IBM

TITLE: IoT based Smart Agriculture Monitoring System

LITERATURE SURVEY:

Zuraida Muhammad, Muhammad Azri Asyraf Mohd Hafez, Nor Adni MatLeh, Zakiah Mohd Yusoff , Shabinar Abd Hamid [1] The term "Internet of Things" refers to the connection of objects, equipment, vehicles, and other electronic devices to a network for the purpose of data exchange (IoT). The Internet of Things (IoT) is increasingly being utilised to connect objects and collect data. As a result, the Internet of Things' use in agriculture is crucial. The idea behind the project is to create a smart agriculture system that is connected to the internet of things. The technology is combined with an irrigation system to deal with Malaysia's variable weather. This system's microcontroller is a Raspberry Pi 4 Model B. The temperature and humidity in the surrounding region, as well as the moisture level of the soil, are monitored using the DHT22 and soil moisture sensor. The data will be available on both a smartphone and a computer. As a result, Internet of Things (IoT) and Raspberry Pi-based Smart Agriculture Systems have a significant impact on how farmers work. It will have a good impact on agricultural productivity as well. In Malaysia, employing IoT-based irrigation systems saves roughly 24.44 percent per year when compared to traditional irrigation systems. This would save money on labour expenditures while also preventing water waste in daily needs.

Divya J., Divya M.,Janani V. [2] Agriculture is essential to India's economy and people's survival. The purpose of this project is to create an embedded-based soil monitoring and irrigation system that will reduce manual field monitoring and provide information via a mobile app. The method is intended to help farmers increase their agricultural output. A pH sensor, a temperature sensor, and a humidity sensor are among the tools used to examine the soil. Based on the findings, farmers may plant the best crop for the land. The sensor data is sent to the field manager through Wi-Fi, and the crop advice is created with the help of the mobile app. When the soil temperature is high, an automatic watering system is used. The crop image is gathered and forwarded to the field manager for pesticide advice.

H.G.C.R. Laksiri, H.A.C. Dharmagunawardhana, J.V. Wijayakulasooriya [3] Development of an effective loT-based smart irrigation system is also a crucial demand for farmers in the field of agriculture. This research develops a low-cost, weather-based smart watering system. To begin, an effective drip irrigation system must be devised that can automatically regulate water flow to plants based on soil moisture levels. Then, to make this water-saving irrigation system even more efficient, an IoT-based communication feature is added, allowing a remote user to monitor soil moisture conditions and manually adjust water flow. The system also includes temperature, humidity, and rain drop sensors, which have been updated to allow remote monitoring of these parameters through the internet. In real time, these field weather variables are stored in a remote database. Finally, based on the present weather conditions, a weather prediction algorithm is employed to manage water distribution. Farmers would be able to irrigate their crops more efficiently with the proposed smart irrigation system.

Anushree Math, Layak Ali, Pruthviraj U[4] India is a country where agriculture plays a vital role. As a result, it's critical to water the plants wisely in order to maximise yield per unit space and so achieve good output. Irrigation is the process of providing a certain amount of water to plants at a specific time. The purpose of this project is to water the plants on the National Institute of Technology Karnataka campus with a smart drip irrigation system. To do this, the open source platform is used as the system's fundamental controller. Various sensors have been employed to supply the current parameters of components that impact plant healthiness on a continual basis. By controlling a solenoid valve, water is provided to the plants at regular intervals depending on the information acquired from the RTC module. The webpage may be used to monitor and manage the complete irrigation system. This website contains a function that allows you to manually or automatically control plant watering. The health of the plants is monitored using a Raspberry Pi camera that gives live streaming to the webpage. The controller receives water flow data from the water flow sensor through a wireless network. The controller analyses this data to see if there are any leaks in the pipe. Forecasting the weather is also done to restrict the quantity of water given, making it more predictable and efficient.

Dweepayan Mishra, Arzeena Khan, Rajeev Tiwari, Shuchi Upadhaye [5] Agriculture is a substantial source of revenue for Indians and has a huge impact on the Indian economy. Crop development is essential for enhanced yield and higher-quality delivery. As a result, crop beds with ideal conditions and appropriate moisture can have a big influence on output. Traditional irrigation systems, such as stream flows from one end to the other, are usually used. As a result of this delivery, the moisture levels in the fields can alter. A designed watering system can help to enhance the management of the water system. This research proposes a terrain-specific programmable water system that will save human work while simultaneously improving water efficiency and agricultural productivity. The setup is made up of an Arduino kit, a moisture sensor, and a Wi-Fi module. Data is acquired by connecting our experimental system to a cloud framework. After then, cloud services analyse the data and take the necessary actions.

