Enhanced Smart Agriculture Model

Dipali Pawar

Professor, Dept. of ETC Engineering, ADCET college, Maharashtra, India

---

Abstract - *Agriculture is the major source of income for largest population in India and it is major contributor to Indian economy. Agriculture in India needs to be modernized for crop production, distribution and cost control. In this paper we proposed Enhanced model for smart agriculture based on key technologies: IoT, WSN and sensors, cloud computing, mobile computing. Marketing agencies and vendors need to be registered to the cloud module using mobile module. Cloud storage stores details of farmers, periodic soil properties of farmlands, vendor and marketing agencies information, government schemes and environmental conditions. Soil and environment properties are sensed and sent to cloud through Internet. This model is beneficial for increase in crop production and cost control of agricultural products.*

***Key Words*: Internet of Things, Cloud computing, Big-Data Analysis, Mobile Computing, Wireless Sensor Network.**

1. INTRODUCTION

India is an agricultural country. In India agriculture is the basic source of livelihood of people. More than seventy per cent of the population depends on agriculture. 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 reduced. Therefore 40 million people pushed into poverty since 2010[1]. 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. Our economy is majorly depends on agriculture. Thus development in this field is essential will contribute to the economic welfare. Technology is playing its role in bringing about change and progress in many sectors[2]. Agriculture is one such sector. Internet-of-Things and Big-Data analysis are recent technologies from last few years and applications are being developed in various domains using these as key technologies. Sensor technology has also been advanced and many types of sensors like environmental sensors, gas sensors are developed and used in applications as per the need. Cloud-Computing and Mobile-Computing are mature technologies and applications exists in almost every field using those technologies. Uses of these technologies in the field of agriculture are also introduced and are used for improvement in this sector.

2.RELEVANCE

2.1 INTERNET OF THINGS

"Internet of Things" term proposed by Kevin Ashton in 1999. IoT enables to interact with the real world objects. Agriculture can be a vast area to integrate Internet of Things with distributed autonomous sensors to monitor environmental condition of grain stores and to analyze data and pass the information to remote user[11].

2.2 WIRELESS SENSOR NETWORK & SENSORS

Wireless Sensor Network abbr. WSN is a distributed collection of small devices, capable of local processing and wireless communication. As the implementation of wireless communication technologies in industrial areas are necessary due to inaccessibility to remote location at every time, to transmit the information generated by sensors along with controlling them. [11].

2.3 MOBILE COMPUTING

Mobile computing has affected lots in number in our day to day life due to its availability and has a cheaper cost of communication. It is in use in almost every field including agriculture sector.

2.4 BIG-DATA ANALYSIS

Big-data is a massive amount of data collected from different sources and for longer period like sensor data, social networking data, and business data. The major challenge is capture, storage, analysis, search. Big-data in agriculture domain is used for supply chain management of products, to minimize the production cost.

2.5 DATA MINING, ANALYSIS and KNOWLEDGE BUILDING

Data mining is process of analysing data to find some patterns hidden in the data. Data mining for agriculture sector have been the topic of research for many years. Data mining have been used for analysing the soil types and properties to classify them.

2.6 CLOUD COMPUTING

Cloud computing provides sharing of resources with cheap cost . Cloud computing service provider offers services like Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) with cheap cost. Cloud computing has been used for storage of agriculture data. It has been used in agriculture sector along with IoT.

