IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 7, July 2021

DOI 10.17148/IJARCCE.2021.10722

IoT Based Crop Prediction and Irrigation Control System

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Abstract: The farmers are struggling to obtain higher rate of yield due to lack of poor knowledge about the soil and water nutrients of the crop for the soil. Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Agriculture 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. The aim of this project work is to propose a Novel Smart IoT based Agriculture this assisting farmers in getting Live Data (Temperature, Soil Moisture, humidity and Rain status) for efficient environment monitoring which will enable them to do smart farming and increase their overall yield and quality of products. The Smart Agriculture being proposed via this project is integrated with Adriano Technology, Breadboard mixed with various sensors and live data feed can be obtained online from using android application and by SMS and also by e-mail. The project being proposed is tested on Live Agriculture Fields giving high accuracy over 98% in data feeds.

Keywords: Adriano, soil moisture sensor, PIR sensor, temperature and humidity sensor, Think speak cloud, Submersible pump.

I. INTRODUCTION

India is a country where agriculture is given lot of importance as it is the backbone of the Indian economy. It provides employment opportunity to more than half of the workforce of the country also contributes 16.5% to total gross domestic product(GDP) ,and also. Earlier days there was no Scarcity of food and water as it was used in efficient manner. Agriculture is the unquestionably the largest livelihood provider in India. With rising population, there is a need for increased agricultural production. In order to support greater Production in farms, the requirement of the amount of fresh water used in irrigation also rises. Currently, agriculture accounts 83% of the total water consumption in India. Unplanned use of water inadvertently

Agriculture is considered as the basis of life for us as it is the main source of food and other raw materials. It plays vital role in the growth of country's economy. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming. In India most of the irrigation system are manually operated one's. These outdated techniques are replaced with automated techniques. This project focuses primarily on redusing the wastage of water and minimizing the manual labor on feald for irrigation. As the world is trending into new technologies and implementations it is a necessary goal to trend up in agriculture also. Many researches are done in the field of agriculture. Most projects signify the use of wireless sensor network collect data from different sensors deployed reducing the wastage of water and minimizing the manual labor on field for irrigation.

at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in agriculture to overcome these problems. So, in order to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all factors affecting the productivity in every stage. But complete automation in agriculture is not achieved due to various issues. Though it is implemented in the research level it is not given to the farmers as a product to get benefitted from the resources. Hence this project deals about developing smart agriculture using IoT and given to the farmers.

Internet of Things was introduced in 2009 and it aims in incorporating all gadgets and devices to the web. "The Internet of Thing" is changing every second. IoT enhances our lives in terms of business; medical-health and society by modifying products which are IoT based making our life easier. It is predicted that by 2020, '50 billion devices will be connected to the web and the market will be worth of $14 T'.Internet of thing is an emerging topic of technical, social and

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economical development. Products like consumer items, big machineries, vehicles, mechanical and utility segment, sensors and others are connected to internet availability giving necessary information that guarantee to change the manner in which we work making our life simpler.

There are five hottest topics of computer in this modern world. These are IoT, Big Data, Cloud Computing, Data Mining and Cyber Security. IoT is one from this topic and this is mostly related to device. It is advance automation and analytic system which is based on physical device. IoT system is unique from rest of the system and is more flexible since it enable many automate features and value. These devices mostly use sensors, AI, and other electronic device. It is upcoming topic in computer world and they are not world widely in used. Some are under implementation and some are under observation.

II. LITERATURE SURVEY

The role information and communication technology lays a major role in strengthening the economy o the country through smart farming and sustainable agriculture practices Agriculture started along with the human civilization but it was totally dependent on nature due to increase in the population there is higher demand or the agriculture products also increased. In-order to cope with this demands framers started using fertilizers. Indiscriminate use pesticides and chemicals polluted soil, water and whole ecosystem. Off late our framers from different parts o India are switching over to sustainable agriculture practice in fields by adopting smart framing techniques as part of digital India campaign to promote digital agriculture. Digital agriculture. Is the use o state-o-the-art technology to integrate agriculture methodology with technology. These technologies can provide the agriculturist with tolls and information to make more informed decisions and improve productivity. Different approaches are studied in literature survey and few of the research work in agriculture applications are summarized below.

