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An IoT Based Real Time Monitoring of Agricultural and Microirrigation System

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Abstract— **Precision Agriculture is a farm management technology that uses information technology to ensure that crops and soil get exactly what they need for better health and productivity. Now modern day technology or IoT invested in modern farms is growing alongside the concept of IoT and Precision Agriculture (PA). The concept of Internet of Things (IoT) helps us to integrate all these resources into precise agriculture. Monitoring real-time nature is an important factor in advanced farming. Graphical User Interface based software will be provided to control the computer system and the system will be isolated, equipped with sensors such as temperature sensor, moisture sensor, ground sensor, ldr sensor, DS18B20 temperature sensor etc. Therefore to overcome the problems in monitoring we go to "IoT Based Real Time Monitoring for Agricultural and Microirrigation system". In the context of real-time monitoring of agriculture and small-scale irrigation of Agriculture, we face the challenge of integrating the Internet of Things with control and sensitivity to improve agricultural efficiency. The use of a sensor network that collects data from different types of sensors and transmits it to a large server using a controller and all of these parameters can be monitored using an LCD display and the Things Speak or Blynk app. Using IoT all data is analyzed with the help of speech tools and the blynk app. Advanced multimedia platform can be remotely controlled by mobile phone and laptop.**

Keywords–Precision Agriculture, Internet of Things(IOT), Sensor, ThingSpeak, Blynk.

1.INTRODUCTION

Water is an important resource in agriculture. The IoT Real-Time Monitoring Program for Agricultural and Microrigation is used to improve agricultural water use. The system consists of a network of moisture sensors, temperature, ground moisture sensors. Soil moisture, soil temperature sensors are placed in the root zone of the plants. The control unit microcontroller is set to threshold values of soil temperature and soil moisture. A control unit is used to control the irrigation engine thus controlling the flow of water in the field.

IoT is based on the growing development of sensors, communication technologies, and IP. The essence of the concept is to have a direct sensory sensor, without the confusion of human involvement to bring about a higher level of programming. The conversion of internet, mobile technology and machine to machine can be seen as an IoT initiative. In the production of future technologies, it is predicted that IoT has the potential to call for various technologies to enable new applications by combining material to support intelligent decision-making.

This is a crop monitoring system. It records soil moisture, air temperature and plant air humidity and will notify you with a notification in the mobile app when plants need water. The use of a sensor network that collects data from different types of sensors and transmits it to a large server using a controller and all of these parameters can be monitored using an LCD display and the Things Speak or Blynk app. Using IoT all data is analyzed with the help of speech tools and the blynk app. Advanced multimedia platform can be remotely controlled by mobile phone and laptop.

2. LITERATURE REVIVEW

"Arduino Based Smart Drip Irrigation System uses Internet of Things" by G. Parameswaran et al. [1]. This paper is based on an intelligent irrigation system with IoT. Farmers start using various monitoring and control systems to increase yields with the help of automatic agricultural parameters such as temperature, humidity, soil moisture, carbon dioxide, light detection, soil pH, etc. are monitored and managed by programs that can help farmers improve agricultural productivity. And the system software for learning and managing various devices is written in the code assembly language and stores the data on the mysql server and sends it directly to the IoT channel by writing the code using the java language.

"IoT Based Automatic Watering of Plants using Raspberry Pi And Android", was developed by Jigyasa Kamthan et al. [2]. In this article on the Internet of Things we can access the existing framework of the network remotely, create new openings for global direct integration with digital infrastructure and result in improved efficiency benefits. Because of digital, there is always a way to reduce risk and make work easier.

This app directly controls and especially the garden water system uses the efficiency of Raspberry Pi. It is achieved by inserting sensors in the field to monitor soil temperature and soil moisture transmitting data to the Raspberry Pi to measure the water requirements of the plants. And we provide the user very easy to manage all the information using the Android system.

