IOT Based Smart Temperature Sensor For Home Balcony Garden

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Abstract- *In an agricultural country like India a lot of people will work with green thumb in mind. Most of the people loves to grow plants at home, but due to their work schedule they won't often take care of plants. The only solution to this problem is smart monitoring of the plant growth by modernizing the current traditional methods of gardening. Hence the proposed system targets at smart way of monitoring the plant growth using automation and IoT technologies. Internet of things (IoT) provides various applications for crop growth and monitoring the growth conditions. Main theme of this project is to increase the plant growth condition by maintaining the suitable moisture level and temperature with the use of moisture sensor and temperature sensor. This project works for the crop development at low quantity water consumption by providing an automatic watering system to the user. People often waste lot of time for watering the plants so an efficient management of water should be developed. The proposed system will work based on the information send by the sensors and so proper growth for the plant will be estimated. With the help of the moisture sensor and temperature sensor details like moisture content and the temperature will be obtained and so based on those reading automatic watering will be done. The major advantage of this system is to make a suitable environment for plant growth and also to minimize the water consumption.*

Keywords- IOT, sensors, smart monitoring, Balcony Garden, NodeMuc

I. INTRODUCTION

Automation is a technique of using computers or mobile phones in monitoring and controlling the simple parameters of day to day life. The standard of our life will be nourished by the practice of using automation for simple things. Using the concept of IOT, we make sensors to communicate with each other which are powerful in automation. When people try to make plantings and set up their own garden, they are cautious in maintenance only in their beginning stages. As days go, on due to lack of maintenance the plants get destroyed.

This project will help people to automatically monitor the parameters and ensures maintenance of the garden. IOT provides solutions for various problems and it allows things to be sensed or controlled remotely in network infrastructure. Plants are considered to be the major source of the survival and helps to purify the air filled with pollutants. Many feel responsible to plant a tree and some consider it as a hobby. planting a tree is not just burying a seed ball in the soil, it has many factors to be considered. Some plants need more care for an efficient growth. There are some plants which are grown only for showcase purposes and homemade agriculture. The required environment must be provided to the plant and should be watered time to time to make the photosynthesis to happen. We also know that one kind of soil or nutrient is not sufficient to all the plants to grow better. Each plant has its characteristics to gain a high yield. To overcome all these problems, we are going to set a monitoring machine. This can be defined as a system which monitors the growth proving a suitable environment. This type of system can be created with the help of Internet of Things (IOT).

1.1 Background History

Nowadays, The Internet of Things (IoT) plays a vital role in our daily life. Rajkumar, Abinaya and Kumar (2017) also indicated IoT as a new wave of information and communication technology (ICT) advancements. Basically, it is a concept of connecting one device with another devices through Internet connection. There are a lot of invention from various industries such as agriculture industry that implement IoT in their system. Irrigation management is one of important factor in agriculture especially for the farmers to increase the cultivation in a way the plants need. By implementing IoT technology, the crops or plants can be monitored and managed simultaneously and all the data will be transmitted to farmers which have precise controlling decision for their crops.

1.2 Problem statement

Presently, the household are using manual irrigation methods to water the plants in their backyard which are using watering can or garden hose. This methods consume a lot of energy and more time spent. An optimum condition of soil

moisture, and balanced supply of water are necessary for a healthy plant. Human factor will cause over-watering or under-watering of plant because they tend to pour the water without giving them the right amount. Thus by having a proper technique and right amount of water through remote monitoring will ensure the growth of plants. Other than that, using manual methods they shall promote the growth of grass or other parasitic plants which will cause competing of nutrients between host plants and parasitic plants. Furthermore, the presence of household also plays an important role to taking care of the plants. If the plants are left for a long time for example if the household went for travelling or committed to outstation's duty, the plant will abandoned and stunted. Being able to have a real-time monitoring method, their plants can be taken care of from a far.

1.3 Existing System:

In this section, three existing systems were be reviewed, which are Arduino based Automatic Plant Irrigation System with Message Alert, Arduino Based Smart Irrigation System using IoT and Smart sensor for automatic drip irrigation system for paddy cultivation system. All the existing systems have their own characteristics, advantages and disadvantages.

