An Optimization of Smart Modern Technique of Plant Focusing

R. Santhana, M. Ramya, D. Karthika and S. Mohanram

Abstract---This project is mainly implemented for maintaining, controlling and monitoring of plants, without direct viewing of plant status in that place in terms of IoT. By using various types of sensors, the sensing of plant conditions can be achieved. Here Raspberry pi3 play a role of controlling overall performance. The server which collects the data and store it for displaying and can also sent to the user mobile. If soil moisture is low, then automatic irrigation system will happen.

Keywords---Smart Irrigation, Monitoring System, IoT

I. Introduction

AT present the Internet of things (IoT) is a major need of searching everyone. It is also used to connecting physical Devices communicate with each other easily. The network with advancement of wired and wireless technologies inter-connected with mobiles like smart phones, PC, Laptop are used. Generally, the IoT is an information sharing purpose in the environment, also is a quick way of sending information.

Physical devices such as sensors, ADC, mobile phone and server will not directly connected to the internet (or) communicate. So using raspberry pi3 controller is suitable. Raspberry pi3 is a single board computer. Here, we can access any type of data. It is a advanced model of controllers.

Now a days agriculture is 50% destroyed. In future agriculture will be a chance of get destroyed. So, improvement of agriculture is a biggest challenging of one. Because, countries are mostly depend on agriculture for their food.

Implementing plant monitoring system, monitoring covered the following parameters such as temperature, soil moisture, humidity and light intensity.so can be used these types of sensors. These all the sensors were connected to the plant and collect the data, this data is passed through the server with the help of raspberry pi3.

The user when need the data that time server send the values to the user mobile through telegram application. Also includes the camera used to take the picture of plants and user show the conditions of plant as well as direct view.

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II. Wireless Sensor Networks

A WSN is a system comprised of Radio Frequency (RF) transceivers, sensors, microcontrollers and power sources. Recent advances in wireless sensor networking technology have led to the development of low cost, low power, multifunctional sensor nodes. Sensor nodes enable environment sensing together with data processing. Instrumented with a variety of sensors, such as temperature, humidity, LDR and soil moisture allow monitoring of different environments. They are able to network with other sensor systems and exchange data with external users.

Sensor networks are used for a variety of applications, including wireless data acquisition, machine monitoring and maintenance, smart buildings and highways, environmental monitoring, site security, automated on-site tracking of expensive materials, safety management, and in many other areas. A general WSN protocol consists of the application layer, transport layer, network layer, data link layer, physical layer, power management plane, mobility management plane and the task management plane.

Currently two there standard technologies are available for WSN: ZigBee, Raspberry pi3 and Bluetooth. They operate within the Industrial Scientific and Medical (ISM) band of 2.4 GHz, which provides license free operations, huge spectrum allocation and worldwide compatibility. In general, as frequency increases, bandwidth increases allowing for higher data rates but power requirements are also higher and transmission distance is considerably shorter.

Multi- hop communication over the ISM band might well be possible in WSN since it consumes less power than traditional single hop communication. It is also possible to create a WSN using Wi-Fi (IEEE 802.11), but this protocol is usually utilized in PC-based systems because it was developed to extend or substitute for a wired LAN. Its power consumption is rather high, and the short autonomy of a power supply still remains an important disadvantage.

III. System Architecture

The proposed hardware of this system includes Raspberry pi3, ADC, Temperature, humidity and soil moisture sensors, LCD. The system is low cost & low power consuming so that anybody can afford it. The data monitored is collected at the server. It can be used in precision farming. The system should be designed in such a way that even illiterate villagers can operate it.

They themselves can check different parameters of the soil like Temperature, moisture, light intensity etc. from time to time. During irrigation period they have to monitor their distant pump house throughout the night as the electricity supply is not consistent.

The system can be installed at the pump house located remotely from the village, it is interfaced with the pump starter & sensors are plugged at different location in the field for data acquisition. Using this system they can switch on their pump from their home whenever they want. with the pump starter & sensors are plugged at different location in the field for data acquisition. Using this system they can switch on their pump from their home whenever they want.

A. Temperature Sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. It is low cost and small size sensor. Its temperature range is -55° to +150°C.

