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J- COMPONENT - FINAL PROJECT

COURSE NAME: EMBEDDED SYSTEMS

COURSE CODE: SWE2010

FACULTY: PROF. SWARNA PRIYA R.M

SMART PRECISION BASED IRRIGATION SYSTEM USING EMBEDDED SYSTEMS

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ABSTRACT

The need for inclusion of technology in the existing agricultural techniques has become the need of the hour. This project proposes a layout of a smart precision based agricultural irrigation system with the use of embedded machines which is value effective along with improvements in the existing conventional techniques and practices in the field of agriculture.

One of the major problems is that there is a lot of human intervention needed even after installation of current systems that exists. The functions carried out by our proposed system is to control water supply to the crops automatically.
The outcome of the system will be based on soil moisture sensors and temperature sensors.

AIM

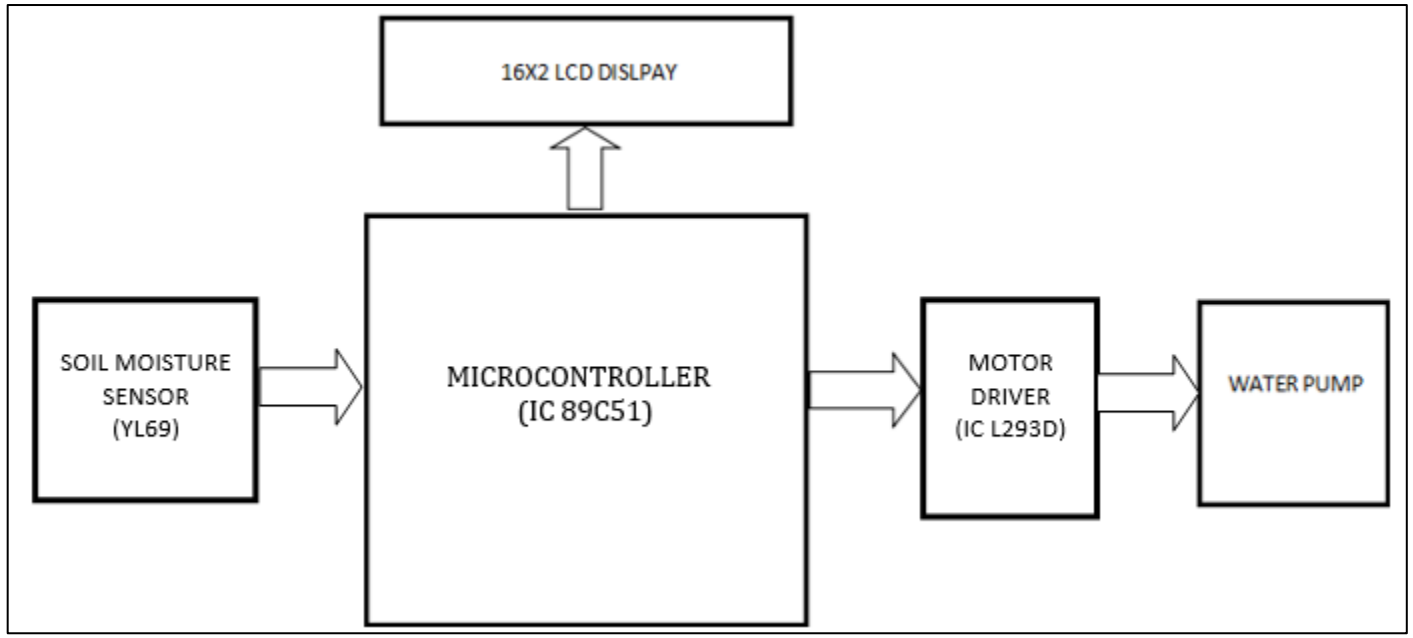
The aim of our project is to minimize the manual intervention by the user. Automatic Plant watering system will serve the following purposes:

- The plants are watered automatically only when there is not enough moisture in the soil. Thus, the users can do their work without having to take out time for watering their plants.

