Smart Agriculture: Detection of Soil Moisture

Ujjwal Tarika, Sameer Ray, Sajid Ali , Amit Kumar Goel

Abstract— **Agriculture plays a major role in the development of the country's economy.The rapid emergence of the iot based technologies redesigned almost every industry including the 'agriculture' or we can say that the 'smart agriculture' .Smart agriculture is an emerging concept,because IOT sensors are capable of providing information about agriculture field an then act upon based on the user input.**

The feature of this paper include development of a system which can monitor temperature ,level of water in the soil and moisture.It also detect if any movement happens in the field which canc destroy the crops in fields through sensors using Arduino UNO board.This paper highlights that what sensor are available for specific agriculture application,like soil prepration,crop status,irrigation,insect and pest detection are listed.technology helping the farmers throughout the crop stages, from sowing of seed to harvesting.Finally based on this throughout review, we identify current and future trends of IoT based on agriculture and highlight potential research challenges.

Index Terms— **IoT, automation, Wi-Fi.**

I. INTRODUCTION

Growth in agriculture sector is necessary for the development of the economy of the country,as the country depends on it . Unfortunately farmers still use the traditional methods of farming which result in low productivity of crops and fruits. But whenever the humans are replaced by the machines the productivity has been improved.Therefore,we need the modern science and technology in the agriculture.

Smart Farming is a farming management concept using a modern technology to increase the quantity and quality of agriculture products.Farmers in the 21 st century have access to GPS,soil monitoring,and Internet of Things technologies.Monitoring environmental factors is not enough and complete solution to improve the yield of the productivity. There are number of factors that affect the productivity of crops which include 1. Attack of pest and insects which can be controlled by the spraying of crop with proper insecticide and pesticides. 2. Attack of wild animals and birds. 3. After harvesting,there is also a problem of storing. So in order to provide the solutions there should be a integrated system which will take care of all factors.

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The paper aims at making the agriculture smart using automation and IoT technologies.The technology which will have main focus will be smart irrigation system with smart control based on real time field data and also the smart warehouse management which includes temperature maintenance,humidity monitoring.These all are the technologies which will be controlled by the Wi-fi or Zigbee Modulus,camera actuators with micro –controller and raspberry pi.

II. LITERATURE REVIEW

This paper describes 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 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. The aim / objective of this paper is to propose a Novel Smart IOT based Agriculture assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to do smart farming and increase their overall yield and quality of products.

Agriculture sector is regarded as the more crucial sector globally for ensuring food security. Talking of India farmers, which are right now in huge trouble and are at disadvantageous position in terms of farm size, technology, trade, government policies, climate conditions etc.

The global population is predicted to touch 9.6 billion by 2050 – this poses a big problem for the agriculture industry. Despite combating challenges like extreme weather conditions, rising climate change, and farming's environmental impact, the demand for more food has to be met. To meet these increasing needs, agriculture has to turn to new technology. New smart farming applications based on IOT technologies will enable the agriculture industry to reduce waste and enhance productivity. It is the application of modern ICT (Information and Communication Technologies) into agriculture. In IOT based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.)

ADVANTAGES OF SMART AGRICULTURE
- It allow farmers to maximize their yield using minimum resources

- Solar powered and mobile operated pumps saves cost of electricity
- It is the cost effective method.
- It delivers high quality crop production

DRAWBACKS OF SMART AGRICULTURE

- Smart agriculture needs the connectivity all the time.if any chance if the connectivity lost the application will not update the data.
- Smart farming require the farmers to learn the use of technology.

EXISTING SYSTEM

- As in the traditional farming.labour are more intensive.risky and resulting to suicidal due low yield or Act of God.
- Small farmers are unaware about the smart farming technology
- Small farmers doesn't have the knowledge of climate change and moisture content in the soil as they only have the practical experiences.

III. ARCHITECTURE OF THE SYSTEM

There are 3 nodes which is present in the system. In the present system, every node is integrated with different sensors and devices which are interconnected to a central server via wireless communication.

The server sends and receives the information from user end from the network connection.

Node 1: Node1 is GPS based mobile robot which can be controlled remotely using computer as well as it can be programmed so as to navigate autonomously within the boundary of field using the co-ordinates given by GPS module.

