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A Review on Monitoring and analysis Agricultural field Operation using IOT Technologies: Assessing the Medicinal Plants in Western Rajasthan

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Abstract: ***Medicinal crops occupy an important position in the socio cultural, spiritual, and health aspect of rajasthan rural population. These have became an integral part of the cultural and rituals. Importance of the medicinal crops in the state but the fact that data on these crops are not collected and disseminated like other crops cultivation and processing of medicinal plant are labor intensive process and have a good potential for employment generation. It is hypothesised that medicinal crops could easily replaced the traditional crops on a selective basis and provide increased net income.***

With the use of smart technology we can guide the farmers to cultivate the medicinal crop with selected area and proper analysis data With IoT, inexpensive monitoring devices can be used anywhere around the farm with little worry for their durability, their cost, or their ability to work together. And therein lies the hidden challenge for IoT on the farm which is to ensure compatibility between sensing devices. The challenging issue is to integrate Raspberry pi with IoT and sensors to increase the efficiency of the agricultural work. As outcome of challenge, temperature, humidity, soil moisture content if occurred in the field are monitored. In the current agriculture system the specifications such as temperature, moisture humidity are detected manually .The disadvantage of this method is increase in labour cost, time and also monitoring cannot be done continuously. Manual Labour is compulsory in the farm.

Keywords: Bigdata, Cloud Computing, IOT (Internet Of Things), smart agriculture, Wireless sensor network.

I. INTRODUCTION

In today's smart world where the man is rapidly proceeding towards development or advancement of various aspects, considering each and every point of possibility for the resulting outcome, we are forced as well as curious to measure quantities surrounding us. Therefore, we came up with an idea of significant relevance to measure and determine important quantities of physics namely temperature, humidity and physical moisture. Smart farmers are using innovative processes in agriculture. Magnetized water is being used to enhance crop productivity and farmers are placing horseshoe magnet in water source or adopting other ways to use this methodology. Task specific machinery and unmanned aerial vehicles (UAV's) fitted with wireless sensor electronic devices are being used to monitor and collect crop related information or facilitate reduction of manual labor and time consuming activities on the farm. Rajasthan has a large population of about 5, 64, 73, 122 crore. Around 80 percent live in villages which utilize local medicine. The state of Rajasthan is situated between 23°3' and 30°12' N latitude and 69°30' and 78°17' E longitude . The total land area of the state is about 3,24,239 km², out of which about 1,98,100 km² is arid and the rest semi arid. The physical features are characterized mainly by the Aravallis and to the some extent by the vindhyan formation, and the Deccan trap. A major portion of western Rajasthan has desert soils and sandy plains. Sand dunes occupy a greater part of western Rajasthan (1,20, 983 km²). The soils of the desert plains are loamy sand to loam and the eastern

part has alluvial soil which supports good forests and agricultural crop. Sensor networks have linked ICT and wireless sensor network technology that has revolutionized the communication processes. Sensor network technology has brought changes in various sectors, including medicine and industrial process control. The rapid technological approach and evolution in recent years extremely enables the achievement of these goals by eliminating many hurdles for enactment, including reservations by agriculturalist themselves. Technical Manufacturers, farmers, and researchers, all together, are combining their energy to find systematic elucidation, advancement in productivity and decreased cost.

II. Literature Review

A Fuzzy Energy Management Approach for Multimedia Traffic In WSN

Wireless sensor network (WSN) is an innovative ad-hoc network with distributed sensing and processing capacities made up of collection of sensor nodes. The sensors transmit information to the sink. The routing protocol for WSN are based mostly on efficiency of energy and some deal with real time requirements. A fuzzy logic system is incorporated to improve the quality of the service of the network. The number of packets transmitted successfully, energy and number of hopes from sink are taken into consideration by the fuzzy logic system to improve the throughput of the network.[1]

Improving the Performance Metric of Wireless sensor Networks with Clustering Markov Chain Model and Multilevel Fusion

A performance metric evolution for a distributed detection Wireless Sensor Network with respect to IEEE 802.15.4 standard was proposed. A distributed detection scheme is considered with presence of the fusion node and organised sensors into the clustering and non-clustering networks. Sensors are distributed in clusters uniformly and non-uniformly and network has multilevel fusion centers. Fusion centers act as the heads of clusters for decision making based on majority like received signal strength (RSS) with comparison the optimize value of the common threshold.IEE 802.15.4 Marcov chain model derived the performance matric of proposed network architecture with MAC,PHY cross-layer parameters ,and channel coding and Rayleigh fading ,simulation results represent significant enhancement on performance of network in terms of reliability, packet failure, average delay, power consumption and throughput. [2]