- As there is no unplanned use of water, lot of water is saved from being wasted.

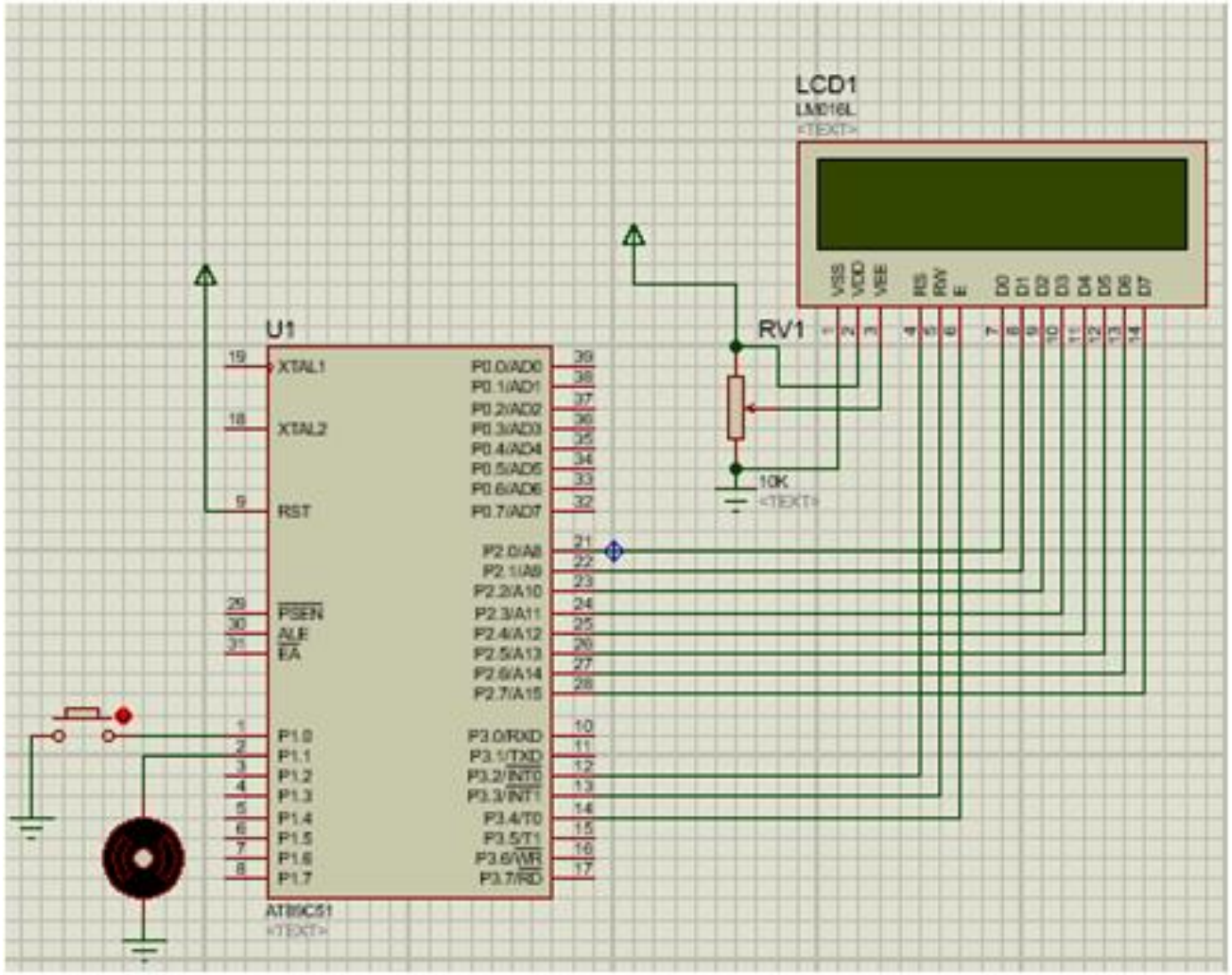
- To display the amount of time the Motor was turned on for until it turns off, seconds.

