

An Integrated Expert Water Management (IEWM) With IoT



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Abstract: Water is the most widely used by all the beings present in the world. Management of water is very crucial for people to organise the water resources. Now a day's water resources are becoming more difficult to get from various sources. Water management with IOT is used in many applications such as water tanks, agriculture and other water management places to maintain the water levels constantly. Artificial Intelligence (AI) is most widely used for various types of water management resources. Many AI algorithms are used in daily life with the integration of IOT. In this paper, an Integrated Expert Water Management (IEWM) system adopted with IOT and AI algorithms are used to develop to maintain the usage of water resources in various applications. Results show the performance of the IWM.

Keywords: IOT, AI, agriculture, water management.

I. INTRODUCTION

Water resources are more important to human life to compare to other requirements. Any living organism cannot live without water. Artificial Intelligence (AI) is working as an intelligent machine and this is part of computer science that provides the expert systems in various fields. AI is the process that is made with human intelligence machine. Even this is called AI the success is more compare with human intelligence. Based on the previous research the AI process various domains. Nowadays machine learning and deep learning are other intelligent domains that improve the machining process and enhance the work and extract better results when compared with previous research. Water management is more likely to be used to maintain the water resources in many places and also water is part of human life. Internet of things (IoT) is the latest technology that is used to improve the transfer of data within the network. Integration of AI with IoT becomes a more efficient domain that can be implemented in any domain especially for the water management resources.

In this paper, an integrated expert water management (IEWM) is connected with IoT sensors to maintain the expert system with the help of AI. IoT is the latest trend if it is integrated with any of the human expert systems such as AI. For any of the proposed systems the integrated system called "Smart Devices". IoT connects the various devices whether it is living, non-living, or virtual objects are connected to each other by taking help to make some communication medium.

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The proposed system mainly focus on providing the water management systems to solve issues based on water resources.

II. RELATED WORK

In this section, various AI and IoT implemented previous systems are discussed.

AI is the traditional technology that makes computers work like humans. This improvement will quicken the advanced change of ventures. Be it people, creatures, trees, machinery, apparatuses, sand, mountains, lakes, structures, or anything one can consider, interfacing them together and settling on 'smart decisions' can make the world an independent spot. To make the world and its physical articles really self-ruling, we need an AI (ML) [1] imitating human learning just as data analysis (DA) [2] module in the framework. ML would make methods to encourage learning in different segments/gadgets of the system to make them programmed and self-standing, while DA would assess/break down every one of the information that is created after some time to discover the past patterns and be increasingly proficient/powerful in future.

The important tools that belong to AI and IOT can be used to solve the various issues present in the various domains. The human mind can tackle specific sorts of learning issues. For instance, there are a lot of optical neurons in the visual framework which makes object acknowledgment simple for people. Learning isn't just limited to people, however it is additionally differentiated to creatures, plants, and so on. A fowl figures out how to fly, a youngster figures out how to talk, plants figure out how to adjust to nature, etc. Our very endurance relies upon the capacity to learn and change in accordance with the earth.

Internet of things (IoT) systems using Artificial Intelligence (AI)

IoT based water tank alert system is developed with the integration of an AI expert system to transfer the information to the server and make the users ready to solve the issue at the sensor level. This is used not only in the water tanks but also in the various water management systems. AI is an intelligence system used to overcome the various issues based on data transfer.

Integrated Expert Water Management (IEWM)

IEWM is the expert AI systems which are used in many applications such as water management applications in many ways which is integrated with IOT sensors. Many sensors are available to check the water level at many places for the efficient water management is utilized.

The IEWM is the very interactive and user-friendly automated dynamic decision-making system that utilizes both real and heuristics to overcome complicated decision-making issues.



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This is also called a high-level of human intelligence and expertise. This will overcome the various complicated issues in a special domain with the help of the application. The proposed system works like a human expert but it responds very fast compare with the human expert system. These systems are filled with full of knowledge which is taken from the expert. This is most compatible with explaining and examining knowledge. In the present domains, expert systems are more compatible at any stage and at any application development especially on water management system.

Following are the Algorithm steps to process the IEWM

- Initialize the IOT
- Start sensors.

