Automated Plant Watering System

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***Abstract* — Daily actions related to farming or horticultural irrigating are the most important practice and the most labor-intensive task. No matter the weather it is, either too scorching and dry or too overcast and rainy, you want to be able to control the amount of water that reaches your plants. Up-to-the-minute watering systems could be effectively used to water plants when they want it. But this manual process of watering requires two vital aspects to be considered: when and how much to water. To replace manual activities and making gardener's work easier, we have created an automatic plant watering system. By adding an automated plant irrigating system to the patch or agricultural ground, you will help all of the plants spread their fullest potential as well as preserving water. Using sprinklers drip emitters, or a combination of them together, we have designed a system that is perfect for every plant in the yard. For the operation of an automatic plant watering system, we have used a combination of sprinkler systems, pipes, and nozzles. In this paper, we have used the ATmega328 microcontroller. It is planned to sense the dampness level of plants at a specific instance of the period, if the moisture content is less than the specified threshold which is predefined according to the particular plant's water need then desired amount of water is supplied till it reaches the edge. Generally, floras need to be watered two times a day, before noon and evening. Thus, the microcontroller is set to water flowers two epochs per day. The system is planned in such a way that it reports its current state as well as reminds the user to add water to the tank.**

Keywords: microcontroller, plants, farming, yard, water, sprinklers.

I. INTRODUCTION

Irrigation is the artificial request of water to the land or soil. It is secondhand to assist in the growing of agricultural yields, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall [i]. When a zone comes on, the water flows/passes through the lateral lines and eventually ends up at the irrigation emitter (drip) or sprinkler skulls.

Numerous sprinklers have pipe thread inlets on the lowest of them which lets a fitting and the pipe be attached to them. The sprinklers are usually fitted withthe top of the head flush with the ground surface. When the water is pressurized, the head will pop up out of the ground and water the desired area until the valve closes and shuts off that zone. Once there is no more water pressure in the lateral line, the sprinkler head will retract back into the ground. Emitters are generally laid on the soil surface or buried a few inches to reduce evaporation losses. Vigorous plants can transpire a lot of water, resultant in an increase in the humidity of the greenhouse air [i]. High relative moisture (above 80-85%) ought to be avoided because it can raise the incidence of disease and reduce plant transpiration. Adequate venting or successive heating and uttering can prevent condensation on plants surfaces and the conservatory structure.

The use of conserving systems during the warmer seasonal months increases the greenhouse air dampness. During periods with warm and humid open-air conditions, humidity control inside the greenhouse can be a test. Greenhouses located in dehydrated, desert environments benefit greatly from evaporative cooling systems since large amounts of water can be evaporated into the inbound air, resulting in significant temperature drops [ii]. Since the relative humidity alone does not tell us anything about the absolute water holding capacity of air, a different measurement is sometimes used to describe the absolute moistness status of the soil.

The vapor pressure deficit is a measure of the difference between the amount of moisture the air contains at a given instant and the amount of moisture it can hold at that temperature when the air would be saturated [ii]. Pressure deficit measurement can tell us how easy it is for plants to transpire: higher values arouse transpiration (but too high can cause wilting), and lower values inhibit transpiration and can lead to condensation on leaf and greenhouse shells. In the mid-20th century, the beginning of diesel and electric motors led to systems that could pump groundwater out of major aquifers faster than drainage sinks could fill up them [ii].

This can lead to the eternal loss of aquifer size, decreased water value, ground subsidence, and other complications. Separately from all these problems and disappointments, there has been a considerable evolution in the approaches to perform irrigation with the help of experts. The application of technology in the areas of irrigation has provedto be of great help as they deliver efficiency and precision.

II. PROBLEM STATEMENT

During day-after-day activities, myriad folks typically forget to water their plants and therefore it becomes challenging for them to retain their floras healthy and flourishing. Also, it’s a challenge for farmers to sustain their fields and manage the watering of plants despite a scarcity of water. Supported on the above background, we have a tendency to the thought that it’s necessary to tool the machine-driven system which can beware of plants considering all the different aspects of the home horticultural system (for a system based on household purpose) as well as larger scenery (for the system based on agricultural farms) and helps them to grow healthy.

