Controlling of Greenhouse Parameters based on IoT and Remote Sensing

Cina Mathew, Rinsu Mathukutty, Ponni Madhanan
Kristu Jyoti College of Management and Technology

Abstract:- **The new milestone in computer communication is Internet of Things (IoT), gaining importance because of wide variety of application in project developments. The IoT is furnishing people with , the remote applications such as smart agriculture, smart environment, smart security, and smart cities etc. The IoT has essentially, increased the remote distance control and variety of interconnected things or devices, which becomes an interesting aspect.This paper discuss about an IoT application for smart agriculture. The paper proposed a remote sensing of agriculture parameters and control system to the greenhouse agriculture. The plan is to control CO_2, soil moisture, temperature, and light, based on the soil moisture the controlling action is accomplished for the greenhouse windows/doors based on crops once a quarter complete round the year. The objective is to increase the yield and to provide organic farming. The result shows the remote controlling of greenhouse parameters.**

Keyword: IOT,Precision agriculture,PCM

1.INTRODUCTION

In the development of plants under light the knowledge about the field and strength of plants are very vital important parameters.One of the main issues in the present agriculture is the less knowledge about agriculture parameters, and about the developing innovations.

In the past people avoid the use of specific development for specific plant growth under specific condition.The technological change in the agriculture helps to develops specific plants under specific condition.Presently the advancement of precision agriculture in green house enhanced the technology. The greenhouse is a house like a structure covered with a transparent material, which can controlled the agricultural parameters, for the healthy plant growth. Hence, it avoids excess of light penetration, extreme temperature,diseases, and insects so on. From this the farmer can grow any plant in any season by maintaining ecological conditions.

The precision agriculture is a framework which incorporates detecting, measuring, and responding.The greenhouse climate is identified and stored in a cloud storage and later the agriculturist will take action based on the received. This can be expert by the present advancement called **Internet of Things (IoT),** and improved by using Wireless Sensor Networks (WSN) that is nothing but an IoT.The farmers can easily identify the sudden changes in greenhouse using precision agriculture. So, that it is necessary to control and monitor the greenhouse parameters.

- *Remote Sensing*

Remote sensors collect data by detecting the energy that is reflected from earth.Remote sensors can either passive or active.Passive sensors responds to external stimuli.They record natural energy that is reflected or emitted from the earth surface.In contrast active sensors responds to internal stimuli.They collect data about earth.It is used in amny different fields such as:

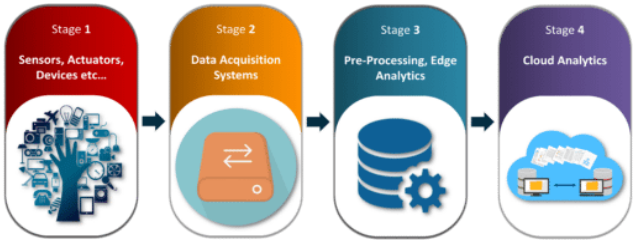
- Coastal application
- Ocean application
- Hazard assessment
- Natural resource management

Remote sensing in greenhouse comes under the category of natural resource management using remote sensing. Here it collect information about the parameters such as soil moisture ,temperature ,light ,co2 level.

The potential of remote sensing to provide spatially and temporally distributed information for precision crop management (PCM). PCM is an agricultural management system designed to target crop and soil inputs according to within, field requirements to optimize profitability and protect the environment.

- *IOT*

Internet of Things (IoT) is a network of devices which can sense, accumulate and transfer data over the internet without any human intervention.In fact, IoT is the technology that builds systems capable of autonomously sensing and responding to stimuli from the real world without human intervention. We therefore need to develop a process flow for a definite framework over which an IoT solution is built. The IoT Architecture generally comprises of these 4 stages:



Stage 1 (Sensors/Actuators):

A thing in the context of “Internet of Things”, should be equipped with sensors and actuators thus giving the ability to emit, accept and process signals.

Stage 2 (Data Acquisition Systems):
The data from the sensors starts in analogue form which needs to be aggregated and converted into digital streams for further processing. *Data acquisition systems* perform these data aggregation and conversion functions.

Stage 3 (Edge Analytics):
Once IoT data has been digitized and aggregated, it may require further processing before it enters the data center, this is where Edge Analytics comes in.

Stage 4 (Cloud Analytics):
Data that needs more in-depth processing gets forwarded to physical data centers or cloud-based systems.
The task of irrigation can be automated with the help of IoT. A set of sensors such as light,humidity,temperature can be used to continuously monitor the field conditions.

2.RESEARCH METHODOLOGY

IT infrastructure [1] for agriculture consists of analysis part (computer network with software's) and storage devices. The information related to soil, temperature, crop information etc. are collected using sensors and cameras. The collected information will be stored in storage devices and this will be analyzed in analyser part by agriculture experts. PDCA(Plan-Do-Check-Act) and cloud services can be used instead of deploying an IT infrastructure,where the information collected by different sensors and cameras is uploaded to the cloud for the analysis.

