JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A NEW IoT GATEWAY FOR SMART AGRICULTURE

[1]Dr.K.Venkata Rao, [2]Mr. Raghavendrachar S, [3]Poojashree K, [4]Preethi K, [5]Rekha N.C, [6]Shalini S

[1]Professor, [2]Associate Professor, [3,4,5,6] Undergraduates,
[1]Department of Computer Science and Engineering,
[1]K. S. Institute of Technology, Bangalore, India.

Abstract : *Agriculture is India's backbone, supplying a set of domestic product to maintain food security. Farming plays an essential part in the development of the country because it accounts for significant portion of the Indian economy. The project aim is to convert the traditional agriculture methods to smart agriculture by using modern technology and Internet of things(IoT). The major part in the system is the robotic vehicle, it is a powerful agricultural machine with a large soil-clearing capacity. This multifunctional system provides an advanced way for tilling, farm levelling, seed planting and harvesting with minimum amount of manpower and labour, making it an efficient vehicle and most important thing is scaring of birds and animals that enter into the field. Second, this project includes security features for a warehouse, such as temperature control, warehouse theft detection, and storeroom humidity control, as well as a soil moisture detector. Also, the condition of the form is updated to user in the form of SMS through Wi-Fi module on the environmental state of fields. All of these functions are managed by any internet-connected Android phone.*

IndexTerms -Raspberry pi, Farming, IoT

I. INTRODUCTION

This project includes developing a warehouse management system using various sensors, as well as designing a robot to perform all agriculture-related operations, scare animals that enter the field, provide irrigation by knowing the soil condition, and design a robot to perform all agriculture related operations. It is critical to mark-up our agriculture industry as technology evolves on a daily basis. In the agricultural industry, several studies are conducted. Many proposals call for the creation of a wireless sensor network that may give different atmospheric aspects by watching atmospheric condition. However, simply studying atmospheric aspects will not boost agricultural production, there are a number of additional variables that might lower crop yield. The solution is to apply automation to boost production by lowering labour and improving work speed in the field by employing robots to execute tasks faster and sensors to safely store grown products. This project aims to transform agriculture into smart agriculture via the use of IoT, and it will be distributed to our country's agriculturalist. Uses virtual network connection and cloud data bases to connect them.

New technologies for monitoring, managing, and coordinating the value cycles of crop and life-cattle production are going to change the agricultural business so thanks to IoT applications. In the agricultural industry, technology plays a critical role in lowering personnel and improving crop yield. Some of the activity is aimed at assisting agriculturists in expanding their business by offering them with a technology based framework. The Internet of Things (IoT) connects machines, gadgets, and their human operators through cable LAN, but it is increasingly adopting wireless technologies, such as 4G-LTE, 5G, Bluetooth, and Wi-Fi. Data captured and delivered from IoT clients is forwarded to a data cloud and stored in a database that is accessible to all network members.

II. LITERATURE SURVEY

In this section we will discuss research papers studying smart agriculture system

In the paper [1] written by Shivangi Vashi, Jyotsnamayee Ram, Janit Modi. The Internet of Things (IoT) is a new technology that uses internet connectivity to connect sensors, vehicles, hospitals, companies, and consumers all around the world. IoT architecture aids in the creation of Smart Cities, Smart Homes, Smart Agriculture, and a Smart World. Because the Internet of Things has a huge number of devices, its architecture is complicated. In the Internet of Things, the most critical parameter is security. Using the example of Smart World, this paper provides an overview of IoT architecture.

In the paper [2] written by Stefano Giordano, Ilias Seitanidis, Mike Ojo, Davide Adami. In our daily lives, technology plays a critical role. There is more demand for IoT in many fields. In the agriculture sector, IoT helps in smart farming, precision making

and much more .This study aimed to protect the crop against animals and birds that enter into the field. It is using the repeller system which makes use of PIR sensor to detect motion and it also has weather monitoring system which contains temperature and humidity sensor. When an animal is identified, The PIR sensor turns on the driver that controls ultrasonic generation and networking connectivity. Weather monitoring system helps in the estimation of pest attack.

