Literature Survey on

Smart Farmer - IOT Enabled Smart Farming Application

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ABSTRACT:

The survey proposes smart agriculture using various devices. Related work is the foundation for advance in agriculture practice. Using smart agriculture, a farmer can control the activities of agriculture like irrigation, animal intrusion, etc. The communication between the devices is increased by the use of IOT. Using IOT in agriculture improves the functionalities used in farming. Until now, the only way of handling the agricultural activities is by traditional method. In this survey Using WSN, data acquisition and transfer and monitoring become easy. This technique provides smart solution for crop growth using IOT.

INDRODUCTION:

Agriculture is one of the most important aspects in India. Irrigation accounts for 55-70% of water usage in India. Water usage for irrigation is nearly 60%. Most of this water used is wasted. We can use soil moisture sensor as a solution for wastage of water. This is done by IOT devices. The IOT networks reduce human labour requirements in the farm. IOT uses wireless sensor networks for gathering the information to monitor and control the activities. For monitoring the farm remotely, the end devices are equipped with soil moisture sensor, temperature sensor, etc. There are no means for farmers to have complete control over their farms and monitor the activity on the farm remotely. Here we try to provide a system that is cost effective and provides the functionalities that is required by the Indian farmers.

IOT devices enable all farms to be connected and share knowledge regarding farming from experienced users. The smart farm, embedded with IOT systems, can support a wide range of devices. Due to the deployment of connected farms, it can be easy to detect disease on crop or virus spread over farm using prediction technique. All sensors and actuators who are monitoring and growing the crops are connected through a gateway. The gateway is intern connected to a server called Mobius. It will communicate with expert farming knowledge system and control actuators to make farm suitable to grow crops.

The device that detects and replies to an input from any sources is called sensor. A motion sensor that uses one or more technologies to detect movement in an area. If a sensor is tripped the light floods surrounding the area and illuminates anything in its path. Key components of a sensor nodes are analog to digital converter, trans receiver, microcontroller and memory. The sensor can take various inputs using these components the input can range from various physical factor.

This is an information technology resource that helps farmers to tackle complex problems in crop production. The inputs for DSS are water, climate, energy, economy and human resources and give an output of these factors, improving the production. The irrigation sensor consists of a camera embedded in a waterproof and closed chamber. Camera takes image of the soil to determine the water content in it. A Gray scale analysis is used to differentiate between light pixel and dark pixel. The contents are forwarded to gateway router. An app is developed on a smartphone which has computation and connectivity capabilities.

The system focuses on protection of the farm from rodents or insects in the field, the system provides real time notification on detecting the problem. The PID sensor is used to sense and detect animals using their body heat, we can improve and integrate this system even in the grain storage area. we have three nodes in this system sink node, a sensor node and an actuator node. acquisition, collection and analysis of information like temperature and soil moisture is done from the sensors and the system identifies an ideal period to start the irrigation process, this saves the time and resources of the farmer, and helps us conserve water and protects the environment. We use cloud computing to deal with the high storage and processing requirements.

Using RaspberryPi we can advance the methods and production of crops. Our main objective is to obtain productivity of crops by minimal water consumption. Efficient ways of managing the water supplied to the crops is done by using two sensors: humidity and temperature sensors. The system made precise with cloud computing as it provides us with real time data. Here the complexity of the algorithm is reduced when compared to other algorithms. In the authors proposed a model for smart agriculture using IOT. This model has been proposed by studying the current agricultural system and its problems. This smart model enables the farmers to have the Remote Monitoring System (RMS). This is used to handle the agriculture activities remotely and also used for collecting data of agriculture in real time. This has been done by using various sensors, smartphone and Wi-Fi network. Monitoring based on WSN which make use of environment factors such as temperature, humidity etc. To reduce the power consumption and problem of using wires for connection, the use of wired communication system is replaced with IOT technology. The node, server and the database are made to communicate via Bluetooth and LPWAN.

In this author have proposed the use of sensing devices in smart agriculture system. The sensors have the RF transmitter. All the sensors are connected to Arduino. Moisture Sensor used to detect soil moisture level which turns the pump on and off. Motion Sensor which is used detect the animal intrusion and alerts the farmer via buzzer. This sensor is connected to Arduino UNO Arduino is connected to PC using Arduino software data are monitored continuously and they are transmitted to RF transmitter.

Using sensors along with multispectral imaging technology detects most of the problems in the agricultural farm. Sensors like the ultrasonic sensor to determine the growth of the crop and also detect the pests intruding the crops. The multispectral camera is a lost effective way to monitor the crop. The accuracy of these technologies is commendable.

Authors have proposed the reliability of smart agriculture. TO improve the performance of a computer reliability of the computer is researched. The reliability of a system is affected when the sensing nodes in the system is increased. To observe the reliability of system we have to consider the no of nodes in the system. If we are using multiple systems the number of nodes in the system varies. The simulation time is kept for desired time, then this desired period is sufficient define a steady state of reliability of the chosen parameters the nodes send data to the server using wireless routines to eliminate connection problem we set the distance small, ideally less than 50 meters.

METHODOLOGIES:

1. IOT devices

IOT devices enable all farms to be connected and share knowledge regarding farming from experienced users. The smart farm, embedded with IOT systems, can support a wide range of devices. Due to the deployment of connected farms, it can be easy to detect disease on crop or virus spread over farm using prediction technique. All sensors and actuators who are monitoring and growing the crops are connected through a gateway. The gateway is intern connected to a server called mobius. It will communicate with expert farming knowledge system and control actuators to make farm suitable to grow crops. Prediction combined with KF: It is used to remove the noise present during communication. For prediction using KF, the nodes form a set of clusters. The cluster head will receive data from different parameters of environment from the leaf node.

