International Journal of Latest Trends in Engineering and Technology
Vol.(11)Issue(2), pp.019-022
DOI: http://dx.doi.org/10.21172/1.112.04
e-ISSN:2278-621X

IOT BASED AGRICULTURE

Ms. Shraddha AshokKumar Maurya[1]

Abstract- IoT have been put into practice widely. Agriculture is vital part of economy. Typical farming decisions are based on best practices, optimized only through the trial and error of previous generations, and they typically haven't been adjusted for in real time. Thus the idea of embedding crop growth models (CGMs) into the IOT application system would make the agriculture system more intelligent and adaptive. We can gather real-time data based on conditions that exist, using wireless technology such as sensors, so that farmers can take actions quickly. They can make well founded decisions for their crops based on weather conditions, moisture and humidity, chemical compositions of the soil. Each species of diseases and pests is considered to be harmful to plants and has a great adverse effect on agriculture. In addition to decreasing crop productivity and quality, pesticides or fungicides which cause environmental pollution are needed to kill diseases and pests. Hence, the use of IoT system to reduce the frequent uses of insecticides and fungicides and to predict when the pests appear in order to lower the appearance of pests. In other words, we propose a system that provides disease and pest prediction information so that farmers can quickly control them.
Keywords – IoT, Smart Agriculture, Sensors

1. INTRODUCTION

For a long period, agriculture has been the main source of production of essential food crops. Today, processing, marketing, and distribution of crops, etc. are all acknowledged as part of agriculture. Agriculture has also proven to be the main source of national income for most developing countries. There are many employment opportunities in agricultural sector such as construction of irrigation schemes, drainage system as well as other such activities. Also agriculture employs many people of the country and contributes to the economic development of the country. As a result, the national income level as well as people's standard of living is improved. IoT is following no physical or invisible boundaries and expanding its roots in all directions. And now IoT has spread its roots in the agricultural sector too, leading to the Internet of Things based agriculture. The crop water management plays an important role in drought areas, which helps managing limited water supply and hence results in preserving water resources effectively. IoT can provide an effective communication medium to farmer of real time data related to dynamic agricultural processes. Farmers with such real-time information available to them can plan their future activities more efficiently to prevent any harm. This paper hence aims on notifying the farmers with the on field real data more precisely and in short span with the possible solutions too, so that the preventive actions would be taken by farmers easily.

2. LITERATURE REVIEW

One of the most often used ways of verifying the agricultural parameters is the manual method of checking done by the farmers themselves. A solution developed with android application which determines the temperature, humidity, moisture, and animal detection is developed using the hardware with the components Microcontroller, buzzer, relay, ADC convertor, GSM module and various sensors all interfaced onto a single board [1]. A solution to on field activities, irrigation problem and warehouse storage problems is provided through a remote controlled robot with three nodes made with various sensors, microcontrollers and interfaced with Raspberry pi and Wireless Sensor Network (WSN) [2]. A system with user validation and then initialization provides complete information regarding temperature, soil moisture, water level, rain detection read by sensors on field through base station, central server system and data analysis [3].The scenario of droughts, decreasing ground water level, unpredictable rain conditions give an alert for urgent need of proper water utilization. To cope up with this situation monitoring of on field activities with use of temperature and moisture sensors is implemented in [4]. After the research in the agricultural field, researchers found that the yield of agriculture is decreasing day by day. However, use of technology in the field of agriculture plays important role in increasing the production as well as in reducing the extra man power efforts. Some of the research attempts are done for betterment of farmers which provides the systems that use technologies helpful for increasing the agricultural yield. A remote sensing and control irrigation system using distributed wireless sensor network which aims for a variable rate irrigation, real time in sensing on field, and to maximize the productivity with minimal use of water was developed by Y. Kim. The system delineates details about the design and implementation of variable rate irrigation and wireless sensor network and on field sensing in real time and controlling the design and implementation by using appropriate software. The whole system was developed using five in field sensor stations which collects the data and send it to the base station using global positioning system (GPS) where necessary action was

[1] Department of Information Technology, KIT's College of Engineering, Kolhapur, Maharashtra, India

taken for controlling irrigation according to the database available with the system. The system provides a promising low cost wireless solution as well as remote controlling for precision irrigation [5]. The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates [6]. In this paper image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. The variations are seen in color, texture and morphology [7]. It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural crops. In addition, a gateway unit handles sensor information [8]. It aims to develop devices to manage, display and alert the users using a wireless sensor network system [9]. Researchers have developed different models in agricultural sector with multiple technologies as mentioned above [10]. The system was developed using microcontroller, Universal Asynchronous Receiver Transmitter (UART) interface and sensors while the transmission was done by hourly sampling and buffering the data transmit it and then checking the status messages. The drawbacks of the system were its cost and deployment of sensor under the soil which causes attenuation of radio frequency (RF) signals [11].

