



Voltage Measurement and LCD displaying(8051)

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AVVA PRAVEEN BABU

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Learning Objective:

- Reading the voltage fluctuations
- Show the leds according to voltage fluctuations
- Show the voltage fluctuations status in LCD display

Inputs and Outputs:-

- Inputs is potentiometer
- Outputs are LEDs and LCD display

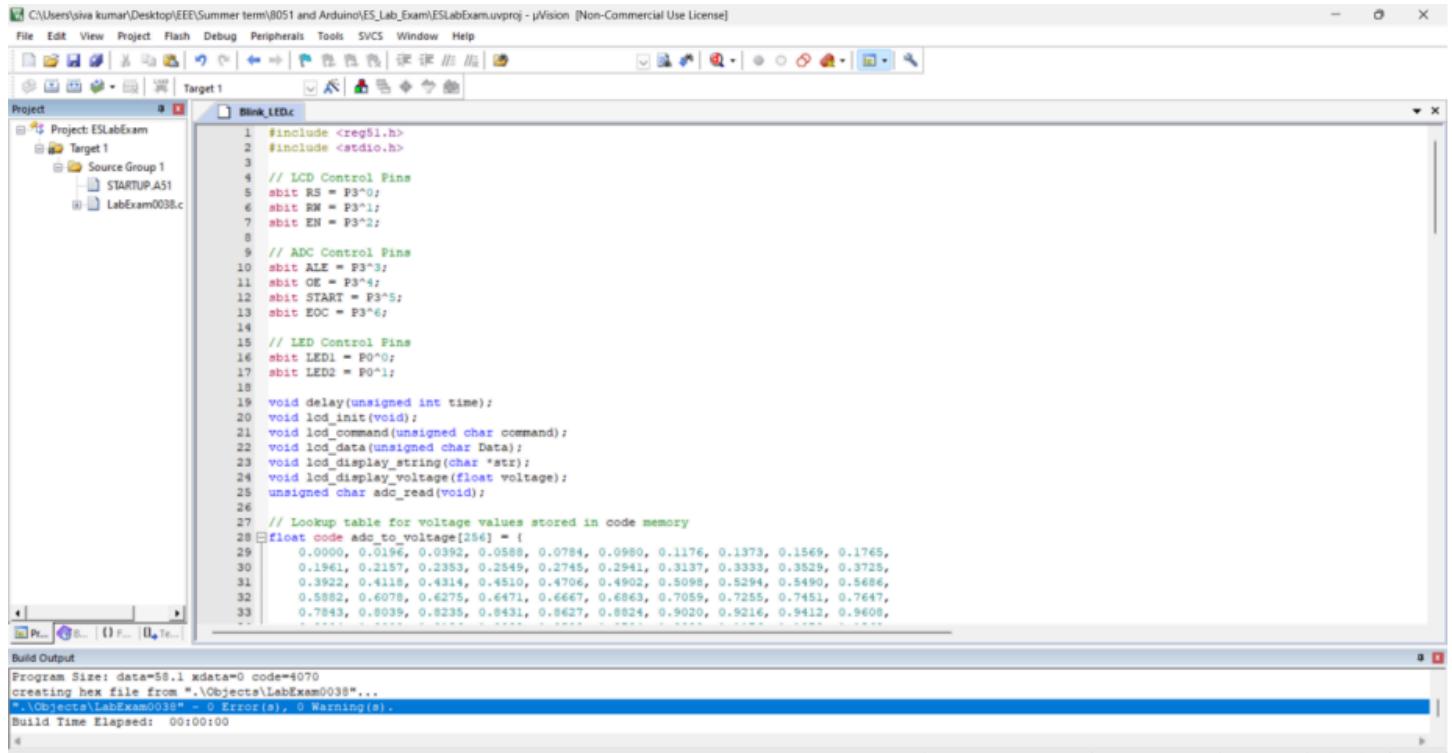
Logic:-

- Connect ADC, LCD,8051
- 5v to the ADC 0808
- The Analog signal from the potentiometer will be converted into a digital signal to the ADC will be passed to the microcontroller
- As per the digital signal, we have to operate in the 8051 and display the voltage variations in the LCD display
- We can't able to print the integer value directly for that, we need to give an ASCII value to the function

Common mistakes:-

- while writing the program code, give the port names according to the circuit. Don't mismatch
- Make sure that connections are made properly if one connection is data will be lost and no output
- while making the connections, make sure that give proper input it's high and low input

