CSE 331: Microprocessor Interfacing & Embedded System

Project Type: Guided

Project Title: Microcontroller (8051) based Water Tank Controller

Name and ID of group members:

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Objective: Water Tank Controller using 8051 Microcontroller project will help in automatically controlling the water motor by sensing the water level in a tank. This system monitors the water level of the tank and automatically switches ON the motor whenever tank is empty. The motor is switched OFF when the overhead tank or container is FULL. Here, the water level of the tank is indicated on LCD. Using this system, we can avoid the overflow of the water.
The project will also help me to understand the application of microcontroller 8051. It will also help me to introduce new problems and answers.

The project will interest in both educational and development purpose because it's an automated system.

Applications:

- ❏ Used in big buildings where the manual monitoring is difficult.
- ❏ Used in industries to control the liquid level automatically.
- ❏ Used in Agriculture.

Working procedures:

This system mainly works on a principle that "water conducts electricity". The four wires which are dipped into the tank will indicate the different water levels. Based on the outputs of these wires, microcontroller displays water level on LCD as well as controls the motor.

Initially when the tank is empty, LCD will display the message Tank is Empty and Motor On automatically. When water level reaches to half level, now LCD displays Motor On and Alarm OFF. When the Tank is Full, LCD displays Motor OFF and Alarm ON . Again, the motor runs when water level in the tank becomes LOW.

Components Required for Water Tank Level Controller using 8051 Microcontroller

- ❏ AT89C51 Microcontroller (or any 8051 based Microcontroller)
- ❏ Crystal Frequency=12mhz
- ❏ AUDIO1U
- ❏ AUDIO10U
- ❏ BUFFER
- ❏ BUTTON
- ❏ BUZZER
- ❏ CAP
- ❏ CAPACITOR
- ❏ FUSE
- ❏ LM016L(LCD DISPLAY)
- ❏ LM358N
- ❏ MOTOR

- ❏ POT-HG
- ❏ RELAY
- ❏ RESISTOR
- ❏ RES10SIPB
- ❏ SW-SPST
- ❏ ULN2003A
- ❏ Keil µVision IDE
- ❏ Proteus (for circuit diagram)

The heart of the Water Level Controller using 8051 Microcontroller project is the AT89C52 Microcontroller. The water level probes are connected to the P0.0, P0.1, P0.2, P0.3, P0.4, P0.5, P0.6, P0.7 through the transistors (they are connected to the base of the transistors through corresponding current limiting resistors). P2.0 for Empty level, P2.1 for HALF Level, P2.2 for Full Level/ Tank is Full and P2.3 for Tank is Overflowing. The Collector terminals of the Transistors are connected to VCC and the Emitter terminals are connected to PORT0 terminals (P0.0, P0.1 and P0.2).

