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An IOT Based Framework for Group Monitoring and Irrigation Control

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Abstract-Today's world is more dependent on the web application as it really helps people to do the work much faster and easier from anywhere on the corner of the globe. Hence, we have proposed the system which is a web based real-time application used for the development of automatic irrigation control and to help the farmer in improving the productivity of the crops. Because the system is automated there is no need of visiting the agricultural land by the farmer personally to provide the sufficient water to the crops and the system will also give the message to the farmer about the environmental conditions, so that farmer can take decision about the crops productivity and watering service. Results shows that the system is cost-effective because there is no extra expenditure required for getting and visualizing the information about environmental conditions of the agricultural field and this system will helps the farmer to increase the productivity without any effort.

Keywords: Virtual Sensor, Internet of Things, ThingSpeak, GSM based Systems.

1. Introduction

Water is a resource whose availability is limited in many agricultural fields, so that it needs to be supplied in a planned and précised way, because if we give too much water to the crops it may causes washing out of fertilizers, this may result in ridicules asphyxiation, substrate flooding, or subterranean water pollution. This can direct to a decrease in the crop production and it can be hazardous to yield. Hence, the proposal automatic irrigation control system is proved fundamentally to be a good tool in supply water to the plants at the necessary amount and regularity.

Suppose have a home plant it becomes difficult for anybody to keep on constantly monitoring it, may plant become dead because it is extremely difficult to always keep on checking the soil humidity, the temperature, the amount of sunlight that it resolving into it and overall health of plant. Because of that what happens is, sometimes we put extra water , sometimes we put too little water ,sometimes we put too much pesticides, sometimes we forget to give nitrogen, sometimes we give too much of nitrogen for which the growth and health of the plant is affected. In order to give a solution for the above problems we propose to do a virtual sensor approach[1], Virtual Sensor for a plant is aimed that improving the health of the plant and let the person know how the plant is, so it takes the electrical signal on the plant like biometric pressure, the temperature, the humidity and everything and it determines what the other

things needed by the plant based on that it generates a real time information of environmental conditions to the user, using that user can control the other parameters.

1.1. Virtual Sensor

The meaning of virtual sensor is a sensor network is created over a large agricultural field of large area. There are many number of sensors monitors certain data value. For example, the soil moisture, the humidity, the outside temperature and barometric pressure everything and then it will informs that value means mitigate that value into a central server. Through virtual sensor we can isolate the case for every plant. For example if we have a tub we can put certain sensors into the tub and we can give ideal value that is required. We can then connect sensor with the cloud. Now that sensor can know what is the soil condition, If the soil is dry it can have a little bit of water in the soil, when it will have enough water it will stop. When there is extreme sunlight the sensor itself could make the curtain to move so that the sunlight effect is less. When it is a cloudy day the sensor itself can manage that such that the tree gets more amount of light.

The virtual sensor acts as a controller as well as sensor once it mitigates the data into the cloud unlike conventional sensor network where the data is stored in a database once the data goes to cloud we can view it through the mobile, we can get the data by our email, we can get the data in our face book, we can get the data in every possible ways.

This is Internet of the Things (IOT) [2], in general we can have a small micro controller many sensors, micro controller will have a internet connectivity it will get connected to internet through Wi-Fi then it will push the data onto a cloud then that data will be able to visualize that data using our mobile, and we can generate some command as for

as the cloud is concerned. IoT is the very popular, easy to use and upcoming technology it has a great future [3].
There are two types of devices that lead to introduce the IoT devices that are as follows:

1. Traditional GSM based System: this type of system has some limitations they are,

a. We have to remember the every command.
b. While typing commands may be wrong.
c. If the number of devices is quite heavy it is difficult for user to correctly remember the part and enter the command.
d. After the command is executed you have no feedback of the system.
e. For notification system, for alarm system user will always have to keep on watching his sms's.
f. Searching of sms may also be delayed due to network congestion. So there is one more kind of the system.

2. Internet Connected Devices: in case of this type of devices, a device can connect with certain servers and can fetch and return data to the server. However this traditional internet connection device does not have the capability to get connected with other internet connection devices this is where we introduce the IoT.

Below figure shows the schematic representation of the IoT with all the possible end users and application areas.

