A Review on Real Time Monitoring of Plant Health using IOT

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Abstract- ***Over the course of the last several decades, there has been a fast expansion in technology aimed at monitoring agricultural characteristics in order to enhance farmland. A wide variety of agricultural characteristics, including light, soil moisture, temperature, and humidity, are among those that are monitored and controlled by systems that monitor and control agricultural parameters. This paper report examines some aspects of this monitoring system and makes recommendations for enhancing it by include other factors for monitoring, such as the speed and direction of the wind, in addition to an automatic control system for light, soil moisture, humidity, and soil temperature. Using TCP/IP with a microcontroller enables us to achieve good error recovery, higher error rate handling, speed, and simplicity, all of which may assist farmers in gaining easier access to information on key agricultural metrics in order to enhance the quality of their farmland. In order to determine the local climatic parameters in different areas of the huge greenhouse, the greenhouse automation system requires many measurement sites. These measurement points are spread out throughout the structure. Once placed in a contemporary greenhouse, the cabled measuring point is not only difficult to reposition once it is in place, but it also raises the cost of the system and makes it more susceptible to error. As a result, a Wireless Sensor Network, which consists of wireless sensor nodes of a small size and which are equipped with one or more sensors, is an alternative that is not only appealing but also cost efficient when it comes to building the necessary measurement system..***

Index Terms-Wireless sensor network, embedded operating system, Base station, GPRS/GSM Modem, TCP/IP protocol.

I. INTRODUCTION

In the realm of real-time monitoring of circumstances such as weather, wind direction and speed, water level, and flood, among other things, the temperature and humidity of the soil are just two of the factors that are being monitored. Monitoring, automatic irrigation facilities, and giving an alarming system that sends a warning alarm to the farmer's phone when a given condition is met based on the Wireless Farming System are all ways in which the Wireless Farming System may appropriately direct agricultural output and boost crop yield.

Conventional wired communication presents a number of challenges, despite the fact that it offers a variety of potential application uses in the real-time monitoring industry.

The technologies of transmission control protocol/internet protocol (TCP/IP), web services, and general packet radio service (GPRS) are utilised in wireless sensor network technology, which helps to facilitate the fulfilment of technical requirements. It also uses very little electricity, which is another perk.

The system is made up of wireless sensor network nodes in addition to a management platform for the network. Automated networking is accomplished by the use of several jump routing methods, in addition to a configurable automated networking monitoring system for the temperature and humidity of the soil. Users do not need to walk into the field and may bring to attention the changing conditions of soil from any part of the world. These changing variables include temperature, humidity, and other aspects.

II. REVIEW OF LITERATURE

It has been presumed that the rate of yield in agricultural production is not becoming better. As a result, a significant number of researchers have created a variety of characteristics and devised associated monitoring systems. The following is a brief summary of some of these points.

The most recent and cutting-edge developments in wireless sensor networks were put to use in this study to monitor a variety of agricultural metrics. In this scenario, the development of small-scale sensor devices that are compatible with wireless technologies has made it possible to perform remote monitoring of the temperature, humidity, and moisture levels. In this research, the implementation of a wireless sensor network coupled with centralised basic nodes using ZigBee was presented. This network would then be connected to a Central Monitoring Station (CMS) using either Global System for Mobile (GSM) or General Packet Radio Service (GPRS) technologies. Following the acquisition of Global Positioning System (GPS) parameters pertinent to the field, the system transmits those values to a central monitoring station. It was hypothesised that this system would analyse the state of the soil and respond appropriately in order to assist farmers [7].

To keep an eye on a high-tech poly home equipped with a wireless sensor that was built with an AVR ATmega8L microcontroller and an RF ZigBee module to ensure safe data transfer. Utilising intelligent sensors can result in improvements to both accuracy and dependability. On the base station, humidity readings are continually checked [4]. This system involves monitoring a variety of parameters, such as humidity and soil moisture, and providing remote monitoring through the use of ZigBee, which transmits data wirelessly to a central server that gathers data, stores it, and makes it possible for it to be presented as needed as well as be delivered to the client mobile [16].

This article demonstrates how to remotely control an autonomous watering system.

This makes use of an embedded system to improve not just the energy levels of farmers but also their productivity in terms of both time and money. If there is, then

A test of the soil is carried out in order to ascertain its required

amount of fertilizer, as well as its chemical components, water content, and salinity. In addition to that, the requirement for water is looked into. The data obtained from wireless sensors is evaluated in order to come up with a method of drip irrigation that is more efficient. The purpose of this research was to investigate several types of self-sufficient monitoring systems that make use of Wireless Sensor Network (WSN), a technology that makes it less difficult for farmers to boost their production [2].