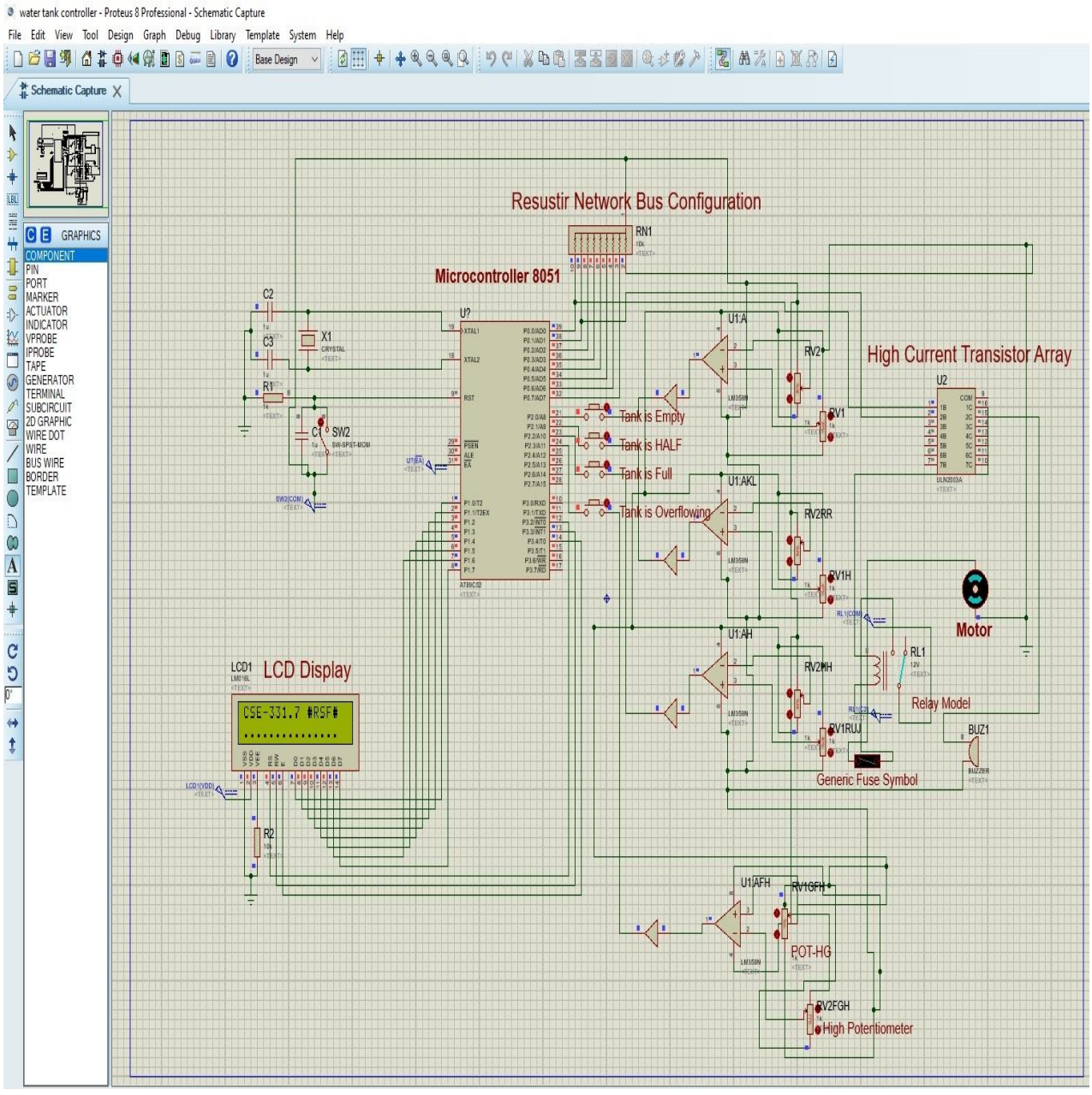
PORT1 of the microcontroller is connected to the data pins of LCD and the control pins RS, RW and E of the LCD Display are connected to the P3.2, P3.3 and P3.4 respectively. For demonstration purpose, we have used a simple DC Motor Pump. It is connected to the Relay and the input to the relay is fed from P0.0 through a transistor.

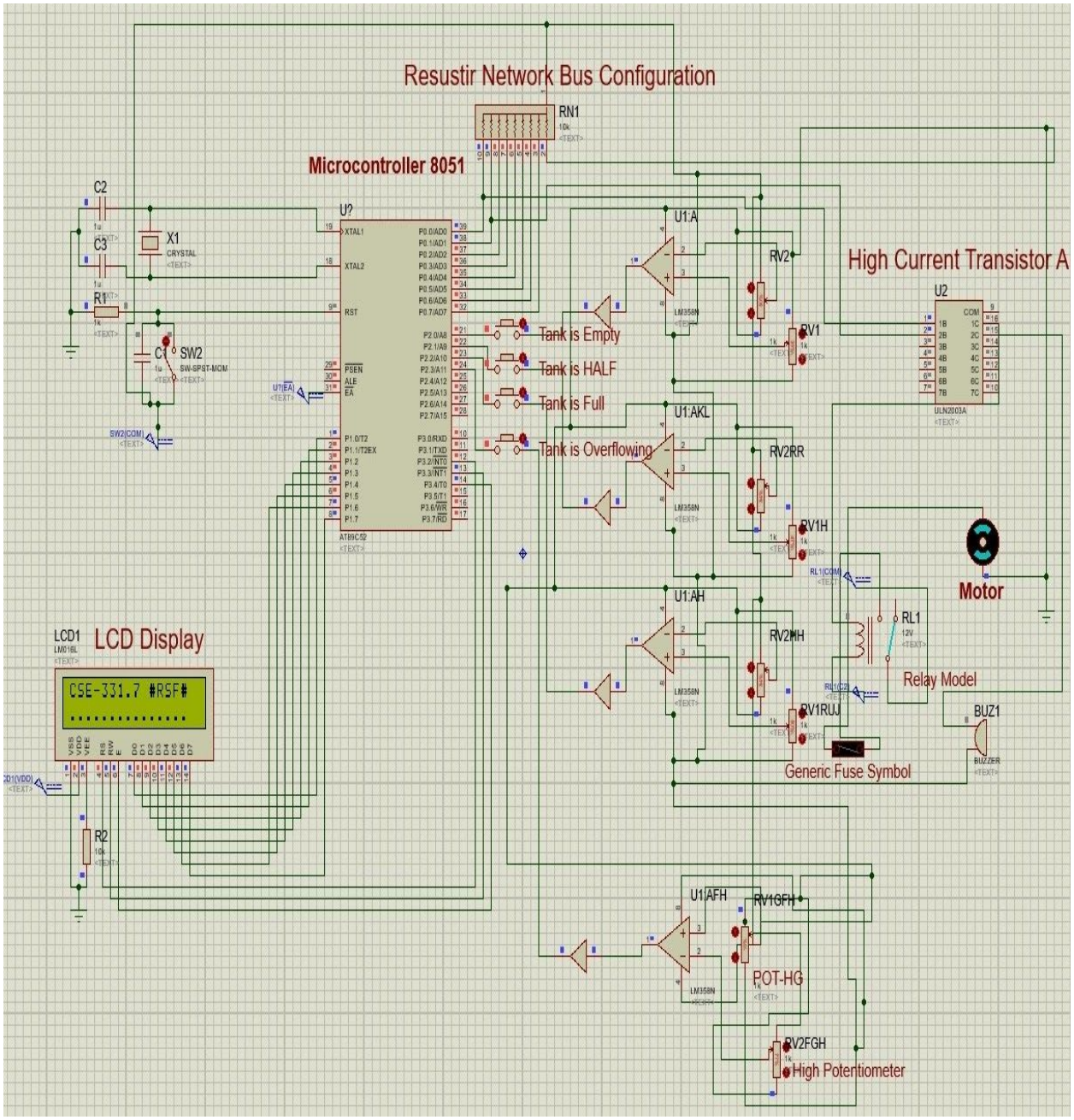
- ❏ Now, initialize the LCD.
- ❏ Continuously check the water level input pins P2.0, P2.1, P2.3 and P2.4.
- ❏ If all the pins are low, then display “Motor OFF and Alarm OFF” on the LCD. P2.0 pin HIGH to run the motor automatically and Display the LCD “TANK IS EMPTY MOTOR IS ON”
- ❏ A HIGH pulse on the pin P2.1 indicates that water has reached half level. So, display the LCD “MOTOR ON AND ALARM OFF” and run the motor normally.
- ❏ If P2.2 is HIGH, then the water level in the tank is FULL. Display the LCD “Motor OFF and Alarm OFF”
- ❏ If P2.3 is HIGH, then the water level in the tank is Overflowing. Display the LCD “Motor OFF and Alarm ON”