Nurulisma Ismail et al. [3] made a proposal for the "Smart Internet-based (IoT) system". This paper focuses on the agricultural sector with the aim of controlling water use and soil erosion in the IoT-based agricultural sector where all information is easily viewed and managed. As part of the development of the system, a number of sensors have been used such as: (i) a soil moisture sensor is used to detect soil moisture and groundwater level; (ii) the humidity and temperature sensor (DHT-11) is used to track early signs of temperature changes; and (iii) a pressure sensor (BMP 280) is used to measure area pressure. These sensors are connected to a Wi-Fi module (Node MCU) and depend on each other to provide additional sensitivity to the irrigation system. Collected data will be uploaded to the cloud (ThingSpeak.com and Firebase) and displayed in graphical form that can be viewed with the app and website. In the end, the project was able to achieve all of its goals in terms of water use, lower project costs, reduced staffing, electricity consumption, and reliability.

In this proposed prototype, they divide the agricultural land to be irrigated into multiple small areas in order to prolong the lifetime of the WSN, and thus the system. In each area, they deploy a set of temperature and humidity sensors to monitor and measure the moisture and temperature of the soil and the humidity and temperature of the air. The data measured by the sensors are transferred to a coordinator node (collection point), called a base station. The coordinator node receives and processes the data and stores the processed data in a database. These sensors are connected to each other and to a coordinator node via ZigBee wireless communication technology. After that, an analysis of the recorded data is performed by checking them with a developed base of threshold values for each measured parameter. From the result of this verification, the irrigation system is turned *ON or OFF*

Srishti Gautam et al. [5]. The IOT-based automation project uses the Raspberry Pi “AUTOMATED DONATION SYSTEM”, This research paper focuses on the use of a self-irrigation system in irrigated fields and orchards. . The main controller is the Raspberry Pi 3 B model. In the event that the moisture content of the content is not determined precisely where it is defined according to the specific water requirement of the plant then the required portion of water is supplied until it meets the limit. The frame will be customized to irrigate the plants twice a day. The framework will be programmed to report its flow and flow just as it reminds the client to replenish the water in the tank. These alerts can be made with the mobile app on any site.

"Io Based Based Smart Irrigation System", developed by Prof. Panchal Sachin D. et al. [6]. The proposed program consists of three main components; the sensor part of the humidity, the control phase and the output phase. Soil moisture was obtained using the YL-69 ground sensor (resistance type sensor) .The control unit was accessed using the ATMega328 microcontroller based on the arduino platform. The output of the irrigation system is controlled by the control unit by opening and closing it depending on the moisture content of the soil. Two design stages were performed; hardware and software.

"Smart Multi-Crop Irrigation System Using IoT" by Anbarasi M. et al. [7]. In this paper the node of the soil moisture sensor is inserted to receive data from the soil and the data is received. Whenever there is a water supply in the field, the LED bulb will continue to burn until it reaches the required water level according to the saved data. The LED bulb will stop blowing once the moisture in the soil has reached a sufficient level. The experimental results describe the data extracted and the audio setup of the smart irrigation system. The system can be managed separately in different fields or in multiple cropping systems and the data of different crops are saved in the database. This saves the moisture and temperature required for each crop and the data can be sent to the controller node when the moisture sensor node is installed in the soil. It gives a warning message to the farmer using IoT technologies.

"IoT-Based Smart Irrigation Systems: An Overview of Recent Practices for Censors and IoT Systems for Accurate Agricultural Irrigation", by Laura Garcia et al. Al [8]. In this article, an overview of the nodes commonly used to use sensor networks intended for irrigation systems is presented. In addition, wireless communication technology is also emerging. The most widely used IoT cloud systems in Smart Irrigation Solutions and the standard structure of these systems are discussed.

3. PROBLEM STATEMENT:

- Water inefficiencies in irrigation and fertilizer application has resulted in increased production cost and lower production in farms.
- Knowing when, where and how much water and nutrient solution to be applied to the right pH are important aspects of farming.
- Irregular watering prompts mineral deficiency in the soil resulting in disease like rotting of plants.
- The exact time a plant needs to be irrigated can be monitored using a soil moisture sensor which leads to saving water wastage.