BLOCK DIAGRAM AND WORKING



First, the code of the project is uploaded onto the IC 89C51. The soil moisture sensor senses the moisture level of the soil. If the moisture is low then, the microcontroller turns ON the motor and the plants are watered. When the moisture in the soil becomes sufficient, the microcontroller switches OFF the motor. The status of the motor, whether it is ON or OFF is displayed on the LCD display.

CIRCUIT DIAGRAM



COMPONENTS OF PROPOSED SYSTEM

1. 16*2 LCD DISPLAY

- LCD (Liquid Crystal Display) screen is an electronic display module. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

2. SOIL MOISTURE SENSOR (YL69)

- The soil moisture sensor, when the sensor-head is inserted in wet soil, moisture bridges the probes through a low-resistance path

3. WATER PUMP

- The water pump uses centrifugal force to send fluid to the outside while it spins, causing fluid to be drawn from the center continuously.

4. 89C51 MICROCONTROLLER

- AT89C51 is an 8-bit microcontroller and belongs to Atmel's 8051 family; It can be erased and program to a maximum of 1000 times

5. MOTOR DRIVER IC L293D

- L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers

ADVANTAGES

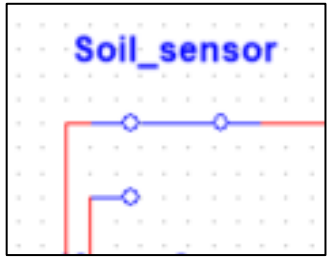
- Used for sensing the moisture level of the soil in the field and recovering it by letting out sufficient water through the motor pump.
- LCD provides ease in the work as it helps the user know what the condition of the motor.
- The project gives a broad outlook to how modern farms and agriculture can help farmers know the status even by staying home.

APPLICATIONS

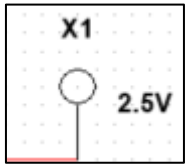
- Works as an automatic plant irrigation system.
- The project can not only be used in farms but also huge industries to provide status of environment

MAIN COMPONENTS

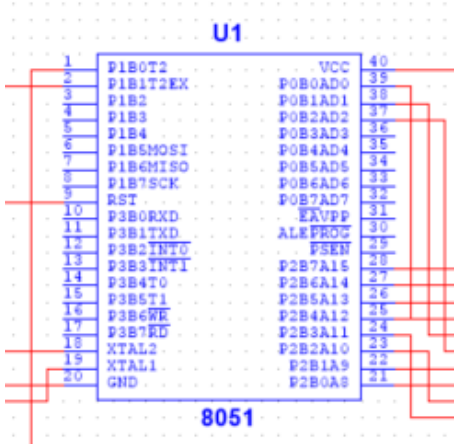
1. Switch (soil sensor)



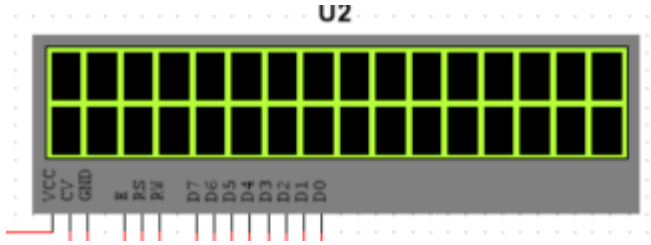
2. LED Probe (Water motor)