R. Nageswara Rao, B.Sridhar [6] Agrarian countries like India rely heavily on agriculture for their development. Agriculture has always been a roadblock to the country's development. Smart agriculture, which comprises modernising present agricultural systems, is the only answer to this challenge. As a result, the suggested strategy attempts to use automation and Internet of Things technologies to make agriculture smarter. Crop growth monitoring and selection, irrigation decision assistance, and other uses are possible thanks to the Internet of Things (IoT). To modernise and boost crop yield, a Raspberry Pi-based autonomous irrigation IOT system has been proposed. This project's main purpose is to produce crops using the least amount of water possible. Most farmers waste a lot of time in the fields in order to focus on water available to plants at the appropriate time. Water management should be improved, and the system circuit's complexity should be minimised. Based on the data collected from the sensors, the suggested system determines the amount of water required. Two sensors detect the humidity and temperature of the soil, as well as the humidity, temperature, and length of sunshine each day, and send the data to the base station. Based on these characteristics, the recommended systems must calculate the irrigation water quantity. The key benefit of the system is the integration of Precision Agriculture (PA) and cloud computing, which will reduce

water fertiliser consumption while increasing crop yields and assisting in the evaluation of field weather conditions.

Shweta B. Saraf, Dhanashri H. Gawali [7] The Internet of Things (IoT) is the internet-based connectivity of a huge number of devices (IoT). A unique identity links each item, allowing data to be sent without human involvement It makes it possible to develop strategies for improved natural resource management. Smart gadgets with sensors, according to the IoT concept, enable interaction with the physical and logical worlds. The proposed system in this study is built on the Internet of Things and uses real-time input data. Over a wireless sensor network, a smart farm irrigation system uses an Android phone to remotely monitor and regulate drips. Between sensor nodes and base stations, Zigbee is utilised to communicate. A web-based java graphical user interface is used to process and present the server's real-time observed data. Field irrigation system wireless monitoring eliminates human interaction and enables for remote monitoring and control using an Android phone.

Cloud computing is a potential choice due to the large volume of data created by the wireless sensor network. This research presents and examines a cloud-based wireless communication system for monitoring and controlling a collection of sensors and actuators in order to determine the water needs of plants.

Shrihari M[8] The concept of automating agricultural production has been around since the early 1990s, and one of the primary challenges that both scientists and farmers confront is irrigation. Irrigation is a dynamic system that is heavily reliant on outside influences. This article describes a method that uses a custom-built mathematical model to handle data from wireless sensors on Google Cloud, resulting in a smart system. An IoT-enabled design that can scale up to big farms. According to Holistic Agricultural Studies, around 35 have been damaged by animals and people. This intelligent system uses Tensor flow and deep learning neural networks to recognise animals depending on their threat level, as well as human intruders who are not authorised on the farm, and to alert the farmer immediately. An android application is included with the device, which allows for remote access and surveillance through live video streaming.

G. Sushanth, and S. Sujatha [9] Smart agriculture is a novel concept since IoT sensors can offer information about agricultural regions and then act on it based on user input. The purpose of this study is to develop a smart agricultural system that utilises cutting-edge technologies such as Arduino, Internet of Things, and wireless sensor networks. Through automation, the research tries to take use of emerging technologies such as the Internet of Things (IoT) and smart agriculture. The capacity to monitor environmental factors is a critical component in increasing crop efficiency. The purpose of this study is to develop a system that can monitor temperature, humidity, wetness, and even the movement of animals that might damage crops in agricultural areas using sensors, and then send an SMS notification as well as a notification on the app developed for the same to the farmer's smartphone via Wi-Fi/3G/4G if there is a discrepancy. The system uses a duplex communication link based on a cellular Internet interface, which allows data inspection and irrigation schedule to be changed using an android app. Because of its energy independence and inexpensive cost, the gadget has the potential to be useful in water-scarce, geographically isolated areas.

Vaishali S, Suraj S, Vignesh G, Dhivya S and Udhayakumar S [10] From the beginning of time, agriculture has been the most important practise in human society. Traditional irrigation methods, such overhead sprinklers and flood irrigation, are inefficient. They waste a lot of water and may even make people sick by causing fungus growth in the soil due to too much moisture. Due to the scarcity of water, an automated irrigation system is essential for water conservation and, as a result, agricultural profitability. Irrigation consumes around 85% of the world's total accessible water resources. This need is projected to increase in the coming years as the population grows. To meet this need, we must employ creative methods that lower the quantity of water utilised in irrigation. Sensors in the automated system monitor the availability of water to the crops, and watering is done as needed through controlled irrigation. Because of its practically limitless storage and processing capabilities, as well as its fast flexibility, cloud computing is an intriguing solution to the massive amount of data generated. The objective is to focus on factors like as temperature and soil moisture. This is a mobile integrated and smart irrigation system based on an Internet of Things-enabled application-controlled monitoring system. The main purpose of this project is to regulate the water supply and monitor the plants using a Smartphone.

