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Monitoring Of Environmental Parameters by Using Cloud Computing

Mayur Randhir [1], R. R. Karhe [2]
PG Scholar [1], Associate Professor [2]
Department of Electronics & Tlcommunication
SGD College of Engineering, Jalgaon, MS
India

ABSTRACT

Now a days monitoring & controlling of environmental parameters is very necessary in various fields, like medical, industrial, domestic application & most important in agriculture applications. E.g. when any type of disasters occurs suddenly, then it is necessary to inform specific information to particular. So this paper discussed about the controlling & monitoring of temperature & humidity environmental parameters. Which can be done by cloud technology in which any time varying data can be logged into & it can be monitored from internet from anywhere. It can be accessed real time varying data with specific intervals. By using logging into the cloud we can analyze any type of sensor through it. Specifically greenhouse i.e. humidity and temperature signals can be logged into cloud so that any authenticated person can observe the specific data from any place. Humidity or temperature may be uncontrollable in case of any disasters like heavy wind, heavy rain, and fire. In these cases, the whole information can be conveyed immediate all over the world using cloud to any authenticated person. It requires hardware like humidity and temperature sensor circuitry, login to cloud provider, Internet connection through LAN or wifi.

Keywords:- Cloud, LAN, WiFi, Humidity And Temperature Sensor Circuitry, Green House.

I. INTRODUCTION

Various methods [1], [2] are available to monitor the sensor parameters. But the method which can be used for disaster management is very useful for the society. At the time of any type of disasters, it is essential to inform specific information to particular. It can be done immediately with this application.

Green house controlling was introduced by many researchers like [3], [4], but their purpose was only to control the parameters. It is the most primary purpose of a greenhouse to give the essential growing conditions for the long life of the plants. But there is a major role autonomous measuring systems to monitor all the essential parameters which are required for creating the optimal environment in the greenhouse. But with this application, it can be incorporate the disaster management process with current sensor networks. This requires provision of monitoring the controlled & un-controlled parameters on the Internet through cloud to monitor real time variations. These real time variations can inform uncontrolled parameters in case of disaster such as air and rain storms, and by caught through fire etc. to green house to take preventive action as early as possible.

This technology proposes the system for monitoring the humidity as well as temperature parameters continuously on cloud. It needs the real time processing which is possible using ARM 11 processing. It is able to sense the signals from various sensors, also can process in real time, can be connected to Internet through LAN or through wifi or cable. It can transmit data through Internet to specific destination like cloud terminal which can be visualized real data through www. Due to these capabilities of ARM 11 processor, it is prefered to use it for this work. Data can be logged into cloud server through subscribing the cloud service from cloud service providers so that it can visualize the immediate data on it. It can be informed immediately if any logged data exceeds more the specific levels.

II. CONCEPT

A. Greenhouse Climatic Control Problem

Crop growth is mainly sensitive to the surrounding environmental climatic variables, the amount of water and the fertilizers given by irrigation system. Greenhouse is ideal for cultivation of proper crop, at which climatic and fertilization variables can be controlled to allow an optimal growth and development. The climate and fertilization are independent issues, so they have different control problems. The exact need of nutrients and amount water for different crop species can be very well controlled, using automated machine working on collected data. The amount of water and fertilizers require to the plant is depends on climate environmental conditions on which growth of the crop is depended. That's why greenhouse crop production is a very complex issue [5]. The Climatic Control Variables are really the dynamic behaviour of the greenhouse. Microclimate is a

combination of physical processes involving energy transfer and mass balance (Includes water vapour fluxes and CO2 concentration). This technology changes with the outlet environmental conditions, architecture of the greenhouse, and performance of the control actuators as well as variety of crop. Proper heating & ventilation are the important way of controlling greenhouse environment. The artificial light is used for controlling inside temperature, humidity and shading. CO2 injection is a control to influence fogging & photosynthesis [6]. In this paper, the intention is to developed the method for the climatic conditions of seasons for greenhouse. Considering the greenhouse structures, the crop types, the commonest actuators and the local conditions of this geographical area, the main climate variables to control humidity & temperature. They are used through the plants as an energy source under the photosynthesis process. This paper is magnifies the concept of humidity & temperature control problems.

