

THE FUTURE OF FARMING THROUGH THE IoT PERSPECTIVE

Chetan N Kulkarni¹, Dr. Ajay U Surwade²

^{1,2}*School of Computer Sciences, Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon*

Abstract - India's major source of income is from agriculture division and 70% of farmers and over-all people depend on the agriculture. In India most of the farming systems are worked manually. The available old-style methods are like sowing, digging, and irrigation system. Due to long-established methods of agricultural process, the Indian farmer faces many problems about productivity of agricultural product than others. Traditional Farming is facing problem Lack of Communication, Lack of Real-time Forecast, Lack of Education, Lack of Automation and Lack of Reach. Today's sensors/IoT Devices In current scenario agriculture and environmental monitoring has become easy due to presence of IoT sensors or devices. These sensors can be connected to each other for providing the information of environmental controls which includes humidity, air temperature, irrigation, soil composition and soil moisture in unstructured manner.

In this paper research gap is identified after carrying out literature review and an architecture is proposed for providing the information of suitable farming conditions to the farmers.

Key Words- IoT, Sensors, Data Sharing, Management, Smart Agriculture, Precision Farming

1. INTRODUCTION

India is earning major income from agriculture sector and 70% of farmers and general people depend on the agriculture [1]. In India most of the farming systems are operated manually. The available traditional techniques are like sowing, digging, and irrigation system. Due to long-established methods of agricultural process, the Indian farmer faces many problems about productivity of agricultural product than others. It is due to unbalance feeding of fertilizer without knowing the specific requirement of nutrient to a crop. Nowadays, soil is checked in the laboratory and proper examine of soil is done also soil proportion is checked. Farmers were having sensors to detect changes in temperature and soil moisture levels, but these two sensors were not connected. It is needed to gather these separate pieces of data.

Internet of Things (IoT) is a system of linked physical objects which are also referred as connected devices or smart devices that are accessible through the internet which are embedded with components such as electronics, software, sensors, actuators, and network connectivity which carries object's behavior and producing intelligent solutions in the form of data sharing. The IoT sensors can connections like RFID, Wi-Fi, Bluetooth, in addition to allowing wide area connectivity using many technologies such as GSM, GPRS, 3G, and LTE. Due to technological changes in IoT devices many technologies can be grouped together to revolutionize agriculture to solve the problems faced by farmers. IoT sensors can deliver farmers with statistics about crop yields, rainfall, pest infestation, and soil nutrition. This paper is organized as Literature review is followed by introduction which is followed by research gap identified followed by proposed architecture which is followed by conclusion and references.

2. LITERATURE REVIEW

The researchers have addressed this problem with different dimensions. Table-1 shows reviews of the important contribution or solutions which are proposed.

Table-1

| Authors | Techniques / Methodology | Contribution |
|-------------------------------------|---|---|
| Tomo Popovic.et.al (2017) [1] | IoT sensor nodes including Arduino, Raspberry Pi, and Libelium Plug and Sense | The stage has already been used for development of smart spraying and irrigation, valuation of the marine environment and fish/mussel farm monitoring. |
| V. M. Abdul Hakkim et.al (2016) [2] | GPS, GIS, Sensor Technology | Comprises three phases including exploration, analysis and execution. Precision agriculture address both financial and environmental issues that edge production agriculture |

| | | |
|---|--|--|
| | | today. |
| Alessandro Massaro et.al (201) [3] | ZigBee protocol, GSM / GPRS, DSS algorithm | A cloud to a web platform for monitoring and activating electro valves of the irrigation network. |
| Ibrahim khider Eltahir et.al (2018) [4] | Sensors | Solar Supply, Soil Humidity analysis is done. The prediction helps to supply the right quantity of irrigation to the crops. |
| Amandeep et.al (2017) [5] | ZigBee protocol, Sensor. | Green energy and smart technology in the agriculture sector will find better productivity. |
| Shailaja Patil et.al (2016) [6] | Image processing, GPS, CCTV | Automation in farming helps to improve the productivity with smart technologies. |
| Rob Dolci (2017) [7] | Bayesian Network Analysis, Multivariate Analysis | Modeling of CO2 Temperature, Humidity and PH with an artificial intelligence system to prescribe different situation and plans |
| Nikesh Gondchawar and Prof. Dr. R. S. Kawitkar (2016) [8] | Wi-Fi, ZigBee, GPS, Sensors, raspberry pi | Smart solution to field activities, irrigation problem which help to improve the yield of the crops and overall production |
| Ojas Savale et.al (2016) [9] | Wireless sensor Network (WSN) | Improvement in the agriculture production with the help of IoT to achieve precision agriculture |

2. Research Gap Identified:

After carrying out literature survey as given in Table-1, the following research gaps have been found.

- A] The current challenges with traditional farming are lack of communication, lack of real-time forecast, lack of education, lack of automation and lack of Reach.
- B] Few data analysis tools or techniques are available which are poorly organized and used
- C] The perception that traditional data warehousing processes are too slow and limited in scalability.
- D] The new emerged technology adoption is one of the keys to increase agriculture productivity in the future.

3. Proposed Architecture

The Literature survey carried out shows that, there is lack of real time information suitable for farming. After identifying the research gap an architecture shown In Figure-1 is proposed. The unstructured data received from sensors can be give as input to the process management unit where it would be mapped to convert this information in structured data. This mapped structure information can be saved on Data Cloud as shown in Figure-1.

The Data Mining techniques can be applied on this structured data. These data mining would produce important information which would be useful for farmers to predict the suitable conditions for framing.

Figure-2 Shows, the workflow of the proposed architecture. It consists of three important sections such as Collecting real time data, processing of the data and Explore or visualize the data. These three steps would convert the unstructured data into structured data.