Hamza BENYEZZA,Mounir BOUHEDDA,Khaoula DJELLOUT,Amina SAIDI [11] Water management currently global problem to all of us to tackle them in near future we need to plan it smartly. As we are living in modern world filled with lots of useful sensors from which we can designed systems with water saving capabilities. The work in this paper is focusing on increasing effective use of water using field assist to farmer. Basically it works with soil moisture sensor which gives finding of moisture level in soil and reconnects with Thing Speaks cloud via Wi-Fi module ESP8266 to observation of soil conditions. Proposed system also set with an algorithm such that on soil moisture pattern data it can predict decision on irrigation of crops. system also warns farmer about empty water source if it occurs . benefits of using this system also includes weather prediction through website. The device has the potential to be beneficial in water-scarce, geographically isolated places due to its energy independence and low cost. The fact that the technology is simple to use for farmers adds to its utility. It also saves water by preventing waste.

Shiny Rajendrakumar, Prof. V K Parvati, Prof. Rajashekarappa [12] Agricultural Irrigation is very important for the production of crops. Many methods have developed to save water in different ways. In traditional irrigation systems we require an operator or farmer to put water on crops but he does not come to know which crop require how much amount of water to get proper amount of yields. Irrigation means planting the crops by water. There are so many traditional irrigation methods, but all these methods consume large amount of water. Automated irrigation is the method which saves the water from up to 97% as compared to traditional methods. By using these modern methods like ICT productivity can be improved without unnecessary wastage of water. Here we are concentrating on loT ie.

Internet of Things technique in irrigation for the purpose to save water. In this paper author states that Soil constitution is related with the availability of elements of nourishment plant requires as well as the presence in soil of elements and chemical composition that exist at different proportion that are best nourishment to plants and soil organisms and appropriate

water to plant is most essential for all of the other nourishment to work at best. The Arduino will on the buzzer to give an alert to the farmer. So Serial monitor of Arduino HE gives a message as "motion detected" when the buzzer is on and as "motion ended" when the buzzer is off. This innovation is prescribed for efficient automated agricultural watering system frameworks and it might give a profitable apparatus for preserving water arranging and watering system booking which is extendable other comparable horticultural harvests. The drawback of this proposed system is the whole system works on electricity, if in the case of electricity problem the farmer cannot on the motor to irrigate his land. The solution is to have generator, if there is no electricity so that generator gets on to run this framework and irrigate his land.

Smart Water Management Using IOT

This project helps us to manage the water level and where we can use in the Society easily. The level of water is maintained by sensor which is presented inside the tank and the data will stored in the cloud using mobile application. Users can view the level of water thorough mobile phones; according to that motor will be work automatic and manual. If the water level is low automatically motor gets switched on if it's up to fill then it will shut down the motor[1]. In our proposed system, Using Mobile phones we can monitor the water level and we can control from anywhere and anytime. It can also used in different industries to maintain the different type of liquids in the tank they can view and maintain the update information through the mobile application. User can also get alert notification according to their fixed criteria. It can also be implemented for flood propane like install this facility in Dams and bank of rivers etc[2]

Hybrid Intrusion Detection Architecture for Internet of Things

In this world, Internet of things (IoT) is an emerging paradigm where we can connect all the things and control in anywhere at any time. A novel intruder deduction architecture model which we are proposing for IoT to find out the anonymous activities in a particular area. This model is based on map reduce to find out multiple intruders in the fields. It wall alert the user by giving alert notification through the mobile application. The internet of things is a worldwide network where we can connect all the devices and control from anytime and anywhere in a wide range of technologies[3]. The main concept of this proposed system is to make a solution for insecure nature of internet to become a much more secure in Iot thorough Mobile application. The results, which alerts the user by alert notification whenever anonymous detection is founded out. It will also find out multiple intruder detection simultaneously. Using unsupervised OPF it will detect (inner attack) and misuse-based intrusion is used to find out (external attack). It can also able to detect the cybercrime attack through IoT[4].

