Terrace Garden Monitoring System Using Wireless Sensor Networks

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Abstract

Terrace Gardening is concerned with growing plants at home or in the greenhouse. Terrace Gardening is becoming very popular among urban residents. With the advancement of technology, the world is being automated. Automated Systems are favoured over the manual system. Automated System reduces manual labour and is energy efficient. In this system, it is proposed to develop an Automatic Terrace Garden Monitoring System. The objective of this system is to provide a water delivering schedule. The proposed system ensures that plants should have enough water for their growth. The suggested system uses Wireless Sensor network, which reduces human effort. This project modernizes the current traditional methods of gardening. Sensors like moisture and temperature are used to get data about the plants and help to take a precise decision. Interfacing sensors, Wi-Fi, Arduino, will implement the operations. All the operations will be regulated by a remote smartphone.

Keywords: *Wi-Fi,Arduino,Wireless Sensor Network*

I. INTRODUCTION

Traditional Gardening requires human interference and time. Due to modernization and urbanization, people are getting busy day by day. Due to this spending, an attentive amount of time to maintain a garden at home becomes difficult. Nowadays there is a need for automation in gardening due to lack of resources like manpower, water and time. As people are in short of time and resources, the recommended system provides automated water delivering schedule. This system saves time and makes life easy. In addition, it promotes gardening at home. The significant perk of Indoor gardening is that plants aid in air filtration. Plants take in CO_2 and produce oxygen. Having plants around will enhance the quality of the air you breathe. Thus, by using Wireless Sensor Network, this system helps to manage a healthy environment at home & will help to build a good eco-system.

The Internet of Things (IoT) implies the use of cleverly related devices and structures to utilize data collected by embedded sensors and actuators in machines and other physical things. [1]. Using the concept of IOT we make sensors to communicate with each other, which are powerful in automation [2]. The aim of this system is to demonstrate the automatic garden watering system. This system consists of a distributed wireless network of soil moisture, temperature [3]. The recommended system required sensors, Arduino and pipe to supply water from a tank. These sensors send their data to the Arduino to examine and make a decision. Water framework essential depends upon soil properties like moistness and temperature and the kind of yield, which is produced in the earth.

II. LITERATURE REVIEW

V. Pandiyaraju et al [1] According to the authors, in the conventional agricultural systems, the farmers used to have their agricultural lands far from their residential areas, so in order to get optimal growth, they use growth supplements. Fertilizers and Pesticides being the major supplements of growth are used negligently and therefore results in poisonous vegetables.

The approach thus led by them was to apply the concepts of terrace gardening technologies for growing plants organically. The main intention of their project was to control the moisture in soil beds to conserve water and electricity. They proposed the idea of a smart roof based design to fulfill their objective, where they made a smart roof from polycarbonate sheets with a supporting frame and rotatable with the aid of motors. The temperature and moisture sensor is attached to the smart roof inside and outside and used continuously at frequent intervals to monitor the moisture contents

of the soil bed. This Hardware (motors and sensor units) are controlled by the Smart Gardening Control Unit (SGCU) and this operates automatically to activate the sprinkler based irrigation system.

The above work is used in an experiment where they chose two sites. One site was equipped with conventional terrace gardening systems and others with their proposed smart system. Based on the readings obtained by SGCU they formed a fuzzy based intelligent rule set. As the amount of water evaporated from the soil-bed is directly proportional to the heat absorbed by the soil-bed. The results show that they were able to control a significant amount of soil moisture loss.

The drawbacks in the system are the complexities involved in the system by the introduction of more hardware nodes and motor based roof design. As their objective was to promote their system to people in the city area, Most people will not have optimal arrangements or home design to support the setting of the system into their homes.

According to N Seenu et al [2] This paper on android based intelligent irrigation system is implemented based on the idea of remote monitoring where the presence of human intervention is not necessary. The project is based on an intelligent microcontroller based irrigation system controller.

The implemented to (remotely irrigate a field by an operator) was to design an irrigation controller through a mobile app to promote remote practices and use of fuzzy logic and neural networks supported by the hardware nodes present in the fields and several parameters that are to be selected on the basis of the stage of the crop.

The Implemented consisted of soil moisture to measure the amount of moisture in the soil and with the temperature sensor, it is interfaced with an Arduino Microcontroller. According to the sensor readings thus obtained on the mobile app, the controller will evaluate the decision and the Motor will be activated through a mobile phone and the water will be delivered from the pump through a relay.

The Key findings from this paper (that can help in developing our project) are that use of manual/automated method for delivering water with the aid of an android app.