The greenhouse monitoring and controlling system that was developed by Aji Hanggoro and Rizki Reynaldo is based on the use of an Android mobile application that was intended to monitor and manage the humidity that is present inside of a green house. This application was designed to monitor and manage the humidity that is present inside of a greenhouse.. In this implementation, software runs on an Android mobile phone connected to a Wi-Fi network. The phone then establishes a connection to a microcontroller and a humidity sensor using serial communication [1].

Agricultural parameters can be monitored remotely using a monitoring system that is based on intelligent sensors. A field programmable gate array (FPGA), a display element that is used for the analysis and monitoring of data, and a relay that is used as a control unit are all employed in this instance to implement the suggested model of an inductor for usage in conjunction with a wireless protocol [18].

This study's objective is to provide monitoring of the marine environment in addition to the benefit of simple implementation and real-time monitoring. System offer architecture of oceanographic monitoring systems based on WSN with a basic design of an oceanographic sensor node, sensors, and sensing parameters, deployment of wireless sensor networks for marine environment monitoring [6]. System give architecture of oceanographic monitoring systems based on WSN with a general design of an oceanographic sensor node, sensors, and sensing parameters. A generic architecture of an oceanographic sensor node, sensors, and sensing parameters is provided by the system as part of its provision of an architecture for oceanographic monitoring systems that are based on WSN.

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In order to create a multi parameter monitoring system, wireless sensor networks and low-power ZigBee technology were used. ZigBee technology is a wireless communication technology that is used for system automation and monitoring. ZigBee is utilised in order to facilitate the collection of real-time data by wireless sensor nodes and its subsequent transmission to a base station. The data are received, recorded, and presented at the base station in order to achieve monitoring of the temperature of the soil, the moisture content of the soil, and the humidity. The data is continually monitored at the base station, and in the event that it rises over the predetermined threshold, a notification is sent to the farmer's mobile device through the GSM network in order to control the situation. The ability to remove equipment and monitor it at the same time is one of the benefits of flexible networking [3]. Other advantages include cheap cost, high capacity, dependable nodes, and simple installation.

Monitoring greenhouse environment parameter and

Control is exercised in an effective manner by means that can be either automatic or manual. The control room, from where we are able to control the operations, gets the status of agricultural environment parameters through ZigBee, which is a network that is manually handled, and sends them back to the controller. These circuits based on microcontrollers are used by us in order to monitor the values of parameters that are continually changed and regulated in order to optimise them in the interest of achieving the greatest possible plant growth and production. Controlling the light, aeration, and drainage process efficiently within a greenhouse is achieved by the communication of a controller with a range of sensor modules. This results in the controller activating a cooler, fogger, dripper, and lights in a proportional manner according to the needed condition of the crops [17]. An automated multi-sensor greenhouse monitoring system controls and monitors a variety of parameters both within and outside the greenhouse using a microcontroller [15].

This study focuses on bringing the irrigation system into the present day both the application of technology in agriculture and the provision of appropriate

Irrigation through the use of the ARM7TDM1 core and GSM. Which not only plays a significant role but is also accountable for managing the watering on the field and sending signals to the receiver via the receiver. The previous iteration of this project was able to determine the current state of the field as well as the weather in real time. SMS notifications are sent to the user upon their request to get the information. Controlling a GSM modem is made easier with the aid of the standard set of AT (Attention) commands. These instructions are what are utilised in order to control the vast bulk of the GSM modem's features [12].

The most efficient use of water is essential for increasing crop production on farms.

is a prerequisite. The usage of an irrigation system can help to better manage water resources. The wireless sensor network collects and reuses rainwater to raise agricultural yields. This is accomplished by adjusting the settings of the irrigation system that is installed on the farm. This not only reduces the cost of cultivation but also makes use of real-time data [11].

Agricultural parameter guarantees a rise in productivity and a decrease in input costs with the assistance of a wireless sensor network thanks to precision farming. This is accomplished by real-time monitoring of location-based environmental and soil conditions. Not only does this make crop management more effective, but it also cuts down on waste and the amount of money spent on labour. In this research, the test bed installation of a wireless sensor network that can perform autonomous and real-time monitoring of soil and ambient factors that have an effect on crop production is discussed. The study presents a number of technical obstacles, such as an energy management strategy, the integration of sensors, real power consumption rates, and any remaining practical concerns [19].

