International Journal of Future Generation Communication and Networking
Vol. 13, No. 2s, (2020), pp. 164–169

Green Indoor Climate and Agri Automation Using IOT and Cloud: A Survey

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Abstract

The proposed system is versatile so it can be used to maintain an indoor climate in Industries, residential homes, roadside gardens, building and it can also work in agricultural automation as well. As an indoor climate is closely related to human health, well-being and comfort. This system can be helpful to society. The development of this system will be based on the internet of things (IoT), Raspberry Pi as a controller, and sensors for sensing environmental conditions. This system monitors different parameters like temperature, moisture, the intensity of light, humidity and ultrasonic sensor for water level indication. Actuators can be used for controlling purpose. In this proposed system the detected data from sensors are transmitted using Wi-Fi to the IoT hub and this collected data further controlled by a dashboard with the help of Azure cloud. IoT supports people to get connected to require system anytime and anywhere. IoT technology helps in collecting information about conditions. The system utilizes the Internet of Things technology and the Azure public cloud platform to automate the management procedure, improve the scalability, enhance user experiences of plants, and contribute to a green indoor climate and Agriculture.

Keywords—*Azure Cloud, Dashboard, IOT hub, Raspberry pi, Sensors.*

I. INTRODUCTION

This is a versatile system that can be used in industrial offices, buildings for maintaining a green indoor climate as well as it can be used as a smart agriculture system for maintaining the farm. Our main objective of this proposed work to develop the autonomous plant watching system which can perform sensing, monitoring and controlling. As the proposed system is versatile so it can be used to maintain an indoor climate in Industries, residential homes, building as an indoor climate is closely related to human health, well-being and comfort and it can also work in agricultural automation as well. This can be helpful to society.

The development of this system will be based on the internet of things (IOT), Raspberry Pi as a controller, and sensors for sensing environmental conditions. This system monitors different parameters like temperature, moisture, the intensity of light, humidity and ultrasonic sensor for water level indication. Actuators can be used for controlling purposes. In this proposed system the detected data from sensors are transmitted using Wi-Fi to the IoT hub and this collected data further controlled by a dashboard with the help of Azure cloud.

IOT supports people to get connected to require system anytime and anywhere. IoT technology helps in collecting information about conditions. The system utilizes the Internet of Things technology and the Azure public cloud platform to automate the management procedure, improve the scalability, enhance user experiences of plants, and contribute to a green indoor climate and Agriculture.

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II. LITERATURE SURVEY

In IOT Based Agriculture Monitoring and Smart Irrigation System Using Raspberry Pi, IoT is a shared Network of objects where these objects interact through the Internet.
Smart Agriculture reduces wastage of water, fertilizers and increases the crop yield. Here a system is proposed to monitor crop-field using sensors for soil moisture, humidity and temperature. By monitoring these parameters, the irrigation system can be automated if soil moisture is low. To cope up with this use of temperature and moisture, sensors are placed at suitable locations for monitoring the crops. However, the use of technology in the field of agriculture plays an important role in increasing productivity as well as reducing manpower [5].

In Greenhouse monitoring using the internet of things, the aim of the paper is to design a greenhouse monitoring system based on the Internet of things (IOT). A greenhouse is a covered area where plants grow and cultivate. There are some important parameters to be monitored inside the greenhouse are temperature, relative humidity and carbon-di-oxide using cosier. The proposed system consists of a sensor that continuously takes in data from the greenhouse environment and reports it to the gateway node. Automating a greenhouse envisages monitoring and controlling of the climatic parameters which directly or indirectly govern the plant growth and hence their produce. Automation is the process control of industrial machinery and processes, thereby replacing human operators[4].

The IoT based greenhouse monitoring system is a complete system designed to monitor and control the environmental parameters inside a greenhouse. The smart greenhouse automatically controls the various parameters needed for the plants and sends the sensory data to a customized webpage for continuous and effective monitoring[11].

In Automation in Agriculture Using IoT and Machine Learning, the purpose of this project is to improve the efficiency of the agriculture sector. IoT helps us in many fields among which agriculture is one of the primary ones. With the help of IoT along with Machine Learning in the field of agriculture, we can increase the efficiency of crop production. Different weather parameters are taken into consideration with which the best suitable crop to be grown are predicted with the help of supervised learning like Decision Tree Classifier, Regression. With the help of different sensors, the soil and atmospheric conditions are determined and transferred through multi-hop communication to the server in which monitoring of crops' health and control of irrigation system takes place[3].

