

Automation and Crop Monitoring in Agriculture Using IoT

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Abstract- Farming is an intricate process, one in which every segment impacts the development of crop production. On every passing day population is increasing and lands are decreasing due to too much civilization and infrastructure development, to feed increasing population agriculture industry need to revolutionize. So IoT has a great potential to improve crop production. In Agriculture industry weather change, diseases, insects damages of crops are majorly analyze by different methods but some of them are unable to proceed properly with precision. To improve the analysis of all, this paper shades the light on IoT based monitoring system to analysis all the demanding issues. In India farmers still follows the traditional farming techniques that lead to poor income from agriculture industry. In this paper we are proposing precise decision support system using IoT for the proper and sustainable development of crops.

Keywords- IoT, Raspberry Pi, Pi Camera and Cloud Computing.

I. INTRODUCTION

Some neoteric technologies such as artificial intelligence, sensor technology such as environmental sensor, cloud computing and big data etc. are used in various fields. Use of all these in the field of agriculture is like an emerging one to improve the sector.

IOT is the method which used to connect the different ideas, thoughts regarding various field to make them interlinked to get right information to right stack holder at right time. It is used to provide the simple and convenient network for all. It can used monitoring and tracking of different domain such as healthy environmental, utility, etc. It is also helpful to make automation to improve the quality and working of field.

[1] Convergence of Internet-of-Things and Artificial Intelligence are used in last few years and these technologies exist in many applications that being developed in various domains. Sensors network with ability of decisions are a modern agricultural technology, developed to help farmers obtain faster and better results with precision, assisting in the determination of various soil characteristics. They can be used

to measure in real-time thus controlling the variable rate application. Sensor technology has also been advanced and many types of sensors like humidity and temperature sensors, soil moisturizer sensor, analog nitrate sensor, analog potassium sensor, analog pH sensor, Environmental sensor are developed and used in applications as per the need. Cloud-Computing and Big data are well used technologies and its applications based on those technologies are exists in almost every field. Uses of these matured technologies with IoT in the field of agriculture domain are also introduced and are used for improvement in this domain. [1]

II. SIGNIFICANCE OF IOT IN AGRICULTURE DOMAIN

The Internet of Things (IoT) has the great caliber to change the agriculture domain. World population is increasing but farming lands are decreasing to feed such a big population, the agriculture industry needs to revolutionize its traditional techniques using IoT..

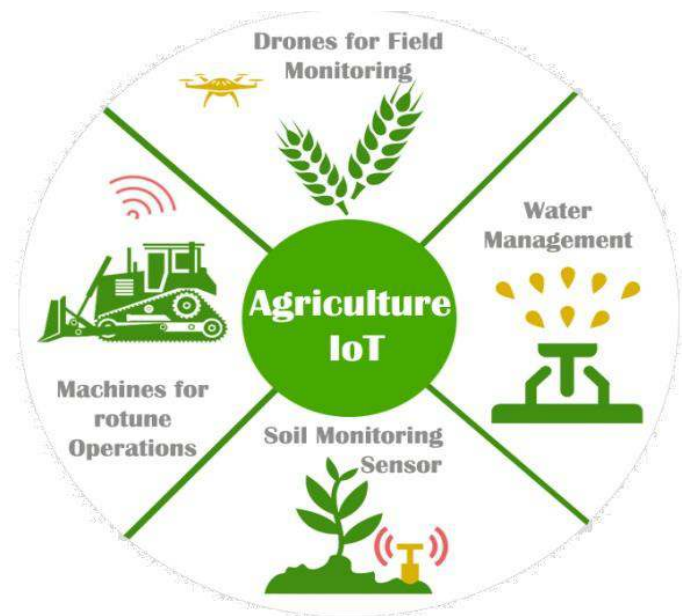


Figure. 1 IoT in agriculture

IoT technologies in farming industry would be stepping stone towards agriculture production enhancement. So IoT will help to take precise decision in cultivation, harvesting, mowing and watering to plants through different sensors.

Agriculture sector is the most important factor in Indian economy. 14.7% of India's growth depends on agricultural sector. Farmers of India have lack of knowledge. A major part of farming and agricultural activity is based on prediction. This prediction sometimes fails. It results into loss of farmers. Due to this, some farmers may commit suicide. Climatic change is the most important barrier that comes in traditional farming. There are many effects of climatic change such as heavy rainfall, most intense storm and heat waves, less rainfall. Climatic change also affect changes in life cycle of plants. IoT can minimize these barrier and increase productivity. As population is increasing day by day, farmers and agriculture companies are moving toward IoT for analytics and greater production capabilities. A forecast by UN Food and Agriculture Organization (FAO) denotes that food consumption will increase by 70% from 2050 as compare to 2006. This will lead to increase in food production. IoT could play important role in fulfilling these needs. It can do so by using proper amount of fertilizers and pesticides, predicting diseases, scanning storage capacities like water tanks and making sure that crops are fed and watered well.

Farmers depend on rains and bore wells for irrigation of their land. Recently they have been using irrigation technique through manual control in which they irrigate their lands at regular interval by turning water pump on/off when required. In this situation IoT is needed to reduce human intervention, time and cost.

III. ROLE OF IOT

A fully automated farm can increase the production of a crop than present traditional technique without interaction of a farmer in zero loss business. With the help of various types of sensors and devices like soil sensor to find quality of soil, soil moisturizer sensor for automated watering systems to plants, temperature and humidity sensor for supportive decision making, camera for image processing, motion detector sensor to find protect crops from animals, relay based sprinkler etc. By applying IoT use of a non-conventional energy source like solar panel can be implemented effectively.