3.LITERATURE REVIEW

The research in agriculture area is enhanced in various aspects to improve the quality and quantity of productivity of agriculture. Researchers have been worked on many

different projects on soil attributes, different weather conditions as well as scouting crops. Some projects worked on actual farm fields and some worked on polyhouses. Researches of Carrnige Mellon University worked on plant nursery using Wireless Sensor Technology .Wireless Sensor Network based polyhouse monitoring system is explained in [3]which make use of environment temperature, humidity,

CO2 level and sufficient light detection modules. This polyhouse control technology provides automatic adjustment of polyhouse. . In [4] authors have proposed development of wsn based above mentioned parameters for agriculture using ZigBee protocol and GPS technology. In some projects such as [5] authors have designed and implemented an approach in development of crops monitoring system in real time to increase production of rice plants. This system has used motes with sensors to check leaf wetness. Later on use of IoThas been proposed in [6-8]. IoTgives platform to researches to maintain real time data and send alerts immediately to farmers.IoTimplementation gives easy access to information that comes from sensor nodes. IoT is also used for product supply chain business process. Cloud architecture gives additional support to IoT in maintaining Big data of agriculture information viz. history information, soil properties, fertilizers distribution, image cultivation through camera and information collected through sensors, recording information etc. Authors have analyzed collected data for finding correlation between environment, work and yield for standard work model construction. Monitoring for adverse signs and fault detection. In [9] authors have discussed the application of data mining with the help of WEKA tool and analysis model using of machine learning algorithms. In [10] authors have 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. Although authors mentioned above have proposed many models in agriculture domain, the effective model is needed that uses new technologies and provides an integrated approach to monitor environmental conditions periodically and various soil properties of farm field through IoTdevices and store these details at the central place in the cloud storage which results in Big –data over the time. It is also usable by multiple vendors or farmers who enquire about crop yield maximization. Farmer can analyze these data for fertilizer requirements for current crop. It will help for smart climate solutions and disaster prevention.

4.PROPOSED WORK

4.1 OBJECTIVE

This system designed to fulfil the gap between farmers and the technology in agriculture. It helps the farmer to understand the requirements to grow the crops in critical seasons and avoid financial loss caused to the farmers. It will be helpful to the farmers of different geographical regions.

In the Agriculture domain Internet of Things (IoT) enables various applications

1. Crop growth monitoring and selection.

2. Irrigation decision support.
3. Crop Selection, Support machinery selection.
4. Land Preparation, Seed selection, Seed sowing, Soil study, weather forecast & insecticide, warehousing facilities.

4.2 METHODOLOGY

The proposed architecture of model as shown in Fig-1 consists of the five modules:

1) SensorModule.

2) Mobile Module.

3) Cloud Module.

4) Big-Data Analysis Module.

5) Government &Banks Module.

i) Sensor module is portable IoT device with soil and environment sensors. This module is responsible for soil sampling at periodic intervals to get soil property values.
Ii) Mobile module provides interface to the users. Mobile applications need to be installed on the end users mobile phone. It has three parts .

a. UI for farmer

b. UI for marketing agency

c. UI for vendor

iii) All the users of agriculture sector needs to be registered to Cloud through Mobile. Cloud storage consisting of Big-Data storage will store all the details of farmer, marketing agent details, and vendors and service provider details and government schemes.
iv) Big-data analysis module provides information of region wise crop production details for each crop, total crop production for each crop in the state, based on this and current requirements for the consumers will be helpful to control the costs for each product.
v) Government &Bank Module will be able to provides the details of recent schemes and subsidies for farmers and agriculture sector. Agricultural banks also provide the details of loan schemes.