B. Temperature Control

Growth of Plants depends on the photosynthesis process which is a measure of photo synthetically active radiation. It is concluded that proper temperature level influences the speed of sugar production by photosynthesis radiation. As higher radiation level may give a higher temperature, it has to be control properly. So it is necessary to adjust the temperature at an optimal level for the photosynthesis process in the diurnal state. In nocturnal conditions, plants are not active therefore; it is not necessary to maintain such a high temperature. Due to this, two temperature set points are usually considered are diurnal and nocturnal [7]. In favourable weather conditions of temperature during the daytime the energy required to reach the optimal temperature is given by the sun. The usual diurnal temperature control problem is the refrigeration of the greenhouse using natural ventilation to achieve the optimal diurnal temperature. On the other hand, heating of the greenhouse up to required temperature is the case of nocturnal temperature control. Some times forced-air heaters are commonly used as heating systems.

C. Humidity Control

Water vapour inside the greenhouse is one of the most significant variables affecting the crop growth. The probability of diseases and decrease transpiration may increase by high humidity. It may cause hydria stress, closing the stomata and thus it may lower down the process of photosynthesis which depends on the CO2 assimilation. The control of humidity is complex because if temperature changes then relative humidity changes inversely. The same actuators are used to control temperature & humidity. The main focus is for temperature control because it is the primary factor in the crop growth. Based on the inside relative humidity value the temperature set-point can be adjusted to control the humidity within a specific range. Therefore to control the required humidity is very difficult task. To control humidity properly internal air can be exchange with outside air by properly controlling ventilations of the green house [8].

III. BACKGROUND

This section gives the detail concept of cloud computing.

A. Cloud Computing

Cloud computing is the latest distributed computing model that implements the utility computing vision [9] wherein computing services are provided on demand basis. Cloud service models enable with new IT business models such as on demand, pay-as-you-go, and utility computing. The objective of the cloud computing model is to increase the capacity and capabilities of client devices by accessing leased infrastructure and software applications instead of owning them. Cloud computing has introduced new kind of information and services and new ways of communication and collaboration. Cloud has created online social networks in which scientists share data and analysis tools to build research communities [10]-[11]. In cloud computing, applications are delivered as services over the internet and user access computing resources from centralized cloud servers through service providers [12]. It reduces the cost and efforts associated with the administration of computer hardware and software for organizations [13]. Computational clouds implement different types of service models for implementing the on demand computing vision [9]. Service providers provide services in the form of various service models; Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS). Fig. 1 shows an abstract level layered cloud computing architecture.

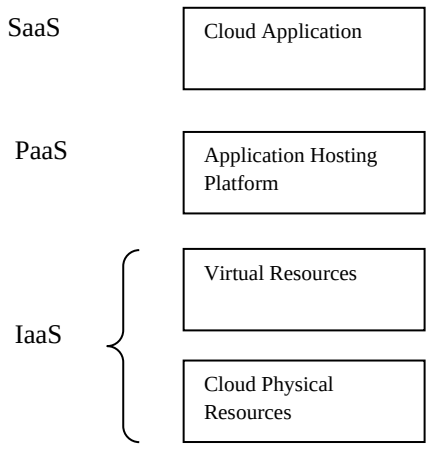

Fig. 1. Layered Cloud Computing Architecture [14]

B. Cloud Architecture

Typical cloud architecture and its components as shown in fig 2. Cloud computing architecture consist of the required components and subcomponents for cloud computing. A cloud- based delivery, a backend platform, a front end platform
mechanism and a network are the main elements of the cloud architecture.

