypad 7
181     if(c1==0){
182         display_digit('7');
183         delay(2);
184         return '7';
185     }
186     //if row=2 column=1 then 8 is returned or if we enter in keypad 8
187     if(c2==0){
188         display_digit('8');
189         delay(2);
190         return '8';
191     }
192     //if row=2 column=2 then 9 is returned or if we enter in keypad 9
193     if(c3==0){
194         display_digit('9');
195         delay(2);
196         return '9';
197     }
198
199     //when fourth row is active and others are inactive
200     r4=0;
201     r1=r2=r3=1;
202     //if row=3 column=0 then * is returned or if we enter in keypad *
203     //if(c1==0){
204     //    lcddata('*');
205     //    delay(2);
206     //    return 0;
207     //}
208     //if row=3 column=1 then 0 is returned or if we enter in keypad 0
209     if(c2==0){
210         display_digit('0');
211         delay(2);
212         return '0';
```

```
213     }
214
215     return 'a';
216 }
217
218 void display_digit(char digit) {
219     switch (digit) {
220         case '0':
221             da = db = dc = dd = de = df = 1;
222             dg = 0;
223             break;
224         case '1':
225             db = dc = 1;
226             da = dd = de = df = dg = 0;
227             break;
228         case '2':
229             da = db = dd = de = dg = 1;
230             dc = df = 0;
231             break;
232         case '3':
233             da = db = dc = dd = dg = 1;
234             de = df = 0;
235             break;
236         case '4':
237             db = dc = df = dg = 1;
238             da = dd = de = 0;
239             break;
240         case '5':
241             da = df = dd = dc = dg = 1;
242             db = de = 0;
243             break;
244         case '6':
245             da = dc = dd = de = df = dg = 1;
246             db = 0;
247             break;
248         case '7':
249             da = db = dc = 1;
250             dd = de = df = dg = 0;
251             break;
252         case '8':
253             da = db = dc = dd = de = df = dg = 1;
254             break;
255         case '9':
256             da = db = dc = dd = de = df = dg = 1;
257             de = 0;
258             break;
259         default:
260             break;
261     }
262     delay(300); // Delay for 200ms to display the digit
263     init_display(); // Turn off the display after showing the digit
264 }
265
266 void delay(int ms) {
267     int i, j;
268     for (i = 0; i < ms; i++)
269         for (j = 0; j < 120; j++);
270 }
```


Discussion:

Here we'll build a PIN Code Based Digital Lock System using 8051 Microcontroller. We'll use a stepper motor as a door lock. It'll unlock the door by rotating the motor 0 degree to 180 degree. We'll use three different color of LED light as indicator. If the system is getting power, then it'll turned on the White LED whole time. If the given PIN code is correct, it will rotate the motor and unlock the door and indicate it by blinking the Blue LED, and if the given PIN code is wrong then the Red LED will blink. We'll define a 5-digit PIN code via programming manually. For getting the PIN as input we'll use a 3x4 Matrix Keypad. The PIN code can be any number between 00001 to 99999. We'll use a single digit 7-segment display, where the given current digit will be display for 2 or 3 seconds. For example, if our PIN code is "12345" then if we started to giving the input, when we press "1", the 7-segment will show 1 for 2 or 3 seconds. Then if we press "2" then the display will show "2" for 2 or 3 seconds. After giving input "12345" if it matches with our PIN that we set for unlocking the door then the Blue LED will blink for 4 or 5 second, which means our PIN is correct. Then the motor will rotate and unlock the door. The door will automatically lock again after 30 seconds. To unlock the door again we need to enter PIN again. We find the idea of building this system from some online source. The link of those sources are in the Reference section:

References:

1. <https://www.electronicshub.org/password-based-door-lock-system-using-8051-microcontroller/>
2. <https://github.com/Sayed-Noman/NSU-CSE331-Password-Based-Door-Lock-Using-8051-Microcontroller?tab=readme-ov-file>