IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, April 2022
Impact Factor: 6.252

Survey Paper on IoT Based Smart Agriculture

Sakshi Kale[1], Mohini Thakare[2], Prof. Mohit K. Popat[3]
U.G. Students, Department of Computer Science and Engineering[1,2]
Assistant Professor, Department of Computer Science and Engineering[3]
Jawaharlal Darda Institute of Engineering and Technology, Yavatmal, Maharashtra, India
sakshikale0910@gmail.com[1], vaishnavithakare0709@gmail.com[2], mohit.popat@jdiet.ac.in[3]

Abstract: *Agriculture is the primary source of livelihood about 58% of India's population. It has always been India's most important economic sector. Issues concerning agriculture have always been an obstruction in the development of the country. The only solution for this problem is upgrading the traditional method of agriculture to smart agriculture. Internet of Things (IoT) technology has brought revolution to many fields. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. In this paper it is proposed to develop a smart agriculture system using technologies such as IOT, Arduino, wireless sensor and Wi-fi module for tracking, monitoring, automating and analysing operations. The aim of this paper is to offer an assistance to farmers in getting Live Data (Temperature, humidity, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. It also include smart irrigation with smart control and intelligent decision making.*

Keywords: Internet-of-Things (IoTs), Sensors, Smart Agriculture, Soil fertility, Irrigation

I. INTRODUCTION

The term Smart Agriculture refers to the usage of technologies like Internet of Things, sensors, location systems, robots and artificial intelligence on your farm. In this paper, it is proposed to develop a smart agriculture system that uses advantages of technologies such as Arduino, IOT and Wireless Sensor Network. The paper aims at making use of evolving technology i.e. IOT and smart agriculture using automation. IoT based SMART FARMING SYSTEM is regarded as IoT gadget focusing on Live Monitoring of Environmental data in terms of Temperature, Moisture and other types depending on the sensors integrated with it. The system provides the concept of "Plug & Sense" in which farmers can directly implement smart farming by as such putting the System on the field and getting Live Data feeds on various devices like Smart Phones, Tablets etc. and the data generated via sensors can be easily shared and viewed by agriculture consultants anywhere remotely via Cloud Computing technology integration. Smart Agriculture System is proposed. In this paper which will use concept of IOT, WSN and cloud computing to help farmer plan an irrigation schedule for his farm through a agriculture profile which can be edited as per his/her requirements. Based on the users input an automated irrigation system is developed to optimize water use for agricultural crops. The system has a distributed wireless network for soil- moisture and temperature sensors placed in the root zone of the plants.[1] The paper is all about automated control features with latest electronic technology using microcontroller which turns the pumping motor ON and OFF on detecting the dampness content of the earth and GSM phone line. It works automatically and hence reduces the man power. Irrigation is the artificial application of water to the land or soil. [2] IoT based SMART FARMING SYSTEM for Live Monitoring of Temperature and Soil Moisture has been proposed using Arduino and Cloud Computing. The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture. The IoT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.[3]

II. LITERATURE REVIEW

There are some related work carried out on IoT based Smart Agriculture as follows:

G. Sushanth , S. Sujatha [1] proposed the making use of evolving technology i.e. IOT and smart agriculture using automation. Monitoring environmental conditions is the major factor to improve yield of the efficient crops. The feature of

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this paper includes development of a system which can monitor temperature, humidity, moisture and even the movement of animals which may destroy the crops in agricultural field through sensors using Arduino board and in case of any discrepancy send a SMS notification.

Adithys Vadapalli, Swapna Fervall & Venkata Rao Dadi [2] proposed the identification of the techniques of smart farming that can give a boost to the deteriorating traditional agricultural sector. Use of smart techniques like Precision farming, efficient water management, Soil moisture and humidity monitoring are sure-shot methods to increase yield per acre of land. Precision Agriculture avoids the improper and excess application of pesticides and fertilizers and enables the farmer to use land according to its quality and nature.

Muhammad Ayaz ,Mohammad Ammad-Uddin ,Zubair Sharif, Ali Mansour, And El-Hadi M.Aggoune [3] The rapid emergence of the Internet-of-Things (IoT) based technologies redesigned almost every industry including ‘‘smart agriculture’’ which moved the industry from statistical to quantitative approaches. Such revolutionary changes are shaking the existing agriculture methods and creating new opportunities along a range of challenges.

Ajit Kumar Singh [4] Proposed an Arduino Based Agricultural System’s design and implementation. This system is able to collect the information about the main environmental parameters. This design improves the real-time performance of the user to the agricultural environment change, and is conducive to the realization of the unattended goal, and promotes the development of the intelligent greenhouse.

Sashant Suhag, Sanskriti jadaun ,Sanskriti jadaun, Nidhi Singh, Prashant Johri and Nidhi Parashar [5] propose a framework for IoT based Soil Nutrition and Plant Disease detection which uses various sensors to collect the plant-related data in form of images at different time intervals using MY THINGS smart sensor and Soil sensors such as proximal soil sensor (PSS) to test the soil fertility which helps to analyze the condition of soil new cultivation, ploughing, water or the land for harvesting. They also proposed the arm to have four degrees of freedom and will be driven by the motors.