3. METHODOLOGY

The paper consists of two parts: the hardware setup and the android application.

3.1 Hardware used –

Humidity Sensors: A humidity sensor senses, measures and reports the relative humidity in the air.

Moisture Sensors: Soil moisture sensors measure the volumetric water content in soil. This is essential in agriculture for proper irrigation.

Temperature Sensors: Plants require proper environmental conditions for proper growth and good health. If the mixture of the atmospheric temperature, humidity and light are incorrect or imbalanced then the crop yield can be affected to a great extent. Temperature sensors can help to avoid such unwanted conditions and hence maintain the environmental balance for the proper growth of plants.

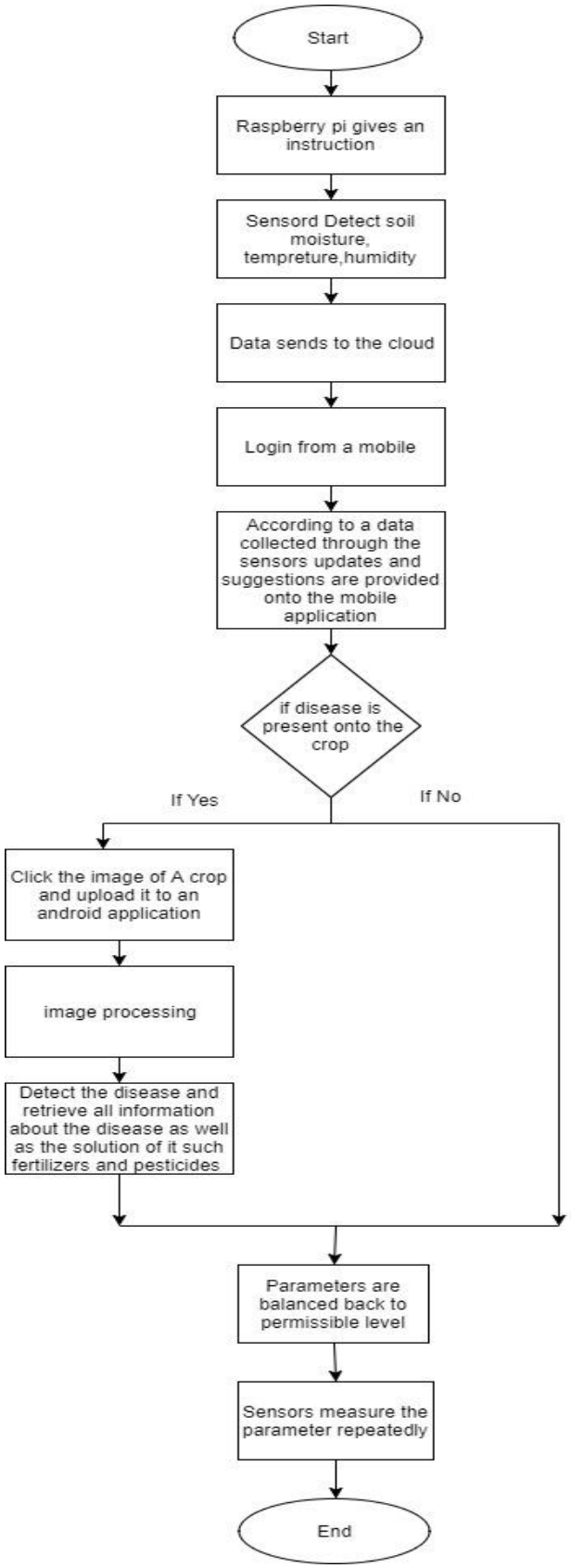
Wireless EC Sensor: This device measures the salinity and nutrients in the soil. This data is crucial to decide the composition and the times of fertilizer treatments required for the plant growth.

Wireless pH Sensor: The pH value determines the acid content in the soil, which varies according to the availability of nutrients in the water and soil. The value affects both, the soil fertility and the ability of plants to absorb nutrients from the soil and water.

Wireless diametric growth sensor: This device detects the growth variations of the stem, the branches and the fruit of the plant in millimeter. It helps to check the plant health in real time, especially in cases of water stress.

Wireless sensor Tensiometer: It detects the force used by the roots to absorb the water. It is a useful tool for irrigation interventions.

Raspberry Pi: The Raspberry Pi is small pocket size computer used to do small computing and networking operations. It is the main element in the field of internet of things. It provides access to the internet and hence the connection of automation system with remote location controlling device becomes possible. Raspberry Pi is available in various versions. Here, model Pi 2 model B is used and it has quad-core ARM Cortex-A53 CPU of 900 MHz, and RAM of 1GB. it also has: 40 GPIO pins, Full HDMI port, 4 USB ports, Ethernet port, 3.5mm audio jack, video Camera interface (CSI), the Display interface (DSI), and Micro SD card slot.