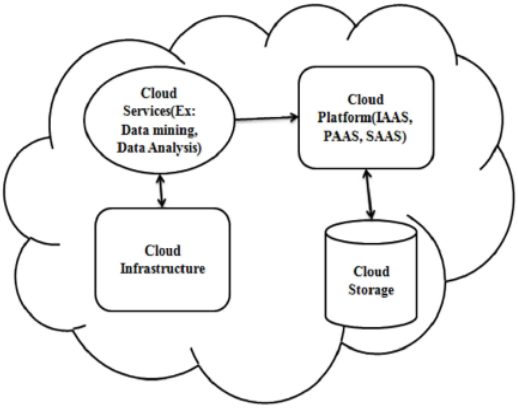

Fig. 2. Cloud Architecture [15]

Three basic cloud computing models are,

- *Software as a Service (SAAS):* It consist of the ICT working tools such as web applications, software etc., without downloading or buying and installing in specific machines. Users are charged for whatever has to be used for a particular duration, this is the another characteristic of this model. In the opposite the traditional way of paying & buying for the full application such as "3.5-inch disk drive".
- *Platform as a Service (PAAS):* It gives clients with the computing platform for developing and designing requiored applications with less number of redundancy. It also co-ordinates the hosting of those applications without concerning about data storage and hardware requirement. In addition, it also ensures the availability of most recent platforms with their security.
- *Infrastructure as a Service (IAAS):* It includes tangible as well as intangible parameters which are used in availing ICT services, like traffic monitoring and redirecting, virtual computers, basic network components etc. As the organizations invest the most in establishing infrastructure, this is the main advantage of cloud computing [15].

Following are the five major benefits of cloud computing.

- It reduces the initial cost.
- On demand resource allocation without an Limit.
- Up gradation & maintenance performed in the back end.
- Easy fast development which consist of collaboration with different systems in the cloud.
- More chances for global service development.

IV. SYSTEM PARAMETERS

A. Temperature Sensor

As most electronic, physical, mechanical, chemical and biological systems are affected by temperature, it is the most often-measured environmental quantity. Certain biological processes, chemical reactions, and even electronic circuits gives best performance with limited temperature ranges. There are many ways of sensing it as temperature is one of the most commonly measured variables so it is therefore not surprising that. Temperature sensing can be done either by remotely or direct contact with the heating source, without direct contact with the source using radiated energy. In the market today, There are different types of temperature sensors are available on including Resistance Temperature Detectors (RTDs), Thermocouples, Infrared, Thermistors and Semiconductor Sensors. Temperature is the most often measured environmental quantity and many biological, chemical, physical, electronic & mechanical systems are affected by temperature. Proper care must be taken to monitor and protect the system as some processes work well only within a narrow range of temperatures. Electronic components & circuits may be damaged by exposure to high temperatures, when temperature level are exceeded. By sensing the temperature engineers can enhance circuit stability. By measuring the inside temperature of the equipment, maximum temperature levels can be selected and steps can be performed to reduce system temperature, or even shut down the system to avert disaster. Different types of temperature sensing techniques are used currently. Thermocouples, sensor integrated circuits (ICs) and thermistors these are the most common of them. As per our requirement temperature range, accuracy, linearity, features, cost and the ease of designing the necessary support circuitry are decided. There are mainly five types of temperature semsors are used,[17]

i) Thermocouple
ii) RTD
iii) Thermistors
iv) Semiconductor Sensors
v) Digital Sensors

B. Humidity Sensor

The presence of water in air is known as humidity. Human comfort as well as many manufacturing processes in industries affected by the amount of water

vapor present in air. Also various chemical, physical and biological processes also affected by the humidity. Humidity measurement may affect the health and safety of the person in industries & also the business cost of the product so humidity measurement is critical. Therefore measurement of humidity is very important, mostly in the control systems for human comfort & industrial processes. Monitoring & sensing of humidity having major role in many industrial & domestic applications. During wafer processing in semiconductor industry, humidity or moisture levels needs to be properly monitored & controlled. Simmilarly also in medical applications, humidity control is required for sterilizers, pharmaceutical processing incubators, respiratory equipments, and biological products. Also in Chemical gas purification, ovens, film desiccation, dryers, food processing & paper and textile production humidity monitoring is necessary. Measurement of humidity is important in agriculture for plantation protection, soil moisture monitoring, etc. For domestic applications, humidity control is required for cooking control for microwave ovens, living environment in buildings etc. In this way, humidity sensors are ued to provide an indication of the moisture levels in the environment in all such applications and many others.[16]

V. CONCLUSION

The proposed system will be very useful for the use with existing system. But the usefulness of the system will be for disaster management. The system will be cost effective, speedy for real time operation and helpful to the society. Newest technique will be used for remote monitoring using cloud logging.

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