Wireless Gardening Using Internet of Thing And Wi-Fi Module

Shakti Bagal[1], Priyanka Pawale[2], Sayali Parbat[3]
[1, 2, 3] Department of E&TC
[1, 2, 3] Bhivarabai Sawant Institute of Technology and Research, Wagholi, Pune

Abstract- *In this hectic life schedule of mankind, finding time to refresh has turned out to be an infeasible task. But it is vital for maintaining our productivity, not just in professional life but also in social life. Gardening is surely a leisure time activity which involves both the physical and psychological aspects. On the other hand, it shows justice to our environmental obligation of keeping the planet green. However the practice of gardening needs some sincere investment of our time and care. But we may not always be available to our garden. In this report we present a smart wireless gardening technique. The technique uses an automated system which intimates us about the whole related parameters for keeping our garden nourished. This report also describes the integration of Cloud Computing with IOT technology to monitor the vital factors which can be used for increasing productivity in similar environments. We intend to monitor the soil moisture, temperature, light through an array of sensors from any garden location. Thus we can have control over our garden even without being physically present. This spares us from all worries regarding gardening and water scarcity. This report describes the hardware and software architecture of a fully automated gardening system, which uses cloud server for data acquisition, aggregation and communication.*

Keywords- Wireless sensor networks, watering system, smart watering, irrigation control, environmental monitoring

I. INTRODUCTION

India is a country in which a good majority of the population depends upon agricultural revenues. The main challenges in the sector are to maintain a good productive despite of the environmental and human challenges. The environmental challenges include the different climatic conditions, proper irrigation, maintaining the acidity or alkalinity of the soil. Another major challenge is the shortage of labor resources. Humanity depends on water and agriculture for survival, so optimal, sustainable and profitable use of our land and water resource is critical. Technology is growing up and today's technology is capable of automating the whole agricultural and gardening systems. Sensing devices play a key role in it. By using the sensing and control systems, we can devise a cost effective and reliable micro sensor network which can be used in a large scale to monitor and control the parameters that control the plant yields.

Wireless sensor networks can revolutionize soil ecology. The general availability and reduction in the cost of micro sensors and low power wireless communications has enabled the deployment of densely distributed sensor networks for numerous environmental monitoring applications. This system is self-configuring, communication is multi hop and nodes can be used to actuate switches which can be utilized for automated monitoring and controlling functions. This paper presents a smart and low cost wireless gardening system which finds an ultimate solution for the problems regarding water scarcity and agricultural productivity. Being centered on Sensor Acquisition system over cloud, the system can bring in considerable changes to the agricultural system. It is a collection of small, low cost, low power, sensors and controller unit which will work collaboratively to sense and process various physical permits and update the data effectively over a cloud server in real time. Sensors that we have used in our gardening system are low cost and easily available. Its small size enables its deployment in large areas easily and can be effectively utilized to measure and monitor various environmental parameters like light, temperature, moisture etc.

The basic structure of our system consists of a controller unit, a cloud server, a sensing platform and a power source. Various sensors can be connected to controller unit and each sensor will act as independent sensor node and will sense the physical parameters and controller will process them and can communicate to a cloud server over Wi-Fi. Thus the various gardening and environmental parameters can be accessed from cloud server. A structured study of the parameters over a period of time can help us to derive an optimal value of the environmental parameters required for a garden and by making use of these factors, we can increase the yield to a good extend. This project also presents the integration of cloud with IOT. IOT (Internet of Things) is a network of internet enabled objects. The smart gardening system we present here can be accessed remotely. As we are all well connected to the Internet, we designed this project in such a way that the parameters can be accessed worldwide. The cloud is a high performance server which is capable of processing all the values received from the controller unit, process and store and visualizes the factors in graphical format in real time.

