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Real Time IoT Application of Urban Garden Design

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Abstract: Gardening is a common pastime for people who love nature. Plants always requires a careful and continues monitoring. Most of the time it will turn into a responsibility. Sometimes garden owner need to go out for a while, then garden may keep on unattended. Internet of thing can give a possible solution for this problem. Environmental condition of the garden can be monitored continuously by using an electronic technology in the garden. Using IoT (Internet of Things), environmental condition in the garden can be monitor through the internet. Gardening is a very exciting to do. So I was very interested in making a project related to it. Nowadays people will enjoy gardening by using an IoT application to it (smart Garden). Moreover the important task here is making the project very simple so that anybody can use this in their garden. In this proposed project garden monitoring system is developed. Here the multiple nodes are designed to collect data from garden and sent to the main node that will upload the data to server where people can assimilate all the condition of their garden.

Keywords: Raspberry Pi, Arduino board, Light sensor, Soil moisture sensor, Humidity and Temperature sensor.

I. INRODUCTION

Internet of Things (IoT) is a system of interconnected computing devices that can communicate data on top of the internet. In order to monitor the environmental parameter in the urban garden, proposed project is developed that consist of an IoT sensor network. Sensor network is having different sensor such as Light Sensor, Humidity Sensor, Temperature sensor and Soil moisture Sensor. The sensed data can be send to the cloud and it can be monitor from office or home. The remote monitoring system can be monitor through the website. This gives a flexibility for data understanding and data visualization.

These days, people having a habit of stay connected with internet in doing everyday job. There are many useful technologies that have been evolved in gardening field. There some of the IoT devices that are used to monitor the plant's growth in the garden. So, this research project will concentrate on developing an IoT device that will monitor the environmental condition in the garden and gives an online feedback to the user. The device is capable of monitoring the environmental conditions in the garden and hold some of the data for future work [1].

People often grow inappropriate plants in their garden so that they generally expire from lack of appropriate nutrients, water, and even too much of sunlight. The proposed method is developed to solve this problem. In this project people can see the environmental condition in their garden by using the website. The urban garden will monitors the humidity, soil moisture, temperature and light in the garden. This also helps the students of agricultural department to study their garden environmental conditions by online. The project most importantly requires a proper connection of all sensors and microcontroller and keep on updating the results using IoT.

II. LITERATURE SURVEY

Environmental conditions are detected using an Arduino board and these values are transmitted to the customer laptop using a Zigbee wireless signal transmission. And these information are recorded in the program. In the database visual C# interface portraits data will store successfully. In addition, if the detected values is outside the value of threshold visual C# will give a caution and send control to the relay module. To make modification and improve environmental conditions, these signals are send to the relay module [2].

The area of Wireless Sensor Network (WSN) is increasing. Low-cost, minor, low-power sensors can be installed in many places are very useful. The main goal is that using economical and inexpensive sensors monitor the environmental conditions in the garden that is small and healthy. Using Arduino board and Raspberry Pi a network of wireless sensor is designed to monitor the environmental conditions in the garden such as humidity, pressure and temperature are measured using XBee sensor nodes that transfer the data from sensor to a fundamental node Arduino data aggregator. On the Arduino a light-weight Web Server is built to display information on the webpage [3].

The WGSN contains a communication node, a sensor joint, a system organizer, a remote actuator. The sensor node look through begging gas discovery by an on-board 2D semiconductor sensors. Since the sensor requires a considerable amount of intensity that ruinously upsets the

lifetime of the node, to accomplish noteworthy vitality reserve funds we utilize a beat warming profile. The transfer hub acknowledges and direct the traffic from the system facilitator to sensor nodes and the other way around. In the event that a crisis is found, the system chief signals and capacities through the Ethernet system or GSM or GPRS and can freely opposes the gas discharge premise through the remote actuator [4].

The cause of online monitoring of cow existence and feeding time in a stretched area enclosed by a fresh grass band using WSN is addressed. The complete taking care time in extended area is determined by ascertaining the taking care time in a particular piece of this zone named the door availability zone here the sensor node fixed on the cows can discuss straight with the passage. The loss of bundles causes a node that is existing in the network kind of the door to normally be names as a missing node. Thus, to limit misclassification of moving average window with ideal edge and window length has been determined [5].

III. PROPOSED SYSTEM

In this project, IoT based device is designed to monitor the environmental condition in the garden. IoT device (see Figure 1) consists of Arduino board that is equipped with various sensors like DHT-11 Humidity and Temperature sensor, LDR light sensor and Moisture sensor. These sensors sends environmental data to Arduino board. Arduino board will send sensed data to the main node (Raspberry Pi) using Zigbee transmitter. In the main node Raspberry Pi will be connect with Zigbee receiver that will receive data from multiple node and upload data to the server cloud where user can see the garden parameter on website.

