AUTOMATIC PLANT IRRIGATION SYSTEM

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ABSTRACT

In daily operations related to watering plants is the most important cultural practice and the most labour-intensive task. No matter whatever the weather is, either too hot and cold or too dry and wet it is very crucial to control the amount of water reaching the plants. So, It will be effective to use an idea of an automatic plant watering system which waters plants when they need it. An important aspect of this project is: "when and how much to water". To reduce manual activities for the human to watering plants, the idea of a plant watering system is adopted. The method is employed to monitor the soil moisture level continuously and to decide whether watering is needed or not, and how much water is needed in the plant's soil. This project can be grouped into subsystems such as; power supply, relays, solenoid valve, Arduino GSM shield, Soil moisture sensor, and LCD .This project on the "Automatic Plant Irrigation System" is intended to create an automated irrigation mechanism that turns the valve of the pumping motor ON and OFF by detecting the dampness/moisture content of the earth. In the domain of farming, the utilisation of appropriate means of irrigation is significant. The benefit of employing these techniques is to decrease human interference and still make certain appropriate irrigation. The model consists of three stages: Firstly, sensing the land's moisture levels. The second stage is the determination of its status: dry or wet. The last and third stage is Valve control

Keywords: automatic plant irrigation system, moisture level, Arduino GSM system,

INTRODUCTION

The greatest crisis in the modern day and age is a great disparity in the agricultural sector turnover. The great losses incurred in agriculture: are material losses or financial losses – most of them are attributed to crop health and quality. If the crops are determined to be not up to par, this may result in a loss. In order to prevent this, we need to maintain the quality of crops and keep them at maximum health. On a practical basis, this is nearly impossible for a farmer who has large lands to observe and maintain. However, this is currently being managed manually. There is a danger in this; many of the labourers are preferring to work at white-collar jobs, and as a result, there is a large deficiency in manpower. This makes automated farming a necessary part of the future. The greatest cause for the crops being not on par is improper irrigation (other than natural calamities). If the irrigation issues are resolved, most of the problem is solved. Hence this is the pinnacle point that needs to be renovated with technology. Automating this part of the process will be extremely beneficial to farmers. The automated plant irrigation system will help to reduce the workload on farmers and help to keep the farmlands well irrigated at all times. Most farmers all over the world suffer to maintain their crops with proper watering methods but find themselves helpless. This system will help farmers irrigate their lands even single-handedly, without the need for additional manpower. Its simple user-friendly

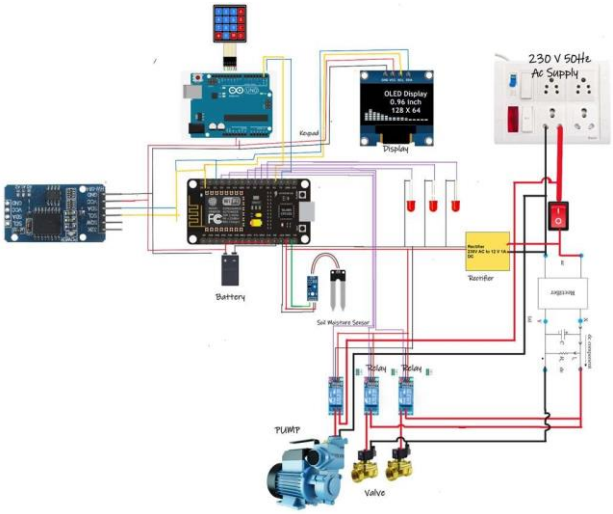
circuitry will make the user feel comfortable in using this system. The user only needs to install the circuit and sensors and connect the pump to the circuit and it's complete. The system will start functioning upon power-up and will need no trigger to keep it running.

PROBLEM DEFINITION

Nowadays, despite being an agricultural country, the number of people who die of hunger is still relatively high. Access to food seems to be difficult, as the price and quantity of food are still beyond the capability of the lower middle class and lower class. Irrigation-induced Crop failure is a major cause of crop loss every year, and in the age of water crises, this has been elevated to great levels. In order to keep up with increasing demand, farmers are required to increase crop efficiency, by rapidly advancing technologies. In order to handle Irrigation issues, this system has been devised and implemented. Usually, farmers need large-scale manpower to irrigate large lands simultaneously. However, the Automatic Plant Irrigation System (APIS) is an automatic system that facilitates automated irrigation of lands simultaneously, upon need.

METHODOLOGY

The automatic irrigation system was designed to continuously sense the moisture and temperature level of the soil. The system responds appropriately by watering the soil with the exact amount of water required and then shuts down the water supply when the required amount of soil moisture is achieved. The reference amount of soil moisture is already fed to the microcontroller beforehand. This reference soil moisture content was made to be adjustable for the three most common soil types (sandy, loamy and clayey soils).