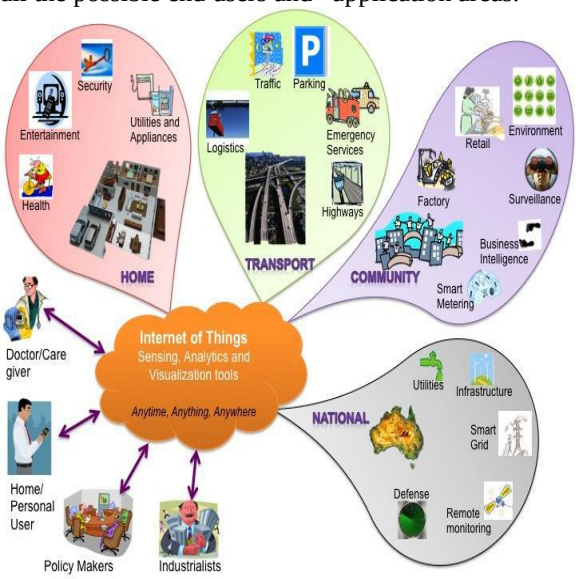

Figure1: Schematic representation of IoT with end users and application areas

The main objective of this paper is to focus on various environmental conditions to take decision about the water supply to the crops and to increase the yield. The rest of the paper is organized as follows. Section 2 presents proposed work. Section 3 presents study of the existing systems related to proposed system. Section 4 represents methodologies and the materials required to carry out task of execution. And section 5 represents the figures and the resultant graphs after successful completion of execution. Finally section 6 concludes the paper with summary of our contributions.

2. Proposed Work

In the proposed system sensor network is created over a large agricultural field, there are number of sensors which monitors the soil moisture, the humidity, the outside temperature and light everything and then it will informs that value into a central server. We can then view the information from the cloud and take decision. If the soil is dry it can have a little bit of water in the soil, when it will have enough water it will stop. When there is extreme sunlight the farmer can make the curtain to move so that the sunlight effect is less. When it is a cloudy day the sensor itself can manage that such that the tree gets more amount of light. Through virtual sensor we can isolate the case for every agricultural crop, and using the ThingSpeak cloud farmer can visualize the information with graph.

3. Related Works

There are different methods like Zig-bee wireless technology, Fuzzy control algorithms, smart farming and smart irrigators through wireless technology, and GPS and GSM systems etc are used to design the irrigation control systems and solve the problems like conservation of water and save the natural resources, to avoid constant maintenance, to avoid over irrigation, water balance and hydrologic flux calculation, to design the fully autonomous and wireless systems which are proposed by the different authors as follows.

[4]In this paper problem solved is Optimization of water reserve in top waterless areas using trustworthy information and estimating the irrigation water obligation in the habitual water hut for the summer by using Kc that is yield co-efficient and NDVI scheme which stands for Normalized Difference Vegetation Index and FAO method to calculate IWR, Result indicate that these two methods calculated values are alike with the IWR values which are calculated using the distant sensing approach, [5] in this paper finding element of the parameters like soil moisture, PH of the soil, temperature, nutrient level in a agricultural land are considered because they plays major job in farming events so, authors have discussed the technology called rank of elegant sensing structure and smart irrigator system with the wireless communiqué technology. And they afford all the indispensable corporeal and chemical parameter to the earth and using smart irrigators they are going to make available water to the plants. And if we want we can also use the smart sense and irrigators system in our project and communicate using wireless technology. [6]preservation of water, saving the natural belongings obtainable for mankind and falling the wastage of water using Android software development kit, GPRS and GSM system ,this system avoid in excess of water supply, less water supply, and chemical erosion in order to reduce the wastage of water By knowing the status of moisture, temperature through GSM water flow which can be controlled by just sending a message from mobile, By implementing this system rural, horticultural lands ,parks, estate can be irrigated. This system is cheaper and efficient than the other computerization that we are using. [7] the paper gives the knowledge about how to provide water to perform according to humidity, moisture, temp, soil type and fertilizers using ZigBee or hotspot based remote monitoring and control system with automatic irrigation administration and it gives the awareness about the various control systems and helps to develop an automatic and

wireless monitoring System, [8]in this paper the author discussed the problem of estimating the parameters and measuring the water dissemination for peel and unpeeled tomatoes and solved using Flickers 2nd law of circulation is solved numerically to foretell drying of water diffusivity. This process provides a easy and correct estimation of temp, here water diffusivity and disclosure to air process optimization are projected based on wetness content & drying heat by means of the numeric imitation, [9] the study helps to solve the trouble of failure in fertility of the soil, wear and tear of water in agricultural crop production using Zig-Bee wireless equipment and Fuzzy control algorithms, Result shows that the organization has status, invariable and trustworthy communication of data and This design involves the wireless sensor set-up and fuzzy direct system for saving water in irrigation system.

4. Methodology and Materials

The virtual sensor acts as a controller as well as sensor once it mitigates the data into the cloud unlike conventional sensor network where the data is stored in a database once the data goes to cloud we can view it through the mobile, we can get the data by our email, we can get the data in our face book, we can get the data in every possible ways.