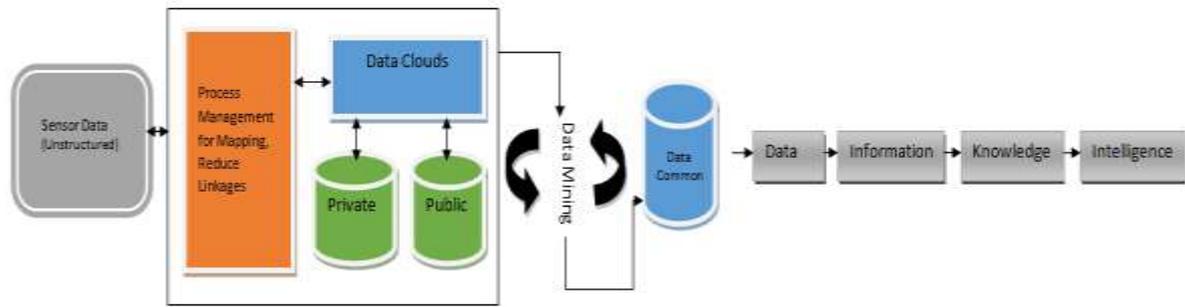


Figure-1: Proposed architecture

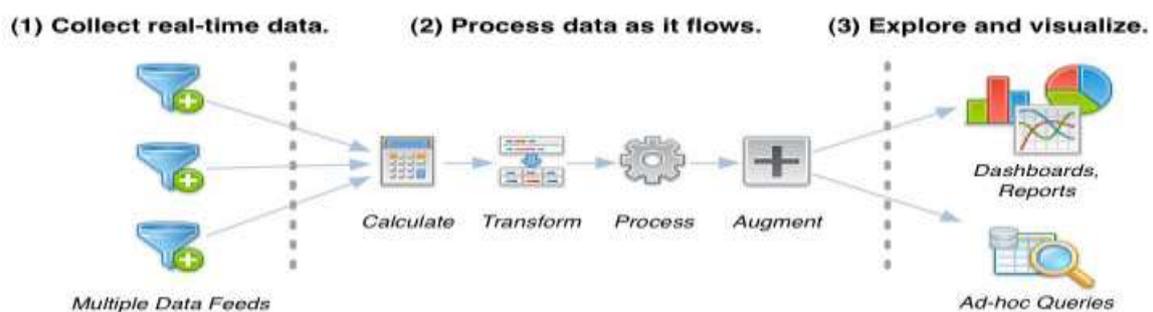


Figure-2: Workflow of Proposed Architecture

4. CONCLUSIONS

In Indian farming conditions depends on the weather conditions. The farmers are traditionally applying their knowledge for framing. If they get weather condition in terms of correct forecasting and information about suitable conditions for farming, then it will be helpful to them.

The architecture proposed in this paper is aiming to provide the correct information in advance to the farmer.

REFERENCES

- 1) Karan Kansara, Vishal Zaveri, Shreyans Shah, Sandip Delwadkar and Kaushal Jan, "Sensor based Automated Irrigation System with IOT: A Technical Review", International Journal of Computer Science and Information Technologies, Vol. 6 (6), pp.5331-5333, 2015.
- 2) Tomo Popovic, Nedeljko Latinovic, Ana Pešic, Zarko Zec evic, Bozo Krstajic and Slobodan Djukanovic, "Architecting an IoT-enabled platform for precision agriculture and ecological monitoring: A case study", Computers and Electronics in Agriculture, pp.255-265, 2017.
- 3) V. M. Abdul Hakkim, E. Abhilash Joseph, A. J. Ajay Gokul and K. Mufeedha, "Precision Farming: The Future of Indian Agriculture", Journal of Applied Biology & Biotechnology, Vol. 4 (06), pp. 068-072, Nov-Dec. 2016.
- 4) Alessandro Massaro, Giacomo Meuli, Nicola Savino and Angelo Galiano, "A PRECISION AGRICULTURE DSS BASED ON SENSOR THRESHOLD MANAGEMENT FOR IRRIGATION FIELD", International journal on Signal & Image Processing, Vol.9, No.6, December 2018.
- 5) Ibrahim khider Eltahir, Khalid Hamid Bilal Abdalla, and Elhassan Mohammed Elhassan Ahmed, "Farm Automation based on IoT", International Conference on Computer, Control, Electrical, and Electronics Engineering (ICCCEEE) 2018.
- 6) Amandeep, Arshia Bhattacharjee and Paboni Das, "Smart Farming Using IOT", In the Proceedings of 8th IEEE Annual Information Technology, Electronics and Mobile Communication Conference, 3-5 October, 2017, 978-1-5386-3371-7/17/\$31.00, 2017.

- 7) Shailaja Patil, Anjali R. Kokate and Dhiraj D. Kadam, "Precision Agriculture: A Survey", International Journal of Science and Research (IJSR), ISSN (Online): 2319-7064, 2016.
- 8) Rob Dolci, "IoT solutions for precision farming and food manufacturing", IEEE 41st Annual Computer Software and Applications Conference, 2017. 0730-3157/17 \$31.00 © 2017 IEEE DOI 10.1109/COMPSAC.2017.157
- 9) Nikesh Gondchawar and Prof. Dr. R. S. Kawitkar, "IoT based Smart Agriculture", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 5, Issue 6, June 2016, ISSN (Online) 2278-1021, ISSN (Print) 2319 5940.
- 10) Ojas Savale, Anup Managave, Deepika Ambekar and Sushmita Sathe, "Internet of Things in Precision Agriculture using Wireless Sensor Networks", International Journal of Advanced Engineering & Innovative Technology (IJAEIT), ISSN: 2348 7208, 2016.