In [1], authors discuss about the system in which the irrigation process is made automated using temperature, humidity, soil moisture sensors and other communication devices. They have tried to automate the irrigation system thereby reduce the water wastage, save money, power and minimize the human intervention. Whenever there is some variation in temperature and humidity the signal will be given to the microcontroller. The system uses GSM and Android app for communicating the status to the farmer. In [2] authors presented an innovative idea to automatically plant the crops and remotely control the field. The system consists of several sensors and actuators implanted in the agriculture field to manipulate the environmental farm opration. All plantation activities are digitally supervised making farmers job easier interesting by determing harvesting period of crops. In [3], authors developed a system will take care of agricultural field and also perform live video streaming to monitor the field the server. Fields are frequently monitored o determine the soil parameter such as temperature using Iot based on the set prints automatic irrigation will be performed .Data collected from fields are hen processed and necessary decision is passed to the owner through mobile phones. In [4], authors developed which makes use of wireless sensor networks for noting the soil properties and environmental factors continuously. Various sensor nodes are deployed at different locations in the farm. Controlling these parameters are through any remote device or internet services and the operations are performed by interfacing sensors, Wi-Fi, camera with microcontroller. This concept is created as a product and given to the farmer's welfare. In[5], authors proposed the system to optimize the water and fertilizer usage for agriculture crops as solution to the defined problem. The system consists of sensors which are placed at the root of the crop measure real time moisture content, temperature, PIR sensors. All these readings from the sensors are managed using zigBee protocol. An algorithm was developed control irrigation time based on soil parameters. In [6], authors explained that the crop growth is mainly depend the soil parameter such as pH level and moisture content. Hence the author proposed an Io monitoring technique to determine the value of these important soil moisture using various sensor designed for purpose. The proposed model also model also helps in detecting plants disease using Infrared sensor. Thus, the developed application ensures to improve the overall crop productivity. In [7], authors proposed a model for accurately predicting the crop yield and also assist the framer about the usage of required fertilizer. Prediction of yield is an important issue in agriculture, farmers are very much interested in knowing the yield of the crop before they actually start cultivating. The model helps in enhancing the crop yield and framers revenue. Nowadays framers face huge loss in the agriculture field because of changing climate condition of environments. The authors in [8] provides a technology enable solution to this measure problem using machine learning algorithm which predicts crop yield from the available real time historically data of tamilnandu weather condition. The model is developed using random forest, supervised machine learning algorithm to predict future crop yield accurately. In[9], authors proposed the system to optimize the water and fertilizer usage for agriculture crops as solution to the defined problem. The system consists of sensors which are placed at the root of the crop measure real time moisture content, temperature, PIR sensors. All these readings from the sensors are managed using zigBee protocol. An algorithm was developed control irrigation time based on soil parameters. In [10], authors proposed a model for accurately predicting the crop yield and also assist the framer about the usage of required fertilizer. Prediction of yield is an important issue in agriculture, farmers are very much interested in knowing the yield of the crop before they actually start cultivating. The model helps in enhancing the crop yield and framers revenue.

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III. PROPOSED MODEL

To overcome the problems of the existing system and to lower the farming cost a smart framing based android mobile application is proposed to provide several service.The majority of rural people, agricultural activities continue to be one of their main livelihood strategies. Production of food crops is not dependent on any formally acquired knowledge of farming but is solely based on indigenous agricultural knowledge passed from generation to generation through experience and careful observations. Resource-poor farmers, especially in rural areas, follow traditional farming methods to produce their food crops and these are specifically tailored to suit their environments. Household members are the main source of farm labour with men mainly responsible for plugging activities while the bulk of planting, weeding and harvesting activities is the responsibility of women. Crop protection against pests is done through traditional methods where farmers mix some combinations of pest control made from locally available resource in order to minimize losses. However there are no weather monitoring, moisture dampness and water management, they depend on rains and flow of water upstream to downstream and canal watering system. As the agriculture has turned to more labour intensive, and skilled people have migrated to urban community for livelihood and comfort living, left the traditional agriculture farmers much more expensive and risky. We heard yield versus suicidal of farmer. To convert loss making traditional farming into high crop yielding and profit making proposed smart agriculture system is brought out.