This is Internet of the Things (IoT) we can have a small micro controller many sensors, micro controller will have a internet connectivity it will get connected to internet through Wi-Fi then it will push the data onto a cloud then that data will be able to visualize that data using our mobile, and we can generate some command as for as the cloud is concerned. IoT is basically a cloud of interconnected devices, in a very simple term devices like micro controllers, micro processors when connected to internet in such a way that each of these device can communicate with every other device we call this entire infrastructure as Internet of Things So, IoT is set of devices which are connected with the internet through specific protocols like MQTT, web sockets, https in such a way that this device can send information not only to server or cloud server can also communicate with each other.

i. *Intel Edison:* Intel Edition is considered to be the most common IoT device, because this run the certain version of full Linux and it can get connected with internet and it can exchange web services, it can call to a service and it can response to a web service, it can get connected with IoT protocols like MQTT by means of which two machines can exchange data among them, it can also take data from the mobile and send some data back to the mobile.

ii. *Thing Speak:* It is an IoT gateway using which we can visualize the data from the sensor and user can also visualize the graphs generated with the help of thingSpeak channel id. It is a free cloud service so that user can access easily and fast without need of any additional cost.

iii. *Internet of Things (IoT):* IoT is basically a cloud of interconnected strategy, in a very simple term devices like micro controllers, micro processors when connected to internet in such a way that each of these device can communicate with every other device we call this entire infrastructure as Internet of Things. So, "IoT" is set of devices which are connected with the internet through specific protocols like MQTT, web sockets, https in such a way that this device can send information not only to server or cloud server can also communicate with each other.

5. Figures and Graphs

Figure below shows the connection establishment for the different sensors, relay and for the power supply, it is the first and foremost setup user needs to do to gain the complete usage by the System. And here Wi-Fi connection is mandatory for the transformation of the real time environmental conditions from the sensors to automate the watering service for the crops so that the productivity will get increased.

Figure2: Connections establishment

Figures below are showing the resultant data for the temperature, moisture, light and rainfall on the System after successful execution and the figure4 represents the graph for the all the readings respectively with response to the change in environmental conditions.

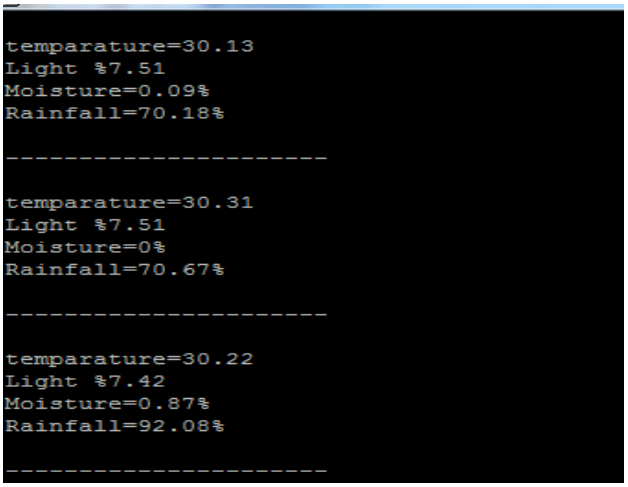

Figure3: Readings of real time environmental conditions

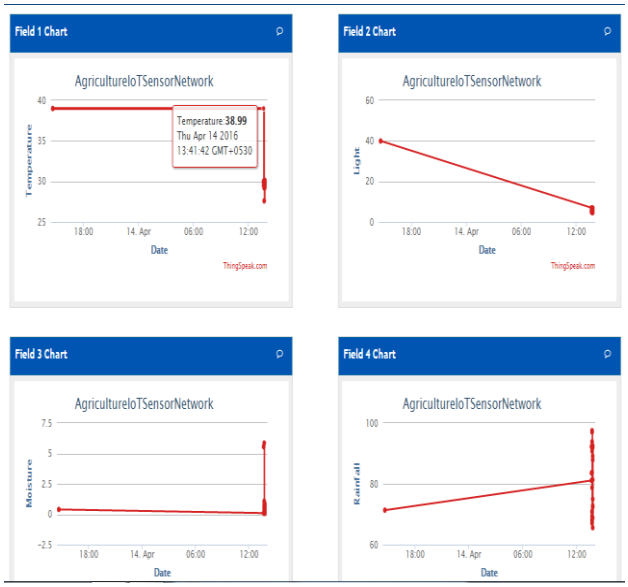

Figure4: Showing the graph for change in the environmental conditions like temp, light, moisture and rainfall.

6. Conclusion

In a country like India increasing the productivity of the crop is one of the major goals in agricultural development, earlier works have proposed different techniques towards improvement of crop productivity, In this proposed work a novel architecture based on advanced IoT architecture is used to improve the productivity of the crop. The proposed system utilizes the physical sensor system to gather the environmental data about the soil and environmental conditions and notifies this data to the farmer, the data can be visualized and analyzed in the real-time using thingSpeak IoT gateway. We have also proposed an irrigation control system using mobiles, it deviates from the existing GSM and GPRS system which is extensively expensive as the SMS's and GPRS based web access is quite expensive. Result shows that the proposed system can monitor and notify about the environmental changes in real-time and the farmer will get the increased productivity of the crops by monitoring the crop using automated watering service.

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