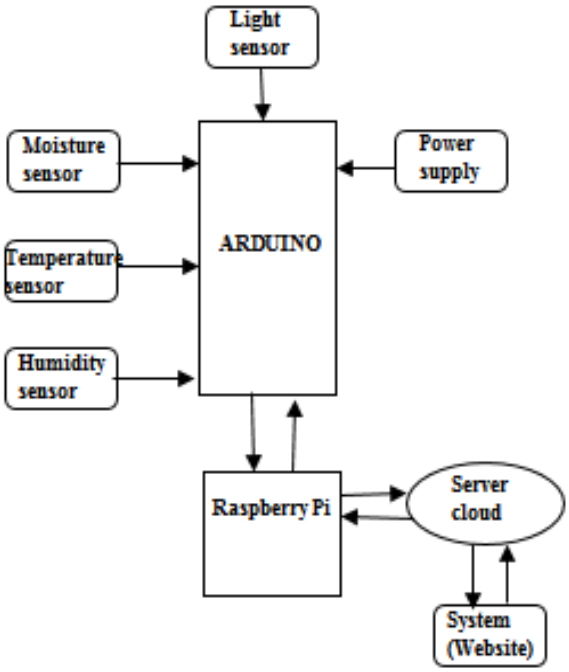

Figure 1: System Block Diagram

IV. SYSTEM ARCHITECTURE

Proposed system consists of two sets of hardware first one is Node and second one is Gateway. Node means the sensors which are located in the garden and are responsible for uploading data to the Zigbee transmitter. Gateway is used to collect entire data from the network through Zigbee receiver and upload it on to the cloud database.

1. Node

Microcontroller (Arduino) will get data from the different sensor and it will pass these data to the Zigbee transmitter. Microcontroller can be connected with all other communication module, power system and different sensors. The sensors will output data in the form of digital or analog to the microcontroller that is Arduino board. Zigbee acts as a communication module and here there is Zigbee transmitter for transmitting data and Zigbee receiver for receiving transmitted data. Power should be given to node.

2. Gateway

Microcontroller (Raspberry Pi) will collect data from the Zigbee receiver and upload data on to the cloud through Wi-Fi module. In order to get the Internet access an external Wi-Fi routers are needed. Wi-Fi router can be new installed one or existing one as long as it requires an internet access. System Architecture is shown in Figure 2.

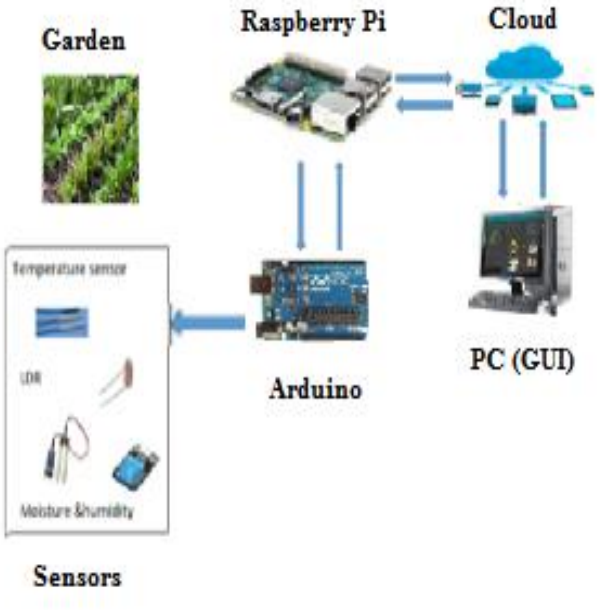

Figure 2: System Architecture

V. SYSTEM IMPLEMENTATION

Arduino board is considered as a heart of the system. Several components are connected to the Arduino board through the output and input ports. Arduino board receives the sensor information from various sensors such as soil moisture sensor.

Soil moisture sensor is used for sensing the amount of water present in the soil. Soil moisture sensor is made of two probes that can be put in the soil to know the amount of water content in the soil. Electricity is passed through these probes, if there is moisture in the soil then the current is passed to soil and probes will detect this and send the information to the Arduino board. If moisture content is not present then current will not pass through the soil. To detect the temperature and humidity present in the environment DHT11 is used. DHT11 is a digital sensor which is having a built-in thermistor and capacitive humidity sensor to detect temperature and humidity respectively. To detect the presence of light LDR sensor is used.

These sensors are connected to the Arduino board in order to send and receive data from the sensors. The sensed data such as humidity, temperature, light and moisture are passed into the Arduino board and data will be send to the Raspberry Pi through Zigbee transmitter Raspberry Pi will receive these information from the Zigbee receiver and upload these data into the cloud.