3.2 Flow of the system

On the basis of such considerations, the algorithm uses a different color image multiplied by the weighting coefficients of different ways to solve the visual distortion, and by embedding the watermark, wavelet coefficients of many ways, enhance the robustness of the watermark.

3.3 Android Application–

The data collected from sensors will be stored on cloud. This data will be retrieved by the application from cloud and hence the suggestions and updates will be provided to the farmer on his mobile android application once the farmer logs into the system with proper validation. Also if the crop is infected with any kind of disease, the farmer can get the solution for disease through app. The farmer will select the disease detection option and the camera will be on, the farmer can click the image of infected crop and select the upload option. Further the app will provide the solution to the disease by referring to the database for disease and its solution which will be stored on cloud. The image will be scanned by image processing technique and hence identification of the disease.

Flow of system: (Fig.1) All sensors are connected to a Raspberry pi interface and the sensors communicate using the wireless sensor network. Sensors collect the data on field and sends to the microcontroller. The data collected is sent to cloud and stored onto the cloud using wireless communication and internet. On valid login into the android application the data is retrieved from the cloud and displayed to the user. According the data collected through the sensors, updates and suggestions are provided onto the mobile application to the user. If a crop is infected with any kind of disease the user clicks the image of the infected crop and submits to the application. Then using the image processing technique the disease is identified and solution will be provided to the user which will be retrieved from the cloud. Then the user can perform required actions and hence balance the parameters back to the permissible level. The sensors on field measure the parameters repeatedly and provide the updates to the user.

4. RESULT AND DISCUSSION

All the components on board are interfaced with the microcontroller and the communication between components is gained through the wireless sensor network. The data from sensors which is stored on cloud is retrieved with the help of android application and hence a complete solution is provided to the farmer with a user friendly interface. Also identification of disease and performing instant action on disease is possible due to the image processing technique used.

5. FUTURE SCOPE

The main problem faced by farmers is that of the market availability. As the farmers are not aware of the markets available to them, they sell of the agriculture products to some third person and hence face loss in their income. To avoid this problem a solution can be provided within the proposed system. A module can be added into this application which would provide the information of available nearby markets to the farmer. Hence the farmers will be able to directly sell their products into the market without involvement of any third party and hence will also gain the appropriate profit.

6. CONCLUSION

The system includes both the hardware and software interfaces and provides an easily accessible and user friendly mobile android application. The application provides suggestions, updates and notifications to almost all the problems faced by the farmers. Hence the farmer can perform instant actions to any problem.

7. REFERENCES

[1] Dr. N. Suma, Sandra Rhea Samson, S. Saranya, G. Shanmugapriya, R. Subhashri, “IoT Based Smart Agriculture Monitoring System”, International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 5, Issue 2, Feb 2017.

[2] Nikesh Gondchawar, Prof. Dr. R.S.Kawitkar, “Smart Agriculture using IoT and WSN Based Modern Technologies”, International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 6, June 2016.

[3] Ojas Savle, Anup Manaagave, Deepika Ambekar, Sushmita Sathe, “Internet of Things in Precision Agriculture using Wireless Sensor Networks”, International Journal of Advanced Engineering & Innovative Technology, Vol. 2, Issue 3, Dec 2015.

[4] S.R.Nandurkar, V.R. Thool, R.C. Thool, “Design And Development Of Precision Agriculture System Using Wireless Sensor Network”, IEEE International Conference on Automation control, Energy and Systems (ACES), 2014.

[5] Y. Kim, R. Evans and W. Iversen, “Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network”, IEEE Transactions on Instrumentation and Measurement, 1379–1387, 2008.

[6] M.K.Gayatri, J.Jayasakthi, Dr.G.S.Anandhamala, “Providing Smart Agriculture Solutions to Farmers for Better Yielding Using IoT”, IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015).

[7] Monika Jhuria, Ashwani Kumar, Rushikesh Borse, “Image Processing for Smart Farming: Detection of Disease and Fruit Grading”, IEEE Second International Conference on Image Information Processing (ICIIP), 2013.

[8] Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel Porta-Gándara, “Automated Irrigation System Using a Wireless Sensor Network and GPRS Module”, IEEE Transactions on Instrumentation and Measurements, 0018-9456,2013.

[9] K.Lakshmisudha, Swathi Hegde, Neha Kale, Shruti Iyer, “ Smart Precision Based Agriculture Using Sensors”, International Journal of Computer Applications (0975-8887), Volume 146-No.11, July 2011.

[10] Yunseop(James) Kim,Robert G. Evans and William M. Iversen,"Remote Sensing and Control of an Irrigation System using a Distributed Wireless Sensor Network",IEEE Transaction on instrumrntation and measurement, Vol.57,No.7 JULY 2008.

[11] Hayes, J.; Crowley, K.; Diamond, D. Simultaneous web-based real-time temperature monitoring using multiple wireless sensor networks. IEEE, 30-November 3, 2005, p4.