An Intelligent Self- Governing Farming System based on Internet Of Things

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Abstract- In this paper, an intelligent self-governing smart farming system based on Internet Of Things (IOT) is proposed for the farmer to analyze and control the farming area optimally. Large areas covered by sensor network, this established the greenhouse with precision environment required for different crops. Greenhouse is the best solution to control and manage the entire problem. This environment builds up by using IOT, so we control the devices or any other environmental needs from anywhere, anytime and simultaneously provide storage and computing resources to implement a web page. The overall system comprises the Humidity sensor, Temperature sensor, Soil moisture sensor, IOT and controlled through a PIC microcontroller, which senses and collects the data about Soil moisture, Humidity, Temperature, and operating the motors based on the response from user.

Index Terms- IOT, Temperature, soil, IR sensor, Arduino.

I. INTRODUCTION

Agriculture is the basic source of livelihood of people in India. In past decade, it is observed that there is not much crop development in agriculture sector. Food prices are continuously increasing because crop rate is declined. It has pushed over 40 million people into poverty since 2017. There are number of factors which are responsible for this, it may be due to water waste, low soil fertility, fertilizer abuse, climate change or diseases, *etc*. It is very essential to make effective intervention in agriculture and the solution is IOT in integration with Wireless sensor networks. It has potential to change the way of development in agriculture and gives great contribution to make it smart agriculture. The internet of things involves a three-tier system. It includes perception layer, network layer and application layer. Perception layer includes sensor motes. Information communication technology (ICT) enabled devices, sensor motes are building blocks of sensor technology. It includes cameras, RFID tags, sensors and sensor network used to recognize objects and collecting real time information.

The network layer is a infrastructure of the IOT to realize universal service. It directs towards the combination of the perception layer and application layer. The application layer is a layer that combines the IOT with the technology of specific industry. The internet of things almost applied in all areas of industry, including smart agriculture, smart parking, smart building environmental monitoring, healthcare transportation and many more. Among them, agriculture is one of the important areas which targets millions of people. Internet of Things (IoT) plays a crucial role in smart agriculture. Smart farming is an emerging concept, because IoT sensors capable of providing information about their agriculture fields. The paper aims making use of evolving technology i.e. IoT and smart agriculture using automation. Monitoring it to the user.

From survey of United Nations – Food and Agriculture Organisations, the world wide food production should be increased by 70% in 2050 for evolving population. Agriculture is the basis for the human species as it is the main source of food and it plays important role in the growth of country's economy. It also gives large ample employment opportunities to the people. The farmers are still using traditional methods for agriculture, which results in low yielding of crops and fruits. So the crop yield can be improved by using automatic machineries. There is need to implement modern science and technology in the agriculture for increasing the yield.

By using IoT, we can expect the increase in production with low cost by monitoring the efficiency of the soil, temperature and humidity monitoring, rain fall monitoring, fertilizers efficiency, monitoring storage capacity of water tanks and also theft detection in agriculture areas. The combination of traditional methods with latest technologies as Internet of Things and Wireless Sensor Networks can lead to agricultural modernization. The Wireless Sensor Network which collects the data from different types of sensors and send it to the main server using wireless protocol. There are many other factors that affect the productivity to great extent. Factors include attack of insects and pests which can be controlled by spraying the proper insecticide and pesticides and also attack of wild animals and birds when the crop grows up. The crop yield is declining because of unpredictable monsoon rainfalls, water scarcity and improper water usage.

II. LITERATURE SURVEY

A literature review is a text written by someone to consider the critical points of current knowledge including substantive findings as well as theoretical and methodological contribution to a particular topic

It proposed work on IoT based smart agriculture. The aim of the paper is making agriculture smart using automation and IoT technologies. Smart GPS based remote controlled robot will perform the operations like weeding, spraying, moisture sensing etc. It includes smart irrigation with smart control and intelligent decision making based on accurate real time field data and smart warehouse management. It monitors temperature maintenance, humidity maintenance and theft detection in the warehouse. All the operations will be controlled by smart device and it will be performed by interfacing sensors, ZigBee modules, camera and actuators with microcontroller and raspberry pi. All the sensors and microcontrollers are successfully interfaced with three Nodes using raspberry pi and wireless communication. This paper gives information about field activities, irrigation problems, and storage problems using remote controlled robot for smart irrigation system and smart warehouse management system respectively [1].