III. Analysis of Problem

The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of their land. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when required. Moreover, for the power indication they are glowing a single bulb between any one of phase and neutral, meanwhile when there is any phase deduction occurs in other phases, the farmer cannot know their supply is low. If they Switch ON any of the motor, there will be the sudden defuse in motor circuit. They may have to travel so far for SWITCHING ON/OFF the motor. They may be suffering from hot Sun, rain and night time too. After reaching their farm, they found that there is no power, so they quietly disappointed to it. This is a question that wants to be answered.

In this age of advanced technology, we need a breakthrough where technology is used to help people to do agriculture. By using IoT technology we prevent the waste of time and energy of farmers.

IV. Proposed Work

The development of a smart agriculture system using sensors, microcontroller within an IOT system is presented. The aim of the survey paper is to demonstrate the smart and intelligent capabilities of the microcontroller to allow the decisions to be taken on watering the plants based on the continuous monitoring of the environmental conditions in the field. It also aims at a predefined irrigation schedule as per the farmers convenience, uploaded into the application developed for the same. This is a photovoltaic powered automated irrigation system that consists of a distributed wireless network of soil moisture and temperature sensors deployed in plant root zones. These sensors continuously monitor the parameters and send it to the Arduino board for further processing which acts as an IOT gateway. This gateway has been given the wireless capability by installing a Wi-Fi module which will be updating the data to the cloud. The data being uploaded to the cloud allows the user to continuously view the parameters from the comforts of his/her home or wherever. The system has the capacity to adapt based on the user input which the farmer can input through the smart agriculture application. The farmer can select a profile based on the season and the crop for irrigation and schedule and plan the water resource utilization sensibly. The volumetric water content in the soil is a primary factor which gives a suggestion that the water is required for the crops. In the absence of this system the farmer has to manually inspect these for all the crops by inspecting the soil in the fields which is tedious, time consuming and straining. This can be taken care by the intelligent system which informs

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the user whenever the water content goes below the threshold set by the farmer himself. Intrusion of animals especially cows, monkeys, dogs etc to the fields is a very common issue and one of the factors for disruption or disturbance to the yield. This requires one person to continuously guard the fields at all the times which will not be accurate and the productivity of one person is wasted. This can be overcome by this system which has a motion sensor to detect the presence of any animal in the fields and send notifications to the farmer in their presence. The distance range for which the farmer needs to detect the animals can be allowed to set by the farmer himself in the application in the beginning.

4.1 Hardware Requirement

A. Arduino Uno

The Arduino Uno is a microcontroller card that supports the ATmega328. All sensors are integrated into the Arduino Uno. These sensors provide information about the ambient conditions for the Arduino Uno. Arduino Uno makes the necessary decisions / actions and uses cloud computing to inform farmers about sensor readings and necessary actions. And also send them a message with the help of GSM.

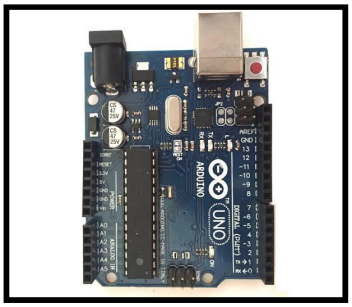

Figure 1: Arduino Uno

B. Soil Moisture Sensor

It detects soil moisture. The sensor has both analog and digital output input and operates according to the principle of open short circuit. The LED output indicates more or less the output in this system. When the ground is dry, the electricity stops flowing and acts as an open circuit. If the ground is wet, the current passes and the circuit is short and the output is zero. Sensor information is indicated by levels. It is corrosion resistant so the sensor has a long time to handle the cost of the farmer at minimal cost.

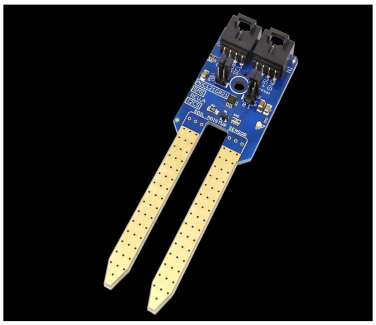

Figure 2: Soil Moisture Sensor

C. Temperature and Humidity Sensor

It is used to measure temperature and humidity. This system displays information about how well it worked. Suppose the threshold is exceeded, the LED starts flashing and the values are immediately displayed on the web page and the farmer can check them.

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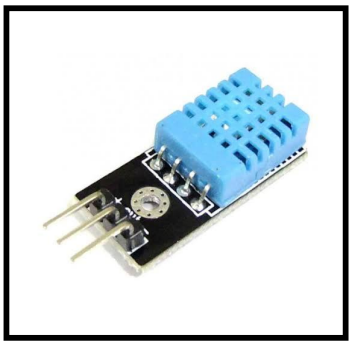

Figure 3: Temperature and Humidity Sensor

D. Acoustic Sensors

These offers various uses in managing the farms, which includes cultivation of soil, weeding and harvesting. Major advantage of using this sensor is its quick response and low cost, mainly while making an allowance for portable equipment. These type of sensors work by measuring the alterations in the noise. These sensors are mainly used for monitoring of pests and its detection, variety of seeds are classified as well by using these sensors.