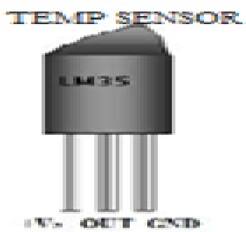


Fig. 1 Temp Sensor

B. Humidity Sensor

Humidity measurement instruments usually rely on measurements of some other quantity such as temperature, pressure, mass or a mechanical or electrical change in a substance as moisture is absorbed. By calibration and calculation, these measured quantities can lead to a Measurement of humidity.

Fig. 2 Humidity Sensor

C. Soil Moisture Sensor

The soil moisture sensor used is capacitive type. The sensor gives analog output of zero volt when there is 100% moisture and 5V for 0% moisture

Fig. 3 Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

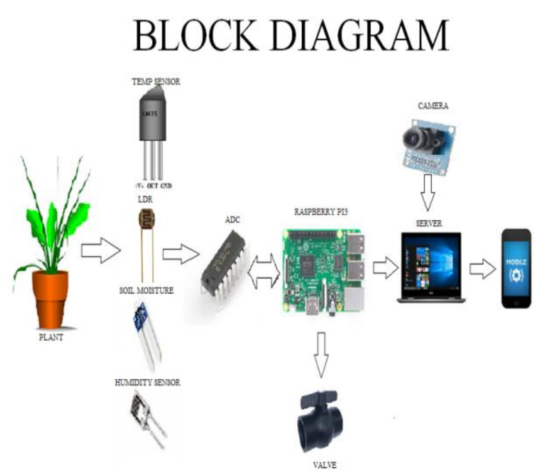
The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

D. LDR

LDR's are light dependent devices whose resistance is decreased when light falls on them and that is increased in the dark. When a **light dependent resistor** is kept in dark, its resistance is very high. This resistance is called as dark resistance.

It can be as high as 10^{12} Ω and if the device is allowed to absorb light its resistance will be decreased drastically. If a constant voltage is applied to it and intensity of light is increased the current starts increasing.

Fig. 4 LDR Sensor



IV. PROPOSED WORK

We propose a Novel internet of raspberry pi3 for monitoring the environmental parameter in an agriculture field. Mitigating this data to the raspberry pi3 through sensors, and then run and predictive analysis and the machine learning on the gathered data (server deployed at Telegram application).The proposed system overcome the limitations of traditional GPRS based system through protocols like MQTT, secured HTTP, which not only ensured that the data is safe and secured, but the entire communication is over an authorized secured socket layer which gives immense security to the data.

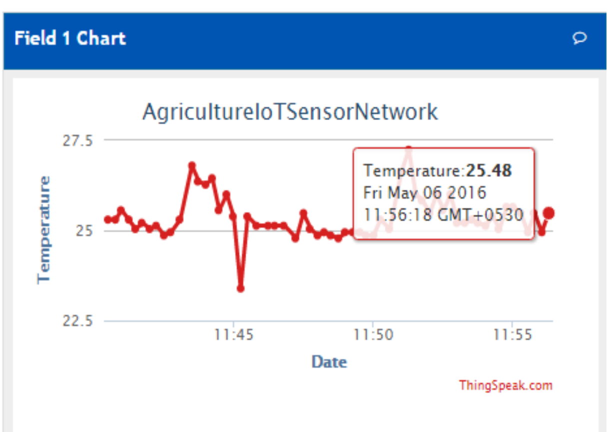
The proposed system also have bandwidth compatible and cross level compatible, therefore the client level solution can be run either on the mobile, PC or on the tablet. The remote monitoring solution that we offer can be monitored in real time through any remote devices including mobiles or tablets. This provides the flexible for the data visualization, data understanding, and the predictive analysis also given the scope for the farmers to prepare for the advanced data which might appear in the future.