It described to monitor the crop-field using soil moisture sensors, temperature and humidity sensor, light sensor and automated the irrigation system. The data from sensors are sent to web server using wireless transmission and JSON format is used for data encoding to maintain server database. The moisture and temperature of the agriculture field falls below the brink, irrigation system will be automated. The notifications are sent to farmers mobile periodically and farmers can be able to monitor the field conditions from anywhere. The parameters used here are soil moisture sensor, temperature and humidity sensor- DHT11, LDR used as light sensor and web server – NRF24L01 used for transmitter and receiver. This system will be more useful in areas where water is in scarcity and it is 92% more efficient than the conventional approach. Automation of irrigation system data was stored in MySQL database using PHP script. Total average power consumption is 2 Ah per day for a single motor pump and water requirement analysis [2].

This project concentrates security and protection of agricultural products from attacks of rodents or insects in the fields or grain stores. Security systems are used to provide real time notification after sensing theproblem. Sensors and electronic devices are integrated using Python scripts. Algorithm is designed based on collecting information to provide accuracy in notifying user and activation of repeller. Testing is done in an area of 10 sq. m. and the device is placed at the corner. The PIR sensor identifies heat it starts URD sensor and webcam. Based on attempted test cases 84.8% success is achieved. It will be helpful to extend the security system to prevent rodents in grain stores [3].

This paper describes Wireless sensor Networks. The network performs three nodes i.e. acquisition, collection and analysis of data such as temperature and soil moisture. The benefits of irrigation process in agriculture are decreasing water consumption and environmental aspects. Cloud Computing is an attractive solution for high storage and processing capabilities of large amount of data by the Wireless Sensor and Actuator Network. This work aims to agriculture, greenhouses, golf courses and landscapes. Architecture is divided in to three main components: a WSAN component, a cloud platform component and a user application component. It contains three different types of nodes such as sink node, a sensor node and an actuator node. Simple TI is a simple protocol for WSAN implementation in a cluster tree topology. The soil moisture monitors to assess the plants it need water for its proper development and optimization of natural resources [4].

This paper concentrated on crop monitoring. Information of temperature and rainfall is collected as initial spatial data and analyzed to reduce the crop losses and to improve the crop production. They have used optimization method to show progressive refinement for spatial association analysis.The application of data mining with the help of WEKA tool and analysis model using of machine learning algorithms [5].

The proposed development of wsn based monitoring of environment temperature, humidity, CO2 level and sufficient light detection modules. for agriculture using ZigBee protocol and GPS technology. Monitoring for adverse signs and fault detection. Wireless Sensor Network based poly house monitoring system which makes use of environment temperature, humidity, CO2 level and sufficient light detection modules. This poly house control technology provides automatic adjustment of poly house [6].

Smart GPS based remote controlled robot will perform the operations like weeding, spraying, moisture sensing etc. It includes smart irrigation with smart control and intelligent decision making based on accurate real time field data and smart warehouse management. It monitors temperature maintenance, humidity maintenance and theft detection in the warehouse [7].

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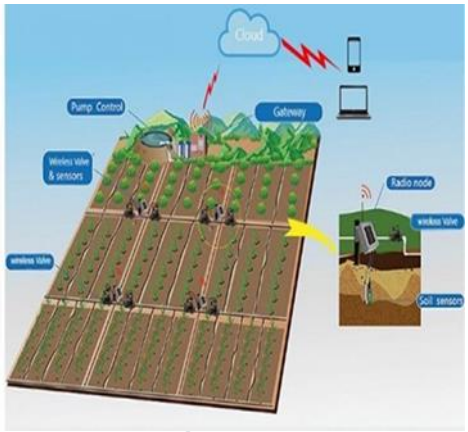