II. METHODOLOGY

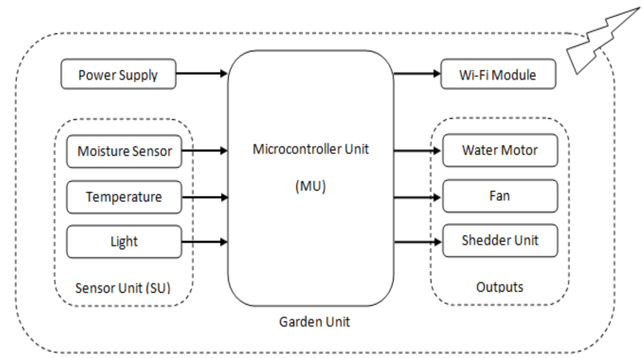


Fig. Garden Unit with microcontroller unit, sensors unit, outputs and Wi-Fi Module.

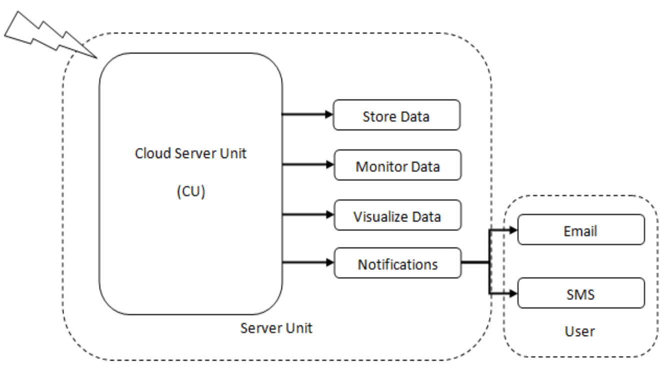


Fig. Server unit showing the available features and user notifications.

i. Atmega328

The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

ii. Wireless Module

The TI CC3000 module is a self-contained wireless network processor that simplifies the implementation of Internet connectivity. TI's Simple Link Wi-Fi solution minimizes the software requirements of the host microcontroller (MCU) and is thus the ideal solution for embedded applications using any low-cost and low-power MCU. The TI CC3000 module reduces development time, lowers manufacturing costs, saves board space, eases certification, and minimizes the RF expertise required. This complete platform solution includes software drivers, sample applications, API guide, user documentation, and a world-class support community.

iii. Soil Moisture Sensor

The Soil Moisture Sensor is used to measure the volumetric water content of soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and biology.

- 10 HS coded pre-caliberated soil moisture sensor
- 10 bit analog resolution for a wide range of 0 to 1023.
- Needs 12mA to 15mA current with 3 to 7V DC.

iv. Ambient Light Sensor

- Low Voltage: 3V to 5V
- Light Resistance: 20 kΩ
- Dark Resistance: 1 MΩ
- Peak Wavelength: 540 nm

v. Temperature Sensor

- Precision IC Temperature Sensor LM35.
- Operating Temperature: -55˚C to +150˚C
- Output Voltage/ ˚C : 10mV

vi. Output Motors

- Centrifugal Pump for Irrigation
- Stepper Motor for Shed Unit to roll on/off greenhouse nest.
- 230V Fan Motor for Fan.

vii. POWER SUPPLY

In every electronic circuit, power supply is required. If the power exceeds its limit, it can be fatal. In this project, power supply is given to microcontroller as it works on dc. Power supply converts ac voltage to required variable dc voltage to switch ON the controller. The controller required 5 V dc to work properly. A power supply is an electronic device that supplies electric energy to an electrical load the primary function of a power supply is to convert one form of electrical energy to another and, as a result, power supplies are sometimes referred to as electric power converters.

viii. PCB DESIGN SOFTWARE

Dip Trace provides the following Features :Easy to learn user interface

To design a schematic, simply select and place components onto your document and connect them together using the wire and bus tools. Multisheet design is supported. Then select the menu option 'Switch to Board' to convert the schematic to PCB. Layout can be updated from Schematic in a few clicks at anytime. When you create or edit design objects they are underlined to improve your work. Step-by-step tutorial available from web-site guides you through the design process and allows to get started with ease.

- PCB Design Software

For PCB design Dip trace software is used.