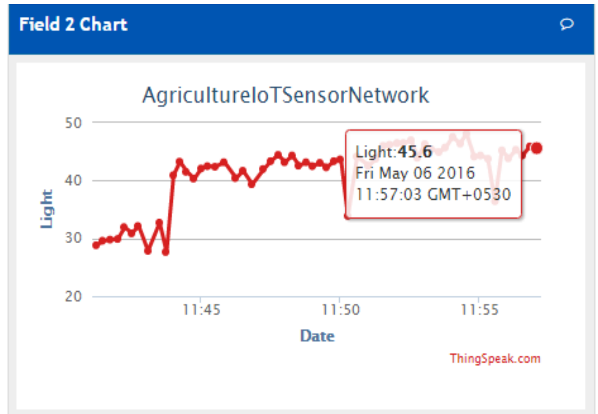
The proposed system is 4G compatible, it is not limited by the bandwidth and high latency, which is experienced for the Internet based system. At the same time the MQTT protocol itself free, the overall operating cost for controlling mechanism is null in comparison with GSM based system, where each SMS's has a cost which is determined by the tariff of the service provider.

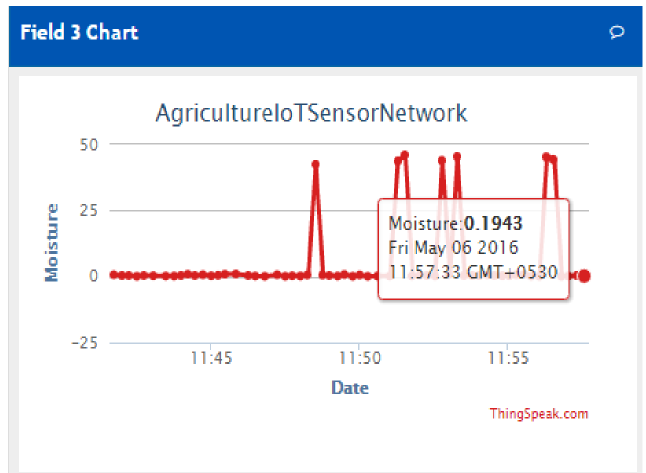
The system architecture is composed of sensors (temperature, moisture, humidity and the light), which are installed in the agriculture field. These sensors will be collecting the environmental parameters. The sensed data is mitigated into the Raspberry pi3 through an ADC gives a real time data visualization.

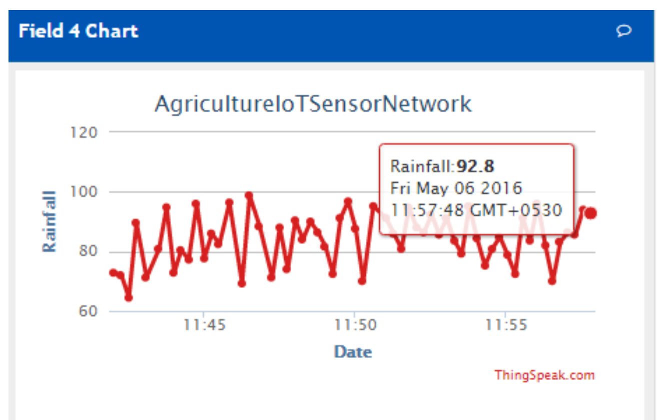
V. Results

The following monitoring results are obtained using temperature, humidity and moisture sensor. These real times monitoring results are recorded on server. The graphs can be plotted. The monitoring of temperature, moisture humidity are plotted









VI. Conclusion and Future Work

Improvement of the crop productivity is a major challenge in the countries like India, the technological improvement is a mandatory work to improve the crop productivity to support and sustain the need for ever green population of our country. In the past several sensor driven network have been proposed to successfully monitor the large agriculture field.

However most of the technology does not offer on the data mining technique and predictive analysis, which limits the data usage to accurate state of the field and crop. We propose a novel technology by means of which gathered data from physical sensing devices is mitigated in the cloud, where a machine learning technique could in real time produce not only the alerts corresponding to the current state of the environment and the crop but at the same time can offer predictive analysis of the future state of environment as well as crops.

The IoT based architecture also offers real time realization and analysis of data which can be used across the globe in conjunction with the parameter been monitored through other parts of the world to understand the abnormal behavior of the similar kind of the crop.

Our result shows that the proposed system has a very optimal latency for controlling the system as well as high packet delivery rates and accuracy for mitigating the data. The system can further been improved by incorporating new self-learning techniques which could deployed in the cloud to understand the behavior of the sensing data and can take autonomous decisions.

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