Algorithm 1. PKF algorithm of the leaf node

Initialize $\hat{x}_0$, $\hat{P}_0$ and $\tilde{x}_0$
for each z_k **do**
    Calculate $\hat{x}_k$ using (3)–(7)
    $\tilde{x}_k \leftarrow A\tilde{x}_{k-1} + Bu_k$
    $e_k \leftarrow H(\tilde{x}_k - \hat{x}_k)$
    if $e_k > \tau$ **then**
        Send $\hat{x}_k$
        $\tilde{x}_k \leftarrow \hat{x}_k$
    end if
end for

Algorithm 2. PKF algorithm of the cluster head

Initialize $\bar{x}_0$
for each prediction time **do**
    if update $\hat{x}_k$ is available **then**
        $\bar{x}_k \leftarrow \hat{x}_k$
        $\tilde{x}_k \leftarrow \bar{x}_k$
    else
        $\bar{x}_k \leftarrow A\bar{x}_{k-1} + Bu_k$
        $\tilde{x}_k \leftarrow \bar{x}_k$
    end if
    $\bar{z}_k = H\bar{x}_k$
end for

2. Soil Moisture Sensor

This IOT device is used to measure moisture present in the soil. Soil moisture sensor consists of two pads with functionality. When the water level is low in the soil, the analogue voltage will be low and this analogue voltage keeps increasing as the conductivity between the electrodes in the soil changes. This sensor can be used for watering a flower plant or any other plants require automation.

3. Smartphone

Smartphone can be used as a powerful tool in smart farming as they have high versatility, flexibility and adaptability they can be transported easily and they provide high computation power at low cost, therefore these are practical equipments. Many smartphone applications have begun to incorporate Internet of things (IOT) ideals, the data from the sensors can be sent to the farmer in a speedy manner, the application can collect data for the different functions to be performed in the form and analyze the data and the application can provide important suggestions.

4. WSN

WSN is wireless sensor network that analyze the surroundings. WSN senses the changes in pressure, temperature, sound, humidity etc. The nodes present in WSN are used to perform tasks like detection, collection of data and processing of the collected data. It can also be used to connect the nodes to the base section.

CONCLUSION:

An agricultural system with a concept of automated irrigation using soil moisture sensors with the help of WSN can be remotely accessed via a smartphone application. Compared to traditional methods in farming, it is significant to use sensors to monitor the crops. The sensors used in the system can be maintained and is operable for the entire cultivation period by using rechargeable batteries or solar panels. For communication, capabilities such as Bluetooth or an

SMS to URL or to a smartphone is used to remotely monitor the whereabouts of the agricultural farm. The farm from going dry is avoided and the use of man power limited.

REFERENCES:

[1] Joaquín Gutiérrez, Juan Francisco Villa-Medina, Aracely López-Guzmán, and Miguel Ángel Porta Gándara, "Smartphone Irrigation Sensor", Proceedings of IEEE Sensors Journal Sensors 2015, P.3-4

[2] F. Viani, M. Bertolli, M. Salucci, "Low-Cost Wireless Monitoring and Decision Support for Water Saving in Agriculture'', Proceedings of IEEE Sensors Journal, Vol 0, 2017, P.6-9.

[3] Jan Bauer and Nils Aschenbruck," Design and Implementation of an Agricultural Monitoring System for Smart Farming", Proceedings of IEEE IOT Vertical and Tropical Submit on Agriculture, 2018, P.978-982.

[4] Soumil Heble, Ajay Kumar, K.V.V. Durga Prasad, Soumya Samirana, P. Rajalakshmi, U. B. Desai" A Low Power IOT Network for Smart Agriculture", Proceedings of Data Science Based Farming Support System for Sustainable Crop Production Under Climatic Changes, 2016, P.609-613.

[5] Ravi Kishore Kodali, Vishal Jain and Sumit Karagwal," IOT based Smart Farming", Proceedings of IEEE Conference, 2017, P.2-6.

[6] R. Nageswara Rao, B. Sridhar, "IOT Based Smart Crop-Field Monitoring and Automation Irrigation System", Proceedings of the Second International Conference on Inventive Systems and Control, 2018, P.478-483.

[7] Prof. K. A. Patil, Prof. N.R Kale, "A Model for Smart Agriculture Using IOT", Proceedings on Global Trends in Signal Processing and Information Computing and Communication, 2016. P.542545.

[8] Chiyurl Yoon, Miyoung Huh, Shin-Gak Kang, Juyoung Park, Changkyu Lee, "Implement Smart Farm with IOT Technology", Proceedings on International Conference on Advanced Communications Technology, 2018, P.749-752.

[9] S.S. Sarmila, N.B. Harshini, S.R. Ishwarya, C.R. Arati, "Smart Farming: Sensing Technologies", Proceedings on Second International Conference on Computing Methodologies and Communication, 2018, P.149-155.

[10] Gauri Garg, Shilpi Sharma, Tanupriya Choudhury, Praveen Kumar, "Crop Productivity based on IOT", Proceedings on International Conference on Smart Technology for Smart Nation, 2017, P.223-226.

[11] Chayapol Kamyod, "End-to-End Reliability Analysis of an IOT Based Smart Agriculture", Proceedings of Third International Conference on Digital Arts Media and Technology, 2018, P.258-261.