Smart Green House Parameter Monitoring And Control System Using Raspberry Pi

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Abstract- *Raspberry pi is useful for small application development because it can be used to integrate with many components such as speakers, LED ,lights sensors ,cameras and wireless communication units to develop smart application. Raspberry Pi can be the future for smart applications and client server communications. This proposed work is a stepping stone to introduce the various features and possibilities available in the raspberry pi and opens up an avenue for researches who wish to embark into this new inventions. Raspberry pi can also be used as an educational tool as it comes with scratch as an animation tool for young learners.The system gives real time remote monitoring system using Raspberry Pi which enables the user to track the different parameters in green house remotely for improving plant growth. The data storage in the database on the cloud for future use in any internet enabled device. This facilitates us to take right decisions at right time to obtain desired results in plant growth.*

Keywords- Green house, Raspberry-pi, IOT, sensors.

I. INTRODUCTION

Greenhouses are frames of inflated structure covered with a transparent material in which crops are grown under controlled environment conditions such as surrounding temperature, humidity, nutrient, soil moisture, etc. Greenhouse cultivation as well as other modes of controlled environment cultivation has been evolved to create favorable micro-climates, which favors the crop production could be possible all through the year or part of the year as required. The environment inside the greenhouse will affect the quality of the plants. As a result, it is important to maintain the parameter such as temperature, light, humidity, and soil moisture. There are number of facilities for performing experiments related to plant growth research, where high degree of climate control is needed especially in greenhouse. Climate control requires real-time precise measurement.

A Raspberry Pi is a credit card-sized computer originally designed for education, inspired by the 1981 BBC Micro. Creator Eben Upton's goal was to create a low-cost device that would improve programming skills and hardware understanding at the pre-university level. It is small size and accessible price, it was quickly adopted by tinkerers, makers, and electronics enthusiasts for projects that require more than a basic microcontroller such as Arduino devices.The Raspberry Pi is slower than a modern laptop or desktop but is still a complete Linux computer and can provide all the expected abilities that implies, at a low-power consumption level.One advantage of using the Raspberry Pi over some other alternatives is the size of the community.

The Raspberry Pi may be operated with any generic USB computer keyboard and mouse. It may also be used with USB storage, USB to MIDI converters, and virtually any other device/component with USB capabilities. Other peripherals can be attached through the various pins and connectors on the surface of the Raspberry Pi.Wireless sensor network technology has been emerging as a feasible solution to many innovate applications. WSN is a low cost wireless network made up of thousands of small sensor nodes which monitor physical or environmental conditions, such as temperature, humidity, soil moisture, turbidity, etc at different locations. The sensor nodes can transmit the data detected by their own sensor and can also pass the data to adjacent nodes. The data can be detected by the sensor nodes and can be transmitted to the base station. After that the data is transmitted to the end user by external network. It can also send command of end user to the network node.

The Internet of Things is a vision of a world in which most objects are connected, transmitting updates about their performance so the people who use them to do the things more intelligently. This vision is being built today, with connected devices becoming more and more frequent in our daily lives. The basic concept behind the internet of things is that virtually every physical thing in this world can also become a computer that is connected to intenet.

II. LITERATURE REVIEW

This paper presents a monitoring and control system for greenhouse through Internet of Things(IOT). The system

will monitor the various environmental conditions such as humidity, soil moisture, temperature, presence of fire, etc. If any condition crosses certain limits, a message will be sent to the registered number through GSM module. The microcontroller will automatically turn on the motor if the soil moisture is less than a particular value. A color sensor will sense the color of the leaves and send message. This work is primarily about the improvement of current agricultural practices by using modern technologies for better yield. This work provides a model of a smart greenhouse, which helps the farmers to carry out the work in a farm automatically without the use of much manual inspection. Greenhouse, being a closed structure protects the plants from extreme weather conditions namely: wind, hailstorm, ultraviolet radiations, and insect and pest attacks. The irrigation of agriculture field is carried out using automatic drip irrigation, which operates according to the soil moisture threshold set accordingly so as optimal amount of water is applied to the plants. Temperature and air humidity are controlled by humidity and temperature sensors. A tube well is controlled using GSM module (missed call or sms).Further, the readings collected from storage containers are uploaded to cloud service (Google drive) and can be forwarded to an e-commerce company[1].