Real-time intrusion detection in the Internet of Things

In the IOT resource-constrained things are connected to the unreliable and untrusted Internet via IPv6 and 6LoWPAN networks. Even when they are secured with encryption and also authentication, these things are exposed both to wireless attacks from inside the 6LoWPAN network and also from the Internet. Since these attacks may occur, Intrusion Detection Systems (IDS) are necessary. In the implementation and evaluation, the primarily target routing attacks such as spoofed or altered information, sinkhole, and selective-forwarding[5]. The evaluation shows that in the simulated scenarios, SVELTE detects all malicious nodes that launch the implemented sinkhole and/or selective forwarding attacks, the true positive rate is not 100%, and there are also some false alarms during the detection of malicious nodes. Also, SVELTE's overhead is small enough to deploy it on constrained nodes with limited energy and memory capacity. And To guard against global attacks it has design and implements a mini-firewall. The detection algorithms in SVELTE currently target spoofed or altered information, sinkhole and selective forwarding attacks. However, it is flexible and can be extended to detect more attacks. Therefore, it is to complement SVELTE with novel and/or available intrusion detection techniques that are feasible to use in the context of the IoT[6].

Survey data on cost and benefits of climate smart agricultural technologies in western Kenya

The data is collected to assess the climate smartness, profitability and returns of soil protection and rehabilitation measures. The data were collected from many households[7]. These households were selected using simple random sampling technique from a primary sampling frame of 180 farm households provided by the ministry of agriculture through the officers. It was administered by trained research assistants using a structured questionnaire that was designed in Census and Survey Processing System . And also the data was exported to STATA version 14.1 for cleaning and management purposes. The data are hosted in an open source data verse to allow other researchers generate new insights from the data[8].

A Model for Smart Agriculture Using IoT

Climate changes and rainfall has been regular over the past decade. Due to this, climate-smart methods called as smart agriculture is adopted by many Indian farmers. Smart agriculture is an automated and directed information technology implemented with the IOT (Internet of Things). IOT is developing rapidly and widely applied in all wireless environments. The sensor technology and wireless networks integration of IOT technology has been studied and review. A combined approach with internet and wireless communications, Remote Monitoring System (RMS) is done. Main aim is to collect real time data of agriculture production environment that provides easy access for agricultural

facilities such as alerts through Short Massaging Service (SMS) and on weather pattern, crops .In this the wise agricultural model in integration with ICT[9]. ICT have always mattered in Agriculture domain. Village farmers may have planted the "same" crop for many years, weather patterns and soil conditions pests and diseases changed. By using the proposed approach, received updated information allows the farmers to cope with and even benefit from these changes. It is really challenging task that needs to provide such knowledge because of highly localized nature of agriculture information specifically distinct conditions. The complete real-time and historical environment information is expected to help to efficient management and utilization of resources[10].

Combined Radar–Radiometer Surface Soil Moisture and Roughness Estimation

A robust physics-based combined active–passive (C-AP), or active–passive, surface soil moisture and roughness estimation methodology is presented. Soil moisture and roughness retrieval is performed through optimization, minimization, of a joint objective function, which constrains similar resolution radar and radiometer observations simultaneously. A data-driven and noise-dependent regularization term has also been developed to automatically regularize and balance corresponding radar and radiometer contributions to achieve optimal soil moisture retrievals. Extensive Monte Carlo numerical simulations and assessment using field data have been performed both to evaluate the algorithm's performance and to demonstrate soil moisture estimation. Unbiased root mean squared errors range from 0.18 to 0.03 cm Through extensive numerical simulations and tests on actual field data, it was shown that, in a C-AP context with noise- dependent self-regularization, soil moisture estimation with errors meeting the SMAP 0.04 cm3/cm3 volumetric water content accuracy threshold is possible. More specifically, unbiased RMSE for soil moisture using Com RAD data and the proposed objective function (3.d) are 0.031 and 0.018 cm3/cm3for Corn and Soybean, respectively[11]. Furthermore, with the available expanded information space provided by using multiple measurements of difference polarizations (HH, VV, and TB-H and TB-V), more than one unknown parameter can be retrieved. This is to develop and present a fully adaptive scheme where it becomes possible to obtain best soil moisture retrievals by fully utilizing the available radar and radiometer information and not rely on a single set of observations or models. Two features merit further detailed investigation. the effects of surface correlation length are not considered in this paper; the currently implemented forward scattering and emission models are the functions of only surface rms height. It is expected that, at L-band, variations in surface correlation length will have noticeable impacts on soil moisture estimation abilities[12].