4.OBJECTIVE AND SCOPE:

The objectives to consider are:

- Simplify the irrigation system by installing and designing the whole irrigation system.
- Save energy, which allows the operation of smart irrigation system used more other application.
- Optimize water consumption.
- Make system easy to use by growers.

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5. RESULT AND DISCUSSION:


Fig.(a) Proposed system design

Various sensors are used to control the irrigation system process. The various sensors used are temperature, humidity, soil humidity sensor, LDR sensor, DS18B20 temperature sensor all measured and tested with past data stored in the system. The automation process of the pump and solenoid valves is opened as required according to the comparator of the system.

The microcontroller makes a decision based on sensory values. As a basic step, the software for the controller must be configured. Before reading the analog input from the sensor, the threshold value for each parameter must be defined first. These values have previously been defined by a thorough analysis of the soil. The sensors are connected to the corresponding pins of the microcontroller.

Soil moisture is the water that is held in the spaces between soil particles. The root zone soil moisture is the water that is available to the plants, which is generally considered to be in the upper 200 cm of soil. Moisture is fundamental importance to many hydrological, biological and biogeochemical process. The proposed system includes soil moisture measurement as the main module. Here we consider the field capacity and permanent wilting point to measure the soil moisture. Irrigation to the field and acknowledgement to the user are done based on the water content in the soil.

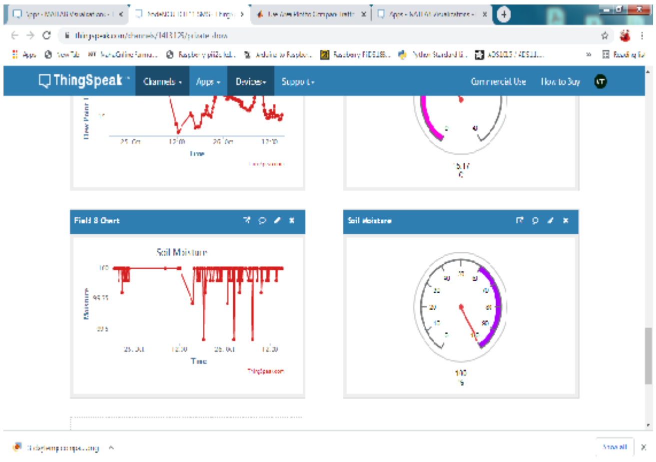
Temperature is another parameter that is measured in this project. This value helps in conservation of water used for irrigation. Even though the soil moisture is less, if the temperature is not too high then the irrigation to the crop can be limited. This is because many plants can withstand low moisture conditions when the temperature is moderate. This is done by DS18B20 temperature sensor.

Here some result pictures are given below:

The surrounding temperature and humidity data observed on blynk app and by using formula we calculated evapotranspiration and water requirement for plant. This is shown in fig.(b).

Fig.(b) Blynk app data

Data observed on thingspeak is given below picture fig.(c)



Fig(c). soil moisture data

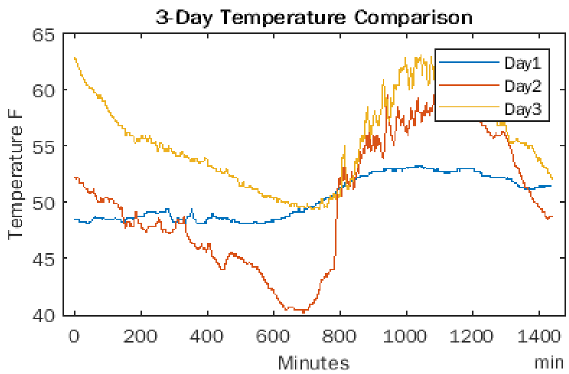


Fig.(d) Three day comparison data

Temperature, humidity, and soil moisture data is given below in the table:

created_at	entry_id	Temp	Humidity	Max temp	Min Temp	Max Hum	Min Hum	Dew Point Temp	soil moisture
Date & Time		°C	%	°C	°C	%	%	°C	%
2021-10-25 13:31:18 UTC	7010	27.5	47	27.6	27.5	47	45	15.16	99.90
2021-10-25 13:51:26 UTC	7011	27.6	47	27.6	27.5	47	45	15.26	100.00
2021-10-25 14:03:53 UTC	7012	27.6	48	27.6	27.5	48	47	15.58	100.00
2021-10-25 14:13:56 UTC	7013	27.6	49	27.6	27.5	49	47	15.91	100.00
2021-10-25 14:23:59 UTC	7014	27.5	47	27.7	27.5	51	47	15.16	100.00
2021-10-25 14:34:01 UTC	7015	27.5	47	27.7	27.5	51	47	15.16	99.90
2021-10-25 14:54:12 UTC	7016	27.5	47	27.7	27.5	51	46	15.16	100.00
2021-10-25 15:04:22 UTC	7017	27.4	47	27.7	27.4	51	46	15.07	100.00
2021-10-25 15:14:25 UTC	7018	27.3	47	27.7	27.3	51	46	14.98	100.00
2021-10-25 15:24:28 UTC	7019	27.3	47	27.7	27.2	51	46	14.98	99.90
2021-10-25 15:34:31 UTC	7020	27.4	48	27.7	27.2	51	46	15.4	99.90
2021-10-25 15:44:34 UTC	7021	27.4	49	27.7	27.2	51	46	15.72	100.00
2021-10-25 15:54:37 UTC	7022	27.5	49	27.7	27.2	51	46	15.82	100.00
2021-10-25 16:14:44 UTC	7023	27.4	51	27.7	27.2	51	46	16.35	100.00
2021-10-25 16:24:47 UTC	7024	27.4	52	27.7	27.2	52	46	16.66	100.00
2021-10-25 16:34:50 UTC	7025	27.4	52	27.7	27.2	52	46	16.66	99.90
2021-10-25 16:44:53 UTC	7026	27.4	53	27.7	27.2	53	46	16.96	100.00
2021-10-25 17:00:00 UTC	7027	27.3	54	27.4	27.3	54	54	17.16	100.00
2021-10-25 17:10:02 UTC	7028	27.3	54	27.4	27.3	54	54	17.16	99.90
2021-10-25 17:20:09 UTC	7029	27.3	54	27.4	27.3	54	54	17.16	100.00
2021-10-25 17:30:15 UTC	7030	27.3	54	27.4	27.3	54	54	17.16	99.90
2021-10-25 17:40:18 UTC	7031	27.2	54	27.4	27.2	54	54	17.07	99.90
2021-10-25 17:50:20 UTC	7032	27.2	54	27.4	27.2	55	54	17.07	100.00
2021-10-25 18:00:28 UTC	7033	27.2	54	27.4	27.1	55	54	17.07	100.00
2021-10-25 18:10:31 UTC	7034	27.1	55	27.4	27.1	55	54	17.27	100.00
2021-10-25 18:20:34 UTC	7035	27.1	54	27.4	27.1	55	54	16.98	100.00
2021-10-25 18:30:36 UTC	7036	27.1	54	27.4	27	55	54	16.98	100.00
2021-10-25 18:40:39 UTC	7037	27	54	27.4	27	55	54	16.88	100.00
2021-10-25 18:50:42 UTC	7038	27	54	27.4	27	55	54	16.88	100.00
2021-10-25 19:00:46 UTC	7039	27	54	27.4	27	55	54	16.88	100.00
2021-10-25 19:10:49 UTC	7040	27	54	27.4	27	55	53	16.88	100.00
2021-10-25 19:20:51 UTC	7041	26.9	53	27.4	26.9	55	53	16.5	99.71
2021-10-25 19:30:54 UTC	7042	26.9	53	27.4	26.9	55	53	16.5	100.00
2021-10-25 19:40:57 UTC	7043	26.9	53	27.4	26.8	55	53	16.5	100.00
2021-10-25 19:51:00 UTC	7044	26.8	54	27.4	26.8	55	53	16.7	99.90
2021-10-25 20:01:03 UTC	7045	26.8	54	27.4	26.8	55	53	16.7	100.00
2021-10-25 20:11:10 UTC	7046	26.8	54	27.4	26.8	55	53	16.7	100.00
2021-10-25 20:21:12 UTC	7047	26.8	54	27.4	26.8	55	53	16.7	100.00