Internet of Things based Expert System for Smart Agriculture

Internet of Things (IoT) is a broad term that describes the interconnection of different daily life objects through the internet. In the concept of IoT every object is connected with each other through a unique identifier so that it can transfer data over the network without a human to the human interaction [1, 2]. IoT has referred as a network of everyday objects having ubiquitous computing. The ubiquity of the objects has increased by integrating every object with embedded system for interaction [21]. It connects human and devices through a highly distributed network. IoT is basically the world wide interconnection of devices. The aim of IoT is to connect every person and every object through the internet. In IoT ,every object is assigned a unique identifier, so that every object is accessible through the internet.[3]

Performance Boost-Up by Using an Efficient Network Management Schemes in Wireless Sensor Network

Wireless sensor network (WSN) applications are becoming more challenging day by day. Some of the major challenges are security attacks, packets drops, high power consumption, low battery backup and some connectivity problems. But the most significant problem is providing quality service under harsh environments, where sensor nodes are facing several problems such as batteries of sensor not working properly, when temperature goes very low tin winter, reliability of monitoring system, energy and power losses etc and performance of network degrades greatly.An efficient Network Management Scheme (ENMS) can handle these major drawbacks and the network works accurately even in harsh environments..[4]

Development an Enhancement Efficient Secured Multi-Hop Routing Technique for Wireless Sensor Networks

Wireless sensor networks use number of sensors to send data from sender to base station. Wireless sensor nodes are battery powered devices .Power saving is always vital to increase the lifetime of WSN. There are many protocols has designed and proposed for WSN to increase its performance in terms of throughout, network lifetime and security, an efficient secured multi hope Routing technique for Wireless Sensor Networks (ES-MHRT) was proposed recently, which was a two contemporary hybrid multi hope routing techniques, namely, fault Multihop routing technique and hierarchal Multi-hop routing technique for providing trustworthy and efficient routing in WSN. It demonstrates the effective performance in terms of network lifetime and superior connectivity. However, from the literature survey, it is observed that in ESMHRT the sender understand the status of delivery report from receiver only, which costs more time to understand the reliable route .Thus sender couldn't forward the data in fast manner, which affects the network performance in terms of throughput and bandwidth utilization. This is the major issue, it is necessary to design an efficient distributed monitoring system, which will help the ES-MHRT to push more volume of data with secure route.[5]

International Journal of Soft Computing and Engineering (IJSCE)

India ranks second in agriculture activities. It is important to increase the overall productivity. However, India faces several problems is the shortage of water for irrigation purposes. Farmers depend heavily on rains because they lack access to irrigation facilities. Crop yields are highly unreliable due to variability of rainfall, amount of its distribution and prediction values of various factors such as weather, water, soil, etc.

Communication Technology (ITC), Sensor networks and other scientific techniques can help farmers to store and utilize rain water, increase productivity, reduce cost and real time values..[6]

Middle-East Journal of Scientific Research 20 (9): 1127-1132, 2014 ISSN 1990-9233,

Application of wireless sensor technology in agriculture can help farming community. Sensor motes have several external sensors for measuring leaf wetness, soil moisture, soil pH and atmospheric pressure. Sensors measure soil moisture and the mote triggers the water sprinkler during the period of water scarcity. After supply of adequate water, the water sprinkler is switched off to conserve water. Value of soil pH sensor is sent to the base station and in turn the base station intimates the farmer about the soil pH on mobile phone via SMS using GSM modem, which helps him to select and reduce the use of fertilizer. To overcome the difficulty of lack of information and technical support and increase rice production, WSN is used by farmers for real-time monitoring and achieving precision agriculture rice cropping.[7]

SURVEY ON ADVANCED IOT BASED AGRICULTURE SYSTEM CONSISTING SMART WATER SUPPLY & CROP PREDICTION IN COST EFFICIENT WAY

The investigation and examination identified with the interconnected field investigations of Internet of Things, Machineto-Machine and Remote Sensor and Actuator Systems, it was conceivable to recognize that there are different advancements over the most recent few years; there is still issue to address in regards to the produced and gathered information. The framework proposed in these undertaking, plans to prompt the blend of such frameworks with the alluring highlights offered by IOT. This joining could be connected to the agricultural applications. The mechanized water system framework exhibited in this work was discovered more feasible, and can oversee water system water supply all the more adequately. It improves the utilization of water for water system reason and crop security. It demonstrates that water utilization is lessened with the execution of soildampness based computerized water system framework.[8]