Flow Chart shown in the Figure 3 gives the work flow of the entire system. As shown in the flowchart sensor node will gather environmental information from the garden. Arduino will receive these information and convert it into digital signal and send it to the gateway that is Raspberry Pi. The data will be received by the gateway and it is responsible for uploading data onto to the cloud over the internet. Once uploading data in the cloud is over then server will monitor the garden environmental data in real time. User data see sensor data such as light, temperature, humidity and moisture value in garden using website over the internet. Server will keep on updating the data depending upon the information that are gathered from sensor. People can see the environmental condition in their garden through website.

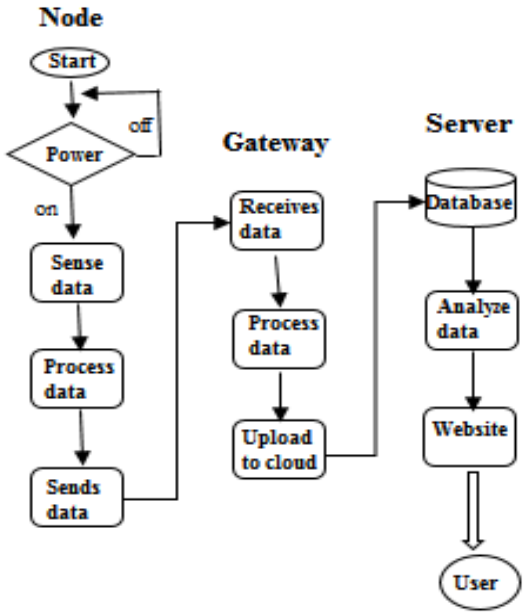

Figure 3: Flow chart of the system

VI. EXPERIMENTAL RESULTS

The proposed system consists of two hardware connection one is Arduino board and raspberry Pi. Arduino board consists of various sensors and a Zigbee transmitter. Raspberry Pi consists of Zigbee receiver for receiving the data from Zigbee transmitter. Both hardware connection is shown in Figure 4 and Figure 5.

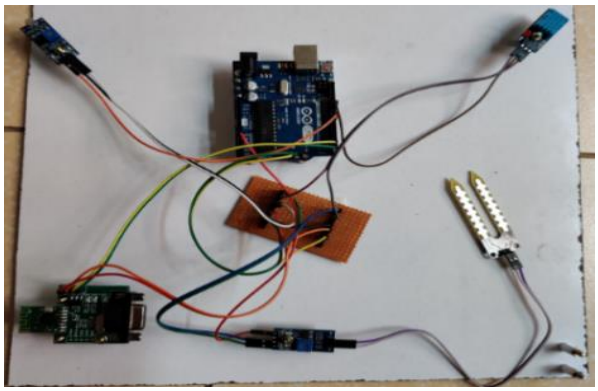

Figure 4: Arduino with Sensors

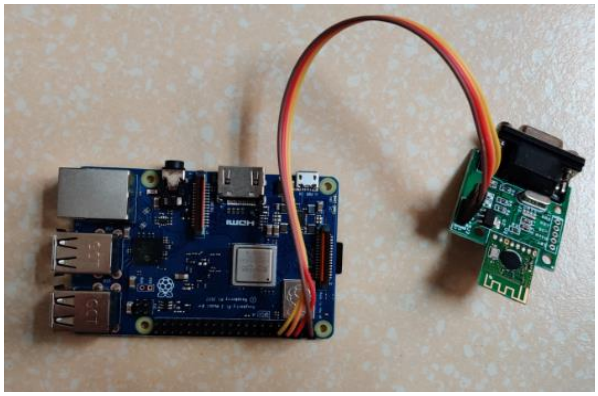

Figure 5: Raspberry Pi

To know environmental conditions in the garden such as moisture of the soil, Temperature, Humidity and light we can browse through the website which is shown in Figure 6.

Figure 6: Results on Website

VII. CONCLUSION AND FUTURE SCOPE

There are many useful technologies that are used in the agriculture field. One of these technology is IoT, which plays a major role in agricultural field by automatically monitoring the environmental conditions of the plants in the garden. Earlier days many sensor related networks are proposed to monitor the garden. But many technologies did not depend on the data analysis which does not give the accurate state and data usage in the garden. Proposed method gives the technology by which data will be gathered from the garden and that can be uploaded on to the cloud. This research project will give the online feedback to the user by collecting the data from the garden using IoT based devices. These IoT devices will help in gathering of environmental data from the garden and help to monitor the growing progress of the plant.

As a future aspects we can add automatic watering system that can provide water to the plants in garden whenever needed. And also mobile application can be developed in order to provide automatic watering.

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