Architectural Framework of Smart Water Meter Reading System In IoT Environment

Internet of Things (IoT) has provided a lot of opportunities to create domestic applications. Smart metering also one of its main application. Water is the previous resource for everyone using this smart metering we can able to maintain the water management and we can also reduce the wastage of water. We propose the architecture frame work for water metre, which it measures the water flow and heat measurements (STUF280T) [13]. We are introducing the concepts in media tech cloud sandbox which we are using as cloud platform. All the data's and information are stored in the cloud and make the process very economical instead of making costlier. And also this IoT concept allows the user to access the data at anytime and anywhere. Smart meter allows the user to maintain the high data and analysis the cost of the process. Other technologies like ZigBee, Bluetooth and gsm are also analysis the same data but using this smart meter user can have Restful based web services for communicating between IoT cloud and water meter in terms of ecological sustainability [14]

An Internet of Things (IoT) based Sustainable Water Management

Increasing dependence on groundwater as a reliable source of water in the rural areas has resulted in its indiscriminate extraction without considering the recharging capabilities of the aquifers as well as other environmental factors. As the availability of groundwater is highly inconsistent and exhibits substantial variations across the country, management of groundwater resources in the Indian context is an extremely crucial proposition. In this paper, we are discussing about a sustainable water management system based on Internet of Things (IoT), which automates the water distribution and storage as well as regulation of water wastage[15]. The requirement analysis is performed for Gudipadu Cheruvu, a remote rural village in Andhra Pradesh, India, where frequent water scarcity issues occur. An IoT system designed for sustainable water management is proposed for the Gudipadu Cheruvu village. The results of the proposed design and its evaluation are described in this paper. We have reached out to the underserved communities facing water crisis and have come up with a viable system that automates the functions as well as increases the sustenance of the source in the long run. The challenges while developing a system for the rural set up was multi-faceted. Illiteracy, lack of awareness and digital divide prevailing in the rural sector had to be confronted. Apart from these, developing a system for the low resource setup was also tackled. We have developed a system that will reduce human intervention in water management which is adaptable in both the urban and rural scenarios incorporating the sustainability factor[16].

Internet of Things (IoT) Enabled Water Monitoring System

Water is always a needy part of everyone's life. Due to environmental situation, water management and conservation will play a vital for human survivals. Recently , there were huge needs for consumer based humanitarian projects that could be rapidly developed using Internet of Things (IoT). This proposes an IoT based water monitoring system that measures water level in real-time [17]. The prototypes are based on the level of the water can be an important parameter hence it comes to the flood especially in disaster areas. A water level sensor is used to detect the water level and based on the fixed parameter, and if the water level reaches the parameter, the alert signal will be feed in real- time to social network like Twitter. A cloud server was configured as data repository. The ultra-sonic sensor could be replaced by precise water level sensor. So that the system can perform more efficiently and gives higher accuracy of water level detection instance[18]

Smart Agriculture using IoT and WSN based modern technologies

In India about 70% of population depends upon farming and one third of the national capital comes from farming. The highlighting features of this concept includes smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, bird and animal scaring, keeping vigilance, weather forecasting, water management, canal controlling in both automatic and manual modes and all these data are stored and displayed in a mobile application. Based on the fixed criteria, the alert SMS and notification is send to the user. Smart warehouse management which includes temperature maintenance, humidity maintenance and theft detection in the warehouse[19]. Controlling of all these operations can done by an application which is connected to internet and operations will be performed by interfacing sensors, Wireless Fidelity etc. The sensors and microcontrollers are successfully interfaced with raspberry pi and it proves that it is one of the solution to field activities, irrigation problems, and storage problems using remote controlled robot, smart irrigation system and a smart warehouse management system respectively[20].

Computers And Electronics In Agriculture Field Through Software Computer Science

It presents the updated view of IoT application for agro-industrial and environment fields. And it is found that most of them relied heavily on heterogeneous components and wireless sensor networks. The selected references were combined into four application domains they are monitoring, controlling, logistics, and prediction. And these references were compiled to create usage of sensors, actuators, power sources, edge computing modules, communication, storage, and visualization stages. Finally, the solution were complied into an IoT architecture that represents a wide range of changes in agro-industrial and environmental fields. However, it seems reasonable to assume that future solutions will need to fully embrace Cloud services and new ways of connectivity in order to get the benefits of a truly connected and smart IoT ecosystem[21].

IOT based monitoring system in Smart Agriculture

Even now different developing countries using the traditional ways and backward techniques in agriculture sector. A little technological advancement has increased the production efficiency significantly. And to increase the productivity the inventive approach is introduced. Smart farming with IOT has been designed. By developing a motor vehicle which can be operated on both automatic and manual modes which can be used for various agriculture activities like cutting, spraying, and weeding etc. The controller will monitor the temperature, humidity, soil fertility, and water management to the field. By using green energy and smart technology the agriculture sector will find a better way to increase the productivity [22].