1.4 Proposed System:

The project consists of a central microcontroller unit, to which other objects are connected. The smart garden consists of Node MCU as a hub to which different types of sensors such as moisture sensor, humidity sensor, temperature sensor and ultrasonic sensor are connected. The ultrasonic sensor is connected to a water tank which indicated the level of water in the tank. Other sensors are connected to their respective positions and these sensors send the data to Node MCU which consists of an inbuilt Wi-Fi technology. Firebase is a database available on the internet in which real-time values of the sensor are updated every second. Android application is developed using android studio software. Within the software, the connectivity between the application and firebase will be made. So, the user can monitor the parameters from anywhere. Watering of garden varies with the type of soil. Hence the values of the sensors are switch in the application which will automate the process. This helps in complete maintenance of the garden.

II. REQUIREMENT SPECIFICATIONS

2.1 Software Requirements

- Arduino Compiler
- IOT Gecko
- MC programming language : C

2.2 Hardware Requirements

1. **NodeMCU:** A microcontroller with inbuilt networking features.
2. **DS18B20 Temperature Sensor**: Used to measure the soil of the plants.
3. **DHT11 Temperature+Humidity Sensor**: Used for measuring the temperature and humidity of the plants.
4. **YL-69 Soil Moisture Sensor**: To detect moisture level present in the soil.
5. **TFT LCD (1"4 inches)**: Display output from sensors.
6. **Minor Components**: Includes 1kW resistor, charging unit, TFT LCD screen, etc.

III. SYSTEM SPECIFICATIONS

3.1 SYSTEM DESIGN

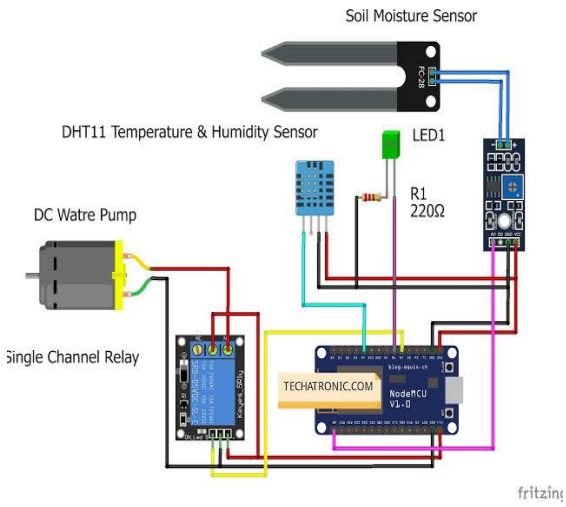

Figure 3.1.0 System design

1. NODE MCU

NodeMCU is a digital microcontroller based upon system on chip (SoC) technology to develop IoT applications (NodeMCU, 2019). It contains an onboard WIFI system for communication of data and other supporting libraries. MCU refers to the Micro Controller Unit. It provides the facility of analyzing, controlling, and monitoring of digital systems... Shown in Figure 3.1.1

1.Open Source
2.System on Chip Technology
3.Low Cost
4.Easily Programmable

5.Interactive and Smart
6.Built-in WIFI
7.Simple IO Handling
8.Network APIs

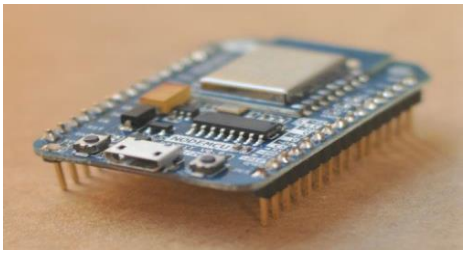

Figure 3.1.1 Node MCU

2.DS18B20 TEMPERATURESENSOR

The DS18B20 is a single wire temperature sensor to sense the real-time temperature. It requires only a single data line to communicate with an integrated device. Shown in figure3.1.2

Figure 3.1.2 Temperature Sensor

3. YL-69 SOILMOISTURESENSOR

YL-69 is the cheapest and reliable soil moisture sensor to sense the humidity in the soil. It consists of two components, a small electric board, and two sensing strips to sense the values. Shown in figure 3.1.3

