NORTH SOUTH UNIVERSITY
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Project Report

Spring 2021

CSE331: Microprocessor Interfacing & Embedded System
Section: 4

Group 5

Project Name: Water level monitoring using 8051/PIC microcontroller

Group Members:

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Objective

The objective is to build a Water level monitor system using a PIC16F877A microcontroller. Our device will detect the water level of the system(reservoir, tank e.t.c) and notify the user about the current state. Our device will notify the user about the current state of the water level via an LCD display.

Applications

Our device can be implemented in,

- Water reservoirs to indicate water level.
- Water cooler, where there is a danger of motor burnout when there is no water in the radiator.
- Fuel tankers to indicate the fuel level of the system.
  A liquid level indicator in the huge containers in the industries.

Working procedures

To understand the working procedure we have first have to know about the components. Also, we have to know their function in this project. The components we have used are,

Component name	Function
PIC Microprocessor(PIC16F877A)	Here Water indicator system's program is stored. According to the embedded program and appropriate input it will produce the desired output.
Crystal Oscillator(X1)	It works as a clock pulse generator. It will synchronize the microcontroller.

LCD diapaly(LM016l)	To show output.
POT(RV1)	To control the contrast of LCD display.
Buzzer(BUZ1)	To generate a sound when the water reservoir is full.
Battery-5v	To provide a power source to the microcontroller and other components.
LED-GREEN	To indicate some outputs.
Switch	To input data.
Resistors	To provide appropriate power to components for smooth functioning.
Transistor(Q1), Diode(D7)	For Buzzer
Capacitor(C1,C2)	Used in Crystal oscillator

Table 1: Components of the Water level indicator System.

At first in Sensors(switch) water level is given as input. Here water reservoir is divided into four levels: low, medium, high, and full. When SENSOR1 is inputted 0 it indicates water level low. Which is also shown in the LCD display. Then when both SENSOR1 and SENSOR2 is inputted 0 it indicates the medium level which is shown in both LED and LCD display(Here both SENSOR1 and SENSOR2 are needed to be inputted as water will rise to medium level after crossing low level. And this goes on. Otherwise it will not show any output.) And this goes on. Table 2 shows appropriate inputs and outputs.

SENSOR1	SENSOR2	SENSOR3	SENSOR4	Water level state
0	1	1	1	Low
0	0	1	1	Medium
0	0	0	1	High
0	0	0	0	Full