In Active Plant Wall for Green Indoor Climate Based on Cloud and Internet of Things, an indoor climate is closely related to human health, well-being, and comfort. Thus, indoor climate monitoring and management are prevalent in many places, from public offices to residential houses. In this article, propose a remote monitoring and control system that is specific to the plant walls. The system utilizes the Internet of Things technology and the Azure public cloud platform to automate the management procedure, improve the scalability, enhance user experiences of plant walls, and contribute to a green indoor climate[1].

In Automatic IoT Based Plant Monitoring and Watering System using Raspberry Pi, the main objective of this proposed work is to develop an Embedded System for plant monitoring and watering system using the Internet of Things, Raspberry Pi as Processor, and sensors for sensing environmental conditions. In this work, the IoT concept is introduced to connect devices through the Internet and facilitate information access by the users. The system can obtain an accurate perception of Environmental information in the agriculture field and then transmit the same to users. The system monitors different parameters like Temperature, Humidity, Soil Moisture and Intensity of light. IR sensor is fixed to check any external object entry into the field, in case of intruder detection buzzer will turn on for a few seconds[8].

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III. SYSTEM BLOCK DIAGRAM

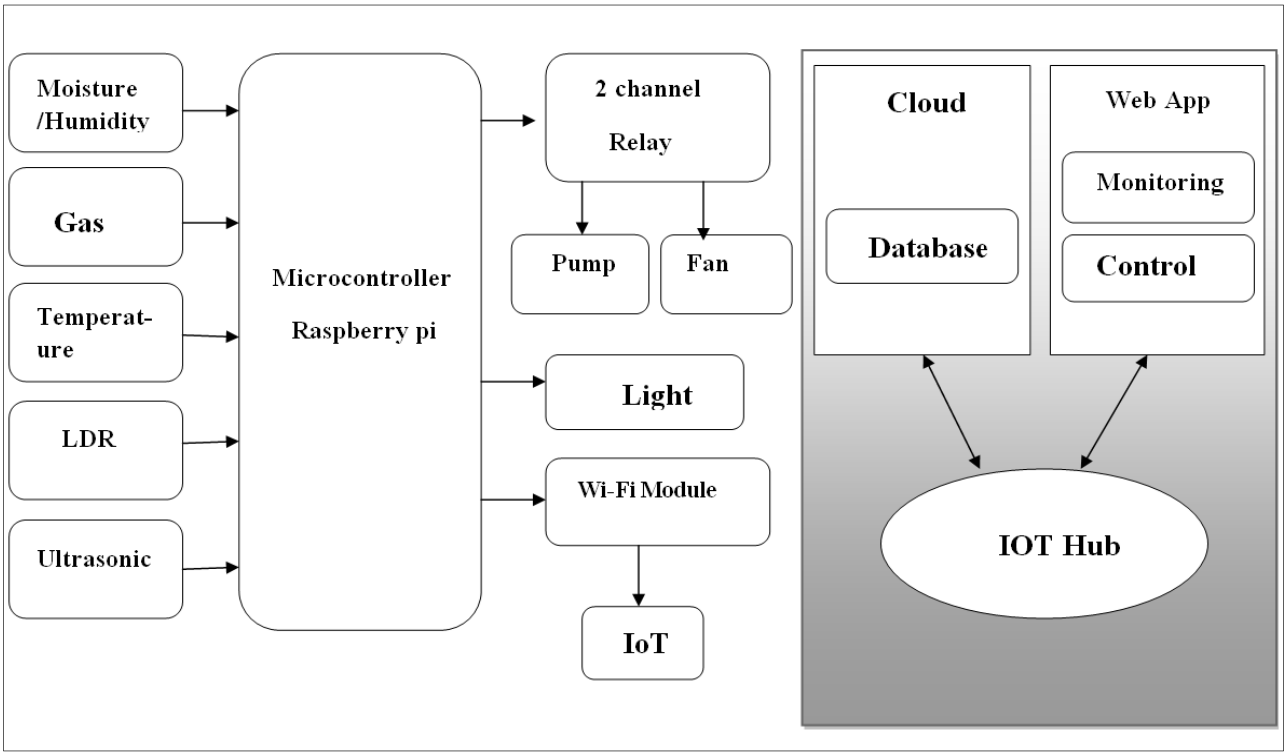

Fig.1 System block diagram

A. Raspberry Pi:

The Raspberry Pi is a small pocket-size computer used to do small computing and networking operations. It is the main element in the field of the internet of things. It provides access to the internet and hence the connection of automation system with remote location controlling device becomes possible.

