Solar Powered Green House Monitoring and Controlling using AWS Cloud by Android Application

Mamatha C.R
Dept. of Computer Science and Engg., Vemana Institute of Technology, VTU

Abhishek Kumar Singh
Dept. of Computer Science and Engg., Vemana Institute of Technology, VTU

Shazia Amreen
Dept. of Computer Science and Engg., Vemana Institute of Technology, VTU

Abstract — In this paper, we present an effective idea of Solar Power System for Internet of Things (IoT) devices to monitor and control the environmental parameters of greenhouse system remotely. The proposed system consists of a Solar Photovoltaic (PV) Power Conditioning Unit (PCU), Wireless Sensor Network (WSN), integrated with Sensors, Arduino UNO and Radio frequency (RF) modules which form the sensor node. All monitored parameters like temperature, humidity, water level and light that sensed by various sensors are transmitted from sensor node to server (AWS cloud) and then controlled by Android device. By using Power Conditioning Unit (PCU), it enables the charging of battery which powers the IoT devices and this is most advantageous among the existing greenhouse system.

Keywords —IoT, Solar PV PCU, WSN, Arduino UNO, RF Module.

I. INTRODUCTION

Nowadays, greenhouse industry is the fastest growing sector in agricultural and horticultural countries. The greenhouse is also called as glass house where plants are cultivated in a controlled climatic environment with suitable fertilization. The benefit of the greenhouse is that we can cultivate desired plants by regulating the climate for different crops as required. It helps the farmers to improve the production in a way the crops need. The ecological parameters are improved such as supplying the essential amount of water and required wavelength of light, favored soil moisture, reduces a prolonged period of growth and thus it gives a higher quality crop yield which is free from pests and diseases. It is moreover prejudiced by working the adaptable components of the greenhouse, such as heating and cooling inputs, drip irrigation, screening, window opening and CO2 dose. Hence, it can be anticipated that the way these controls are functioned stimulate to feeding the essential load (sale (POS) networks, as well as broad deployments of radio-frequency identification (RFID) tags to track the movement of millions of inventory items. Manufacturers connect thousands of devices to monitor and manage production in machine-to-machine (M2M) networks. Utilities deploy connected sensors and meters to enable everything from customer billing to maintenance troubleshooting. Each network could amount to tens of thousands of connected devices. Nobody referred to these initial networks as IoT, and there were significant differences. Normally, they dealt with only one type of coupled device or one application, had a very limited and strongly defined set of purposes, and often used patented protocols rather than IP or the cloud, which have become the dominant networking and computing options today.

Indexcopernicus: (ICV 2015): 79.58
© 2014-17, IRJCS- All Rights Reserved
Still, these amounted to early large-scale attempts to connect devices with some level of built-in intelligence and communication for the purpose of managing critical business functions. They were the forerunners of what we think of as IoT today [5].

II. RELATED WORK

[1] Sheetal Vasari, Aarti Bakshi, Tanvi Thakur
This paper intends that the Internet of things (IoT) and cloud computing equally makes a structure that pedals greenhouse effectively. This system will sense all the environmental parameter and sends that data to the user via the cloud. The user will take essential action authorizing to that this will do by using actuator by using this arrangement. This ability allows the farmer to improve the farming in a way the plants need. It leads to greater crop yield, extended production period, better quality, and less use of chemicals [5].

[2] Yun Zhang, Farhan Patwa and Ravi Sandhu
AWS cloud is the needed distribution of IT resources and applications through the Internet through pay as you go pricing. Whether you run applications that share photos to millions of mobile users or provide facilities that support the acute tasks of your business, the cloud offers fast access to elastic and low-cost IT resources and you don’t requirement to make huge up-front funds in hardware and apply a lot of time supervision that hardware. Instead, you can provide precisely the right type and size of computing resources you need to control your newest bright idea or function your IT department. With cloud computing, you can access as countless resources as you need, almost instantaneously, and only pay for what you use. In its modest form, cloud computing offers an easy way to access servers, storage, databases, and a broad set of application services over the Internet. AWS possess and reserve the network-connected hardware essential for these application services, while you provision and use what you required for your workloads. Information and capitals sharing in cyber security alliance in public cloud are accomplished [4] [13].

The solar PV PCU observing using Internet of Things has been experimentally demonstrated to work agreeably by monitoring the parameters effectively through GPRRS. The intended system not only monitors the factors of solar PV PCU, but it also controls the data and yields the report conferring to the requirement. It also stores all the parameters in the cloud in a suitable mode. This will help the user to analyse the state of various constraints in the solar PV PCU [1] [10].

In this paper, a design concept of wireless sensor network is achieved using low-cost transceivers and Arduino UNO microcontroller. The system is well suitable for environmental monitoring. As per necessities, the sensor nodes are made as minor as possible. The proposed system is protected; each node has its own data buffer acknowledged by a 64-bit address along with Onion protocol which boosts the data encryption among nodes. This root the sniffing of the packet very problematic. And also, an ultra-low power consumption system with suitable Arduino optimization, 3000mAh Li-Po or Li-ion batteries can maintenance a node for more than fifteen months. This makes nRF4L01 (+) module an economical substitute to XBee modules [6].

III. PROBLEM STATEMENT

A number of challenging difficulties related with the existing systems are the complexities in monitoring climatic parameters like humidity, water level, light, and temperature directly or indirectly manage the plant growth and the system cannot be controlled remotely. It involves high maintenance and needs for skilled labor for controlling the greenhouse. If there is any variation in the system then the changes or maintenance should be completed according to farmer directions [7] [8].