Table 2: Appropriate inputs and desired outputs

Image of Schematic Circuit

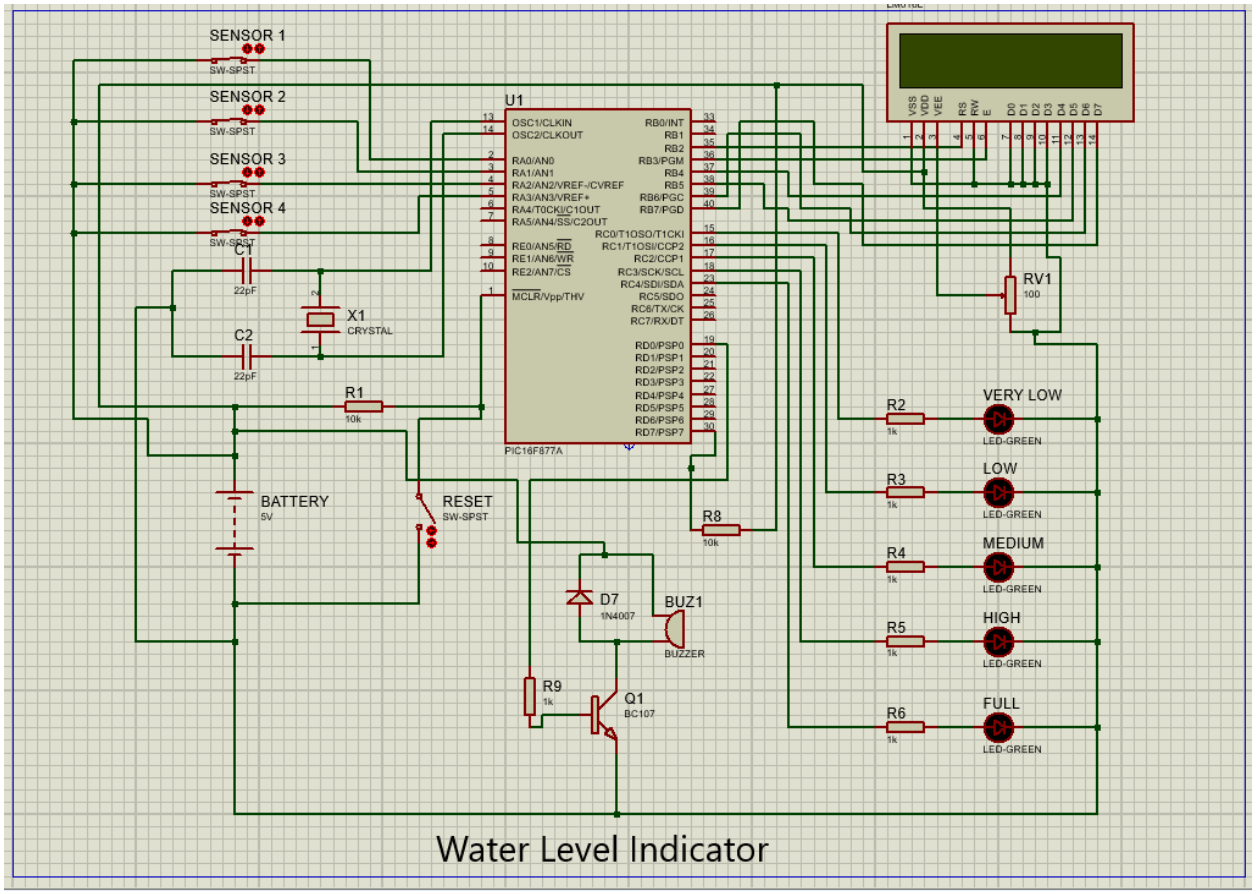

Figure 1: Water level indicator schematic diagram

Code

```
// LCD module connections
sbit LCD_RS at RB2_bit;
sbit LCD_EN at RB3_bit;
sbit LCD_D4 at RB4_bit;
sbit LCD_D5 at RB5_bit;
sbit LCD_D6 at RB6_bit;
sbit LCD_D7 at RB7_bit;

sbit LCD_RS_Direction at TRISB2_bit;
sbit LCD_EN_Direction at TRISB3_bit;
sbit LCD_D4_Direction at TRISB4_bit;
sbit LCD_D5_Direction at TRISB5_bit;
sbit LCD_D6_Direction at TRISB6_bit;
sbit LCD_D7_Direction at TRISB7_bit;
// End LCD module connections

char txt1[] = "Water";
char txt2[] = "Level";
char txt3[] = "Indicator";
char txt4[] = "CSE 331";


char wtr1[] = "Level: ";
char wtr2[] = "Very Low";
char wtr3[] = "Low";
char wtr4[] = "Medium";
char wtr5[] = "High";
char wtr6[] = "Full";

void main()
{

  int i = 0;
  int c = 16;
  int b = 0;
  CMCON = 0x07;
  ADCON1 = 0x06;
  TRISA = 0x0F;                 // set direction to be input
  PORTA = 0x00;
  PORTD = 0x00;
  PORTC = 0x00;
```

```
TRISB = 0x00;                //  set direction to be output
TRISC = 0x00;                // set direction to be output
TRISD = 0x80;                // set direction to be output

PORTD.F2 = 1;
PORTD.F7 = 1;

Lcd_Init();                  // Initialize LCD
Lcd_Cmd(_LCD_CLEAR);         // Clear display
Lcd_Cmd(_LCD_CURSOR_OFF);    // Cursor off
Lcd_Out(1,1,txt1);           // Write text in first row
Lcd_Out(2,1,txt2);           // Write text in second row
Delay_ms(500);
Lcd_Cmd(_LCD_CLEAR);         // Clear display
Lcd_Out(1,1,txt3);           // Write text in first row
Lcd_Out(2,1,txt4);           // Write text in second row
Delay_ms(500);

// Moving text
for(i=0; i<15; i++)
{
  Lcd_Cmd(_LCD_SHIFT_RIGHT);
  Delay_ms(125);
}



do
{
  Lcd_Cmd(_LCD_CLEAR);
  Lcd_Out(1,1,wtr1);
  if(c>0)
  {
    PORTD.F2 = 1 ;            //LCD Backlight ON
    c--;
  }
  else
    PORTD.F2 = 0;             //LCD Backlight OFF

  if(b>0)
  {
    PORTD.F0 = 1;             //Buzzer ON
    Delay_ms(125);
    PORTD.F0 = 0;             //Buzzer OFF
```

```
      b--;
    }

    if(PORTD.F7 == 0)           //Manual Backlight ON
      c = 16;

    if(PORTA == 0x0F)
    {
      PORTD.F1 = 1;
      Lcd_Out(1,8,wtr2);
      PORTC = 1;
    }
    else if(PORTA == 0x0E)
    {
      Lcd_Out(1,8,wtr3);
      PORTC = 3;               //LED Bar
    }
    else if(PORTA == 0x0C)
    {
      Lcd_Out(1,8,wtr4);
      PORTC = 7;               //LED Bar
    }
    else if(PORTA == 0x08)
    {
      Lcd_Out(1,8,wtr5);
        PORTC = 15;            //LED Bar
    }
    else if(PORTA == 0x00)
    {
      Lcd_Out(1,8,wtr6);
      PORTC = 31;              //LED Bar
    }
    else
      PORTA = 0x0F;
   Delay_ms(125);