The method is suggested Sheetal Vatari; Aarti Bakshi; Tanvi Thakur, Green house by using IOT and cloud computing .There are many techniques available for the precision agriculture to monitor and control, environment for the growth of many crops. Due to unequal distribution of rain water, it is very difficult to requirement needed farmer to manage the water equally to all the crops in whole farm it requires some irrigation method that suitable for any weather condition, soil types and variety of crops. Green House is the best solution to control and manage all this problem. It is more important to search a method that gives perfect analyzation and controlling to develop proper environment. This environment builds up by using two technologies IoT and cloud computing. By using IOT we control devices or any environmental needs anytime, anywhere and the cloud which provides storage and computing resources to implement a web page[2]

The proceeding of A low cost environment monitoring system using raspberry Pi and arduino with Zigbee by Akshay D. Deshmukh; Ulhas B. Shinde discuss a monitoring system which gives information about environmental conditions on a more local level and bringing out the new scope in monitoring the current environment problems. This paper intends to provide information using wireless sensor technology which comprises of raspberry pi, Arduino Nano, Zigbee, wireless sensor network(WSN) and sensors. Realization of data gathered by sensors based on embedded raspbian linux is displayed on Graphical User Interface (GUI). The system is developed using open source hardware raspberry pi and Zigbee which proves to be cost effective and having low power consumption. The sensors will gather the data of various environmental parameters and provide it to raspberry pi which act as a base station. Some sensors will directly process the data and provide it to the raspberry pi while some sensors will provide the data through Arduino Nano to raspberry pi using serial interface. The raspberry pi will then transmit the data using Zigbee and the processed data will be displayed on GUI through Zigbee that is on the receiver side[3].

In this paper, we describe a wireless sensor network system that we have developed using open-source hardware platforms, Raspberry Pi and zigbee. The system is low-cost, low power consuming and highly scalable both in terms of the type of sensors and the number of sensor nodes. Raspberry Pi is cheap, flexible, fully customizable and programmable small computer embedded linux board and abilities of its usage as WSN node and sensor node. Raspberry Pi works as a base station which connects the sensor nodes via zigbee protocol in the wireless sensor network and collects sensors data from different sensors, and supply multi-clients services including data display. The client can visit the base station remotely via (website) Ethernet or command console[4].

This paper proposes an approach to build a cost-effective standardized environmental monitoring device using the Raspberry-Pi . The system was designed using Python Programming language and can be controlled and accessed remotely through an Internet of Things platform. It takes information about the surrounding environment through sensors and uploads it directly to the internet, where it can be accessed anytime and anywhere through internet. [5].

This paper presents the wireless sensor network system and Internet of things (IOT), by using WSN it develops an open source hardware platform, raspberry pi , zigbee and sensors. Sensor node is a combination of sensor, controller and zigbee module, which makes it well suited for a wide variety of applications related to environmental monitoring. The Internet of Things (IoT) is an emerging key technology for future industries, and environmental monitoring. Raspberry Pi works as a base station which connects the number of distributed sensor nodes via zigbee protocol. The whole data will be stored in base station and the stored data will send to the cloud (Ethernet) and also the client can visit the base station remotely via (website) Ethernet. Such a sensors are temperature, vibration, pressure, moisture, light, and pollution[6].