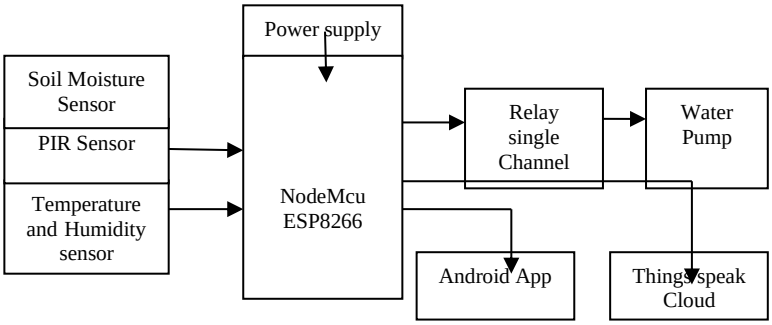

Fig 1.Block Diagram Flow of the processes in proposed model

In the proposed system, Crop monitoring is done where sensors are used to collect information in the agricultural field. The different sensors used are temperature and humidity sensor and soil moisture sensor. The information collected by the sensors is sent to the NodeMCU. The collected information can be displayed in the android application. The information collected by the sensors is updated periodically to the Firebase cloud platform through Wi-Fi. SMS alert will be sent to the farmer when the motion of predators and animals is detected in figure 2.videoacility is provided for framers to learn the working and orating of these farm machineries thus the developed mobile app creates awareness abut usage of various ICT enabled tools and technology for making framers lie better.

IV. EXPERIMENTAL RESULT

The working of the Proposed model experiment setup is done at the farm levels it is implemented with farm model where we have collected some raw soil of different places and placed them in our model and soil moisture sensor is inserted in to the soil and a water tank is fixed at the model and it is inserted with AC Power driven Submersible Motor and then it will be connected to power source of 230 volts via Single Channel relay.

Fig 2. Snapshot of Proposed model (Working Model)

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Above figure shows the complete experimental setup of the circuit where the sensors like soil moisture, dht11,PIR, relay channel and ac motor is connected to the micro controller nodemcu(esp8266) each sensor has their specific tasks and their own threshold values that has been set in the algorithm and program modules as soon the circuit gets power up with power source the modules written for each sensors will get activated and start sensing the values from the sources and then keep sending them to the thingspeak cloud instantly.

4.1 Analysis of Soil Moisture Readings.

The above graph show in fig 3 the variation in soil moisture level time to time above graph is auto plotted in thingspeak server for soil moisture reading we have created field1 as soil moisture reading channel to load soil moisture values and display graph for android user. So that they will understand the change in the output values of soil moisture sensor.

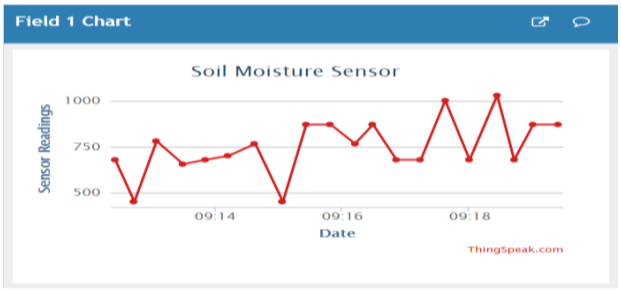

Fig 3. Graph showing soil moisture

4.2 Analysis of PIR Sensor Values

The above graph show in fig 4 auto-generated graph that loads from thingpspeak cloud and then it shows instantly whenever data been upload from PIR sensor it show clearly that 1 being the presence of intruder at certain time and 0 being no intruder present in the farm land.