IV. EXISTING SYSTEM

A. MANUAL SET-UP
This set-up includes visual analysis of the plant growth, physical irrigation of plants, rotating ON and OFF the temperature regulators, physical spraying of the fertilizers and pesticides. It is time overwhelming, susceptible to human error and hence less precise and undependable.

B. PARTIALLY AUTOMATED SET-UP
This set-up is a mixture of physical management and partial automation and is similar to physical set-up in most compliments but it reduces the labour involvement in terms of watering the set-up. It consists of monitoring of ecological conditions like temperature, humidity and soil control will be sense by using sensor network using Internet of things [7] [8] [12].

V. PROPOSED SYSTEM

Implementation of proposed system is to be done using Embedded System consisting of an Arduino Uno that can be driven from the grid, a battery and also with solar energy. Building a separate photovoltaic (PV) structure for our application is unbiased about taking the right components and connecting them with a few wires. We needed a PV module a charge regulator and a battery to advance the Arduino project successively running the off grid. The system basically is the same as if you would build off-grid PV for e. g. a caravan, a weekend home or a small house.
Using Arduino shield consisting of GPRS, this can be connected to the AWS cloud and by developing the android application; we can monitor and control the environmental parameters. The greenhouse Microchip and AWS cooperated to advance this integrated resolution to help IoT devices rapidly and easily comply with AWS's mutual authentication IoT security system. The solution enhances a high level of security, shortens the supply chain, and is now one of the fastest methods to connect to the AWS Cloud [15].

![Fig. 1 The Movement of Data from Arduino to AWS and the Android device](image-url)

**Fig. 1 The Movement of Data from Arduino to AWS and the Android device**

**A. ARDUINO UNO**

It consists of a microcontroller board made with the ATmega328P. It comprises a USB connection, 14 digital (input-output) pins (by which 6 be able to cast-off as PWM yields), a 16 MHz quartz crystal, an electric power jack, 6 analog input devices, an ICSP a reset button and header. It comprises the whole thing needed to sustenance the microcontroller. Basically, attach it to a computer through a USB cable or else power the device with an AC-to-DC connecter otherwise batter to get running. You can interfere with your UNO without distressing too much about doing something wrong, worst case situation you can substitute the chip for a few dollars and start the system again.

**B. GENERAL PACKET RADIO SERVICE (GPRS)**

It has a packet based wireless message facility that possesses the potentials of Data speed from 56 Kbps to maximum speed of 114 Kbps and uninterrupted connection towards the Internet for mobile phone and computer operators. To start with GPRS we need the following:

- A GSM-GPRS board. This board can be interfaced with the RS-232 DB9 connector. The rest ones you stop required items assume that the board you have, also interface using an RS-232 connector.
- A laptop with spare USB port (I’m assuming your laptop does not have RS-232 port. I have not seen a laptop with RS-232 port in over last 10 years)
- A USB to RS-232 board. Please note, this should not be a USB-to-RS232 (TTL), but a full USB-to-RS232. The output should be RS232 voltage ranges (around +/-12V). This is due to the fact that the board I had, allowed interfacing with RS-232. If your board has TTL interfaces, please get a US-to-RS232 (TTL) interface.
- An RS-232 cable (please ensure you get the right combination of male/female). My USB-to-RS232 adapter had male output and GPRS board had female input. Thus, one RS232 cable with male/female combination.
- A SIM card that has data plan.
- A power supply for your GPRS board. Generally, the GPRS boards require 2 Amp supply. So please read the board specifications and get the power supply accordingly.

C. Virtual Private Server

Amazon EC2 allows you to acquire compute through the launching of virtual servers called instances. When you launch an instance, you can make use of the compute as you wish, just as you would with an on-premises server. Because you are paying for the computing power of the instance, you are charged per hour while the instance is running. Once you stop the illustration, you do not require paying for the service again. There are two concepts that are key to launching instances on AWS: (1) the amount of virtual hardware dedicated to the instance and (2) the software loaded on the instance. These two dimensions of new instances are controlled respectively, by the instance type and the AMI [4] [5]. In our experimental setup, we have designed the greenhouse system. We have taken four sensors LM 35 temperature sensors which can sense temperature and power transmission attached to it that is FAN which will adjust the set threshold value, HUMIDITY sensors detect the humidity of greenhouse and if it is too high or too low then using SPRINKLER and LED it can adjust its value. LDR for light detection is used, if it is too high then LED with different color can adjust its value for ideal light. WATER LEVEL SENSOR is used to detect the water level and if the water level is too low then water pump motor which is attached to it by power transmission can trigger and fulfill the requirement of greenhouse.

After monitoring the result, we have drawn the graphs with the following result as shown below.

![Fig. 3 The Experimental System of Greenhouse](image)

![Fig. 4 Behaviour of Temperature with and without Controlling](image)
VI. CONCLUSION

Solar panels with the help of photovoltaic power conditioning unit can charge the battery during the daylight and IoT devices which consists of various wireless sensors network which can sense the different environmental parameters. The GPRS shield which is fixed on the Arduino consists of sim slot which can be configured using the driver to the host machine, where sim contains the active data plan. The sim consists of IP address which can be used to configure with the AWS cloud which provide different types of service like SaaS, PaaS and IaaS. EC2 of AWS can provide cheap and high security service infrastructure to fulfill our requirement. These can be controlled with the help of Android device. So that, we can get the non-polluting, renewable source which is cost effective and at the same time which can be remotely controlled from anywhere.
REFERENCES


[10]. Yin Jie, Ji yong Pei, LI Jun,guo Yun, Xu Wei, "Smart Home System based on IOT Technologies", International conferences on computational and Information Science Issue: November-2013.