How to Operate

- Initially, write the program for Water Level Controller in Keil µVision IDE and generate the .hex file.
- Now give the connections as per the circuit diagram.
- Now Start VSM Debugging
- When all the Switch are off, then display “Motor OFF and Alarm OFF”
- When Switch 1 is on, then display “TANK IS EMPTY MOTOR IS ON”
- When Switch 2 is on, the display “MOTOR ON AND ALARM OFF” (water has reached half level)
- When Switch 3 is on, the display “Motor OFF and Alarm OFF” (Tank is FULL)
- When Switch 4 is on, the display “Motor OFF and Alarm ON” (Tank is Overflowing)

Images of Schematic circuit:




Resustir Network Bus Configuration
Microcontroller 8051
High Current Transistor A
Tank is Empty
Tank is HALF
Tank is Full
Tank is Overflowing
LCD Display
CSE-331.7 #RSF#
Motor
Relay Model
Generic Fuse Symbol
POT-HG
High Potentiometer

Code:

tishitu_root.c

```
#include"tishitu_root.h"
void init_lcd()
        {
command(0x3c);
command(0x0c);
command(0x06);
        }
void command(int a)
{
ready();

P1=a;
P3_2=0x00;
P3_3=0x00;
P3_4=0x01;
P3_4=0x00;
}
void display(char *str)
{
unsigned int i;
for(i=0;i<=strlen(str)-1;++i)
{
if(i==16)
command(0x80);
//if(i==8)       //
//command(0xc0);//
ready();
P1=str[i];
  P3_2=0x01;
   P3_3=0x00;
  P3_4=0x01;
  P3_4=0x00;
}
}
void firstline()
{
```

```
command(0x01);
command(0x80);
}
void loading(unsigned int l)
{
unsigned int i;
 firstline();
display("CSE-331.7 #RSF#");
 secondline();
for(i=0;i<=16;i++)
 {
 msdelay(l);
 display(".");
 }
}

void secondline()
{
//command(0x01);
command(0xc0);
}

void ready(void)
{
P3_4=0x00;
P1=0xff;
P3_2=0x00;
P3_3=0x01;
while(P1_7)
{
P3_4=0x00;
P3_4=0x01;
}
P3_4=0x00;
}
void msdelay(unsigned int itime)
{
unsigned int i,j;
for(i=0;i<itime;i++)
```

```
{
for(j=0;j<110;j++)
{;}
}
}
```