Dip Trace provides the following features : Easy to learn user interface to design a schematic, simply select and place components onto your document and connect them together using the wire and bus tools. Multisheet design is supported. Then select the menu option 'Switch to Board' to convert the schematic to PCB. Layout can be updated from Schematic in a few clicks at anytime. When you create or edit design objects they are underlined to improve your work. Step-by-step tutorial available from web-site guides you through the design process and allows to get started with ease.

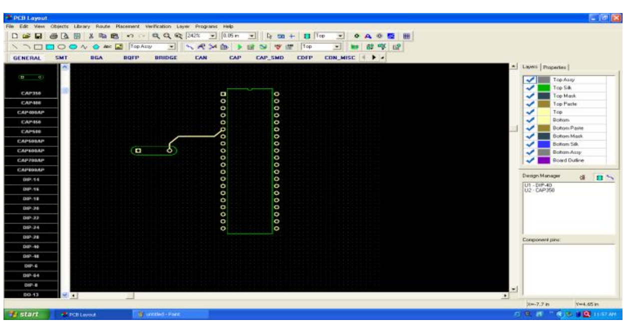
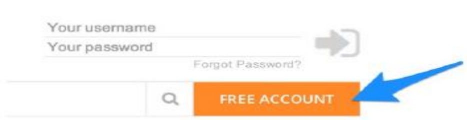


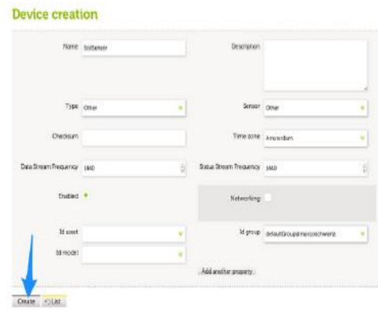
Fig No.3: Window of Dip trace

- Setting up your Carriots account

To upload data to Carriots, you first need to create an account:



When the account is created, you will have to create a device, which is the entity that will receive the data from our hardware project:



Finally, you will need to know your API key for the rest of the tutorial. You can find the key under the "MY ACCOUNT" menu:

When all these steps are done ,we are ready to send data to your newly created device.Be sure to keep the device name and your API key around, you'll need them for the next part of the guide.

III. LITERATURE SURVEY

Cloud Computing has many important applications, some of them are futuristic while a large number of them are practically useful like business applications, home automation application, health application, commercial applications, environmental application which is basis relevant to our research.

IoT's can form a useful part of the automation system architecture in modern greenhouses. Compared to the wired systems, the installation of IoT devices is fast, cheap and easy. Moreover, it is easy to relocate the measurement points when needed by just moving sensor nodes from one location to another within a communication range of the coordinator device. If the greenhouse's plant is high and dense, the small and light weight nodes can even be hanged up to the plants branches [2].Many research and projects have been done in order to improve the conditions and cultivation of crops under greenhouse. Qian et al.[3] proposed wireless system solution for greenhouse monitoring and control. This system consist of wireless sensors, such as temperature sensor, humidity sensor, light sensor and so on (integrated with PIC 16F877 and ZigBee module). The data is stored and displayed on the LCD. After the data being dealt through control algorithm, which sends control commands to the actuators and PIC 16F877. All the wireless nodes are based on ZigBee module.

Ibrahim and Munaf [4] proposed system to control and monitoring the environment inside greenhouse. The system consists of a number of local stations and a central station. The local stations are used to measure the environmental parameters and to control the operation of controlled actuators to maintain climate parameters at predefined set points. For each local station a PIC Microcontroller is used to store the instant values of the environmental parameters, send them to the central station and receive the control signals that are required for the operation of the actuators. The communication between the local stations and the central station is achieved via ZigBee wireless modules.

Zhou Jianjun1 and .et al. [5] Presented system that consists of a data acquisition controller and greenhouse remote monitoring and control software. The system ,monitor temperature ,humidity, soil water content and concentration of carbon dioxide inside the greenhouse which then saved to a database. According to the current indoor temperature, the target temperature and the offset temperature, PID (Proportional Integral and Derivative) control method is used to control temperature control in greenhouse. The system is implemented using low power wireless components, and easy to be installed.