III. PROPOSED IDEA

There are two functional mechanisms in this paper. They are moisture sensors and motor/pump. Arduino board is programmed using the Arduino IDE software. A humidity sensor is used to detect the soil moisture content. Motor/pump is used to supply water to plants [ii]. Soil moisture and temperature-programmed range are set particularly for specific plants requirement, and according to that system is being operated. Both humidity and temperature sensor are connected to the controller's input pin. Pump and servo motor coupled to the output pin. In the case of soil, moisture value is less than threshold system automatically triggers water pump on till sensor meets the threshold and then sets off automatically [iii]. The overall activity is reported to the user using the mobile application.

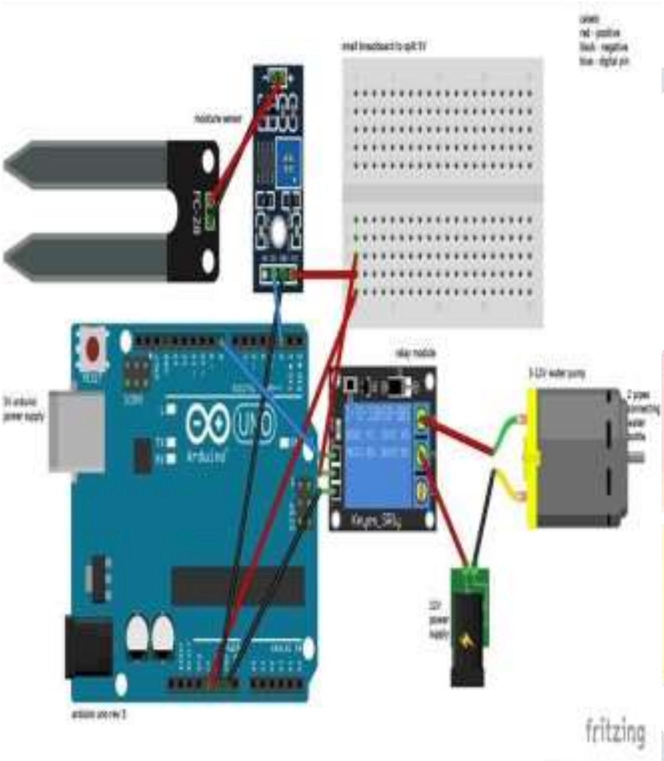

Fig. 1: Circuit Diagram of Proposed System.

A. Detecting Moisture Content:

This will be conquered by a soil moisture sensor. They are coupled to an Arduino microcontroller board. Arduino board is programmed employing the IDE software. Humidity device senses to indicate that the plant needs watering humidity levels in the mud, and guides the signal to the Arduino[iii].

Fig. 2: Block diagram of Automated Gardening System

B. Automatic Watering to The Plant and User Notifications:

On receiving a logic high indication, Arduino will alert the user by turning on the first buzzer. In this work, we have used an Arduino microcontroller in blend with a relay control switch to control the motor and overall functioning. The Motor may be driven by an external 9V battery with interfacing to a microcontroller [iii].

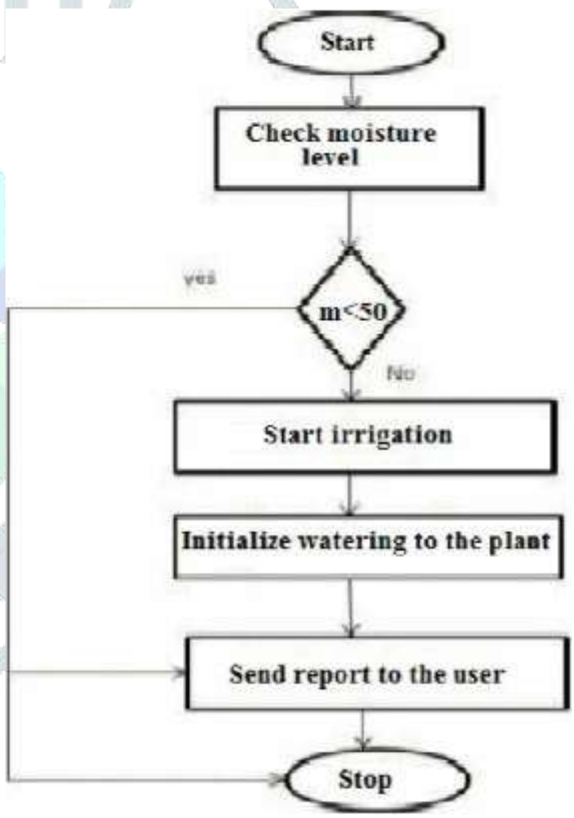

Fig. 3: Flowchart of Automated plant watering system

IV. COMPONENTS USED FOR IMPLEMENTATION OF SYSTEM

A. Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, 16 MHz ceramic resonators, USB connections, a power jacks, an ICSP plug, and a reset button [iii]. It contains everything needed to support the microcontroller; simply use the USB cable or power it with an AC-to-DC adapter or battery is connected to a computer begins [iii].

