Smart Irrigation System in Biophilic Buildings

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Abstract -***This paper primarily focuses on how people's physiological and psychological states can be influenced by architectural design, which is an extension of the biophilic relationship to nature. Establishing an environmentally friendly setting enables us to enhance human and nature interactions to a better extent. By keeping the plants healthy as well, it accentuates the higher human health rates keeping in mind the social and economic sciences.***

Keywords-Arduino Uno, Embedded C, Soil Moisture Sensor, 5V Relay, Water pump

INTRODUCTION

How is the idea of designing homes with plants & greenery all around? Interesting right! Where you can sit and breathe with plants & feel the beautiful essence of nature. But to experience this we need to care, nourish our plants regularly which is a quite impossible thing to be done nowadays. It is due to the occupied working schedules of each one of us in our day to day lives. This will lead to improper watering of plants and due to which plants may wither and perish.

Despite the fact that plants require very little care and may be left alone for lengthy periods of time, extended trips lasting a week or longer can be detrimental to the health of our plants owing to the absence of moisture in the soil. In an effort to solve this problem, we are developing an autonomous irrigation system utilizing the Arduino UNO. The use of intelligent irrigation systems in biophilic structures is a fantastic way to improve relationships between people.

Biophilia explains human nature relations and focuses on people's mental & physical health with their wellbeing. In our project we are developing a structure which will automatically irrigate the plants & keep them healthier. This project emphasizes on managing the natural resources, reducing the wastage of water and also maintaining environment friendly relations.

The result of which plants will always be healthier & greenery will always be maintained in the surrounding. Also stress free mindsets, human productivity with relaxation and positivity can be established.

LITERATURE REVIEW

Review 1:-

Jana Soderland and Peter Newman are the authors of a review of the "Biophilic Architecture" theory and findings. It was published in the Journal of Environmental Science on December 10, 2015. It can be summed up as a link with our fundamental human nature supported by sound human physiological and psychological evidence. It suggests that strengthening relationships between people will have favourable financial results as well as a strong theoretical foundation.

Review 2:-

"IOT-enabled smart agriculture." Unnati Mundra and Sweksha Goyal are the authors. On May 5, 2019, it appeared in the International Journal of Computer Science and Mobile Computing. It discusses IOT-based smart agriculture and how it can detect obstacles as well as moisture, humidity, and temperature. This value can be utilised to automate the process of agriculture and carry out necessary actions in an efficient and effective manner.

Review 3:-

A study on a smart irrigation system that uses IOT to enhance the beauty of a crop field. Author Ashwini B.V. published it in the International Journal of Engineering and Technology. The research article shows how using the WS and GPS modules along with a data mining technique improved crop yield and decreased crop waste.

Review 4:-

Automatic irrigation system implementation. The writers are Dr. V. Berlin Hency and U. N. V. P. Rajendranath. It appeared in the 2015 edition of the International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS).

By connecting sensors to a microprocessor, the ARDUINO board was used to build the automatic watering system.

Solar cells can be used to power the entire system, keeping maintenance costs down.

METHODOLOGY

The proposed system is designed to automate the irrigation process in a plant. The system's core concept is based on a moisture sensor that detects the soil's moisture level. Whenever the sensor detects a low moisture level in the soil, it triggers the water pump to start, which is controlled by a microcontroller.

The moisture sensor used in the system is a reliable and precise sensor that measures the soil moisture level continuously. The sensor is connected to the microcontroller, which processes the moisture data and makes decisions on whether to turn on or off the water pump. The microcontroller receives the signal from the moisture sensor and compares it with a predefined threshold value. If the moisture level falls below the threshold value, the microcontroller sends a signal to the water pump to start irrigating the plant.

Once the water pump starts irrigating the plant, it continues until the soil has received sufficient water. The moisture level in the soil increases, and this is detected by the moisture sensor. The microcontroller receives the updated data from the sensor and compares it with the predefined threshold value. If the moisture level reaches the threshold value, the microcontroller sends a signal to the water pump to stop, and the system goes into standby mode.

This system's primary advantage is that it conserves water by only irrigating the plant when it's necessary. It also ensures that the plant receives the appropriate amount of water, which helps prevent overwatering and under watering. Additionally, the system is easy to install, operate, and maintain, making it an ideal solution for individuals and businesses looking to automate their plant irrigation process.

Figure 1- Set up for Automatic Irrigation System.

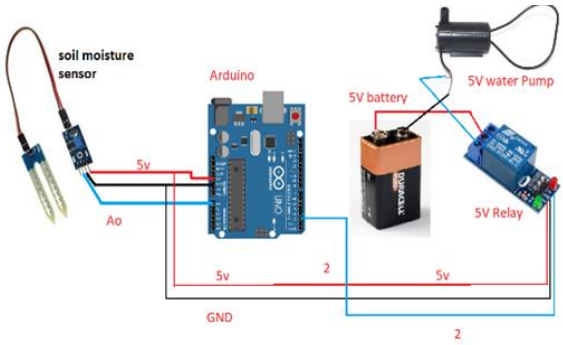

Figure 2- Circuit Diagram for project.

Soil moisture sensor:

Understanding how the soil moisture meter operates is very simple. It has two exposed probes whose resistance fluctuates according to how much water is present on earth, functioning as variable resistors.

Due to the inverse relationship between this resistance and soil moisture, more water in the soil causes an increase in conductivity and, as a result, a decrease in resistance. Less water in the soil causes poor conductivity, which increases resistance. Based on impedance, the sensor generates an analogue voltage.

An electronic module that links the probe to the Arduino is included with the sensor. An LM393 High Precision Comparator is used to connect the module's digital output—which is created by turning the analogue signal into a digital output—to the microcontroller.

Pump:

A small pump is needed to irrigate the plant, but a larger pump that can supply more water is needed to irrigate a garden; this pump cannot be directly powered by an Arduino. Consider the situation where you need to operate a larger pump and require a driver to provide enough current for the pump in order to illustrate the need for a 5V relay. A suitable relay and an AC-powered pump

are further choices. Simply replace the DC power input of the relay with an AC power input before utilizing a different DC power source to power the Arduino.

TESTING

The entire circuit, minus the pump and sensor probe, was then put in a plastic box after the code had been uploaded to the Arduino. Now insert the soil moisture sensor. For greater accuracy, position the sensor as near as possible to the plant roots. The last step is to place your irrigation system's engine in a water-filled container, and it will be ready to care for your beautiful plants even if you aren't there. Depending on the plant, you may need to adjust the moisture percentage before starting and stopping the pump.

RESULTS

The device automatically waters the plants, which maintains their health. If the water level is higher, it also takes the appropriate safety measures and instantly ceases watering. As a result, water waste is also prevented.

FUTURE SCOPE

"Biophilic design" is a great concept for creating communities that value environmental sustainability and technology utilization. The greatest benefit of this effort is that it will spread people's love of the outdoors and the natural world.

A clever irrigation system will ensure that the plants are always healthy, directly influencing human productivity and manner of life.

CONCLUSION

A "Smart Irrigation system based on soil moisture" has been created and tested using Arduino. It was created by fusing all the benefits of the hardware elements that were employed.

The system's ability to function independently has been evaluated. The moisture sensors gauge how much moisture the various plants contain (or moisture level). The moisture sensor transmits a signal to the Arduino board, which then activates the water pump and supplies water to the appropriate plant if the moisture level falls below the required and advised level.

The system automatically switches off and the water pump is turned OFF when the proper moisture level is attained. As a result, the system has been put through a lot of testing and is thought to be trustworthy.

REFERENCES

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