In the paper [3] written by Chiyurl Yoon, Miyoung Huh, ShinGak Kang, Juyoung Park. Tells about the rise of introduction of the Internet of Things (IoT) and industrialization, information technology (IT) has led to several studies not only in industry but also in agriculture. This work implements wireless communication to communicate between sensor equipped nodes and control devices such as mobile phones. The nodes collect environmental and growth data from the greenhouse and transmit it to the user control device through LPWAN, which allows MQTT communication over IP from the gateway to the server. The user can then go to the next step. All environmental information should be delivered to the user via the control device without any data loss.

In the paper [4] written by Rodrigo Filev Maia, Ibrahim Netto, Anh Lan Ho Tran In this paper, fertility of soil plays a major role in agriculture. Loss of vegetation leads to soil erosion. The soil fertility can be increased by adding fertilizers to the soil. Precision agriculture employs a variety of tools to monitor the health of soil and crops, including satellite and aerial imagery. Drones have recently been used in several studies to manage and monitor soil and crop in agriculture fields. The state of the soil and the environment is monitored and maintained in this article using internet of things (IoT) devices. The monitoring nodes, which are equipped with sensors to monitor both soil and the environment, are placed across the field. Data is sent to the central node via the ZigBee network. The data from all monitoring nodes will be collected by the central node and delivered to the cloud over the internet. The user receives information about the local meteorological conditions over the internet, which helps them make decisions about irrigation and other crop-related tasks. Future uses include using the Internet of Things to detect crop fires and elephants entering sugarcane fields.

In paper [5] written by Mr. V. Gowrishanker and Dr. K. Venkatachalam. This paper describes, that project has developed a robot called Agribot which is used for performing basic agriculture operations like spraying water and pesticide, sowing of seeds, ploughing and so on. Arduino is used to control various operations. L293D driver is for proper movement of wheels. Ploughing, seed sowing is done simultaneously as the robot moves forward. Solenoid valve helps in spraying pesticides periodically. The project helps to perform basic agriculture operations automatically without any manual work in the field.

In paper [6] written by Utsav Dihingia, P. Amar, M. Megha Shyam, Vaibhav Thomas. This paper tells, classifying animals are different in different fields like, Agriculture, highways, railways etc., One cannot monitor the place or field continuously and to classify the animal. An image classifier/identifier will helps in such situations where the process of identifying and classifying the animal is done automatically. The purpose of this project is to build a system that detects animals which enter into form or any household using convolutional neural network (CNN) and raspberry pi. The project is using mobile net and single shot detector as base and detection network. Using application program interface user can identify the name of animal identified. This feature is applicable in the field of farming, household, railways, streets etc.

III. SYSTEM OVERVIEW AND DESIGN

The project is divided into three parts: node1, node2, and node3, as well as an Android phone application to control the system. Each node in this project is connected to a variety of sensors and all this information send to the cloud through IoT and from the cloud we can access the information from the mobile application so that the necessary actions will be taken. The method of operating a system is manual method. The operator of the system will manage these duties conducted by the system with the help of a mobile application in the manual approach, while some employ the automatic technique.

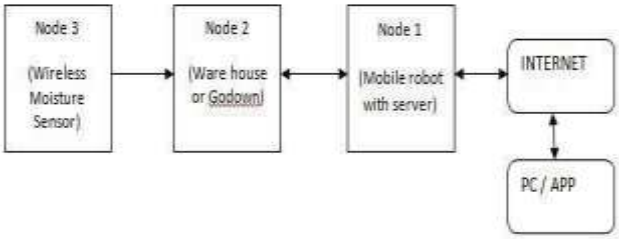

Fig 1. Framework

VI. ARCHITECTURE

Node 1: Node 1 is a smartphone-controlled mobile robot that has been programmed to wander autonomously within the farm's range based on the user's instructions. Animal and bird scaring, ploughing, seed cutting, harvesting, and water spraying are among the duties performed by the application controlled robot, which contains several sensors and appliances, including a pi camera and motors.