The work is proposed by Imran Bin Jafar; Kanij Raihana; Sujan Bhowmik; Shifur Rahman ShakilIn ,Wireless monitoring system and controlling software for Smart Greenhouse Management . A wireless control system with a subsequent software have been designed and practically implemented to establish the Smart Greenhouse Management. Here, the control system can repeatedly handle vital factors for plants according to the real time clock set with microcontroller and routinely carry out wireless transmission of sensors' information to remote software for any further analysis. Moreover, the essential factors, Sunlight, Temperature and Humidity are controlled by the whole system. Particularly, a sensing network running by ATmega328 microcontroller based Arduino UNO Module was exclusively deployed to digitally process analog value of sensors attached to plants [8].

III. PROPOSED SYSTEM

The basic architecture of wireless sensor node for environment monitoring is presented. The system is designed based on the following features:all nodes are similar in architecture and functionality, architecture can be improved in simple way; low power consumption, power effective, every node is capable of transmitting the data collected to the central system directly of working cooperatively with the rest one.
This methodology consist of basic step:

1) Install the operating system of raspberry pi.
2) Making analog to digital converter for sensor data interface. The data is received from the sensor unit to raspberry pi.
3) The data is transmitted via wifi and is stored on Web. Test the receiving unit so that it can receive data0. The data is stored on the web server that is IoT.
4) Making the software to get the data. Finally finalize the project by combining all the system.

We have developed the sensor nodes network using raspberry pi and IoT. Raspberry pi acts as a main processor. A wireless sensor network consist of raspberry pi as a master as well as different types of sensors.A regulated power supply is provided to the overall system.The block diagram of proposed work depicted in figure 1.

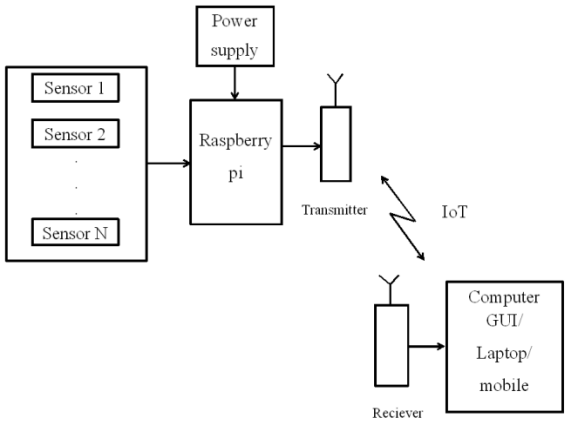

Figure 1: Block diagram of proposed work

1.Sensor unit

The sensor are deployed in the greenhouse which sense the current climatic values of greenhouse. The sensed data is in analog form so it is given to ADC.ADC will convert analog signal to digital form and transmit the data to microcontroller. The overall system is controlled by microcontroller of raspberry Pi. Different types of sensors are attached to the sensor nodes. There is serial communication between sensor unit and raspberry PI. A GUI is used to display the data on the computer.

2.IoT

IoT is used for transferring of data of devices via internet. By using IoT we can control the appliances anywhere, anytime and the cloud which provides storage and computing resources to implement webs application. The data is stored on the web server.

3.Raspberry Pi

The raspberry pi is a low cost, low power credit size single board computer which has recently become very popular. The raspberry pi is the cheapest ARM11 powered Linux operating system capable single board computer board. Raspberry Pi can be connected to a local area network through Ethernet cable or USB Wi-Fi adapter, and then it can be accessed by more than one client from anywhere in the world through SSH remote login or by putty software by just putting raspberry pi ip address in it. The raspberry pi is booted by external SD or micro SD card.

IV. CONCLUSION

The whole research goes under the branch of Control System Engineering of Electrical Engineering where the

different parameters of a Greenhouse are extracted from the sensors used within the house and then through signal processing, initiatives like switching on/off Cooler, Heater, Artificial Lights, Water Pumps are done as feedback of the system. The implementation of this Smart Greenhouse is customizable, which means it can be programmed according to the users requirement and the system is of low cost which is compatible in the perspective of various countries where the implementation of this system can help the farmers to grow more plants and as a result it can contribute to the economy of any country.

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