The objective of the present work is to design and implement wireless gardening system using cloud computing and Internet of Things platform for monitoring and control of the environmental parameters such as temperature, humidity and light intensity in a garden.

IV. CONCLUSION

In this project, a wireless gardening system is studied that can be implemented and applied to irrigate gardens and monitor environmental conditions surrounding it. The development of wireless gardening system can be proposed to be used in several commercial activities like food gardening, agriculture since it can be obtained in low cost and in reliable operation. This application of sensor-based site- Specific irrigation has some advantages such as preventing moisture stress of trees, diminishing of excessive water usage, ensuring of rapid growing weeds and derogating calcification. Different kinds of sensors (that is, temperature, humidity, and moisture etc.) have been involved in gardening. In future works, it can be said that an cloud based control of wireless gardening automation will be possible. The system to be developed can also be utilized to transfer fertilizer and the other agricultural chemicals (calcium, sodium, ammonium, zinc) to the field with adding new sensors and valves.

ACKNOWLEDGEMENT

We put on record and warmly acknowledge the constant encouragement, Invaluable supervision, timely suggest and inspired guidance offered by our guide Prof. S.S.Dubal and Head of Department of Electronics and Telecommunication Engineering, JSPM'S Bhivarabai Sawant Institute of Technology and Research this paper to a successful Completion. Last but not the least we communicate our sincere thanks to all of our friends who have patiently comprehensive all sorts of help for accomplish this undertaking.

REFERENCES

[1] D.D.Chaudhary1, S.P.Nayse2, L.M. Waghmare, "Application Of Wireless Sensor Networks For Greenhouse Parameter Control In Precision Agriculture", International Journal of Wireless & Mobile Networks (IJWMN , February 2011,Vol. 3, No.1, pages 1-3.

[2] Andrzej Pawlowski, Jose Luis Guzman ,Francisco Rodríguez, Manuel Berenguel,José Sánchez and Sebastián Dormido, "Simulation of Greenhouse Climate Monitoring and Control with Wireless Sensor Network and Event-Based Control",' sensor Journal', 2009, Vol 9, Page 2.

[3] ZHANG Qian, YANG Xiang-long, ZHOU Yi-ming, WANG Li-ren and GUO Xi-shan, "A wireless solution for greenhouse monitoring and control system based on

ZigBee technology" ,Journal of Zhejiang University SCIENCE 2007 8(10): page 1-2.

[4] Ibrahim Al-Adwan and Munaf S. N. Al-D " The Use of ZigBee Wireless Network for Monitoring and Controlling Greenhouse Climate"International Journal of Engineering and Advanced Technology (IJEAT) ',2012 , Volume-2, page 1-5.

[5] Zhou Jianjun, Wang Xiaofang, Wang Xiu1, Zou Wei1 and Cai Jichen "Greenhouse Monitoring and Control System Based on Zigbee" , Proceedings of the 2nd International Conference on Computer Science and Electronics Engineering (ICCSEE 2013) ,page 1-5.

[6] Baggio A (2005). Wireless sensor networks in precision agriculture. In: On-line Proc. of the Workshop on Real-World Wireless Sensor Networks, pp. 50-51.

[7] Constantinos Marios Angelopoulos, Sotiris Nikoletseas, Georgios Constantinos Theofanopoulos, ACM 978-1-4503-0901-1/11/10. A Smart System for Garden Watering using Wireless Sensor Networks.

[8] Chetana A. Kestikar , Rutuja M. Bhavsar, Automated Wireless Watering System (AWWS) . International Journal of Applied Information Systems (IJAIS) – ISSN : 2249-0868 , Volume 2– No.3, PP: 40-46

[9] Neethu Prasannan, Akhil Manikkoth, Gandhiraj R, Soman K.P, Internet of Things through Motes, IJARCSSE, Volume 3, Issue 6, PP: 1698-1705