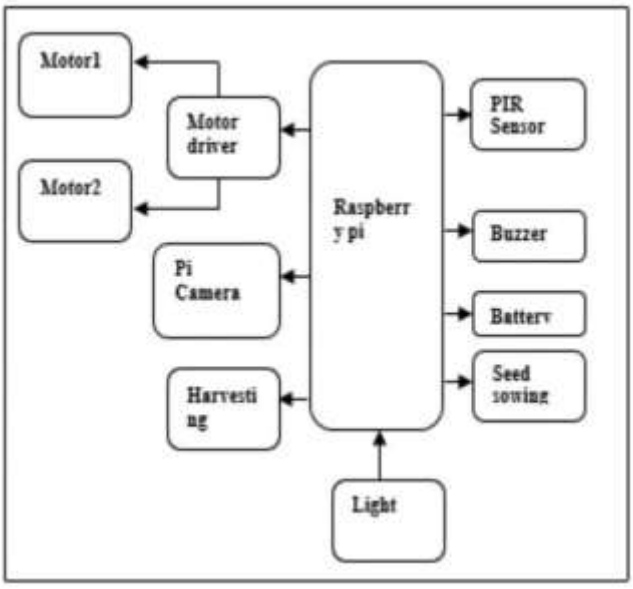

Fig 2.Node 1: Robot

Node 2: Node 2 is a warehouse/gowdon management facilitates the storage of agriculturists collected crops. A temperature sensor, a motion sensor, a water pump, a heater, a fan, and a humidity sensor are all connected to an Arduino microcontroller in Node 2. The motion detector will be placed in the store to detect motion once the safety motion has been enabled. It will send an alert alarm to the user via Raspberry Pi if it detects motion in the room, allowing the user to identify theft and rat detection. Both temperature and humidity sensors work at the same time crosses their path (for example, millets have a maximum temperature of 26-29 degrees and a minimum temperature of 8-10 degrees), the user will be able to turn on and off the heater and cooler using a mobile application.

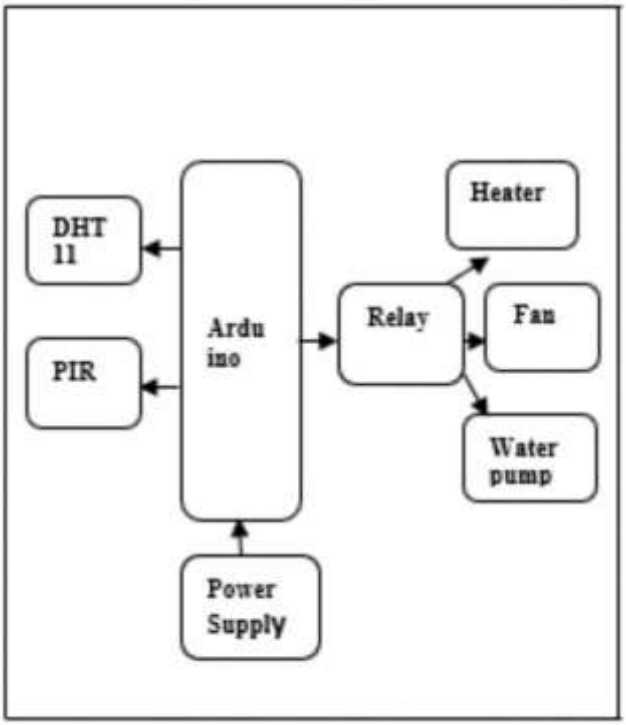

Fig 3.Node 2: Warehouse

Node 3: Node 3 is an irrigation node that includes a soil moisture detector that measures the soil moisture content in the field and turns on the motor if it is dry. The wireless NRF Trans receiver is used to connect all three nodes. All sensor data is hosted in the cloud via IoT and can be accessed using a mobile app.

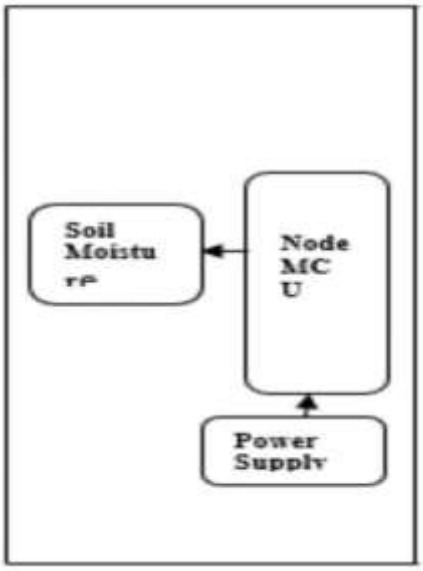

Fig 4.Node 3: Irrigation node

4.1 Equipment's Used

Various types of sensors and microcontrollers are employed in this enterprise to assist in the conversion of agricultural to smart agriculture. The following is a list of sensors and the programme that was used in this venture:-

1. **Raspberry Pi :-** It's a little portable computer that's used for small tasks and networking. The Raspberry Pi is a critical component in the IoT market. It grants access to the wireless network, making it possible to connect to an automated system that manages the device from remote locations. A different version of the Raspberry Pi software is available.