IoT Based Smart Agriculture Monitoring and Irrigation System Using Raspberry Pi Kit

The sensors are successfully interfaced with Raspberry pi and wireless communication is achieved. All observations and experimental tests prove that this project is a complete solution to the field activities irrigation problems. Implementation of

such a system in the field can definitely help to improve the yield of the crops and aids to manage the water resources effectively reducing the wastage.[09]

IOT BASED SMART SECURITY AND MONITORING DEVICES FOR AGRICULTURE

The farmers have more difficulties to monitor all the farms at the same time. Hence the project is developed to monitor the farms in the field using the concept of IoT(Internet of things). Temperature level, soil moisture and water level are monitored according to the readings of these sensors and the pump is switched on to provide adequate water to the fields. Here all the data"s are parsed into the server and are able to monitor the plants continuously and easily able to monitor the health of farms. By using the IoT, the development time gets reduced and thus time for monitoring the farms.[10]

A Comparative Study on Internet of Things (IoT) and its Applications in Smart Agriculture

Coping with agriculture and its demands are really a challenging one nowadays. Agriculture serves as the heart of Indian economy and half of the population in India survives because of agriculture.Farmer suicides up 40 per cent in a year,1,2 Official sources said that the agri-crisis was becoming worse due to poor rain and climatic conditions. From 2015 to till date farmers are suffering from severe scarcity and difficult to recover from drought. The IoT is a technology which serves as a solution to the problem. It uses various sensors which is connected through internet and also with the integration to the satellites it do wonders in all sectors. It also uses various protocols by enabling the IoT to grow faster.[11]

A Comparative Analysis on Smart Farming Techniques using Internet of Things (IoT)

Agriculture is considered as one of the major sources in maintaining a nation's GDP. Most of the developing countries and under developed countries are relying on cultivation to improve their economic wealth. In this modern technology era, technology can play a tremendous role in the agriculture sector. The advanced technology has the capability to automate various cultivation phases like watering, fertilizing, harvesting and much more. In order to make the cultivation phases smarter, we deploy smart sensors in the fields to sense the water level, photo sensors to ensure sufficient sunlight is available for plant's growth, sensors to sense the nitrogen content and thereby to inform the farmer to initiate steps for proper fertilizing, etc. There are many works done in this area, and much more is progressing in the labs now. We analyzed the various standard IoT techniques used in Agriculture sector based on hardware and software, and thereby deriving the existing challenges for making farming much smarter and efficient.[12]

S.No.	Title	Reference	Year	Remark
1.	A Fuzzy Energy Management Approach for Multimedia Traffic In WSN	[1]	2013	Wireless sensor network (WSN) is an innovative ad-hoc network with distributed sensing and processing capacities made up of collection of sensor nodes
2.	Improving the Performance Metric of Wireless sensor Networks with Clustering Markov Chain Model and Multilevel Fusion	[2]	2016	A distributed detection scheme is considered with presence of the fusion node and organised sensors into the clustering and non clustering networks
3.	Internet of Things based Expert System for Smart Agriculture	[3]	2016	the concept of IoT every object is connected with each other through a unique identifier so that it can transfer data over the network without a human to the human interaction
4.	Performance Boost-Up by Using an Efficient Network Management Schemes in Wireless Sensor Network	[4]	2016	Some of the major challenges are security attacks, packets drops, high power consumption, low battery backup and some connectivity problems.