LCDMessage.c

```
#include"tishitu_root.h"

void main(void)
{

//char str[16];
unsigned int read=0;

unsigned int c=1;
 P0_0=0x00;
 P0_1=0x00;

init_lcd();

loading(100);

        firstline();
        display("Auto Water Tank");
 secondline();
  display("ControllerSystem");
  msdelay(2000);
while(1)

{
if((P2_3==0)&&(P2_0==1))
{
```

```
P0_0=0;
P0_1=1;
firstline();
display("Motor OFF ");
secondline();
display("Alarm ON");
msdelay(1000);
}
if((P2_3==0)&&(P2_0==0))
{P0_0=0;
P0_1=1;
firstline();
display("Motor OFF ");
secondline();
display("Alarm ON");
msdelay(1000);
}
{
if(c==1)

if((P2_3==1)&&(P2_2==1)&&(P2_1==1)&&(P2_0==1)&&(c==1))
{P0_0=0;
P0_1=0;
firstline();
display("Motor OFF ");
secondline();
display("Alarm OFF");
msdelay(1000);

}
if((P2_3==1)&&(P2_2==1)&&(P2_1==1)&&(P2_0==0)&&(c==1))
{P0_0=1;
P0_1=0;
firstline();
display("TANK IS EMPTY ");
secondline();
display("MOTOR IS ON");
msdelay(1000);
```

```
}
if((P2_3==1)&&(P2_2==0)&&(P2_1==1)&&(P2_0==1)&&(c==1))
{P0_0=0;
P0_1=1;
 firstline();
display("Motor OFF ");
secondline();
display("Alarm ON");
msdelay(1000);

}
if((P2_3==1)&&(P2_2==0)&&(P2_1==1)&&(P2_0==0)&&(c==1))
{P0_0=0;
P0_1=1;
firstline();
display("Motor OFF ");
secondline();
display("Alarm ON");
msdelay(1000);

}
if((P2_3==1)&&(P2_2==1)&&(P2_1==0)&&(P2_0==1)&&(c==1))
{P0_0=0;
P0_1=0;
firstline();
display("Motor OFF ");
secondline();
display("Alarm OFF");
msdelay(1000);

}
if((P2_3==1)&&(P2_2==1)&&(P2_1==0)&&(P2_0==0)&&(c==1))
{P0_0=1;
P0_1=0;
 firstline();
display("Motor ON ");
secondline();
display("Alarm OFF");
msdelay(1000);
```

```
}
if(P2_2==0)
{c=0;}
}
if(c==0)
 {
if((P2_3==1)&&(P2_2==0)&&(P2_1==0)&&(P2_0==1)&&(c==0))
{P0_0=0;
P0_1=0;
firstline();
display("Motor OFF ");
secondline();
display("Alarm OFF");
msdelay(1000);

}
if((P2_3==1)&&(P2_2==0)&&(P2_1==0)&&(P2_0==0)&&(c==0))
{P0_0=0;
P0_1=0;
firstline();
display("Motor OFF ");
secondline();
display("Alarm OFF");
msdelay(1000);

}
if((P2_3==1)&&(P2_2==1)&&(P2_1==0)&&(P2_0==1)&&(c==0))
{P0_0=0;
P0_1=0;
firstline();
display("Motor OFF ");
secondline();
display("Alarm OFF");
msdelay(1000);

}
if((P2_3==1)&&(P2_2==1)&&(P2_1==0)&&(P2_0==0)&&(c==0))
{P0_0=0;
```

```
P0_1=0;
  firstline();
display("Motor OFF ");
secondline();
display("Alarm OFF");
msdelay(1000);

}
if(P2_1==1)
c=1;
 }
}
}
```

Discussion:

This product is designed to automatic control of motor, which ensures constant reserve of water in storage tanks.
Automatic water level controller is used to automatically fill the over head tank as and when it gets empty and monitor the water level in it.
Automatic water level controller switches ON the motor when the water level in the overhead tank drops below pre fixed low level(on point) and puts off the motor when water level rises up to pre fixed high level (off point) motor also switches off when the sump water is exhausted before filling overhead tank, pump running dry, Mains voltage fluctuations.
State of the art, digital technology, advanced microcontroller based products. The system is very versatile, A number of tailor made variations like control of multiple tanks, or multiple pumps are possible.

We manufacture and provide water level controller for agriculture and city water supply, is a state of the art instrument to control your pump. It controls your pump as per levels in the overhead and underground tanks and also guards your pump against power fluctuations. Water level controller is a novel and fitting solution for all your water problems. Pump is switched ON when overhead tank is empty and is switched OFF when either overhead tank is full or underground tank is empty.

The water level controller for societies offers a solution for pumping of the water to overhead tanks in buildings. It avoids:
Dry Running of the Pumps
Overflowing of over head tanks
Manual operation
And this results in
Water Saving

Man power Saving
Electricity Saving
Plus it offers pump protections to safe guard the pump against electrical extremities.

Contribution:

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