Result:-



```
#include <reg51.h>
#include <stdio.h>

// LCD Control Pins
sbit RS = P3^0;
sbit RW = P3^1;
sbit EN = P3^2;

// ADC Control Pins
sbit ALE = P3^3;
sbit OE = P3^4;
sbit START = P3^5;
sbit EOC = P3^6;

// LED Control Pins
sbit LED1 = P0^0;
sbit LED2 = P0^1;

void delay(unsigned int time);
void lcd_init(void);
void lcd_command(unsigned char command);
void lcd_data(unsigned char Data);
void lcd_display_string(char *str);
void lcd_display_voltage(float voltage);
unsigned char adc_read(void);

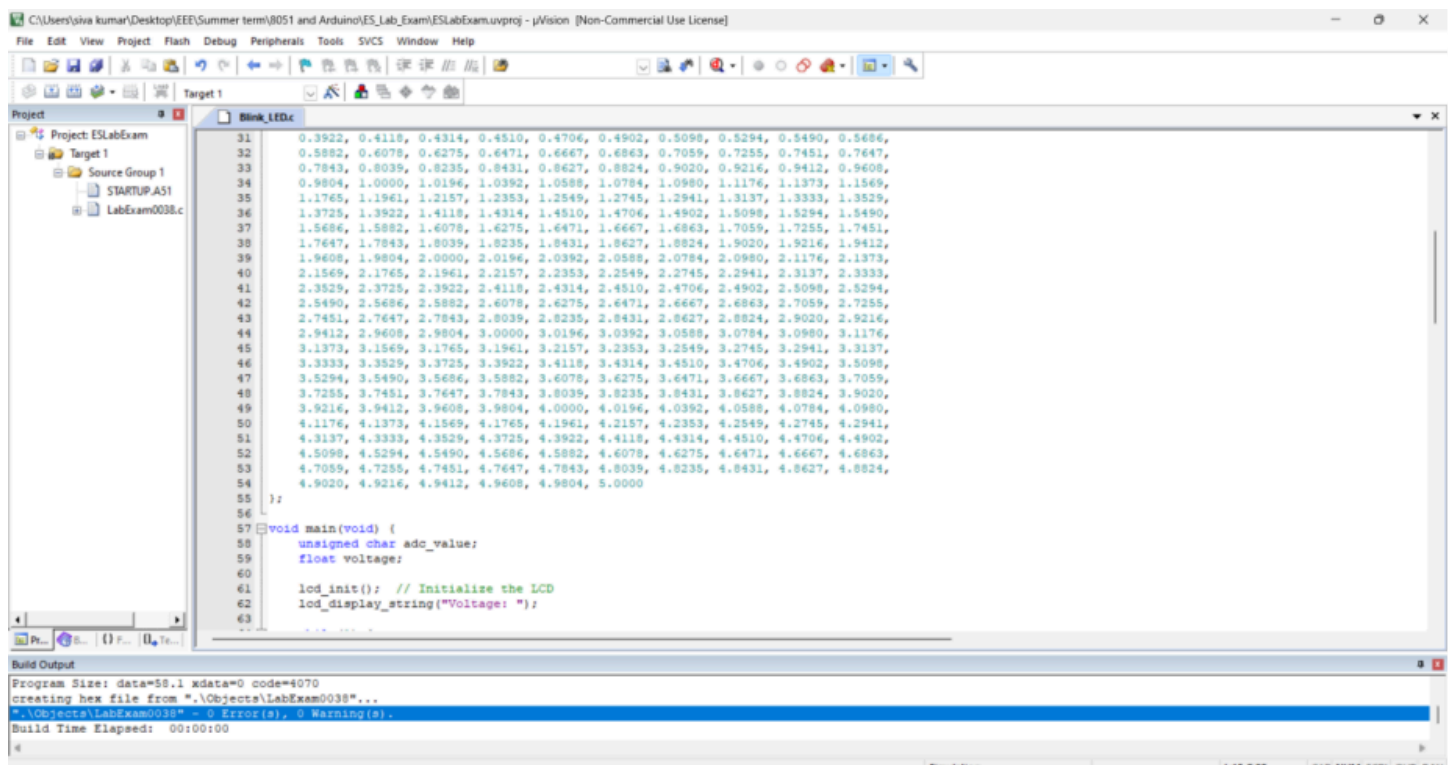
// Lookup table for voltage values stored in code memory
float code adc_to_voltage[256] = {
0.0000, 0.0196, 0.0392, 0.0588, 0.0784, 0.0980, 0.1176, 0.1373, 0.1569, 0.1765,
0.1961, 0.2157, 0.2353, 0.2549, 0.2745, 0.2941, 0.3137, 0.3333, 0.3529, 0.3725,
0.3922, 0.4118, 0.4314, 0.4510, 0.4706, 0.4902, 0.5098, 0.5294, 0.5490, 0.5686,
0.5882, 0.6078, 0.6275, 0.6471, 0.6667, 0.6863, 0.7059, 0.7255, 0.7451, 0.7647,
0.7843, 0.8039, 0.8235, 0.8431, 0.8627, 0.8824, 0.9020, 0.9216, 0.9412, 0.9608,
0.9804, 1.0000, 1.0196, 1.0392, 1.0588, 1.0784, 1.0980, 1.1176, 1.1373, 1.1569,
1.1765, 1.1961, 1.2157, 1.2353, 1.2549, 1.2745, 1.2941, 1.3137, 1.3333, 1.3529,
1.3725, 1.3922, 1.4118, 1.4314, 1.4510, 1.4706, 1.4902, 1.5098, 1.5294, 1.5490,
1.5686, 1.5882, 1.6078, 1.6275, 1.6471, 1.6667, 1.6863, 1.7059, 1.7255, 1.7451,
1.7647, 1.7843, 1.8039, 1.8235, 1.8431, 1.8627, 1.8824, 1.9020, 1.9216, 1.9412,
1.9608, 1.9804, 2.0000, 2.0196, 2.0392, 2.0588, 2.0784, 2.0980, 2.1176, 2.1373,
2.1569, 2.1765, 2.1961, 2.2157, 2.2353, 2.2549, 2.2745, 2.2941, 2.3137, 2.3333,
2.3529, 2.3725, 2.3922, 2.4118, 2.4314, 2.4510, 2.4706, 2.4902, 2.5098, 2.5294,
2.5490, 2.5686, 2.5882, 2.6078, 2.6275, 2.6471, 2.6667, 2.6863, 2.7059, 2.7255,
2.7451, 2.7647, 2.7843, 2.8039, 2.8235, 2.8431, 2.8627, 2.8824, 2.9020, 2.9216,
2.9412, 2.9608, 2.9804, 3.0000, 3.0196, 3.0392, 3.0588, 3.0784, 3.0980, 3.1176,
3.1373, 3.1569, 3.1765, 3.1961, 3.2157, 3.2353, 3.2549, 3.2745, 3.2941, 3.3137,
3.3333, 3.3529, 3.3725, 3.3922, 3.4118, 3.4314, 3.4510, 3.4706, 3.4902, 3.5098,
3.5294, 3.5490, 3.5686, 3.5882, 3.6078, 3.6275, 3.6471, 3.6667, 3.6863, 3.7059,
3.7255, 3.7451, 3.7647, 3.7843, 3.8039, 3.8235, 3.8431, 3.8627, 3.8824, 3.9020,
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4.9020, 4.9216, 4.9412, 4.9608, 4.9804, 5.0000
};

void main(void) {
    unsigned char adc_value;
    float voltage;

    lcd_init(); // Initialize the LCD
    lcd_display_string("Voltage: ");
}
```