This system monitors many agricultural parameters with the purpose of automating the system by making use of the low-power wireless communication technology known as ZigBee. ZigBee allows real-time data to be sent from a wireless sensor node that is collecting it to a base station. At the base station, the data are received, stored, and presented in order to accomplish monitoring of the soil's temperature, soil moisture, and humidity. At the base station, constant attention is paid to the monitoring of the data. If it goes beyond and beyond the limit that was set, a message will be sent to the farmer's mobile phone using the GSM network in order to regulate the situation [5].

This article discusses the monitoring and management of a

number of different
agricultural characteristics by employing peripheral equipment like valves and watering pumps that are controlled by a microcontroller to boost the farmer's production [14].

The purpose of this study is to propose a Monitoring System for Vegetable Greenhouses. It is based on a wireless sensor network. The architecture of it was created so that it could monitor the circumstances under which crops grew in greenhouses. The architecture of the entire system is made up of a base station, a data center for the internet, and a collection of sensor nodes. For the central processing unit of the wireless sensor node, the JN5139 microprocessor was selected as the best option. The ZigBee protocol has been utilized to provide wireless communication between individual nodes. In order to provide screen display, system setup, and GPRS-based remote data forwarding, a custom gateway node was constructed through the use of an ARM7 CPU and integrated ZKOS operating system. A Client/Server mode is utilized by the administration software for the distant data center in order to do time-series analysis and the dissemination of real-time data. An interface based on GSM short messages is designed in order to communicate real-time environmental measurements, and in order to trigger an alert, a measurement must be greater than some pre-defined threshold.

threshold. After putting the entire system through rigorous testing for more than a year, and finding the findings to be satisfactory. Based on this finding, it appears that this approach was rather helpful for monitoring the environment of the greenhouse [21].

ZangChangli created a system for monitoring soil utilizing a wireless sensor network as the processing platform and information gathering. This system was presented in the article that was proposed by LIU Yumei. The coverage was extensive, which essentially eliminates many of the drawbacks associated with wired connections. It has implemented the technology that is based on Web Services, GPRS, and ZigBee respectively. The way that it was designed offers several benefits, including low cost and low power usage [10].

In order to construct an automated irrigation system, an algorithm is utilized, and the system must meet certain criteria regarding the threshold values of soil temperature and moisture content. It was coded into a gateway that was based on a microcontroller specifically for the purpose of controlling the amount of water. This technology is utilized in areas where there is a scarcity of water to maximize the utilization of available water resources for agricultural output. The widespread wireless network of soil-moisture and temperature sensors provides the plants' root zones with the sustenance they need to survive. The information gathered by sensors is processed by a gateway unit, which also has the ability to send data to a web application and can activate actuators. The system that was being used got its electricity from solar panels. It had a bidirectional communication link that was founded on an interface between cellular networks and the internet. The automated system was evaluated for a total of 136 days in an agricultural field consisting of sage. There was a reduction in water use of almost 90 percent. In other locations, three identical copies of the automated system have been put to productive use for the past 18 months. Because of its cheap cost and energy independence, the system has the potential to be beneficial in locations that are physically isolated and have a limited supply of water [9].

The system utilizes three sensors in order to measure all four climatic variables.

Commercial sensors are competent. The acquired data is analyzed to determine the network's dependability and its ability, which are normally located between the lower and higher plants in the greenhouse. This allows for the detection of the microclimate layers that exist. In a climate controlled greenhouse, the network is able to identify small variations such as the presence or absence of direct sunlight near the walls of the greenhouse. The dependability and practicability of the constructed sensor network is of the utmost importance [20].

This methodology provides a practical approach to crop monitoring that has been proven to be beneficial. It has been outfitted with a number of different external sensors, including ones that measure soil moisture, soil pH, leaf wetness, and air pressure. Right after the field has received a suitable amount of water from the sprinkler, the water sprayer is turned off. Because of this, water saving is accomplished. The value of the soil pH sensor is sent to the base station, which then sends messages to the farmer about it via a GSM modem. By monitoring the pH level of the soil, it is easier for the farmer to choose the crops and fertilizer that will be required for the upcoming season. As a consequence, it may lead to a decrease in the amount of fertilizer used. With the assistance of a wireless sensor network, the outcome of this research is an automated control of water sprinkling as well as the eventual transmission of information to farmers [13]. This development of rice cropping monitoring using WSN is being created not only to overcome the shortage of information and technical assistance but also to raise the amount of rice that is produced. In addition to this, it helps farmers achieve precision agriculture and allows for real-time monitoring, all of which are benefits that are contributed by this technology.