2021-10-25 20:31:15 UTC	7048	26.8	54	27.4	26.8	55	53	16.7	100.00
2021-10-25 20:41:19 UTC	7049	26.8	54	27.4	26.7	55	53	16.7	99.90
2021-10-25 20:51:28 UTC	7050	26.7	54	27.4	26.7	55	53	16.61	100.00
2021-10-25 21:01:31 UTC	7051	26.7	54	27.4	26.7	55	53	16.61	99.41
2021-10-25 21:11:34 UTC	7052	26.6	54	27.4	26.6	55	53	16.51	100.00
2021-10-25 21:21:36 UTC	7053	26.6	54	27.4	26.6	55	53	16.51	100.00
2021-10-25 21:31:39 UTC	7054	26.6	54	27.4	26.6	55	53	16.51	100.00
2021-10-25 21:41:42 UTC	7055	26.6	54	27.4	26.5	55	53	16.51	100.00
2021-10-25 21:51:46 UTC	7056	26.5	54	27.4	26.5	55	53	16.42	100.00
2021-10-25 22:01:55 UTC	7057	26.5	54	27.4	26.5	55	53	16.42	99.90
2021-10-25 22:11:57 UTC	7058	26.5	54	27.4	26.5	55	53	16.42	100.00
2021-10-25 22:22:00 UTC	7059	26.5	54	27.4	26.5	55	53	16.42	99.80
2021-10-25 22:32:02 UTC	7060	26.4	54	27.4	26.4	55	53	16.33	100.00
2021-10-25 22:42:05 UTC	7061	26.4	54	27.4	26.3	55	53	16.33	99.90
2021-10-25 22:52:08 UTC	7062	26.4	53	27.4	26.3	55	53	16.03	100.00
2021-10-25 23:02:11 UTC	7063	26.3	53	27.4	26.3	55	53	15.94	100.00
2021-10-25 23:12:13 UTC	7064	26.3	54	27.4	26.3	55	53	16.24	100.00
2021-10-25 23:22:16 UTC	7065	26.3	53	27.4	26.3	55	53	15.94	99.90
2021-10-25 23:32:19 UTC	7066	26.2	53	27.4	26.2	55	53	15.85	100.00
2021-10-26 00:12:43 UTC	7067	26.1	53	27.4	26.1	55	53	15.76	100.00
2021-10-26 00:53:02 UTC	7068	25.9	53	27.4	25.9	55	53	15.57	99.90
2021-10-26 01:03:05 UTC	7069	25.9	53	27.4	25.9	55	53	15.57	100.00
2021-10-26 01:13:08 UTC	7070	25.9	53	27.4	25.9	55	53	15.57	100.00
2021-10-26 01:23:11 UTC	7071	25.9	53	27.4	25.8	55	53	15.57	100.00
2021-10-26 01:33:13 UTC	7072	25.8	54	27.4	25.8	55	53	15.77	99.90
2021-10-26 01:53:21 UTC	7073	26	54	27.4	25.8	55	53	15.96	99.41
2021-10-26 02:03:23 UTC	7074	25.9	54	27.4	25.8	55	53	15.87	100.00
2021-10-26 02:23:31 UTC	7075	26	55	27.4	25.8	55	53	16.25	100.00
2021-10-26 02:33:36 UTC	7076	26.1	56	27.4	25.8	56	53	16.62	100.00
2021-10-26 02:43:43 UTC	7077	26.1	57	27.4	25.8	57	53	16.9	100.00
2021-10-26 02:53:45 UTC	7078	26.1	59	27.4	25.8	59	53	17.45	100.00
2021-10-26 03:03:51 UTC	7079	26.2	63	27.4	25.8	63	53	18.59	99.90
2021-10-26 03:13:53 UTC	7080	26.3	66	27.4	25.8	66	53	19.43	100.00
2021-10-26 03:23:56 UTC	7081	26.2	64	27.4	25.8	66	53	18.84	100.00
2021-10-26 04:09:13 UTC	7082	26.3	62	26.4	26	63	62	18.43	100.00
2021-10-26 04:19:19 UTC	7083	26.3	60	26.4	26	63	60	17.9	99.80
2021-10-26 04:29:25 UTC	7084	26.4	59	26.4	26	63	59	17.73	99.90
2021-10-26 04:39:28 UTC	7085	26.5	60	26.5	26	63	59	18.09	100.00
2021-10-26 04:49:36 UTC	7086	26.4	56	26.5	26	63	56	16.9	100.00