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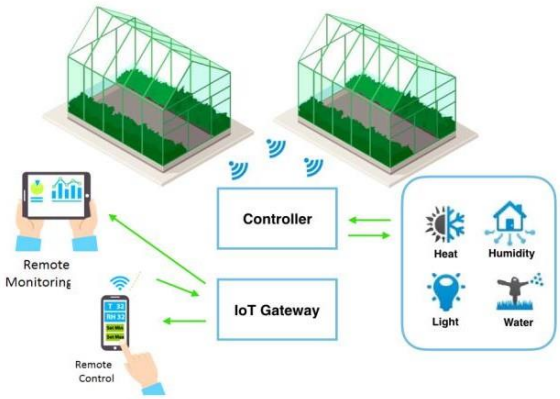
Mohamed Rawidean Mohd Kassim, Ibrahim Mat, Ahmad Nizar Harun "Wireless Sensor Network in Precision Agriculture Application" 978-1-4799-4383- 8/14, this work describes a Precision Agriculture (PA). A WSN is the best way to solve the agricultural problems like farming resources optimization, decision making support, and land monitoring. Using this approach provides real-time information about the lands and crops that will help the farmers to make right decisions. Precision agriculture systems based on the IOT technology explains the hardware architecture, network architecture and software process control of the precision irrigation system.



The software collects data from the sensors in a feedback loop depending on that activates the control devices based on threshold value. Implementation of WSN in PA optimizes the usage of water fertilizer through irrigation and also maximized the yield of the crops [11].

This paper describes greenhouse technology in agriculture represents the design and implementation based on ZigBee technology using CC2530 chip. It is mainly used for environment monitoring system. The wireless sensor and control nodes uses CC2530F256 core for data acquisition, data processing, data transmission and reception. Here computer provides all the real time data for the concerned person using wireless communication like temperature control, fans condition. In this system uses intelligent monitoring and control of green house. It is helpful to farms for scientific and balanced planting crops [12].

Anand Nayyar et al., have proposed a This paper is to propose a Novel Smart IoT based Agriculture Stick 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. The Agriculture stick being proposed via this paper is integrated with Arduino Technology, Breadboard mixed with various sensors and live data feed can be obtained online from Thingsspeak.com. The product being proposed is tested on Live Agriculture Fields giving high accuracy over 98% in data feeds [13].

Raheela Shahzadi et al., have proposed a These expert systems rely on the stored knowledge base. We propose an expert system based on the Internet of Things (IoT) that will use the input data collected in real time. It will help to take proactive and preventive actions to minimize the losses due to diseases and insects/pests. we have presented an ES for Cotton crop based on the concept of IoT. We tried to develop and initial frame for IoT-based agriculture. We developed an IoT-based ES. Its based ES consists of three modules; the first part consists of the deployment of WSN in the cotton fields. WSN has used for the monitoring of the cotton crop condition. The Wasp mote agriculture sensor board has used for the monitoring of the cotton crop condition. It consists of temperature sensors, humidity sensors, leaf wetness sensors and soil sensors.

In the concept of the IoT, the server should send the commands to the actuators of the fields, so the actuators of fields can take appropriate decisions. The sever should be intelligent enough to take decisions appropriately. For this purpose, we deploy an ES so that it can make decisions automatically. In Table 5 describes that different ES developed during a different era, but in this paper, we combine the IoT and ES. The sensors send the data to the server on the server side; we deployed the ES, which process and analyzes the sensor data. The data is fed to the ES that analyses it using the knowledge base and produces findings and recommendations. The ES consists of user interface, knowledge base and inference engine. On the server side, we deploy the concept of smart irrigation. Sensors monitor the soil moisture, leaf wetness, temperature, and humidity level in the environment and send the recommendation to the farmer about the irrigation in the cotton crop.

In this paper, we ES for identification of different weeds, pests and different insects which attack on the cotton crop. These findings are sent to the farmer's mobile phone for taking necessary actions in the field. We proposed an initial framework for the working of Smart Agriculture (SA).Before developing the concept of SA we conduct the survey and ask form user either the proposed system will be accepted by users or not. In this survey, we also ask from farmers and experts the flaws of the current system and whether they are satisfied the working of current agriculture or not. After that proposed system was evaluated by 100 different users like farmers and experts of Agri domain and 65 percent of respondents are satisfied with the working of SA and they are willing to accept the concept of SA. As we know farmers are illiterate in Pakistan so that we get 65 percent results. By deploying the IoT-based ES the productivity rate of the cash crops can be increased and problem of farmers also be reduced The proposed system was evaluated by 100 experts from the field and was found helpful for the farmers [14].