Build Output

Program Size: data=58.1 xdata=0 code=4070
creating hex file from ".\Objects\LabExam0038"...
".\Objects\LabExam0038" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:00



```
#include <reg51.h>
#include <stdio.h>

// LCD Control Pins
sbit RS = P3^0;
sbit RW = P3^1;
sbit EN = P3^2;

// ADC Control Pins
sbit ALE = P3^3;
sbit OE = P3^4;
sbit START = P3^5;
sbit EOC = P3^6;

// LED Control Pins
sbit LED1 = P0^0;
sbit LED2 = P0^1;

void delay(unsigned int time);
void lcd_init(void);
void lcd_command(unsigned char command);
void lcd_data(unsigned char Data);
void lcd_display_string(char *str);
void lcd_display_voltage(float voltage);
unsigned char adc_read(void);

// Lookup table for voltage values stored in code memory
float code adc_to_voltage[256] = {
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0.7843, 0.8039, 0.8235, 0.8431, 0.8627, 0.8824, 0.9020, 0.9216, 0.9412, 0.9608,
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3.3333, 3.3529, 3.3725, 3.3922, 3.4118, 3.4314, 3.4510, 3.4706, 3.4902, 3.5098,
3.5294, 3.5490, 3.5686, 3.5882, 3.6078, 3.6275, 3.6471, 3.6667, 3.6863, 3.7059,
3.7255, 3.7451, 3.7647, 3.7843, 3.8039, 3.8235, 3.8431, 3.8627, 3.8824, 3.9020,
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4.1176, 4.1373, 4.1569, 4.1765, 4.1961, 4.2157, 4.2353, 4.2549, 4.2745, 4.2941,
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4.5098, 4.5294, 4.5490, 4.5686, 4.5882, 4.6078, 4.6275, 4.6471, 4.6667, 4.6863,
4.7059, 4.7255, 4.7451, 4.7647, 4.7843, 4.8039, 4.8235, 4.8431, 4.8627, 4.8824,
4.9020, 4.9216, 4.9412, 4.9608, 4.9804, 5.0000
};

void main(void) {
    unsigned char adc_value;
    float voltage;

    lcd_init(); // Initialize the LCD
    lcd_display_string("Voltage: ");
}
```