The Raspberry Pi Zero W extends the Pi Zero family. Launched at the end of February 2017, the Pi Zero W has all the functionality of the original Pi Zero but comes with added connectivity, consisting of 802.11 b/g/n wireless LAN, Bluetooth 4.1, 1GHz, single-core CPU, 512MB RAM, Mini HDMI, and USB On-The-Go ports, Micro USB power, HAT-compatible 40-pin header, CSI camera connector.

B. Moisture Sensor:

Moisture sensor measures the water content in the soil. This sensor reminds the user to water their plants and also monitors water content in the soil. It uses capacitance to measure dielectric permittivity of the medium. This creates applied voltage proportional to the dielectric permittivity. It operates at 5V.

C. Gas Sensor:

MQ2 smoke sensor has been used in this project which helps in detecting if there is some sort of leakage of any gases in the crop field or may be fire. Once the gas is detected an alarm is triggered which helps in alerting people and take necessary action and precaution. It works on inverted logic. An MQ2 smoke sensor has great sensitivity and has quick response time and at the same time is stable

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and has a long lifetime. It is used for the measurement of gas concentration. The gas sensor is used to detect Co2 gas in the environment.

D. Temperature and Humidity Sensor:

Temperature and humidity sensors monitor environmental conditions. The temperature sensor operates when the applied voltage increases. Similarly, the humidity sensor works by a change in temperature in air and change in electrical current. The different types of humidity sensors are capacitive, thermal and resistive we have used DHT11 sensors in our project. It is basically a humidity and temperature sensors which helps in getting the digital output. It is quite reliable and has good stability and at the same time is cost-effective. It comprises three main elements a resistive type humidity sensor, an NTC thermistor (for temperature measurement) and an eight-bit microcontroller which helps in converting analog signals from both sensors and helps in sending out digital signals.

E. LDR Sensor:

It is used to find out the intensity of light by using the intensity value we can apply PWM to the light. It turns on/off light when it required. LDR (Light Dependent Resistor) is the light sensor which is usually used for the purpose. Its main function is to monitor the intensity of light. It turns off the light when it needs to save the power and turns on the light when light are required in the greenhouse. The Light Subordinate Resistor (LDR) is fair another extraordinary sort of Resistor and subsequently has no extremity. Meaning they can be associated in any course. They are breadboard inviting and can be effortlessly utilized on a board too. The image for LDR is fair as compared to Resistor but includes internal bolts as appeared underneath. The bolts demonstrate the light signals. It can be utilized to sense Light, it is a little, cheap and effectively accessible. When light falls on the LDR then the resistance decreases and increases in the dark. When an LDR is kept in the dark place, its resistance is high and, when the LDR is kept in the light its resistance will decrease.

F. Ultrasonic Sensor:

An ultrasonic sensor is installed at the bottom of the system to measure the water level in the tank. An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns. Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. The working principle of this module is simple. It sends an ultrasonic pulse out at 40 kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

G. Actuators:

The actuators in the system consist of a pump, light, and fan. The pump is used for filling the tank. Light and fan are used to control the temperature and humidity in the surrounding environment.

H. Pump:

Micro DC 3-6V Micro Submersible Pump Mini water pump For Fountain Garden Mini water circulation System DIY project. This is a low cost, small size Submersible Pump Motor which can be operated from a 3 ~ 6V power supply. It can take up to 120 litters per hour with a very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor. The dry run may damage the motor due to heating and it will also produce noise.

I. IOT:

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IoT supports people to get connected to require system anytime and anywhere. IoT technology helps in collecting information about conditions. The system utilizes the Internet of Things technology and the Azure public cloud platform to automate the management procedure, improve the scalability, enhance user experiences of plants, and contribute to a green indoor climate and Agriculture.

J. MQTT Dashboard:

MQTT (MQ Telemetry Transport) is an open OASIS and ISO standard (ISO/IEC PRF 20922) lightweight, a publish-subscribe network protocol that transports messages between devices. The protocol usually runs over TCP/IP; however, any network protocol that provides ordered, lossless, bi-directional connections can support MQTT. It is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited.

K. Azure Cloud:

Microsoft Azure, formerly known as Windows Azure, is Microsoft's public cloud computing platform. It provides a range of cloud services, including those for compute, analytic, storage and networking. Users can pick and choose from these services to develop and scale new applications, or run existing applications, in the public cloud. Microsoft Azure is widely considered both a Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) offering.