Vaishali S et al [3] About 85% of the total available water resources around the world are solely used for irrigation purposes. The traditional methods of irrigation such as overhead sprinkler and flood type are not that efficient. This paper proposes a mobile integrated, IOT based smart irrigation system based on application controlled monitoring system.

The problem, for which they proposed solution consists of raspberry pi, water pump, moisture and temperature sensors for communication. The water required to irrigate the field is decided on the different stages of plant growth. The entire system is communicated via the Bluetooth network.

Their system has a scalable design and easy to use but the communication protocol they used for the system is Bluetooth which is low in range and therefore restricts its range of operation.

P. Lashitha, et al [4] proposed a system in which hardware is interfaced with all the sensors in the board. The sensors give input to the controller and the farmer receives the data on the cloud platform in detail. Test results show that the hardware can be controlled remotely using wireless network technology. The implemented system tries to mitigate the primordial techniques related to agriculture. It will help the farmer to monitor more than one land at the same time. Monitoring through this system requires limited manpower, people with physical disabilities can be hired for monitoring fields.

T.Thamaraimanalan, et al [5] IOT provides solutions for various problems and it allows things to be sensed or controlled remotely in network infrastructure. This prototype will help people to automatically monitor the parameters and ensures the maintenance of the garden. With the development of sensor technology, the system can be elevated to the next level which helps the users to utilize their investment in a budgetary manner. A number of plants are being damaged each and every day for the urbanization process. The main intention of this project is to maintain the nature of the plants leading to the prolonged life of both plants and human beings. The feedback provided by the system will improve the implementation of the gardening process.

According to Sandhya.B.R, et al [6] Nowadays, utilizing an optimized garden watering system has become fundamental due to the lack of water resource.

The recommended system propounds a design for garden watering based on an android application using Raspberry Pi 3. Depending upon the moisture level of garden and sunlight intensity, the system can detect the appropriate time of water supply to the plants and trees in the garden.

III. SYSTEM ARCHITECTURE

Irrigation in India to a maximum extent is dependent on the monsoons, which is also a substantial source of water.

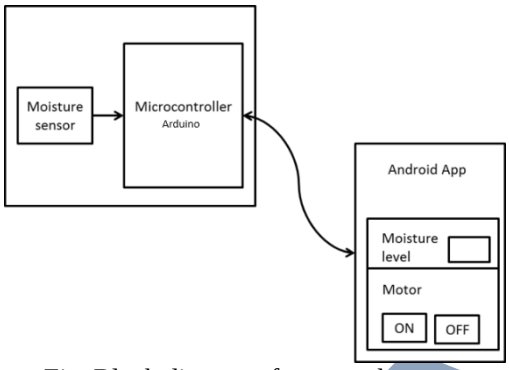

Fig: Block diagram of proposed system

Depending on the soil type, plants are to be provided with water through a conventional irrigation system. Moisture sensor is interfaced to Node MCU. Moisture is sensed by moisture sensor and then data of moisture level is fetched by microcontroller i.e. node MCU. Values of moisture of soil are transferred to android app via Wi-Fi. Android app allows user to control the motor when moisture goes below threshold value. Like one node shown in above figure, we are using five nodes, which will be placed on 5 different places.

SENSORS: Sensors are the devices which convert the physical parameter into the electric signal. The system consists of

- Soil moisture sensor - used to measure the moisture content of the soil.
- Temperature sensor - used to keep record of the temperature in the environment.

ARDUINO: Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button. The Moisture sensor is interfaced to Arduino. Moisture is sensed by moisture sensor and then data of moisture level is fetched by microcontroller.

DC MOTOR: DC motor in simple words is a device that converts direct current (electrical energy) into mechanical energy.

Android Application: The android application is the mobile operating system installed in the user smartphone. A remote user can monitor and control the garden from its Android application and communication is done via locally or remotely. When the threshold value of the sensor reaches the maximum level, the android application for smart home automation system instantly alerts the user to remotely monitor the garden.

IV. CONCLUSION

In this paper, we presented the architecture and the implementation of a smart terrace garden monitoring system. The system consists of two types of sensors that are moisture sensor and temperature sensor, electric motor and an application that is used for data collection. The objective of this system is to provide a water delivering schedule. The proposed system ensures that plants should have enough water for their growth. Thus this system aims to support a terrace garden. The system is low maintained and economical. Also, it is very easy to use and saves a lot of time by reducing human efforts. The drawback of this proposed system is that the sensors we have in the suggested system are still unable to accurately measure the moisture properties of sandy soil due to its large particle size and also since there will be different species of plants in the garden the sensor is not calibrated properly for each plant and its soil properties. All sensors monitor the environmental condition and according to these conditions Arduino takes its decision. The motor will be turned OFF if it's raining outside or moisture of soil is more or adequate.

V. REFERENCES

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