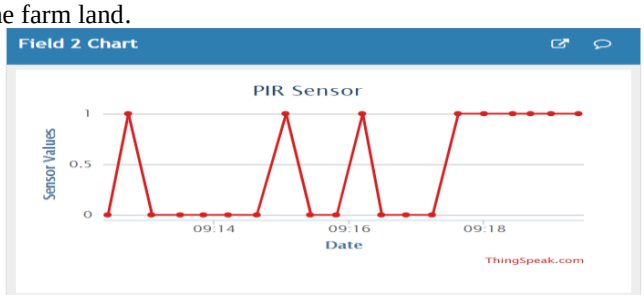

Fig 4. Graph showing PIR Sensor

4.3 Analysis of Temperature and Humidity

The above show in fig 5 the graphical result of both humidity and temperature from DHT11 sensor we have two channels for reading temperature and humidity values. And then both values will be displayed in the graph instantly. Whenever it crosses the saturation point further action will be taken by the micro controller.

Fig 5. Graph of humidity and temperature of soil

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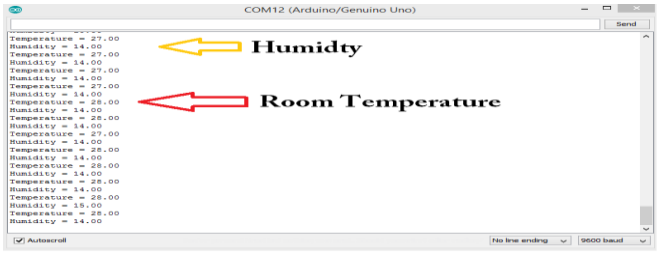

4.4 Framer login and Home page

The above graph show in fig 5 appliction should be installed in the smart phone and framer need to register to the application aftet successful registration the details will be sent to admin for approval. Once the admin approved the framer detals then the can able to login to aplication using username and password .If the username and password are invalied or If the user registration is not apporved then the framer not able to lgin to app

Fig 6.Snapshot of framer login and Home page

4.5 Framers details

Fig 7. Snapshot of framers details

This screen shows the main window of the farmers where the farmer will be having many options like
Load Feed: it loads the sensor value readings from the thingspeak clouds.
1. Graphical Readings: It shows the graph of thingspeak sensor records by forwarding the request from app.
2. Analysis Result: It shows the List of cops that can be cultivated in the land based on sensor readings.
3. Configure Alert Timing: Here user can set alert timing statistics based on minutes that app can send alerts.
4. Send Alert: This will send alert message to the farmer about soil moisture level and data received information's
5. about us: It shows author details of the app.
6. Close: Closes the application from the android main screen.

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4.6 Crop prediction

Crop prediction is done using machine learning algorithm, prediction is based on the past output data o the crops. This figure show in fig 6 the application crop prediction from the application after receiving the sensor values from thingspeak .

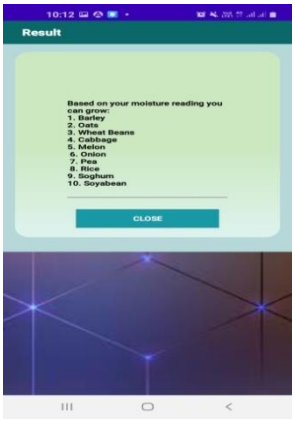

Fig 8. Snapshot of crop prediction

V. CONCLUSION

The smart irrigation system implemented is cost effective for optimizing water resources for agricultural production. The proposed system can be used to switch on/off the water sprinkler depending on the soil moisture level sensor, temperature sensor and by rain sensor also there by making the process simpler to use. Through this project it can be concluded that there can be considerable development in irrigation with those of IOT and automation. Thus this system is a solution to the problems faced in the existing process of irrigation. It also provides awareness and usage of tools and technology. Hence overall android app is used to automate the agricultural process.

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