2021-10-26 04:59:39 UTC	7087	26.4	53	26.5	26	63	53	16.03	100.00
2021-10-26 05:09:48 UTC	7088	26.5	51	26.5	26	63	51	15.52	100.00
2021-10-26 05:19:50 UTC	7089	26.5	51	26.5	26	63	51	15.52	100.00
2021-10-26 05:29:53 UTC	7090	26.5	50	26.5	26	63	50	15.21	100.00
2021-10-26 05:40:02 UTC	7091	26.5	50	26.5	26	63	50	15.21	99.90
2021-10-26 05:50:05 UTC	7092	26.5	49	26.5	26	63	49	14.9	100.00
2021-10-26 06:00:07 UTC	7093	26.5	49	26.6	26	63	49	14.9	99.90
2021-10-26 06:10:12 UTC	7094	26.5	49	26.6	26	63	49	14.9	100.00
2021-10-26 06:20:14 UTC	7095	26.6	49	26.6	26	63	49	14.99	100.00
2021-10-26 06:30:17 UTC	7096	26.5	50	26.6	26	63	49	15.21	100.00
2021-10-26 06:40:19 UTC	7097	26.5	51	26.6	26	63	49	15.52	100.00
2021-10-26 06:50:26 UTC	7098	26.6	50	26.6	26	63	49	15.31	100.00
2021-10-26 07:10:34 UTC	7099	26.6	49	26.6	26	63	49	14.99	100.00
2021-10-26 07:20:37 UTC	7100	26.6	50	26.6	26	63	49	15.31	100.00
2021-10-26 07:37:40 UTC	7101	26.6	52	26.6	26.5	52	51	15.92	100.00
2021-10-26 07:47:43 UTC	7102	26.6	52	26.6	26.5	53	51	15.92	100.00
2021-10-26 07:57:47 UTC	7103	26.6	49	26.6	26.5	53	49	14.99	100.00
2021-10-26 08:07:50 UTC	7104	26.7	49	26.7	26.5	53	49	15.08	100.00

6.CONCLUSION

Finally, "An IoT Based Real Time Monitoring of Agricultural and Microirrigation System" can be used to monitor and control the irrigation system of the agricultural sector. It depends on the technology of the Internet of Things connected to certain sensors: (i) humidity sensor (ii) soil humidity sensor (iii) temperature sensor, etc. This interaction is intended to provide additional sensitivity to the irrigation system. . The collected data is displayed on the LCD display unit and analyzed using the ThingSpeak app. The user can monitor the irrigation system through a report displayed from the application system on the mobile platform. The application can be used to display readings from sensors and to control the water pump in case of emergency. This is to alert the user and make the system easier for the user.

Therefore, this system avoids high irrigation, low irrigation, upper soil erosion and reduces water wastage. The main advantage is that the operation of the system can be changed according to the situation (crop, rainfall condition, soil, etc.). By implementing this policy, irrigated land can be provided for agriculture, horticulture land, auditorium, golf course. Therefore, this system is cheaper and more efficient compared to other types of automation systems. In large-scale operations, high-sensitivity sensors can be applied to large areas of farmland.

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