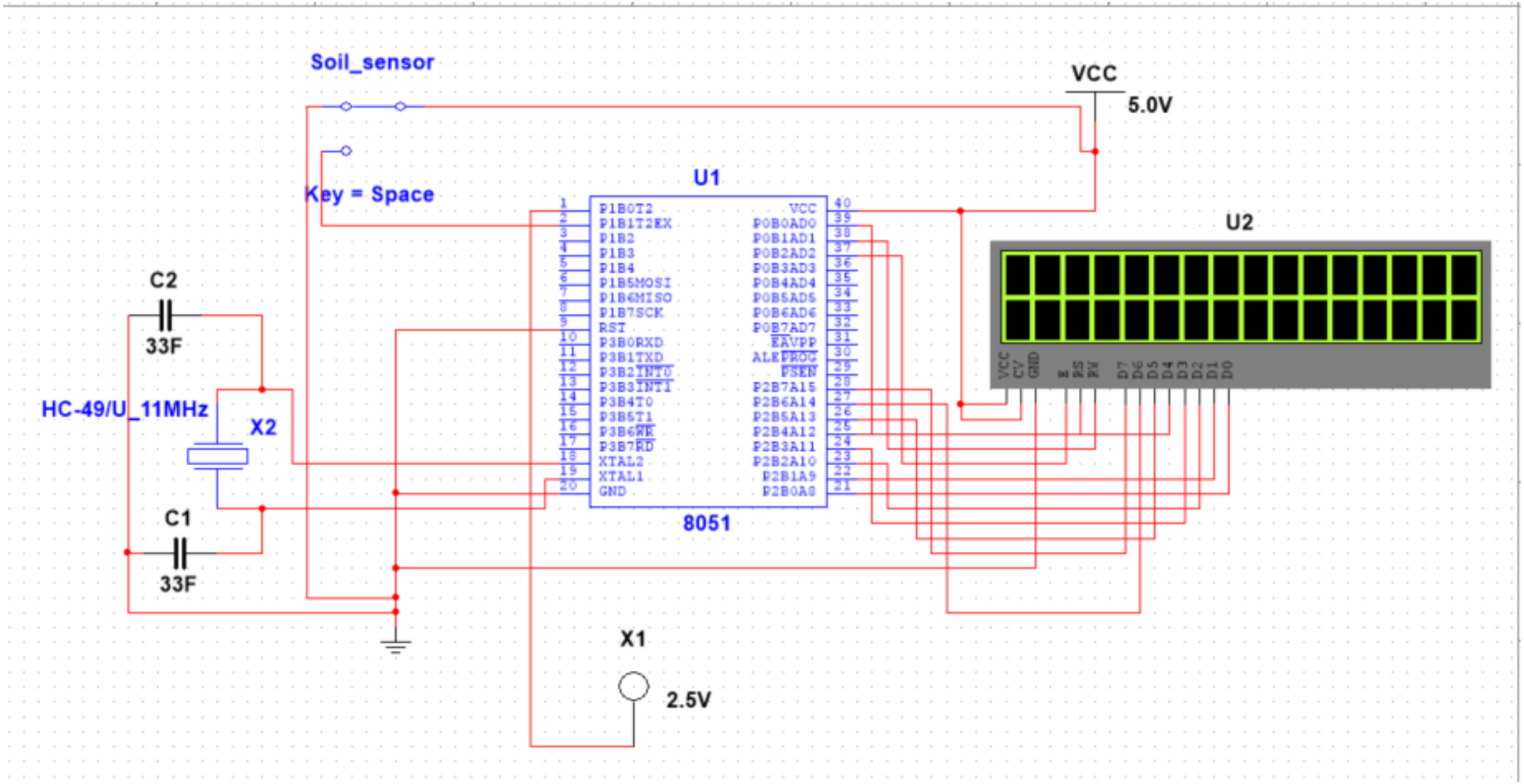
3. 8051 MC



4. LCD (16X2)



SIMULATION

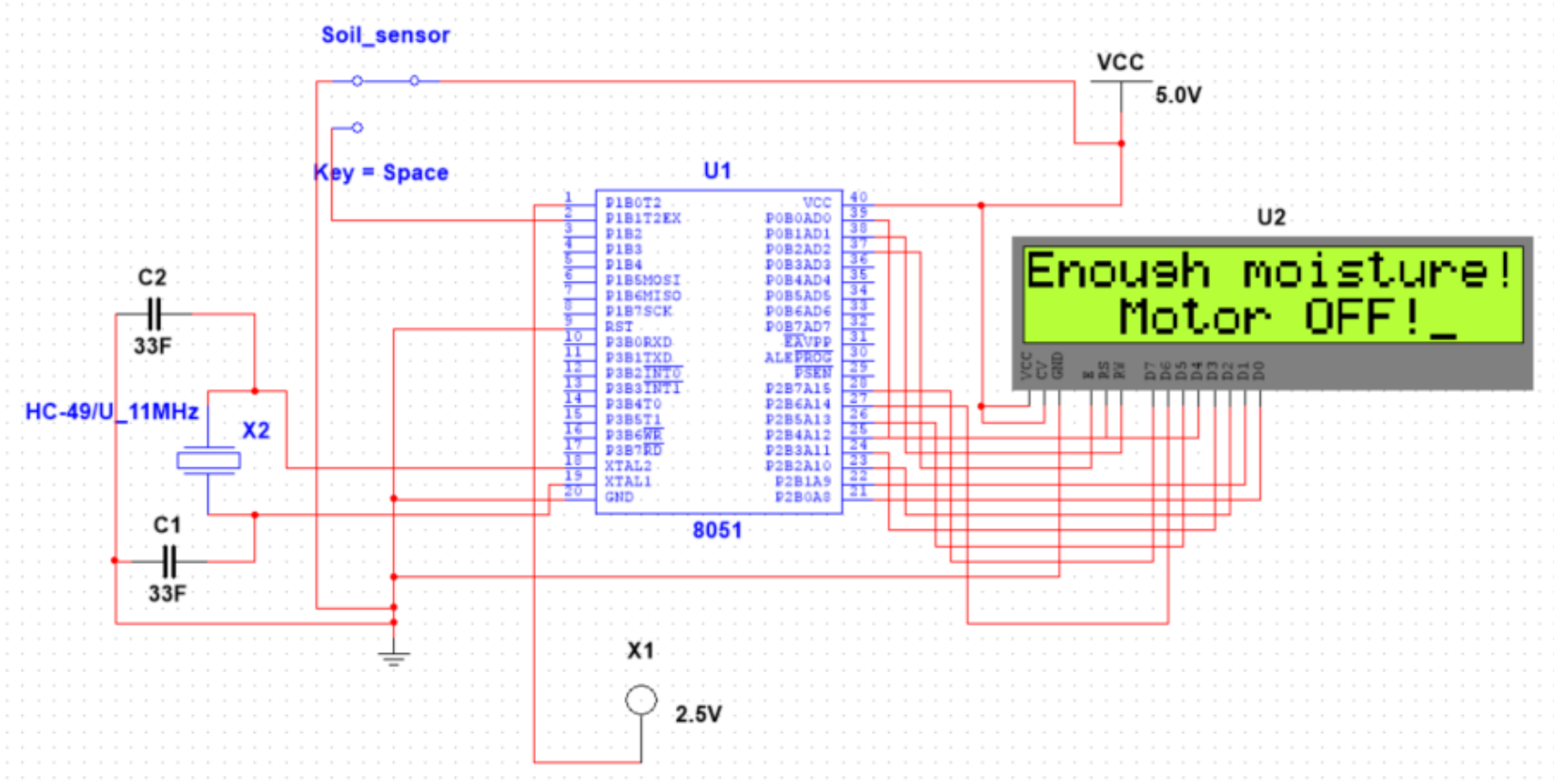

Soil_sensor
VCC
5.0V
Key = Space
U1
U2
C2
33F
HC-49/U_11MHz
X2
C1
33F
X1
2.5V
8051
P1B0T2
P1B1T2EX
P1B2
P1B3
P1B4
P1B5MOSI
P1B6MISO
P1B7SCK
RST
P3B0RXD
P3B1TXD
P3B2INT0
P3B3INT1
P3B4T0
P3B5T1
P3B6WR
P3B7RD
XTAL2
XTAL1
GND
VCC
P0B0AD0
P0B1AD1
P0B2AD2
P0B3AD3
P0B4AD4
P0B5AD5
P0B6AD6
P0B7AD7
EAVPP
ALEPROG
PSEN
P2B7A15
P2B6A14
P2B5A13
P2B4A12
P2B3A11
P2B2A10
P2B1A9
P2B0A8
VCC
CV
GND
E
RS
RW
D7
D6
D5
D4
D3
D2
D1
D0