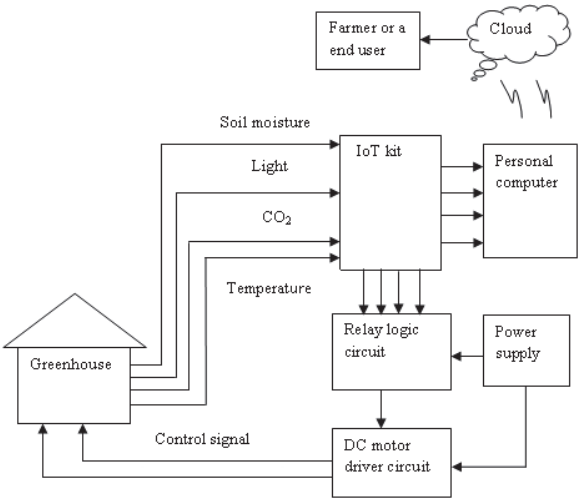
The solution[2] can be given to the farmers through SMS. The solution consists of client stub and a server stub. Server stub consists of group of application (message process, query process, database and analytical process) which receive the queries from client stub and deliveries the data to the client stub. The server stub contains the information about crop,fertilizers, water management, protection, and weather etc.

A system using technological development in wireless sensor networks that is Programmable System on Chip (PSOC)[3], which can monitor and control greenhouse parameter of precision agriculture by conducting several experiments. The design of this system is to avoid irregular distribution of water to the crops in the field.The potential transpiration rate is important for healthy plant growth if it falls below the potential value ,it is due to the variations in soil moisture level.

A wireless sensor network[4] is as an alternative and efficient way to solve the agriculture issues for monitoring agriculture parameters such as temperature, humidity, etc., for the précised agriculture methods. Here, the focus is on the hardware and network architecture, and software process control for the precision agriculture system.

A control system[5] for an intelligent farming composed mainly two parts in Intelligent Farming (IF) that is sensor system and control system used to monitor and control the farm field. The new technology used for this is Internet of Things (IoT) to monitor and control useful information from the farm field to the owner/farmer.
Through the introduction of IoT based precision agriculture framework for greenhouse. The concentration is to give field data that is remotely controlled greenhouse agriculture parameters, to the agriculturists from long distance, and controlling can be made for the greenhouse windows/doors to roll on/off.The agriculturists can avoid physical visit to the fields. For this utilized an IoT kit with internet connection which comprises of an electronic devices and different sensors.

Block diagram



- ***Greenhouse***

The main purpose of a greenhouse is securing a reasonable amount of heat and water vapors so that warmth and humidity is maintained within the greenhouse.

- ***IoT kit***

IoT kits are hardware kits that are designed for the rapid development of IoT solutions. Developer kits bundle a microcontroller or single-board computer and compatible components that you can use to prototype your IoT devices. IoT developer kits often include components such as breadboards, jumper wires, expansion boards, power supplies, batteries, sensors, and actuators.
The IoT kit utilized here is comprises of a 32 bit on chip processor and Wi-Fi microcontroller framework. It additionally comprises of various sensors. The detected analog information from the sensors are given to the processor to change into digital form. The digital values can be seen on the personal computer.

- ***Relay logic circuit***

Relay logic is a method of implementing combinational logic in electrical control circuits by using several electrical relays wired in a particular configuration.. It is a low powered electrical network with required input and output. The input may be a control relay or a switch. It is used to control DC motor direction in clockwise and anticlockwise direction.

- ***DC motor driver control circuit***

The DC motor driver control circuit consists of an ICL293D; it is used to control DC motor in clockwise and anticlockwise directions. The input signal to the IC is from relay logic circuit.

- ***Personal computer***

The greenhouse parameters such as CO2, soil dampness,temperature, and light are monitored with the help of a personal computer.

- ***Cloud***

The IoT kit is compatible with the Amazon Web Service(AWS) cloud benefit, by having a cloud account farmer can get to greenhouse data. This innovation comprises of a virtual groups of personal computer with RAM memory, CPU, hard disk, OS, and so on. With the assistance of sign in facilities,farmer can get to information from the cloud.

- ***Farmer or a end user***

The farmer or an end user can get greenhouse data by having web association in his portable devices with sign in tothe AWS account.

3.PROCEDURE

Nomenclature: CO2=400 to 600ppm, Temperature=20 to26°C,
Light=650 to 750cd, Soil moisture= 100 to -3 volt

Procedure

Begin
Step1: Initialize the values of the greenhouse parameters;
Step2: Compare the received values from cloud storage with the initial values;
Step3: If the received values are low as compared to threshold value
Step4: Initialize IOT port reader;
Step5: Read the parameter values; The door is roll on/off based on the readings;
Step6: The motor is stopped when a stop signal is encountered;
Step7: Refresh the reset timer;;
Step8: The refresher time is 4 hours interval set for plants ;
End

The CO2 level maximum at night timebecause from day time the greenhouse start to consume CO2 level till night time.

In IoT kit if the soil moisture sensor gives a negative value means the plant is covered by water and positive value indicates the soil is dry .When the sensor returns a negative value then the door will be closed automatically otherwise the soil will be re-wet.

The temperature should be maximum for the healthy growth of plants and maintain a sustainable amount of light penetration inside the greenhouse as compared to the outside.

4.FUTURE ENHANCEMENT

This system does not discuss about the control measures that is needed to be adopted when the agricultural parameter level exceeds the threshold limits (for eg: when the temperature level exceeds 26°C, it will affect the development of plants). This technique is not economical for the poor farmers.

5.CONCLUSION

IOT is used to connecting devices and peoples to share information. This system helps the farmers to remotedly control the parmeters using IOT. Based on the soil moisture level the system can control the windows/doors of the greenhouse. This helps the farmers to avoid their physical visit to the field, and they can increase the yield of plants by controlling the agricultural parameter to a level which is suitable for the healthy growth of crops. This system is accomplished with the help of IOT kit and interent connection.

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