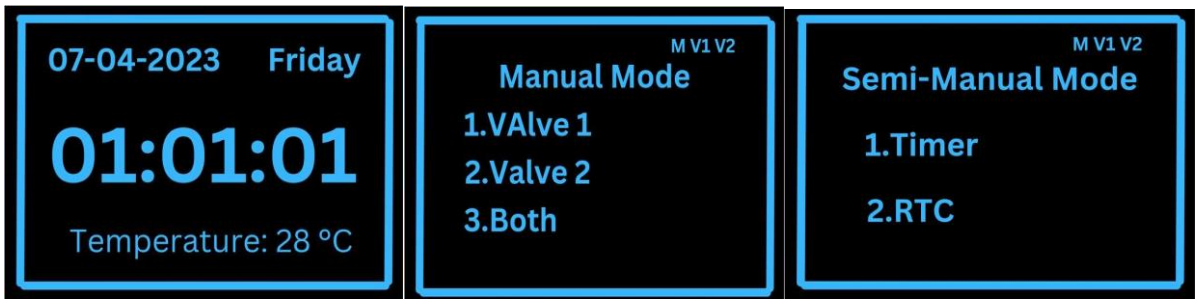
The moisture sensors and temperature sensors were designed using probes made from corrosion resistant material which can be stuck into soil samples. Voltage levels corresponding to the wet and dry status of the soil sample were computed by measuring the resistance between the moisture probes and matching them to output voltage of a comparator circuit.As shown in the figure we create connections to the solid state relays, LCD, Moisture Sensor, keypad, Arduino, and small fountain pump system, Arduino allows the pump to open or close automatically.

Home Screen: In the Home Screen You Can see the Date In the upper left corner, Today's Day on the Upper Right Corner, Real Time On the Middle, and Temperature At the Bottom Of the Screen.

By pressing the Enter button you Menu Screen will Appear.

Menu: These model have 4 modes in the menu option

1. Manual
2. Semi-Manual
3. Automatic
4. Setting



Manual Mode: In this mode valves and the motor operate manually. Users have to select the valves by pressing 1,2 or 3 buttons. .Description of button's are given In the Display.

- ➢ press 1 for operation of valve 1
- ➢ press 2 for operation of valve 2
- ➢ press 3 for operation of valve 3

by pressing 9 users will go to the main menu again and the valve and motor will turn off automatically.

Note:

- If the user selects Option 1 then the first valve 1 will open and after 3 seconds the motor will start . It is the same for all options.
- If the user presses the back button then the first motor will OFF and then the valves are going to be turned off after 3 seconds.

Semi-Manual Mode: Semi-Manual Mode contain 2 options:

1. Timer Mode.
2. Real Time Clock (RTC) Mode.

Timer Mode: In timer Mode Motor Run For Selected Time Period and Then Turn Off Automatically.

As You Enter on Timer Mode, First "H" Symbol Will Blink That Means You can Vary Hours

For Set the Hour Press "+" or "-" Button to Increase or Decrease Hour Time Respectively. By pressing Enter Button , "M " Will Start to Blink then You Can Vary minutes and the same procedure is For seconds. By selecting time Press Enter Button. The Motor Will Turn On For Your Selected Time And Then Automatically Turn Off.

RTC Mode: RTC stands for Real time control. In this mode users have to select time when they want to start the motor and period for operation. Example (If any user selects operating time for motor at 12.30pm for 20 minutes then motor will start at 2.30pm and gonna operate for 20 minutes and then it will turn off at 12.50pm. This process will continue until user changes the time venue and operating time of motor.)

Automatic Mode:

In this method soil moisture sensor is used to detect the moisture value of soil.If value of moisture goes below the threshold value then soil sensor sends command to the controller which operates valve and motor.when sufficient

irrigation is done and value of moisture goes above threshold value then again sensor send command to controller to turn off the valve and motor.

RESULT

Power Consumption:

Table Of Power Consumption:

	Motor/Valves Off	Motor/Valves ON
Voltage(V)	**220-240**	**220-240**
Current (A)	**0.5**	**2.5**
Frequency (Hz)	**50**	**50**

Impulsive Current when Motor start : 5 A
Solenoid Valves:
Voltage: 12 V
DCCurrent: 1 A
SMPS (Switch Mode Power Supply):
230 V AC → 12 DC
Digital Circuit Current Consumption:
230 V AC → 5V DC
Power Consumption Calculations:

❖ **Power consume if both motor and valve are OFF for a day :**

In working condition when both motor and valves are off then the whole circuit consumes about 0.5 A of current. then total power consumption is

Power in Ac circuit = V*I*CosΦ

here V= 230 A, I= 0.5 A, Assuming CosΦ is 0.98 then

total power Consume is: P= 230 X 0.5 X 0.98

P=112.7 Watt/Hour

so, therefore in one day model consume:

P=112.7 X 24

P=2704.8 Watt/day Approximately P≈ 2700 watt/day

so, therefore in one Month model consume:

P=2700 X 30

P= 81 KW/Month

❖ **Power consume if Motor is On for the 1 hour per day:**

Power Consumed By Motor For 1 hour:

Power in Ac circuit = V*I*CosΦ

here V= 230 A, I= 2.5 A, assuming CosΦ is 0.89 then total power Consume is:

P1= 230 X 2.5 X 0.89)

P1=574.93 Watt/Hour

Power Consume By Digital Circuit For 23 Hours:

Power in Ac circuit = V*I*CosΦ

here V= 230 A, I= 0.2 A, assuming CosΦ is 0.98 then total power Consume is:

P2= 230 X 0.2 X 0.98 X 23

P2=1036.84 Watt/Hour

so, therefore in one day total consumption is:

P=P1+P2 P=574.93+1036.84

P=1611.77 Watt/day P=1.6 KW/day

so, therefore in one Month model consume:

P=1.6 X 30

P= 48 KW/Month

Moisture level results:

After the setup was finished all of the values from the sensor were documented. Therefore, it was possible to see how the moisture level changed over time. The moisture level was checked once every hour for a complete cycle, from one irrigation to the following one. The result is presented in the graph below, Figure 5.4, where the blue line represents the moisture level and the green line marks the threshold value where watering was started.