Build Output

Program Size: data=58.1 xdata=0 code=4070
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".\Objects\LabExam0038" - 0 Error(s), 0 Warning(s).
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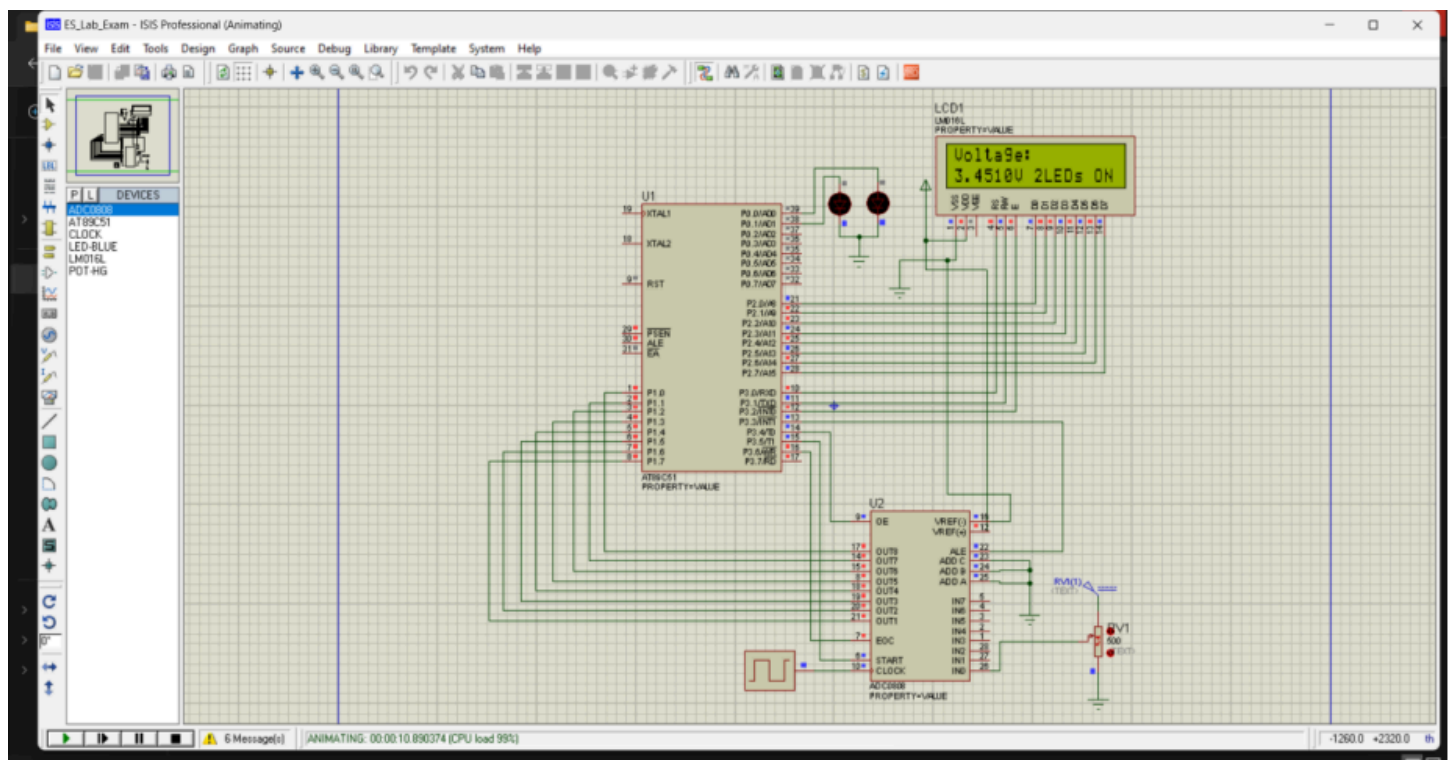
```
C:\Users\sviva kumar\Desktop\EEE\Summer term\B051 and Arduino\ES_Lab_Exam\ESLabExam.uvproj - µVision [Non-Commercial Use License]
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Project: Project: ESlabExam
Target 1
Source Group 1
STARTUP.A51
LabExam0038.c

124  SH = 0;
125  delay();
126  }
127  }
128  // Function to display string on LCD
129  void lcd_display_string(char *str) {
130  while (*str) {
131  lcd_data(*str++);
132  }
133  }
134  }
135  // Function to display voltage on LCD
136  void lcd_display_voltage(float voltage) {
137  char buffer[10];
138  sprintf(buffer, "%1.4f", voltage); // Format voltage with 4 decimal places
139  lcd_display_string(buffer);
140  }
141  }
142  // Function to read data from ADC
143  unsigned char adc_read(void) {
144  unsigned char adc_value;
145
146  ALE = 1;
147  START = 1;
148  delay();
149  ALE = 0;
150  START = 0;
151
152  while (EOC == 1); // Wait for end of conversion
153
154  OE = 1;
155  adc_value = P1; // Read ADC value from Port 1
156  OE = 0;
157
158  return adc_value;
159  }
160  }
161  // Function to generate delay
```