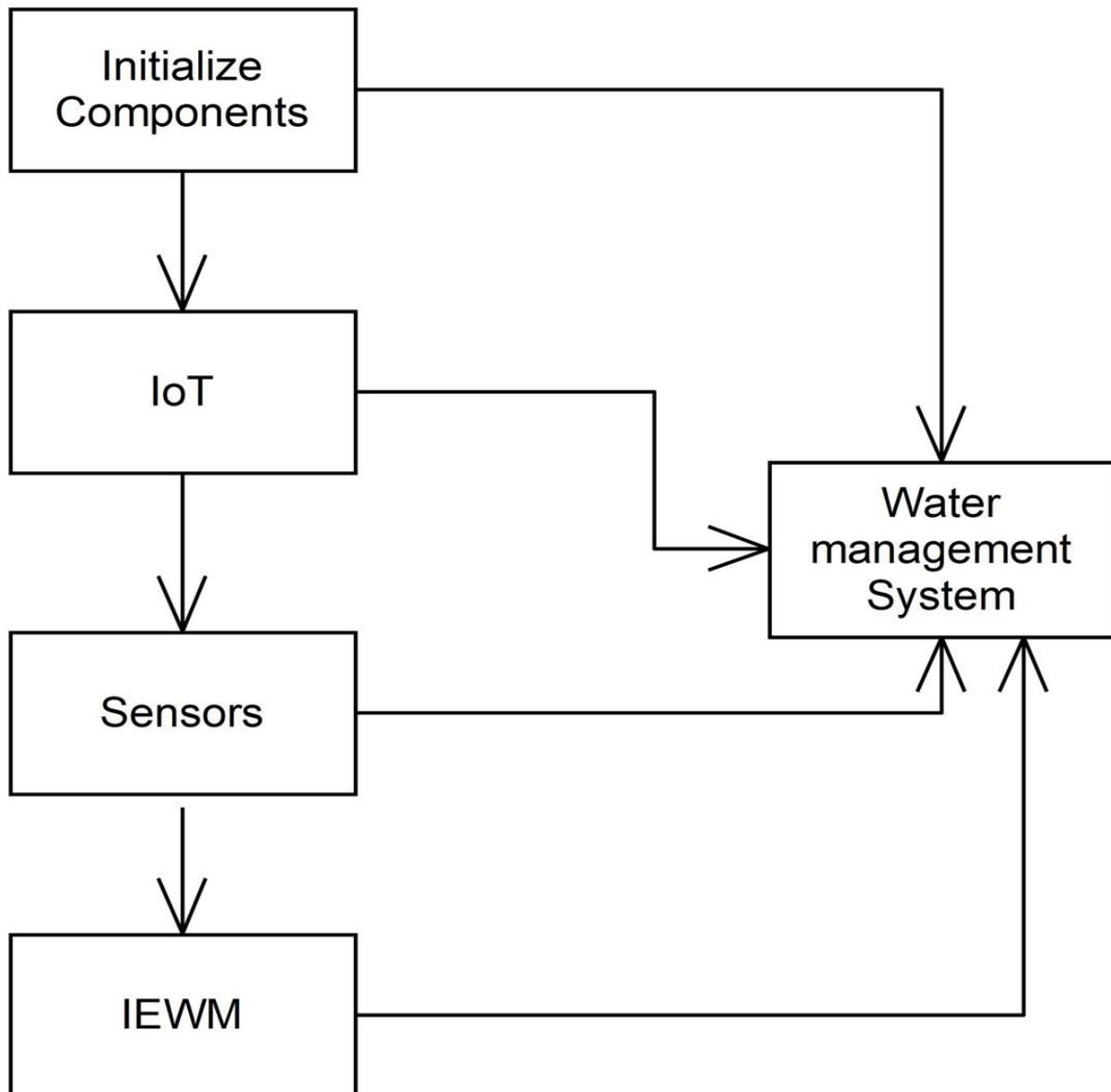


Figure: 1 Flow Diagram

- Place the sensors at any water management place.
- Place the IEWM.
- Take the readings of the water resources and water management.
- Readings are stored in database.
- If any abnormal conditions identified the alert will be sent to the user to overcome that.

III. EXPERIMENTAL RESULTS

The implementation is done with the java and jdk 1.8 and netbeans as the 8.0.2. The parameters shown in this system is time to transfer the data from sensors to system. Accuracy is other parameter to show the result accuracy.