2. **PIR SENSOR:** Function of PIR within 10 metres of the sensor, a PIR sensor detects a human or an animal moving about. The actual detection range is between 5 and 12 metres, thus this figure is an average. PIRs are made up of a pyroelectric sensor that can detect amounts of infrared radiation. For a number of vital tasks or things where knowing when someone has left or entered the area is required. PIR sensors are great because they provide flat control with little effort, have a wide lens range, and are easy to operate.

3. **DHT11 SENSOR:** Temperature corrected over the entire range Measurement of relative humidity and temperature a digital signal that has been calibrated, Long-term stability that is exceptional, Extra components are not permitted**.** Long transmission distance is required, as is low power usage

4. **SOIL MOISTURE SENSOR:** The soil moisture sensor module is used to keep track of soil moisture. After detecting the volumetric content of water inside the soil, it outputs the moisture level. On the module, there are digital and analogue outputs as well as a potentiometer for altering the threshold level. Microcontrollers, as well as ordinary Digital/Analog ICs, are straightforward to use. It's small, cheap, and easy to get to.

5. **PI CAMERA:** It's a custom-designed image sensor add-on board for Raspberry Pi that recognises animals and birds entering the field in this project.

IV. OVERALL SURVEY

This survey aids in the development of a smart agriculture model utilizing robots and various sensors. While not all of the papers cited will be fully implemented, some of the characteristics may be improved. The major goal of this project is to create an integrated automated system that reduces manual field monitoring and provides an advanced approach to seed, plough, water, and cut crops with the least amount of manpower and effort, resulting in an efficient vehicle. To provide a concept for a comprehensive Internet of Things system that spans the full farming value chain and is based on self-contained IoT modules connected by a huge cloud network. The method creates a network of commercial system users, agricultural technology providers, and IT professionals, with the goal of improving agricultural efficiency and sustainability. The suggested system will be able to measure essential agricultural parameters and send the information to the field manager, who will be able to analyse the data and take the required steps to improve his or her field's crop.

VI.CONCLUSION

With the goal of improving agricultural efficiency and sustainability, the method establishes a network of commercial system users, agricultural technology providers, and IT professionals. The proposed system will be able to measure critical

agricultural parameters and send the data to the field manager, who will be able to analyse the data and take the necessary steps to improve the crop in his or her field.

REFERENCES

[1] Shivangi Vashi, Jyotsnamayee Ram, Janit Modi, Saurav Verma and Dr. Chetana Prakash, "Internet of Things (IoT): A vision, architectural elements ,and security issues," 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, 2017, pp. 492496.

[2] Stefano Giordano, Ilias Seitanidis, Mike Ojo, Davide Adami and Fabio Vignoli, "IoT solutions for crop protection against wild animal attacks," 2018 IEEE International Conference on Environmental Engineering.

[3] Chiyurl Yoon, Miyoung Huh, Shin-Gak Kang, Juyoung Park and Changkyu Lee, "Implement smart farm with IoT technology," 2018 20th International Conference on Advanced Communication Technology (ICACT), Chuncheon-siGangwon-do, Korea (South), 2018, pp. 1-2.

[4] Rodrigo Filev Maia, Ibrahim Netto and Anh Lan Ho Tran, "Precision agriculture using remote monitoring systems in Brazil," 2017 IEEE Global Humanitarian Technology Conference (GHTC), San Jose, CA, 2017, pp. 1-6.

[5] Mr. V. Gowrishankar and Dr. K.Venkatachalam,"IoT Based Precision Agriculture using Agribot",2018 GRD Journal for Engineering ISSN:2455-5703

[6] Utsav Dihingia, P. Amar, M. Megha Shyam, Vaibhav Thomas, S. Chidambaram, "Animal Identification Using Deep Learning on Raspberry Pi",2020 International Journal of Research in Engineering, Science and Management(IJRSESM).