By image processing of crop leaf or crop disease can be easily detected and precise diagnosis is also possible. Alarm system can be use so that animals cannot be disturb the productivity of the plant. Due to IOT artificial intelligence can decide how much amount of water supply is needed for

agriculture. Shortage or excess of water damages the crops. By using IOT we can analyze water requirements.

Weather forecasting with accuracy can be done. It lead to high productivity. It is possible to decide how much amount of fertilizer and pesticides are required. By using IOT we can maintain record of pH levels, temperature and soil moister. With the use of this record farmer can make decisions about agriculture.

IV. PROPOSED ARCHITECTURE

The sensor input module is the heart of this architecture, as it does half of the work of module. sensor input module is responsible for communications between sensor and internet as well as communication with the mobile app. sensor input module consist of three main entities those are Communication internet, mobile app, cloud computing.

Sensor Kit module is portable IoT device with soil and environment sensors. Mobile App module provides interface to the users. Agro Cloud Module consists of storage, Big-Data mining, analysis and knowledge building engine and application module to communicate with the users.

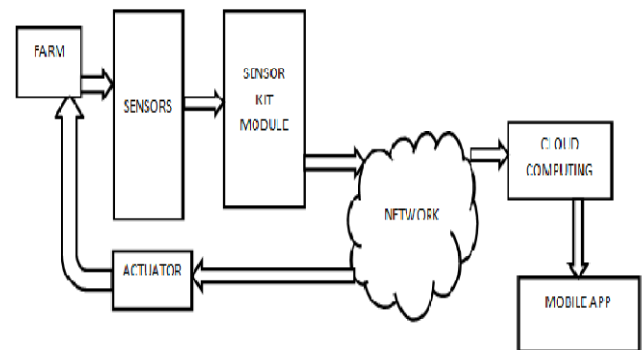


FIGURE. 2 MULTIDIMENSIONAL MODULE FOR SMART IOT

4.1. Relevant Work:

4.1.1 Cloud Computing:

All the user of agricultural sector need to be registered ToAgroCloud through mobile app. AgroCloud storage consisting of Big-Data storage will store all the details of farmer, agro marketing detail, and service provider . Cloud computing provides sharing of resources with cheap cost. Cloud computing service provide offers services like infrastructure as a services (IaaS), Platform as a services (PaaS) , like and software as service (SaaS) with cheap cost. Cloud computing has been used for storage of agriculture data [4,5]. It has been use in agriculture sector along with IoT. [2, 3]

4.1.2 Mobile app:

Mobile app application need to be installed on end user mobile phone. Mobile apps contributing and playing vital role in development of farming based applications in IoT. Mobile apps made possible to use power IoT everywhere, anytime and at any place, with internet IoT is buttons away. The fact is getting established slowly but steadily that mobile apps are leveraging the IoT.

4.1.3 Actuator:

It perform important role in a multidimensional smart IOT agricultural. An actuator is switch or mechanism or device which converts energy into motion. In this paper we are using actuator to turning up motor, sprinkler

4.2. Sensor Kit Module

This module is an important part of this agricultural and is responsible for soil sampling for period interval to get soil property values.

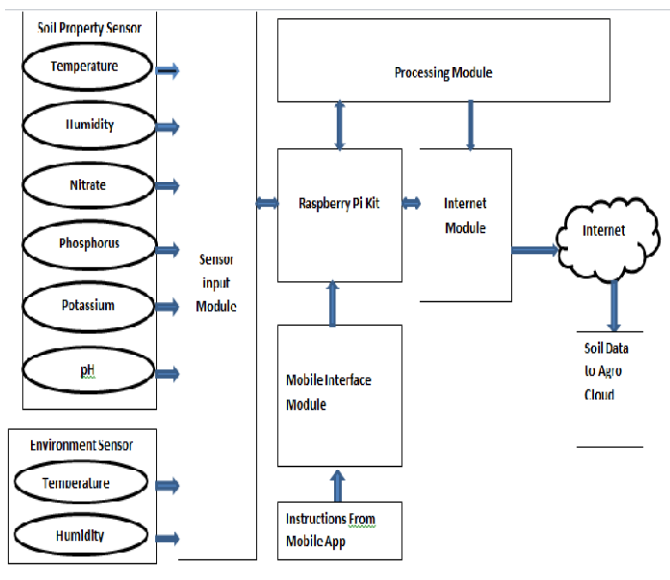


Figure 3: Sensor Kit Module

Figure 2 show the sensor kit module. Sensor kit is cost effective and portable kit in which we have considered the used of raspberry-pi kit which is IOT enabled device with memory and processing capability. The major compound of this kit is like temperature sensor, humidity sensor, nitrate sensor, potassium sensor, pH sensor and environment sensor.

V. OBJECTIVE

The main purpose of this system is to increase the production of crop using automation. Increase the production of a crop with minimum interaction of a human being using IoT technology, in IoT uses of different types of sensors such as humidity sensor, temperature sensor, rain sensor using this

sensor collect the data that shoes the exact condition of a plant and atmosphere and all the information is send to the farmer using cloud computing. This system introduce the smart solution for agriculture and efficiently solve the problem related to the farm.

VI. CONCLUSION

Farming is a complex task and it need to revolutionize and sensor networks IoT help us to achieve this by enabling interact with the real world objects. In this paper we are dealing with the sensor network design that enables connecting agriculture to the IoT. Sensors based on IoT continuously monitors soil and weather, on the basis of generated data AI system takes the appropriate decision according to data. The connection sets up the links among agronomists, farms, and thus improves the production of agricultural products. It is a sensor based network using IoT designed to achieve precision in agriculture.

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