The suggested irrigation management system makes use of an intelligent humidity sensor and low power SWT in order to facilitate

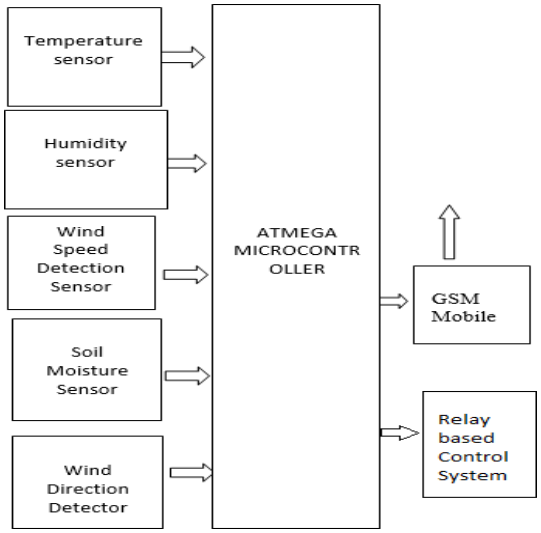
Irrigation management. This study makes use of the laptop/computer or personal digital assistant (PDA) as a monitoring device. This suggested system makes use of an open loop automated irrigation controller. The system is also adaptable. The crop and the soil's moisture levels are both taken into consideration when determining the quantity of water that must be supplied in order to keep the moisture level at an optimal level. In addition to the relay switch and the pump, a microcontroller is utilized in order to exercise control over the processes. It utilizes the JN5121 module, which is an IEEE 802.15.4/ZigBee wireless microcontroller. This module is utilized in the sensor node. The ARM9 sink node was utilized in order to aggregate the collected data. The GPRS gateway had been utilized for the transfer of data across great distances. A transportable unit was employed as the monitoring instrument in this scenario. As part of the research done for this suggested system, a wireless sensor network in agriculture that was based on ZigBee was analyzed. The signal intensity is affected by a variety of elements, including the node spacing, crop canopy, antenna height, and density of leaves. As a result, this research will examine these few concerns about the use of ZigBee in agricultural settings. The Texas proposal for an agricultural WSN that is efficient in terms of energy use. It employs the 8051 MCU sensor node and hardware that is equipped with CC1110 system on chip. A CC 1110 evaluation module is inserted into a smart RF04 evaluation board in order to make

LCD and LED buttons easily accessible for the purposes of control and monitoring. The hardware gives the user the ability to modify the sensitivity of a receiver as well as the radio transmission power level in numerous levels. TOSSIM was used to replicate the actions of two nodes—a receiver and a sender—in order to evaluate how well PDMAC and SMAC function in comparison to one another.

In this, the CC2420 ZigBee/RF module and the MSP430 can be found being utilized.

The suggested system of node design would use RF Tran's receiver core unit of the wireless communication system and, accordingly, the microcontroller unit. The RF module is connected to the SPI bus by way of the MCU. This system also includes a web server for communication, an expert system for agriculture, and a web-based monitoring center all of which are components of this system. Only when the real-time data has been delivered to the sink node via the sensor node does the information begin to be posted to the real-time data base that is located on the internet via GPRS.

The camera nodes and livestock monitoring sensor network,



in addition to the

Additionally included within it are soil moisture sensors. Collars that are made to order are what are utilized to secure the sensor nodes to the cow. The research proposes and investigates the use of programmable system on chip technology as a component of WSN for the purpose of monitoring and controlling a variety of greenhouse parameters. Because it is the first touch starting kit with a low cost USB thumb drive and low power RF, we have selected CC3271 PSOC for this. In addition to that, it includes the IDE software that is necessary for the sense and control of the data collecting. It consists of a multifunction board with a power amplifier, a PC dongle with RF, and two battery boards. According to the specifications of the greenhouse, it was utilized for light sensing, touch sensing, temperature sensing, and proximity sensing. The humidity of the surrounding agricultural environment as well as the temperature of the soil are being measured by the equipment. In order to assess the veracity and precision of the information,

Temperature and humidity monitoring system, two distinct sets of tests (one each in an open room and a closed room scenario) were carried out.

Consumers who have hand-held devices like a PDA may take use of a variety of services that are both diverse and easy thanks to the Dongbu Handong Seed Research Centre and a management sub-system. The application of A2S allowed for the monitoring of their growth process as well as the regulation of the environment within the greenhouses.

The suggested system is able to monitor the surroundings of the greenhouse as well as regulate the greenhouse [3]. It is necessary to develop and implement a practical deployment of WSN-based greenhouse management in order to realize the potential of modern precision agriculture.