  }while(1);                   // Endless loop
}
```

Discussion

In this project, our main objective was to indicate the user water level state of the water reservoir at a certain stage. Now from our project demonstration, we saw that it was capable of producing desired outputs for appropriate water level inputs. Now although it produced desired output still there are issues that need to be resolved. Here our buzzer system is not working at all. As it would be a more convenient system if it had worked. Also, resetting the whole system was faulty too.

Now our device is only in schematic form. So how well it performs at the implementation level is still unknown. Also, our knowledge of limited electrical equipment is also a limitation for us. For example, if we were familiar with different models of microprocessors and other electrical components our implementation could have been more convenient, fast, cheap, and sustainable. Our schematic diagram could also be improved, cheap, and more sustainable if our knowledge of electrical equipment were not limited. Also, we were novices at using simulation software(Proteus and Mikroc). If we were more experienced with these our implementation would be a lot better. For example, we were having a hard time adding appropriate library files in Mikroc for different electrical components. Also using system-defined functions, appropriate ports to input and output was difficult. Also, the schematic diagram became a bit messy for using a lot of wires. So troubleshooting and tracing wires were difficult too.

There are no such things in this world that can not be developed. Our device not an exception to this as well. We could have added motor pumps which would have filled the reservoir. We could have controlled the motor pump too. Implementation of this could lessen wastage of water. Also, our indicator shows only four states of water level. We could have added a measurement device to indicate water level more descriptively. Also, we could have added a memory device to record information about the refill and release of valuable liquids to the reservoir. This would have helped significantly in the industrial sector.

Contribution

As the name of this assessment says ‘Group Project’, it truly was. All members of the group were active, worked together very hard, and contributed in various ways. So naming contribution was hard in this case. But credit should be given where it is due. So,

Jobs in Project	Md Mehedi Hasan 1731705042	Kazi Mushfiq Rafid 1731345042
Writing Project Proposal	✅	✅
Drawing Schematic Diagram	✅	✅✅
Writing Code	✅✅	✅
Writing Project Report	✅✅	✅✅

Note: Here ✅ indicates contribution level. Multiple ✅ indicate multiples of contributions from an individual.