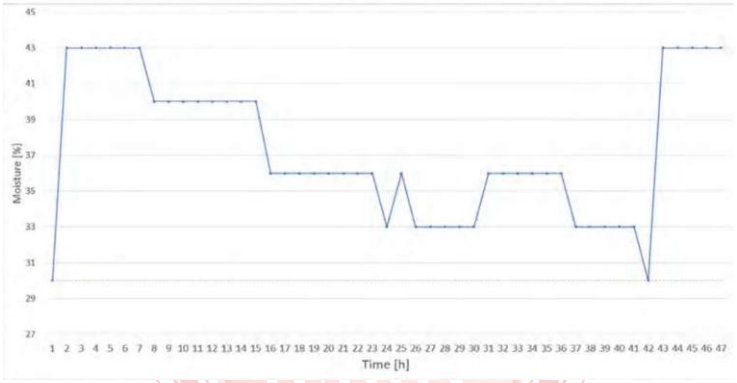


Fig: Graph showing a complete moisture level cycle

Plant Health:

A picture of the plant before the test was started is shown on the left-hand side of Figure 4.1. The right-hand side shows the plant after the four-week test. The leaves had the same colour and texture after the test. Also, there were new leaves and buds growing in the pot.

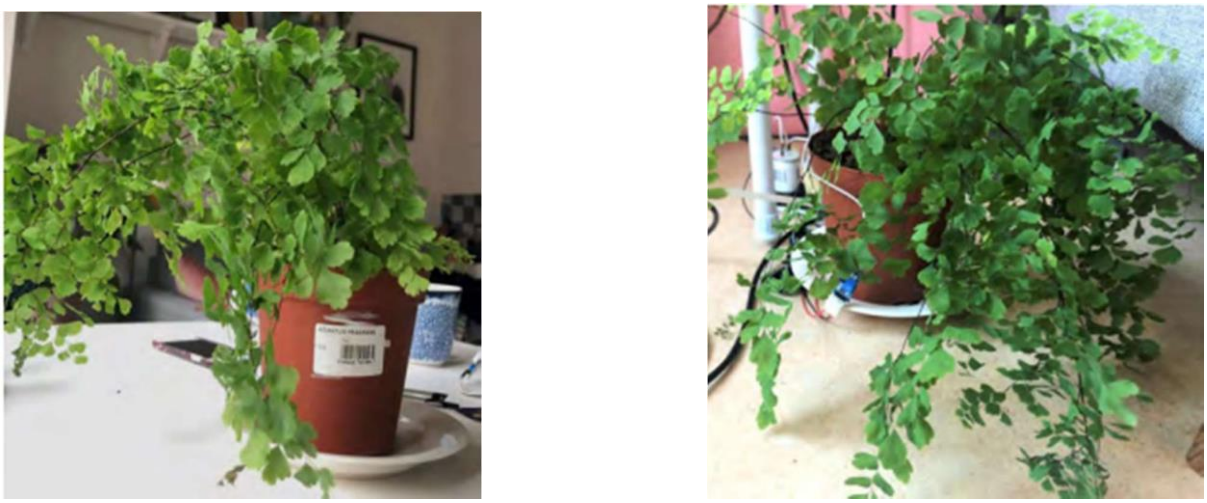


Fig :The plant, Adiantum, before the four-week test (left) and after (right)

CONCLUSION

This project on the "Automatic Plant Irrigation System" is intended to create an automated irrigation mechanism that turns the valve of the pumping motor ON and OFF by detecting the dampness/moisture content of the earth. In the domain of farming, the utilisation of appropriate means of irrigation is significant. The benefit of employing

these techniques is to decrease human interference and still make certain appropriate irrigation. The model consists of three stages: Firstly, sensing the land's moisture levels. The second stage is the determination of its status: dry or wet. The last and third stage is Valve control.The Project helps to reduce the wastage of water occurring during manual operation and provide flexible operation features like Automatic,Semi-Automatic and Manual mode.Also it consist feature of real time control in which user can select venue and operation time according to their need. Appropriate irrigation scheduling should lead to improvements in yields and incomes, result in water saving and, in turn, increase the availability of water resources and should have a positive impact on the quality of soils and ground water. From this work, we can control the moisture content of the soil of cultivated land. According to soil moisture, the water pumping motor turned on or off via the relay automatically. This saves water, while the water level can be obtained in a preferred aspect of the plant, thereby increasing productivity of crops.

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