Automated plant irrigation system

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ABSTRACT

In a modern society, maintaining domestic orchards is complex, because the gardens are dried for lack of hydration. To avoid this, it is proposed to design an automatic irrigation system, which combines free hardware and software solutions, to measure moisture from land and air because they are part of the orchard ecosystem. A microcontroller was added to this solution, which acts as an operations center to ensure the supply and dosing of water to keep a plant hydrated. From the above, this solution, includes an LCD where you will see the humidity and temperature and where you can manage the irrigation time managing to minimize the work of people.

Keywords: *Plants, Humidity, Temperature, People, Microcontroller.*

https://github.com/Luis23310/Proyecto-

Introduction.

The problem that arises in this project, focuses on the low availability that people have to keep crops or domestic gardens hydrated, that is, prevent them from deteriorating due to lack of hydration. They consent that many people like to make their own crops, with ornamental plants in gardens or create vegetable planting orchards, this allows people to lower the stress level and improve health. However, maintenance becomes a problem when watering the plants are concerned, there are those who decide to hire people for the care of their gardens, others, give up time to take care of their crops, but do not keep record and end up failing control and care of them.

Clearly, there are drawbacks, when crops are abandoned for extended periods of time, sometimes plants die, from the incidence of the sun and due to lack of moisture in their roots, in addition the excessive consumption of water at the time of irrigation produces incorrect oxygenation of the plant [1]. These situations require the need to automate the irrigation process, to ensure that plants receive proper hydration, depending on the condition that forms their ecosystem, which justifies the use of the moisture sensor.

The automatic irrigation system is developed to be applied in vertical orchards. However, the solution could be applied to any type of crop, where the extent of land is not very large, that is, applied to the green areas of households. It should be considered that the irrigation system allows the recirculation of water, driven by a submersible pump, which includes a nutrient hydroponic solution [2].

The main objective of the system is to keep the plants hydrated minimizing the work of humans, through an automatic irrigation system that is managed a PIC16F15244 microcontroller that receives certain signals that report the state of humidity and temperature.

Figure 1. Dry plant

Methodology.

This work includes several methodologies, on the one hand, the traditional methodologies that enabled the approach of theoretical foundation [3] and on the other the development of software with agile methodology and finally the integration of the automatic irrigation system controlled by the microcontroller.

The design of the system was initially carried out by developing a flowchart as shown in diagram 1,°conditions were implemented es de where,, if the soil humidity is ≤ 30% Begins to water and if the temperature is 34oCthe motorwill start to cool to the correct temperature.

Models ofother irrigation systems were following, with the relevant adjustments and the needs of this objective that is to improve the hydration of the plants. Among the modifications that were implemented was the development of a software and the use of the MPLAB application with a set of humidity and temperature sensors.

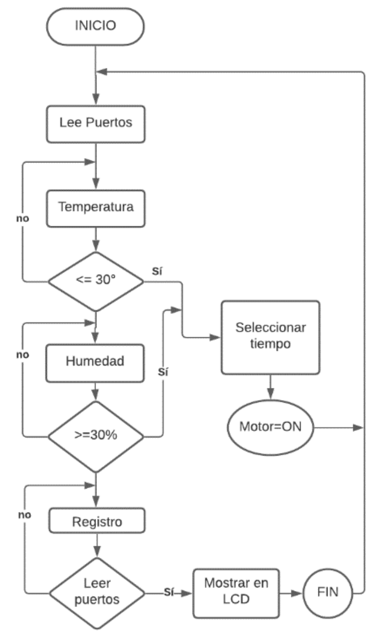

Diagram 1. Flowchart

Results.

Work was done with the MPLAB Platform to perform the irrigation control system, starting from here, an LCD was made where it was given the order to show the temperature in degrees Celsius (°C), humidity and irrigation time in seconds (S) shown in Figure 2.

```
void main()
{
    INI();
    while(1)
    {
        Boton_Aumento = PORTBbits.RB0;
        Boton_Decremento = PORTBbits.RB1;
        Boton_Aceptar = PORTBbits.RB2;

        switch(ESTADO)
        {

            case 0:

                Lcd_Command(LCD_CLEAR);
                Lcd_ConstText (1, 1, "TIMER");
                Lcd_ConstText (2, 1, "TIEMPO:");
                Lcd_ConstText (2, 11, "SEG");
                ESTADO = 1;
            break;
```

Figure 2. LCD

The implementation of the sensor was made which will help us to sensing the temperature and humidity and is located in [image 3]. Three pushbuttons were also implemented where the first represents the increment, the Second represents the decrement and the third represents acceptt, the code can be seen in figures 4, 5, and 6 found in annexes.

```
    if (channel == 0b01000000)
    {
        SENSOR1 = (VOLTAJE*100);
        sprintf(SEN1, "%i", SENSOR1);

    }

    if (channel == 0b01001000)
    {
        SENSOR2 = (VOLTAJE*100);
        sprintf(SEN2, "%i", SENSOR2);

    }
}
```

Image 3. Sensors

After finishing the respective code, the simulation of this project is elaborated in the proteus 8.9 tool and it is verified that everything runs according to the code, this simulation can be seen in Figure 7.

Annexes

```
if (Boton_Aumento == 0)
{
    __delay_ms(250);
    TIEMPO = TIEMPO + 1;
    if (TIEMPO > 60)
    {
        TIEMPO = 0;
    }
    sprintf(TIEM, "%i", TIEMPO);
    Lcd_ConstText (2, 9, TIEM);
}
```

Fiure 4. Increase Button

```
if (Boton_Decremento == 0)
{
    __delay_ms(250);
    TIEMPO = TIEMPO - 1;
    if (TIEMPO < 0)
    {
        TIEMPO = 60;
    }
    sprintf(TIEM, "%i", TIEMPO);
    Lcd_ConstText (2, 9, TIEM);
}
```

Figure 5. decrement Button

```
if (Boton_Aceptar == 0)
{
    __delay_ms(250);
    ESTADO = 2;
}
```

Fiure 6. Start Button

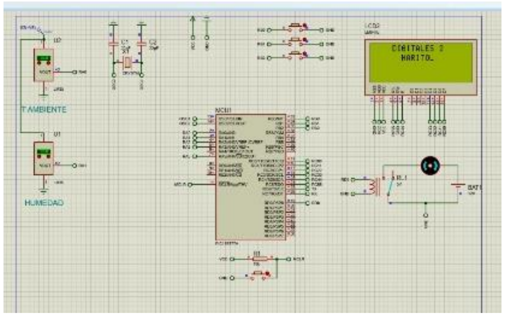

Figure 7. Project Assembly.

Conclusions

- Thanks to the results that are presented by obtaining them from the sensors, it reduces the work of farmers or peasants and helps better water management.
- The system that is implemented reduces water consumption and helps crop production as it helps reduce crop death due to lack of water. Thanks to a time, automation it helps to have a low water consumption and helps to minimize costs.
- Thanks to the advancement of technology, it helps to measure soil moisture at low cost.

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