WORKING

- For simulation, we have used Multisim 14.2 Software and Keil for writing and testing the embedded c code.
- Here a switch connected to 5v VCC acts as soil sensor during run time.
- Switch ON (1/High) denotes that soil moisture sensor senses low moisture and switch OFF denotes that soil sensor senses enough moisture.
- Based on the sensor input a LED probe(indicator) ,which denotes the water motor in our case, turns on(high) if sensor gives high input and turns off (low) if sensor gives low input to the micro-processor.
- Both the switch(Sensor) and LED (Motor) are connected to P0 port pins as input and output pins respectively.
- An LCD 16x2 screen is also connected to the MC setup. With the help of LCD interfacing in Port 1, the screen displays the status of the system i.e., whether motor is on/off, how long the motor has watered the plants etc.
- Once all components are connected we use KEIL software to run/edit the Embedded C code and get a .hex file of it. We then Input this code onto our 8051 Microprocessor and run the simulation.

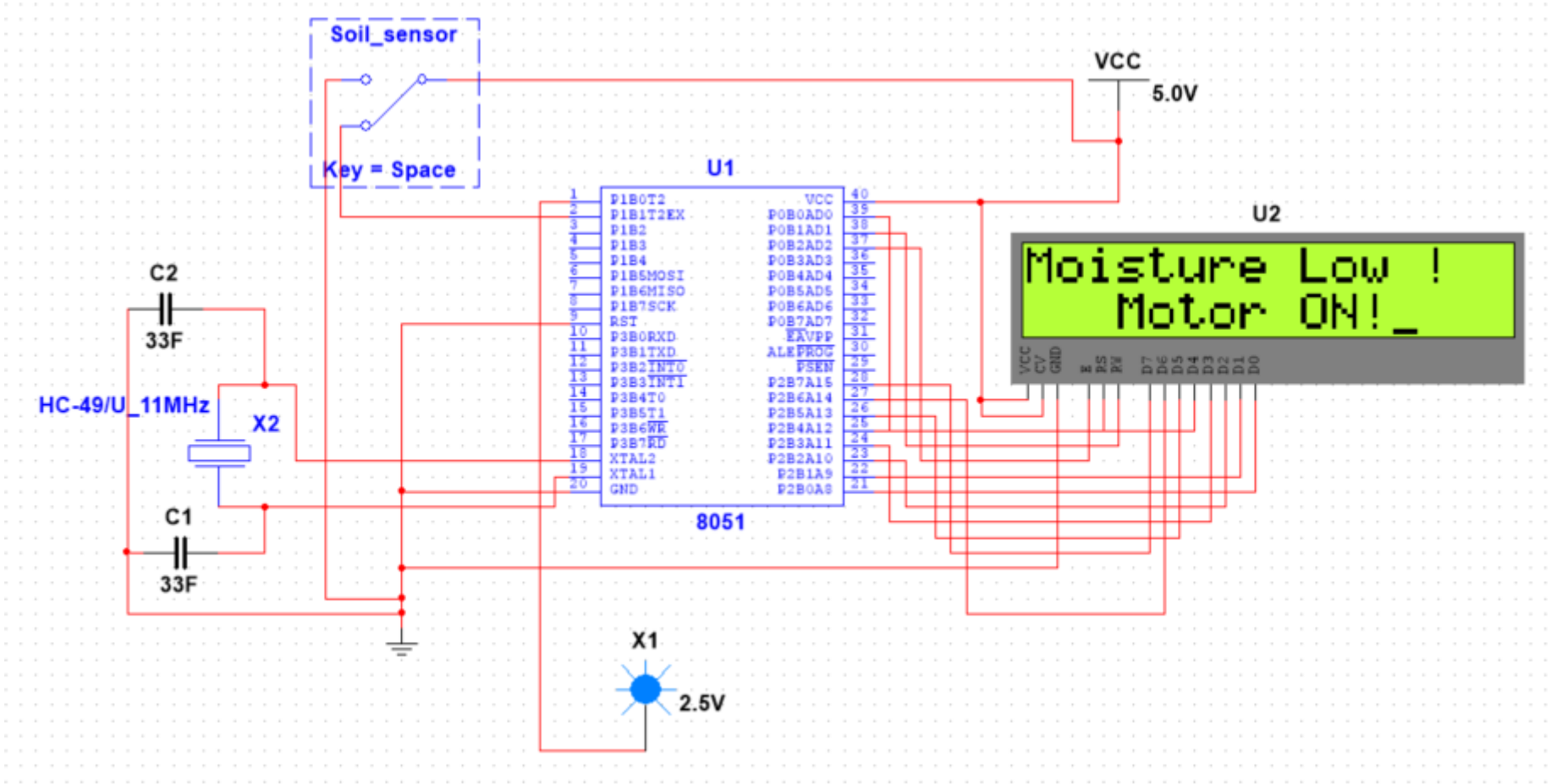
IMPLEMENTATION

- When sensor is OFF(low), meaning soil sensor senses enough moisture in soil.



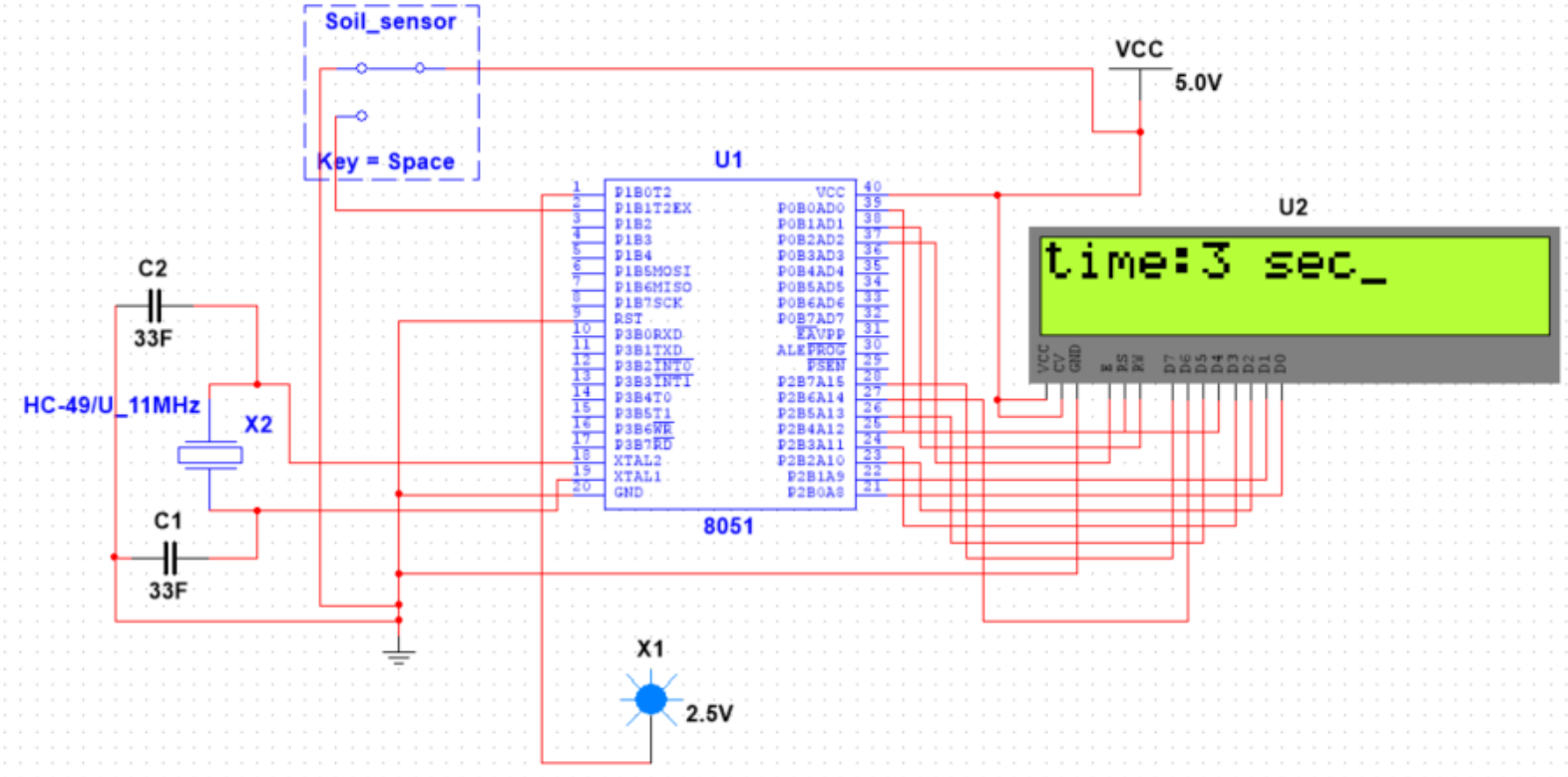
- As switch is off, the LCD displays enough moisture and turns the motor off, LED probe off.