5.	Development an Enhancement Efficient Secured Multi-Hop Routing Technique for Wireless Sensor Networks Monitoring System	[5]	2017	There are many protocols has designed and proposed for WSN to increase its performance in terms of throughout, network lifetime and security, an efficient secured multi hope Routing technique for Wireless Sensor Networks (ES-MHRT) was proposed recently,
6.	International Journal of Soft Computing and Engineering (IJSCE)	[6]	2017	Communication Technology (ITC), Sensor networks and other scientific techniques can help farmers to store and utilize rain water, increase productivity, reduce cost and real time values
7.	Middle-East Journal of Scientific Research 20 (9): 1127-1132, 2014 ISSN 1990-9233,	[7]	2017	wireless sensor technology in agriculture can help farming community. Sensor motes have several external sensors for measuring leaf wetness, soil moisture, soil pH and atmospheric pressure. Sensors measure soil moisture and the mote triggers the water sprinkler during the period of water scarcity.
8.	SURVEY ON ADVANCED IOT BASED AGRICULTURE SYSTEM CONSISTING SMART WATER SUPPLY & CROP PREDICTION IN COST EFFICIENT WAY	[8]	2019	smart agriculture goes about as an IOT gadget and transmits the information gathered from different sensors to a remote server Android App utilizing Wi-Fi connects.
9.	IoT Based Smart Agriculture Monitoring and Irrigation System Using Raspberry Pi Kit	[9]	2017	a system is proposed to monitor crop-field using sensors for soil moisture, humidity and temperature. By monitoring these parameters, the irrigation system can be automated if soil moisture is low.
10.	IOT BASED SMART SECURITY AND MONITORING DEVICES FOR AGRICULTURE	[10]	2017	an agricultural product needs security, monitoring and maintenance at very initial stage. These challenges should be taken into consideration. The combination of traditional method with software technologies like Internet of Things and Wireless Sensor Networks can lead to agricultural development.
11.	A Comparative Study on Internet of Things (IoT) and its Applications in Smart Agriculture	[11]	2018	The agriculture is getting automated day by day by simplifying the work of farmers and optimizing the crop production. On the IoT in agriculture works by collecting information from soil, humid level, and temperature monitoring is easy and can be done in a regular basis which is helpful in predicting the ecological factors
12.	A Comparative Analysis on Smart Farming Techniques using Internet of Things (IoT)	[12]	2018	the growth and progress of IoT-based system used in the agriculture sector and in smart

				farming. It all started by using Zig-bee based Wireless Sensor Networks (WSN) later followed by centralized IoT boards and processors like Arduino, Raspberry PI, etc.

III. PROPOSED MONITORING SYSTEM OVERVIEW

The system consists of two subsystems called the master and slave, Raspberry pi is the master node and wireless sensor units act as slave node. They are bundled with an experiment sensor to detect the wetness in the soil. These sensors are then integrated with the Raspberry pi. The analog signals received from the sensors are sent to the ADC (analog to digital converter). Then the converted data is sent to the raspberry pi. IOT embedded web based application is developed for monitoring and controlling the devices remotely any time and from anywhere. The information collected from the sensors are stored in the database or the servers. Proposed framework assist client with enhancing standard and size of their homestead yield by watching encompassing temperature, dampness, soil dampness content, and furthermore recognizes fire if happened in the ranch by any way. Every task mentioned is performed without human interaction. By using wireless sensor networks and IoT system can be efficient. This Monitoring System is mainly made of three parts: sensor networks, raspberry pi and IoT Interface.

MQTT Brokers, Publishers & Subscribers

In a nutshell, MQTT consists of publishers and subscribers, and they're all connected through a broker. The terminology can be confusing, but if you translate it into client-server notation, it's this simple:-

- The broker is the server
- The publishers *and* subscribers are the clients.

ESP8266EX is integrated with a 32-bit Tensilica processor, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. ESP8266EX is capable of functioning consistently in industrial environments, due to its wide operating temperature range. With highly-integrated on-chip features and minimal external discrete component count, the chip offers reliability, compactness and robustness.

Engineered for mobile devices, wearable electronics and IoT applications, ESP8266EX achieves low power consumption with a combination of several proprietary technologies. The power-saving architecture features three modes of operation: active mode, sleep mode and deep sleep mode. This allows battery-powered designs to run longer. The ESP8266EX microcontroller integrates a Tensilica L106 32-bit RISC processor, which achieves extra-low power consumption and reaches a maximum clock speed of 160 MHz. The Real-Time Operating System (RTOS) and Wi-Fi stack allow about 80% of the processing power to be available for user application programming and development.