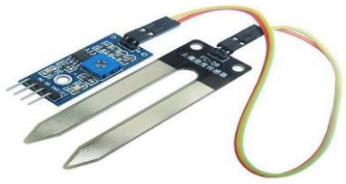

Figure 3.1.3 Soil Moisture Sensor

4.TFT LCD (1”4 inches)

1.4 inches TPT LCD is integrated over the NodeMCU to display the results on the device. If the mobile application is facing any error related to network or other components, then the fetched environmental values will be displayed on the integrated TFT screen .shown in figure 3.1.4.

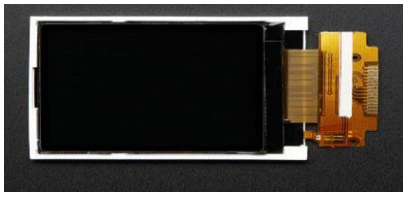

Figure 3.1.4 TFT LCD

3.2 IMPLEMENTATION

The proposed system incorporates the physical configuration of its electrical components with communication approaches that cover the methods and types of data transfer between the device and application. The implementation is mainly consisting of two parts:

- Device
- Mobile Application

The device will be using sensors which are programmed with microcontroller and linked with a mobile application to transfer the data that is collected from the device. The development of this prototype consists of both hardware and software along with a communication medium. The emphasis is more on the hardware side as manufacturing of device from components which are vital for projects purpose. The proposed design is a portable and area independent automated system that, as stated in previous sections to collect information about garden health with sensors. Below is the block diagram of the device's physical configuration. In Fig. 4.1.1, the Central point is the NodeMCU controller to which sensors of temperature, humidity, and moisture are connected with power supply, charging unit, and display. A small TFT LCD screen is used here to build the display over the device. The system is composed of three units: Sensors, power, and display. The unit for sensors is consists of temperature, humidity, and moisture sensors.

The overall working process of the proposed system is shown in Fig.4.2.1 named as operational flow. Initially, the user begins by starting the device, and the underlying area are tested by a constructed device. The device analysis the garden area and tries to fetch the defined real-time parameter values by using integrated sensors. If the values are successfully fetched, then the device determines the network access. Otherwise, the device is restarted and debug procedure activated, which find and handle the error. If the device found a network connection, then the retrieved results are delivered via mobile application. If there is any problem while

connecting with the network, then the retrieved results are shown by the TFT screen integrated on Node MCU.

FLOW CHART:

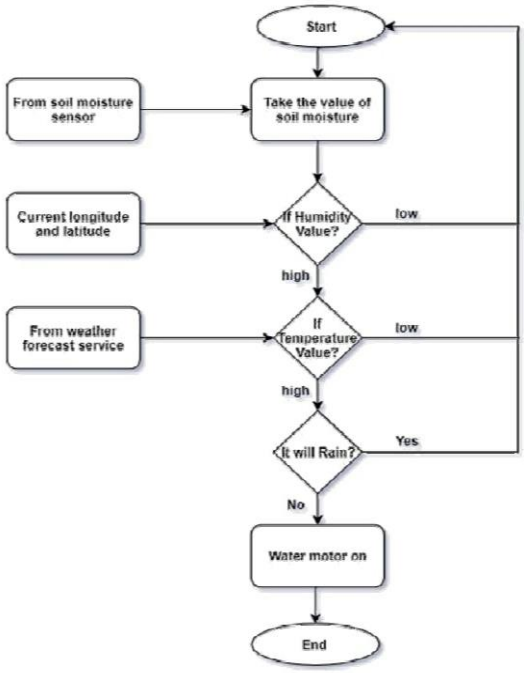

Figure 3.2.1 Operational flow

BLOCK DIAGRAM

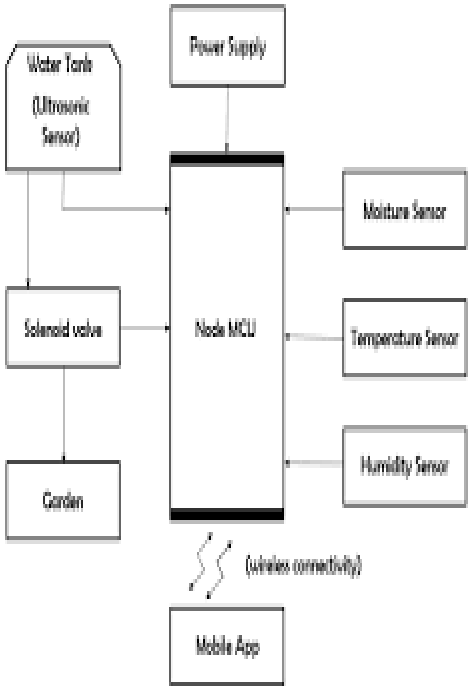

Figure 3.2.3 Overall system diagram

INPUT DESIGN :prototype of how all the components and sensors are configured over Arduino. The principal component is Arduino that is attached over a breadboard. LCD and JSON is a communication interface for data sharing between a device and a mobile app.

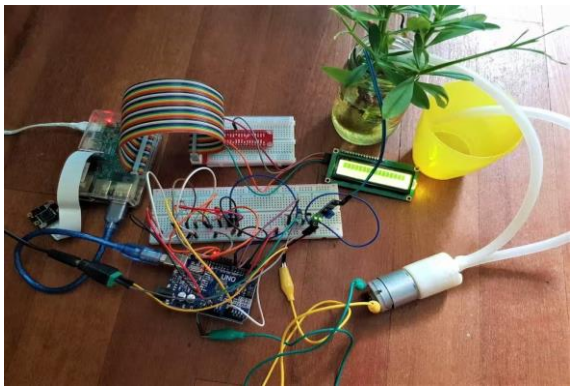

Figure 3.2.4 Input Design

OUTPUT DESIGN: The real-time results on a TFT screen that is integrated on the device board. It displays the current moisture and temperature of soil, humidity, and temperature values. In the bottom of the screen, the IP address of an attacheddevice.

Figure 3.2.5 Output Design

The mobile application, which is integrated with a GSM device that enables mobile computing services. The same environmental results of soil moisture, humidity, and temperature of plants are shown on the application screen. Users and gardeners will be able to treat their plants with more care by using these real-time results.

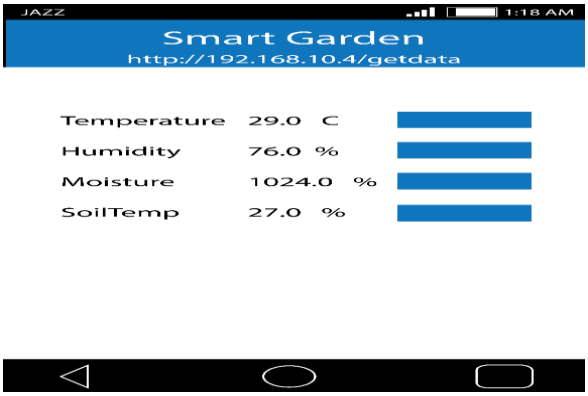

Figure 3.2.6 output Reading

IV. CONCLUSION

4.1 Summary

The proposed approach of smart garden monitoring is based upon NodeMCU microcontroller, mobile computing, and the internet of things. It provides real-time statistics of garden environmental factors, so the local users and gardeners are able to treat their plants in a well manner. Soil temperature, moisture, and relative humidity are considered environmental factors. The results are shown on the TFT screen, which is integrated over the proposed device. The result are also delivered through a mobile application. This approach can remedy the problems of gardening that are faced in urban areas due to lack of gardeners.

4.2 Future Work

For the future work of this project, there are a few suggestion that can be considered in upgrading the system to be better and more efficient way.

- We can add sensor that may be capable in monitoring the ph level of soil or water level sensor to monitor the water inside the tank used in irrigating the plant.
- It can be considered to improvise so that this system can be used to manage more plants and not limited to only one plant.
- The system could be more efficient in alerting the user if there are a type of notification that could be implemented in the system such as SMS.

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