Figure 4: Acoustic Sensors

E. Optical Sensors

Optical sensors use a phenomena called light reflectance, which measures the organic substances in soil, moisture, minerals, colour and composition, etc. Ability of soil to reflect light depends upon the various parts of the electromagnetic spectrum are tested by these sensors. Variation in the soil density are indicated by the alteration occurred in the reflection of waves.

Figure 5: Optical Sensors

4.2 Irrigation

The current situation of irrigation methods is expected to be changed by adopting the emerging IoT technologies. A significant increase in crop efficiency is expected with the use of IoT based techniques, such as crop water stress index (CWSI)-based irrigation management. For this, attaining crop canopy at different periods and air temperature are needed for the calculation of CWSI. A wireless sensors based monitoring system where all the field sensors are connected to collect the mentioned measurements, further transmit to processing center where corresponding intelligent software applications

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are used to analyze the farm data. Not only this but information from other sources including weather data and satellite imaging is applied to CWSI models for water need assessment, and finally specific irrigation index value is produced for each site. A prominent example is VRI (Variable Rate Irrigation) optimization by Crop Metrics, which works according to topography or soil variability, ultimately improves the water use efficiency.

4.3 Soil Monitoring

The rich diversity and nutrition of the soil fade away due to years of farming. Thus, to conserve fertility, it has become essential to combine agriculture with technology. [9] IoT sensors can be used to overcome this problem. Soil Monitoring with IoT uses technology to empower farmers and producers to maximise yield, reduce disease and optimise resources. [10] Farmers can detect nutritional deficiency and determine if they need to fertilise the soil with additional nutrient content to increase crop fertility. IoT sensors can measure soil temperature, NPK, volumetric water content, photosynthetic radiation, soil water potential and soil oxygen levels. As these sensors can monitor changes in soil nutrients in real-time, they find applicability in farmlands, greenhouses, and soil research, too.[9]

V. CONCLUSION

The IoT based smart agriculture System being proposed via this survey paper will assist farmers in increasing the agriculture yield and take efficient care of food production as the system will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results and it help to farmer for irrigation system. And soil fertility.

REFERENCES

[1]. G. Sushanth and S. Sujatha "IoT based Smart Agriculture Management System" Department of ECE, Christ University, Bangalore, India,2018.

[2]. Adithya Vadapalli,Swapna Peravali & Venkata Rao Dadi "Smart Agriculture System using IoT Technology" PG Scholar, Department of Instrument Technology, Andhra University, Andhra Pradesh, India. Assistant Professor, Department of Instrument Technology, Andhra University, Andhra Pradesh, India. PHD Scholar, Department of Instrument Technology, Andhra University , Andhra Pradesh, India.

[3]. Muhammad Ayaz, Mohammad Ammad-Uddin, Zubair Sharif, Ali Mansour, And El-Hadi M. Aggoune "Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk "Sensor Networks and Cellular Systems Research Center, University of Tabuk, Tabuk 71491, Saudi Arabia CS Department, COMSATS University Islamabad, Sahiwal 57000, Pakistan Lab-STICC, UMR 6285 CNRS, ENSTA Bretagne, 29806 Brest, France.

[4]. Ajit Kumar Singh, Patna Women's College, Bihar, India.

[5]. Sashant Suhag, Sanskriti jadaun, Sanskriti jadaun, Nidhi Singh, Prashant Johri and Nidhi Parashar "IoT based Soil Nutrition and Plant Disease Detection System for Smart Agriculture" Department of computer science and engineering Galgotias University Uttar Pradesh , India-201310. Department of computer science and engineering Meerut Institute of Technology Uttar Pradesh India-250103.

[6]. Yasir Fahim and Tania Sarkar " IoT based SMART FARMING SYSTEM " Central Institute of Technology, July 2019.

[7]. Kanumuri Dinesh Varma "Smart Farming using IoT" IOT with Cyber Security Bournemouth University Bournemouth England.

[8]. Sashant Suhag ,Sanskriti jadaun, Ayush Shukla, Nidhi Singh, Prashant Johri, Nidhi Parashar "IoT based Soil Nutrition and Plant Disease Detection System for Smart Agriculture" Department of computer science and engineering Meerut Institute of Technology Uttar Pradesh India-250103.

[9]. Ashwini Viswanathan "IoT in Agriculture For Healthier, Fertile Soil" https://www.cropin.com/blogs/iot-in-agriculture-for-healthier-fertile-soil?hs_amp=true

[10]. "Soil Monitoring with IoT – Smart Agriculture" https://www.manxtechgroup.com/soil-monitoring-with-iot-smart-agriculture/#:~:text=Soil%20Monitoring%20with%20IoT%20uses,potential%20and%20soil%20oxygen%20levels