Fig. 4: Arduino Uno

B. Moisture Sensor

Soil moisture sensor measures the soil water content. Soil moisture probe comprises a plurality of soil moisture sensors. Soil moisture sensor technology, commonly used are:

i. Frequency domain sensor, such as a capacitive sensor.
ii. Neutron moisture meter, characteristic of the usage of water in the neutron moderator.
iii. Soil resistivity. In this actual project, we will use soil moisture sensors that can be inserted into the soil to portion the soil moisture content

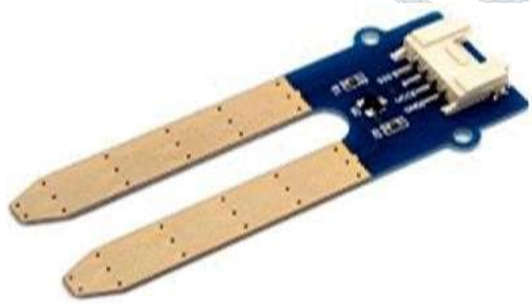

Fig. 6: Moisture Sensor

C. Water Pump

Water is cast-off to perform a specific task of artificially pumping. It can be measured by an electronic microcontroller. It can be only promoted by sending the signal and turned off as needed. The non-natural process is called Water Pumping Station. There are many varieties of pumps. This project uses a small pump linked to the H-bridge [iv].

Fig 5: Water pump

D. The Relay Module

Relay is an electrically operated switch. Many relays for switching solenoid mechanism mechanically operated, but can also be used for other principles of operation. Relays are widely used in early computers to telephones and perform logical operations [iv].

E. Arduino IDE Tool

Arduino open-source environment, you can easily write code and upload it to the 110 board. It works on Windows, Mac OS X, and Linux. The environment is written in Java, and rendering to the processing, AVC-GCC, as well as other open-source software's [iv].

V. PROPOSED METHODOLOGY

A. Build System Relay

We created connections to the solid-state relays, Arduino, and small fountain pump system, Arduino permits the pump to open or close automatically. A banded cut through the inner tube of the pump segment insulated wire, only half. Fix the new cut wire, there are two output relays at both ends and placed on the bare electrical tape. Finally, the ground relay is linked to the Arduino ground and also relay input to the Arduino digital pins [iv].

B. Build up System Reservoir

The submerged pump supplies the desired amount of water needed by the plant to work properly. To automate this process, we use a float valve, which you need to open whenever needed, close the connection when the water level rises, and water hoses. Drilling is high enough to ensure that the float valve chamber, sufficient to accommodate the width of the tank float [3].

C. Build System tubing and connect

Connection to the plastic lob provender pumps and drilling small holes through the water droplets. This is all of the trunk circuit [v].

D. Code

An automated plant watering system is programmed using Arduino IDE software. Arduino microcontroller checks soil moisture level, if low, triggering a water pump until sensor reaches threshold [iv]. Later, the structure will re-check the soil moisture between periodic intervals to see if you need more water. If the liquid in the initial inspection, no water or comment, the system waits 24 hours and repeats the process.

VI. RESULTS AND DISCUSSIONS

From this effort, we can regulate the moisture content of the soil of sophisticated land. Conferring to soil moisture, water driving motor turned on or off via the relay automatically. This keeps water, while the water level can be obtained in a chosen aspect of the plant, thereby increasing the productivity of crops [v]. Servo motor from vegetation water homogeneously dispersed in water, to guarantee the maximum utilization of absorption through. Thus, there is a negligible waste of water. The system likewise allows the delivery to the plant when desirable based on the type of plant, soil moisture, and observed temperature. The anticipated work minimizes the efforts of major agricultural regions. Many aspects of the system can be customized and cast-off software to fine-tune the requirements of the plant [v]. The product is a scalable, supporting technology. By means of this sensor, we can see that the soil is wet or dry. If it is dry, the motor will repeatedly start pumping water.

VII. CONCLUSIONS

An involuntary system using a microcontroller, moisture sensor, and other electronic tools have been developed. It is observed that the wished-for methodology controls the moisture content of the soil of cultivated land. The motor automatically jolts pumping water, if the soil is dry and needs water and stops when the dampness content of the soil is preserved as required.

VIII. REFERENCES

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