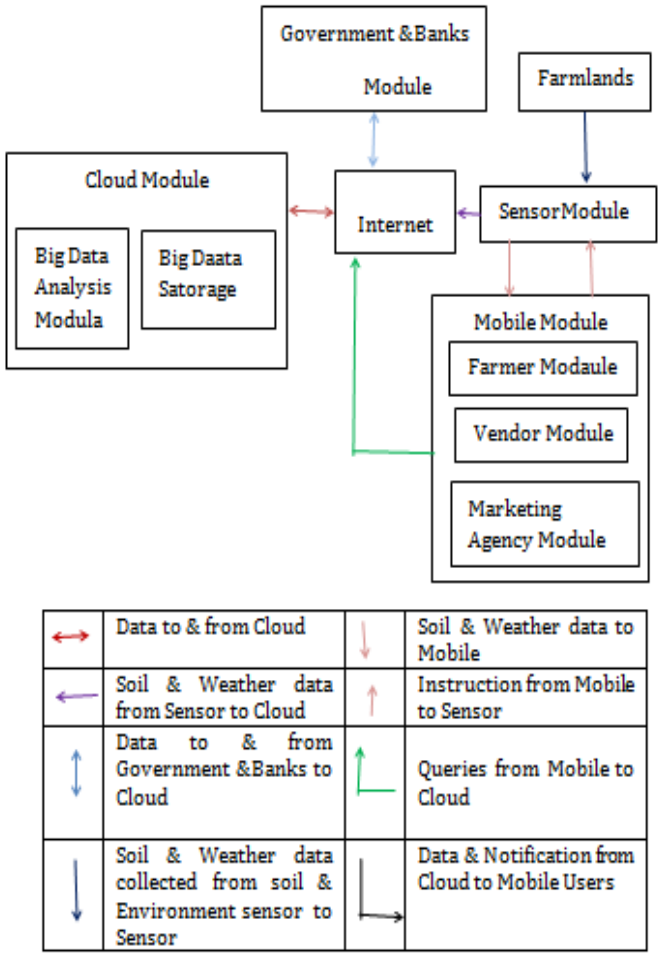

Fig- 1: Proposed Architecture for Enhanced model for Smart Agriculture

REFERENCES

[1]"A Model for Smart Agriculture Using IoT".International Conference on Global Trends in Signal Processing, Information Computing and Communication, 2016.

[2] "IMPLEMENTATION OF IoT (INTERNET OF THINGS) AND IMAGE PROCESSING IN SMART AGRICULTURE".2016 International Conference on Computational Systems and Information Systems for Sustainable Solutions.

[3]Yongxian Song, Juanli Ma, Xianjin Zhang, Yuan Feng, "Design of Wireless Sensor Network-Based Greenhouse Environment monitoring and Automatic Control System", JOURNAL OF NETWORKS, VOL. 7, NO. 5, MAY 2012.

[4]G.V.Satyanarayana, SD.Mazaruddin, "Wireless Sensor Based Remote Monitoring System for Agriculture using ZigBee and GPS", Conference on Advances in Communication and Control Systems 2013.

[5]N.Sakthipriya, "An Effective Method for Crop Monitoring Using Wireless Sensor Network", Middle East Journal of Scientific Research 20(9):1127- 1132, 2014 ISSN 1990-9233.

[6]Alexandros Kaloxylos "Farm management systems and the Future Internet era", Computer and Electronics in Agriculture 89(2012)130144.

[7]Xiaohui Wang, Nannan Liu, "The Application of Internet of Things in Agricultural means of production supply chain management", ResearchArticle, Journal of Chemical and Pharmaceutical Research,2014,6(7):2304-2310.

[8] Li Minbo, Zhu Zhu, Chen Guangyu, "Information Service System of Agriculture IoT", AUTOMATICA 54(2013) 4, 415-426.

[9] Sally Jo Cunningham, Geoffrey Holmes, "Developing innovative applications in agriculture using data mining", SEARCC'99 conference proceedings.

[10]D.Rajesh, "Application of Spatial Data Mining for Agriculture", International Journal of Computer Applications (0975-8887) Volume 15- No.2, February 2011. 545.

[11] "Development of IoT based Smart Security and Monitoring Devices for Agriculture".

[12] "Framework to Leverage Cloud for the Modernization of the Indian Agriculture System" AnupriyaTuli, NitashaHasteer, Megha Sharma, AbhayBansalAmity University Uttar Pradesh, India. anupriyatuli6@gmail.com nhaster@amity.edu megha.rsystems@gmail.com abansal1@amity.edu

[13] "Internet of Thing – A relief for Indian Farmers".

[14] IEEE ICC 2017 SAC Symposium Internet of Things Track. "An IoT Service Oriented System for Agriculture Monitoring".