The cluster-based routing algorithm allows for significant reductions in the amount of energy that is consumed by nodes that are engaged in the process of data transfer. One of the objectives of this research is to investigate the possibility of using wireless sensor networks (WSN) to precision irrigation systems on the grounds that the acoustic emission theory may be used to predict crop water stress. This research presents a suggestion for a completely new sort of routing protocol for WSN that will be called PECRP (Power efficient Clustering Routing Protocol). The name of this protocol was inspired by the findings of this study. It is well-suited for long-distance and complex data transmission, such as that necessary for patient monitoring or chemical detection in agricultural settings. This type of data transfer may be accomplished with ease thanks to its suitability. PECRP is the combination of benefits as same as those of some excellent cluster-based routing protocols together, such as PEGASIS (Power-Efficient Gathering in Sensor Information Systems) and HEED (Hybrid Energy Efficient Distributed Clustering Approach), etc. PECRP is a combination of the benefits as same as those of some good cluster-based routing protocols together. PECRP is a mix of the benefits that are similar to those that are offered by some of the most successful cluster-based routing protocols. This study focuses on the integration of contemporary computer tools by combining the toughness of programming languages with the usability of a good interface. The research for this article was conducted by the authors of the previous section. The building of an application development environment for WSN is essential; thus, the study presented in this article focuses on the integration of computer tools that are already in use. The study examines two distinct applications of WSN, the first of which is the monitoring of a mushroom crop, and the second of which is electronic health. Both of these applications are discussed in detail. The IEEE 802.15.4 protocol is employed to make these two applications possible, and the monitoring function is at the heart of each of them. Their findings illustrate how useful WSN may be for fulfilling the prerequisites of a variety of applications. In order to explore the impact that traditional irrigation systems have on the environment that is around a sugar field, the researchers designed and installed a WSN on the sugar field. After the system has successfully collected the information from the sensor network, it will use a microwave connection to send the information to the back-end server..

A self-organizing ad hoc sensor network is set up in a vineyard for the purpose of this research article. It travels across the vineyard and gets data on the temperatures at each location. The back-end programed analyses the temperature data and generates and displays a map depicting the potential for powdery mildew growth [8]. This assists in vineyard management.

III. PROPOSED WORK

The practice of farming is contingent on a number of agricultural parameters, including temperature, moisture, humidity, wind speed, and wind direction, amongst others. The state of the weather has an effect on these characteristics,

which in turn creates problems in the growth of plants, which leads to a lower yield. Therefore, monitoring in real time becomes the first stage in the process. Nevertheless, these monitoring strategies do come with a few downsides.

In order to circumvent the problems caused by the methods used in the past, the following strategy will be proposed:

i. Readings from a variety of parameters are recorded via sensors. These measurements are sent to the microcontroller, which features an integrated A/D convertor with 10 bits of resolution. The system that is being proposed may be understood with the assistance of figure 1, which illustrates a variety of sensing units.

ii. This convertor transforms all analogue data into a digital form equivalent to its original form before sending it to a GSM mobile device.

iii. When using GSM, user mobiles will get a variety of AT commands in the form of SMS. At the same time, one is able to visualize the data on the TCP/IP protocol suite.

iv. The Atmel AVR microcontroller has the very lowest price of any microcontroller that is currently available from any manufacturer.

Their benefits include great performance with minimal

Fig.1 Basic block diagram of proposed system [4].

Power consumption. It also boasts a sophisticated RISC architecture and non-volatile memory segments with a high durability rating.

Several agricultural factors may be measured with the use of technologically advanced sensors, which play a significant role in real-time monitoring. For example, air velocity sensors are what are used to detect wind speed.

Because GSM (Global System for Mobile) is a cellular network, it follows that in order for mobile phones to connect to it, they must first look for other cells in the nearby area.

IV. ADVANTAGES & APPLICATION

It requires no operating system for this hardware which results in reduction of cost and portability. The data collection, monitoring and materials application to the crops allows for higher yields and lower cost, with less impact to the environment. Each area receives only what is required for its particular space, and at the appropriatetime and duration. Remote monitoring is possible from fieldto farmer's home. Continuous surveillance is done through monitoring section. Low power consumption and easy to install.

Intelligent agricultural and environmental sensing is the most important application. Precision agriculture is one of the most promising application domains where wireless sensor networks may deliver a feasible or even optimalsolution. It concentrates on monitoring micro-climates in field. It has been instrumented a field with sensor nodes equipped with sensors for measuring air temperature, relative humidity and soil moisture.

V. CONCLUSION

This project finds application in domestic agricultural field. This system allows cultivation in places with water scarcity thereby improving sustainability. Furthermore,

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