- As switch turns on, meaning the soil sensor sensing low moisture.



- The LCD displays moisture is low and Turns on the Motor (The led ON)

- Once the Plants are watered enough, the sensor again goes back to low(OFF)



- The LCD displays the amount of time the motor watered in seconds, and then proceeds back to the sensing enough moisture phase and turns the motor (LED) off.

CODE

- In our simulation, we have used KEIL software to run the code and save the embedded c code as a .hex file.
- We start off by defining all the variable and ports/ pins we have connected our components to.

```
 5 sbit RS = P0^0;
 6 sbit RW = P0^1;          // Read/write line
 7 sbit Enable = P0^2;      // Enable line
 8 #define LCD_PORT P2      // define port
 9 sbit sensor = P1^1;      //sensor(switch)
10 sbit motor = P1^0;       //motor(LED)
11 unsigned char c;
12 unsigned char a[32];
13 int num[10];
14
```

- All functions defined in our code:

```
16 void send_cmd(unsigned char);
17 void send_char(unsigned char);
18 void LCD_init(void);
19 void delayms(unsigned int);
20 void display1();
21 void display4();
22 void watering();
23 void number(unsigned int);
24 void halt();
```

WOKING OF THE CODE

- In the Main function depending upon the sensor input we call appropriate functions. If sensor is sensing high we call the function which displays “Moisture LOW Motor ON” onto the LCD and turn the motor ON . This function runs until the sensor is turned off and then it displays the time for which the sensor was ON, meaning the amount of time in seconds that the motor was ON.
- If Sensor is sensing low we call the function halt(), the function displays “ Enough moisture! Motor OFF” onto the LCD and turns the motor OFF.

```
void main()
{

  int temp=0;
LCD_PORT = 0x00;  // Make the port as output port
sensor = 0x00;    // Make the port as output port
motor = 0x0F;     // LCD initialization
LCD_init();
display1();
  while(1){
if(sensor==1)     //Soil sensor sensing LOW moisture
{
  display4();     //displays that moisture is low
  motor = 1;      //motor ON
  watering();     //calling the function that displays watering on LCD and shows time of watering
}else if(sensor ==0)//Soil sensor sensing Enough moisture
{
  halt();         // funtion that displays enough moisture and turns motor off
}
  }
}
```

LINKS:

CONTROL+CLICK to view the content in links

- Code for the project:

https://drive.google.com/file/d/1BZrXTOThYPkqf-WJ2gTK5wX65DJ4UrjG/view?usp=sharing

- Working of simulation video

https://drive.google.com/file/d/1mC7eUkKoLGZh9tLMq8sE9wVs0VkSURjm/view?usp=sharing

THANK YOU!!