IV.PROPOSED SYSTEM FLOW

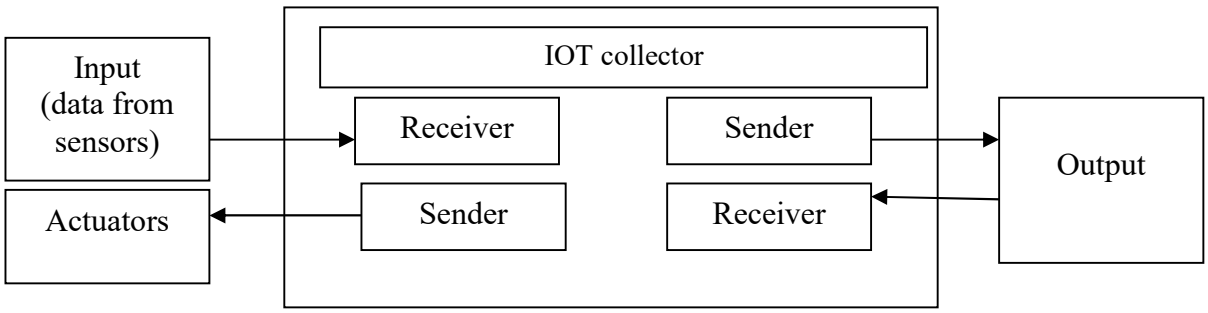

Fig.2 Proposed system flow

In this system flow,input is data from the sensors which is further transmitted to the IoT collector for processing. The processed data is transferred to the azure cloud for storage. IoT hub provides control actions according to previously decided threshold levels of sensors using actuators. It provides remote control using IOT from anywhere.

V. CONCLUSIONS

The traditional system for plant monitoring is labour-intensive and time-consuming. The proposed system saves time, money and human effort. It provides a controlled environment for the plants to prevent them from damage and thus increasing the overall performance. The system automatically controls the various parameters needed for the plants and sends the sensors data to a customized webpage for continuous and effective monitoring. In this proposed system remote monitoring and management solution that is based on IOT and cloud platform. It is capable of performing plant care functions according to the user schedule. It also increases the yield and rate of growth and produces organic agricultural products. It also reduces the effort and time of farmers for making farming efficient and profitable activity. This system indicates that a cloud and IoT based remote monitoring and management system can be significant merit to application in terms of its reliable performance, real-time monitoring, timely feedback, and convenient remote control.

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REFERENCES

[1] Yu Liu, KahinAkram Hassan, Magnus Karlsson, Ola Weister, and Shaofang Gong, "Active Plant Wall for Green Indoor Climate Based on Cloud and Internet of Things",*IEEE*,2018.
[2] Saraswatishelvane, Madhuri shedage, akshadaphadtare, "Greenhouse monitoring using raspberry pi",IRJET,vol.06, April 2019.
[3] Abhishek L, Rishi Barath B," Automation in Agriculture Using IOT and Machine Learning",IJITEE,vol.08, June 2019.
[4] Aadil Imam, Deepak Gaur," Smart Greenhouse Monitoring using the Internet of Things",IJIRCSE,vol.02, March 2016.
[5] Mrs.T.Vineela, NagaHarami, Ch.Kiranmai, G.Harshitha, B.AdiLakshmi," IOT based Agriculture monitoring And smart irrigation system using raspberry pi" IRJET,vol.05,jan2018
[6] Raspberry pi beginner's book.
[7] Kiran ganesan,uzmawalele,namratahambire,piyushchoughule,deepthioommen," Raspberry pi based automated greenhouse",IRJET,vol.05,march 2018.
[8] Ansushak,dr.u.b.Mahadevaswamy, "Automatic IoT based plant monitoring and watering system using Raspberry pi" ,mecs,IJEM,vol.06,2018.
[9] Rupali satpute, hemantgaikwad,shoaib khan,adityainamdar, deep dave," IoT based greenhouse monitoring system",IJRASET,vol.06,april 2017.
[10] Kiran otale,shubhampatil,akshaypatil," IoT based modern agriculture system using Raspberry pi",IJAREST,vol.04 May 2017.
[11] M.krishnamohan, jakkulalikhitha, tejaswyyamarthi, kagithasravani, "Greenhouse monitoring system using IoT",IJMTST,vol.03, March 2017

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