The Remote controlled robot have various sensors and devices like camera, obstacle sensor, siren, cutter, sprayer and using them it will perform tasks like; Keeping vigilance, Bird and animal scaring, Weeding, and Spraying


Node 1 : Mobile Robot
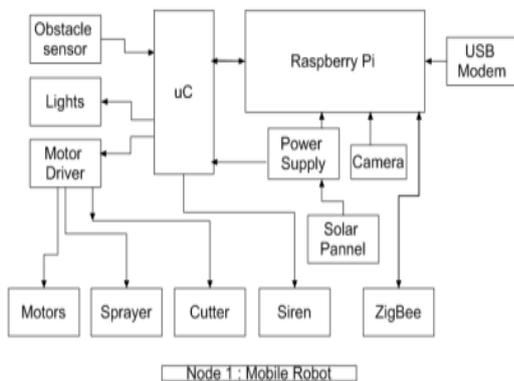
Node 2:

Node2 will be the warehouse. It consists of motion detector, light sensor, humidity sensor, temperature sensor, room heater, cooling fan altogether interfaced with AVR microcontroller. Motion detector will detect the motion in the room when security mode will be ON and on detection of motion, it will send the alert signal to user

via Raspberry pi and thus providing theft detection.

Temperature sensor and Humidity sensor senses the temperature and humidity respectively and if the value crosses the threshold then room heater or cooling fan will be switched ON/OFF automatically providing temperature and humidity maintenance.Node2 will also controls water pump depending upon the soil moisture data sent by node3.

Node 2: Godown/Warehouse
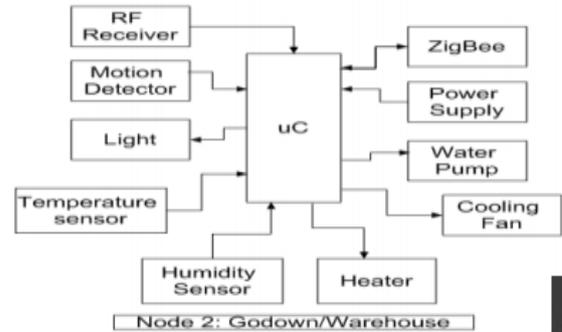
Node 3:

- Node3 is a smart irrigation node with features like ; Smart control of water pump based on real time field data i.e. automatically turning on/off the pump after attaining the required soil moisture level in auto mode, Switching water pump on/off remotely via mobile or computer in manual mode, and continuous monitoring of soil moisture

Node 3 : Wireless Moisture Sensor Node
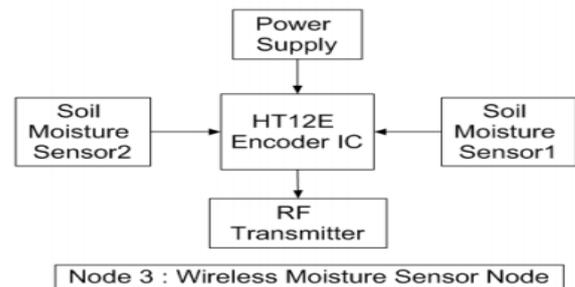
IV. SMART AGRO MOBILE APPLICATION

The farmers are the end users of this application. This application will provide full wireless connectivity to the farmers for their farm. The processed data from the cloud will be accessed by the farmers using this mobile application. The farmers will get a graphical representation of data as well for better understanding of the parameters. With the help of this data analysis the farmers will be aware of the climatic conditions of the farm and accordingly will control the devices such as light and motor pump. Each farmer will have its own account through which he can login using a unique username and password. New users can register using their email ID and create a new account. The farmers will get the direct readings from the sensors for the node they have selected. Based on this they will also get an alert for which device should be switched on or off. The farmers can thus check for the readings and wirelessly control the devices for the field.

The farmers can also be attach with the government to have a direct selling in the food department of government where they will have more profit. Apart from this the application also provides other beneficial services for the farmers as follows:

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V. SOME OTHER FEATURES IN APPLICATION

Weather forecast: The application will provide time to time weather forecast for the farmers including the minimum and maximum temperature for the specified crop, the humidity, wind pressure and chances for rainfall. This will prepare the farmers for the climatic conditions and accordingly the crop parameters will be controlled.

● Agro calendar: It provides the farmer to store the events for the sowing ,spraying pesticides ,harvesting etc.
● Notifications: The farmers will get app notifications for new updates regarding the weather changes. Also, notifications from the agro calendar regarding date of harvest, pesticides and fertilizers will be generated.
● Agro News: This application also provides the news related to the agriculture or the schemes which government will roll out for the farmers

VI. CONCLUSIONS

Through this paper we have made an attempt to lessen the manual work of the farmers and make them a smart farmer. We have implemented a system that will collect data from multiple nodes and using this sensor data the farmers will be able to control the operations on the agricultural field wirelessly and remotely anytime. This system will be a service provided to the farmers for digitalizing agriculture.

The sensors and microcontrollers of all three Nodes are successfully interfaced with raspberry pi and wireless communication is achieved between various Nodes. All observations and experimental tests proves that project is a complete solution to field activities, irrigation problems, and storage problems using remote controlled

robot, smart irrigation system and a smart warehouse management system respectively

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