Build Output

Program Size: data=58.1 xdata=0 code=4070
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Target 1

Project: ESlabExam

Source Group 1

STARTUP.A51

LabExam0038.c

```

63
64 while(1) {
65     adc_value = adc_read(); // Read ADC value
66     voltage = adc_to_voltage[adc_value]; // Get voltage from lookup table
67
68     lcd_command(0x00); // Move cursor to the second line of LCD
69     lcd_display_voltage(voltage); // Display the voltage on LCD
70
71     if (voltage > 3.0) {
72         LED1 = 1; // Turn on LED1
73         LED2 = 1; // Turn on LED2
74         lcd_command(0x00); // Move cursor to display status
75         lcd_display_string("2 LEDs ON");
76     } else if (voltage >= 2.0) {
77         LED1 = 1; // Turn on LED1
78         LED2 = 0; // Turn off LED2
79         lcd_command(0x00); // Move cursor to display status
80         lcd_display_string("1 LED ON");
81     } else {
82         LED1 = 0; // Turn off LED1
83         LED2 = 0; // Turn off LED2
84         lcd_command(0x00); // Move cursor to display status
85         lcd_display_string("LEDs OFF");
86     }
87
88     delay(10); // Delay for some time (1000 ms)
89 }
90
91 // Function to initialize the LCD
92 void lcd_init(void) {
93     lcd_command(0x38); // Initialize LCD in 8-bit mode
94     delay(1);
95 }

```

Build Output

Program Size: data=58.1 xdata=0 code=4070
 creating hex file from ".\Objects\LabExam0038"...
 ".\Objects\LabExam0038" - 0 Error(s), 0 Warning(s).
 Build Time Elapsed: 00:00:00

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File Edit View Project Flash Debug Peripherals Tools SVCS Window Help

Target 1

Project: ESlabExam

Source Group 1

STARTUP.A51

LabExam0038.c

```

91 // Function to initialize the LCD
92 void lcd_init(void) {
93     lcd_command(0x38); // Initialize LCD in 8-bit mode
94     delay(1);
95     lcd_command(0x0C); // Display ON, Cursor OFF
96     delay(1);
97     lcd_command(0x06); // Auto increment cursor
98     delay(1);
99     lcd_command(0x01); // Clear display
100     delay(1);
101     lcd_command(0x80); // Move cursor to the first line
102     delay(1);
103 }
104 // Function to send command to LCD
105 void lcd_command(unsigned char command) {
106     P2 = command;
107     RS = 0; // Select command register
108     RW = 0; // Write operation
109     EN = 1;
110     delay(1);
111     EN = 0;
112     delay(1);
113 }
114 // Function to send data to LCD
115 void lcd_data(unsigned char Data) {
116     P2 = Data;
117     RS = 1; // Select data register
118     RW = 0; // Write operation
119     EN = 1;
120     delay(1);
121     EN = 0;
122     delay(1);
123 }

```

Build Output

Program Size: data=58.1 xdata=0 code=4070
 creating hex file from ".\Objects\LabExam0038"...
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Simulation 1:15 0:30 CAP: 8184 SCL: 0.00 BSM