Ahsan Morshed et al., have proposed a In this paper, we present the design of Smart FarmNet, an IoT-based platform that can automate the collection of environmental, soil, fertilisation, and irrigation data; automatically correlate such data and filter-out invalid data from the perspective of assessing crop performance; and compute crop forecasts and personalised crop recommendations for any particular farm. Smart FarmNet can integrate virtually any IoT device, including commercially available sensors, cameras, weather stations, etc., and store their data in the cloud for performance analysis and recommendations [15].

III. EXISTING SYSTEM

The feature of the paper includes monitoring temperature and humidity in agricultural field through sensors using CC3200 single chip. Camera is interfaced with CC3200 to capture images and send that pictures through MMS to farmers mobile using Wi-Fi.

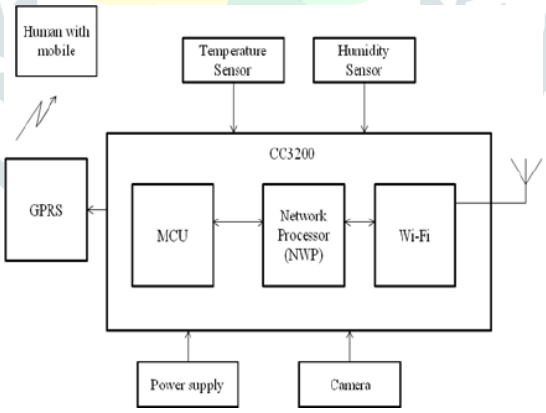
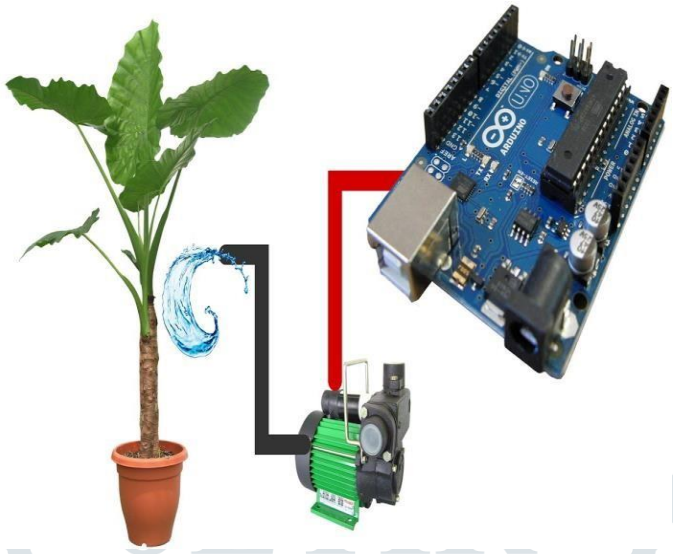


Fig2.1(a): Block diagram of existing system

CC3200 is the main block of this proposed system consists of microcontroller, network processor and Wi-Fi unit on same die. It is portable, low power for battery-operated, secure and fast connection. Environmental conditions variations will affect the overall yield of the crop. Plants require proper very specific conditions for optimal growth and health. Monitoring the condition of crop field is very much necessary so sensors are used. Temperature infrared thermopile sensor- TMP007 is used, it has built in digital control and math engine. It senses the temperature values in real time and humidity sensor- HDC1010 track the relative moisture of air within the farming field. Camera is interfaced with CC3200 camera booster pack via PCB using MT9D111 camera sensor. This is used to capture current images of the particular field those images are sent to the farmer through GPRS.

IV. PROPOSED SYSTEM

In this paper, agriculture monitoring using IOT proposed. One involves the information about temperature, soil moisture, in the farm field to the farmers through IOT. Another category involves automated and IOT based water management system which informs the farmers about water flow over the farm field based on required quantity after sensing the moisture content in the soil. It consists of relay and motor to switch on and off of water supply motor based automatically and based on their requirements automated by farmers via IOT.



V. CONCLUSION

The paper proposes a wise agricultural model in integration with ICT. ICT have always mattered in Agriculture domain. Village farmers may have planted the "same" crop for centuries, but over period, weather patterns and soil conditions and epidemics of pests and diseases changed. By using the proposed approach, received updated information allows the farmers to cope with and even benefit from these changes. It is really challenging task that needs to provide such knowledge because of highly localized nature of agriculture information specifically distinct conditions. The complete real-time and historical environment information is expected to help to achieve efficient management and utilization of resources

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