Sensors

The distributed sensor network that consists of soil moisture sensor, temperature sensor, humidity sensor, colour sensor and water level sensor. There are different types of soil sensor technologies and measurement techniques that have been developed for the measurement of soil moisture content. The commonly used soil sensors are based on frequency domain reflectometry (FDR), which uses capacitance probes to measure the dielectric permittivity of the soil. In this work however, we used a resistive soil sensor, which was developed using two probes to pass electrical currents into the soil and reads the response or resistance to get the moisture content of the soil. The resistive sensor works on the principle that the more moisture we have in the soil makes the soil to conduct electricity easily due to lower resistance while dry soil conditions makes the soil conducts electricity poorly due to higher resistance.

Laravel is an open-source PHP framework, which is robust and easy to understand. It follows a model-view-controller design pattern. Laravel reuses the existing components of different frameworks which helps in creating a web application. The web application thus designed is more structured and pragmatic. Laravel offers a rich set of functionalities which incorporates the basic features of PHP frameworks like CodeIgniter, Yii and other programming languages like Ruby on Rails. Laravel has a very rich set of features which will boost the speed of web development.

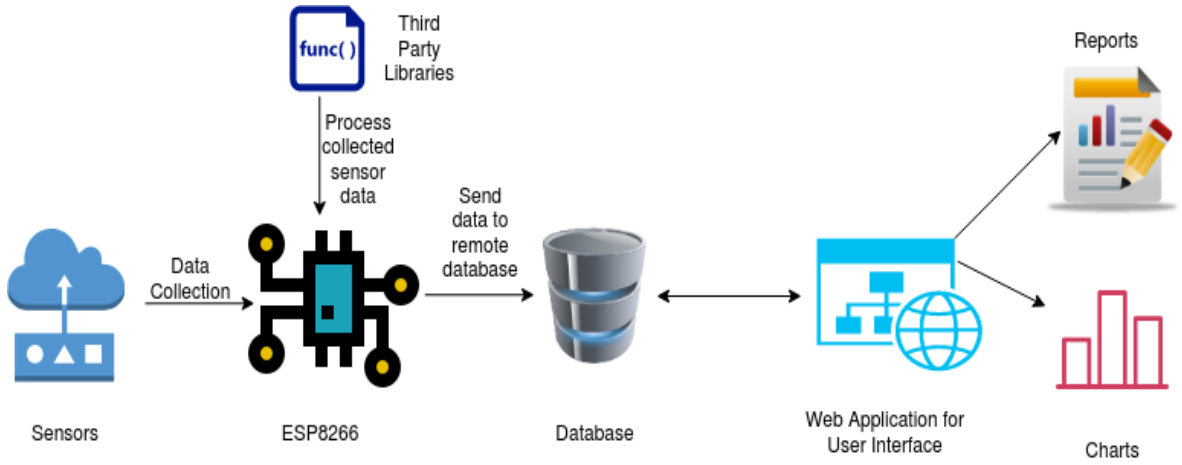
Laravel offers you the following advantages, when you are designing a web application based on it −

- The web application becomes more scalable, owing to the Laravel framework.
- Considerable time is saved in designing the web application, since Laravel reuses the components from other framework in developing web application.
- It includes namespaces and interfaces, thus helps to organize and manage resources.

The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins that allow you to control electronic components for physical computing and explore the Internet of Things (IoT).

In this proposed system we will retrieve data from relevant sensors from selected localities. ESP8266 WiFi module will collect all the data from sensors & also from third party libraries. After collect data , that data will send to remote databases. The data repositories will having connectivity with the user interafce through a web application. This web application can be used by every one to get in lively updates about the pollution levels in their concern locations. This web application will be able to visualized data in the form of reports or in chart formats.

Proposed System Flow



Proposed Flow Diagram of Research Implementation

IV. Conclusion

Application consists of wireless sensing devices that are placed in agricultural areas to gather data such as moisture, temperature, humidity and fire. The gathered information are communicated to Raspberry pi via Wi-Fi using Master Slave communication model. Raspberry pi, which acts as a master node, controls its devices or process known as slaves. This process consists of functions like storing data, collecting data from slaves, computing and integration of data. The raspberry pi can establish a Wi-Fi network and run the communication model that is used to collect data from sensors to raspberry pi and from pi to the server. The user alliance that is the web application based on IoT platform allows users to maintain agricultural data in

actual time. The primary preferred standpoint of the proposed framework is that the cost of the setup progressively is low as raspberry-pi and other computerized sensors with web of things are utilized. The framework can without much of a stretch conclusion the encompassing condition. The application of the proposed system come in the areas of agricultural fields, agricultural research stations, cultivation areas and nursery plants.

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