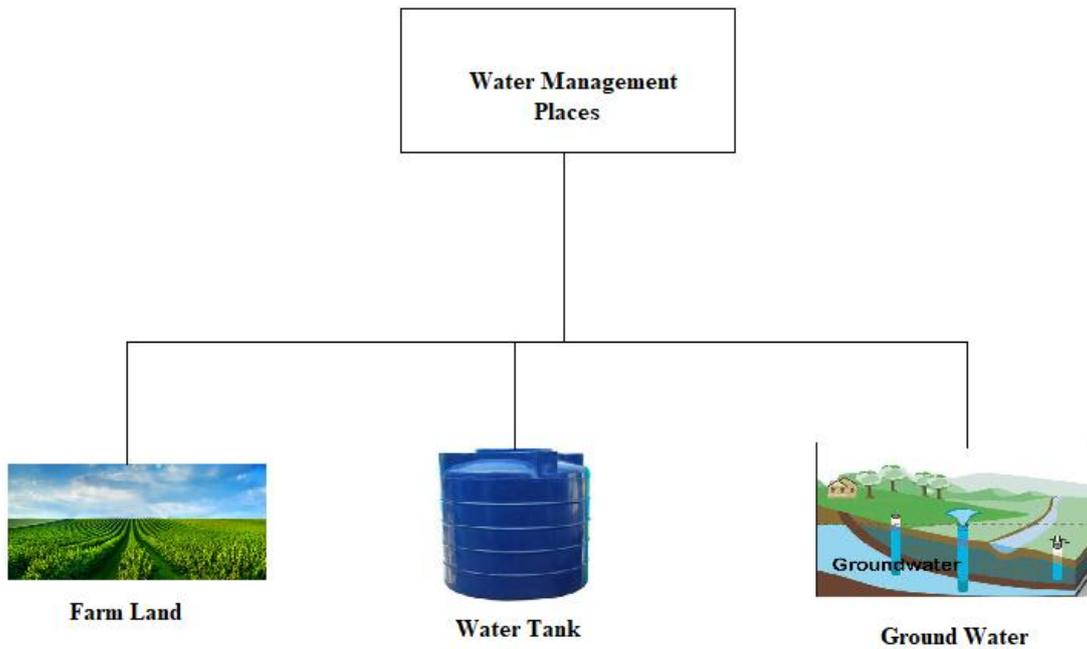


Figure: 2 Various Ground Water Places

Performance Evolution

Various performance measures are calculated with this namely False Positive Rate (FPR), False Negative Rate (FNR), Sensitivity, Specificity and Accuracy, the performance of the system i.e nodes in the network is estimated. The basic count values such as True Positive (TP), True Negative (TN), False Positive (FP) and False Negative (FN) are used by these measures.

False Positive Rate (FPR)

The percentage of cases where issues are solved to normal, but in fact it did not.

$$FPR = \frac{FP}{FP + TN}$$

False Negative Rate (FNR)

The percentage of cases where issues are solved, but in fact it did.

$$FNR = \frac{FN}{FN + TN}$$

Accuracy: This will calculate the overall accuracy of the solving issues.

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

	Time (msec)	Accuracy
Traditional Water Management System	0.10	87
Integrated Expert Water Management (IEWM)	0.04	98.7

Table: 1 Show the Performance of the IEWM

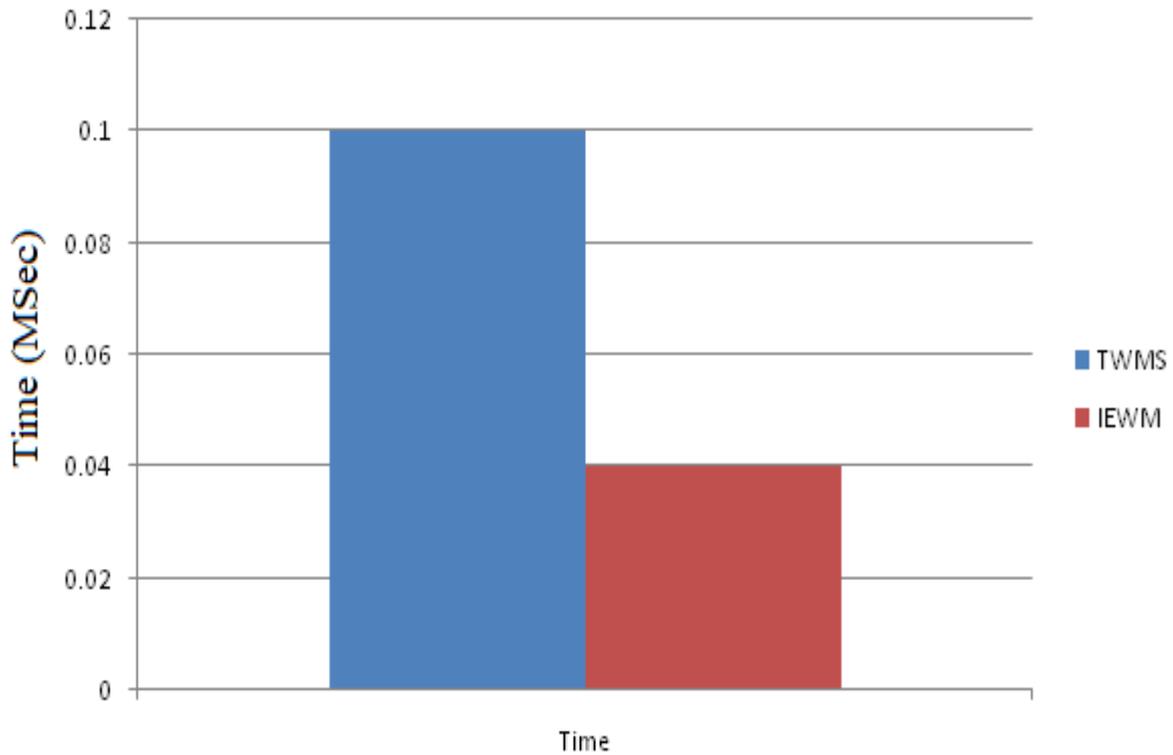


Figure: 3 processing time to send message from sensors to system

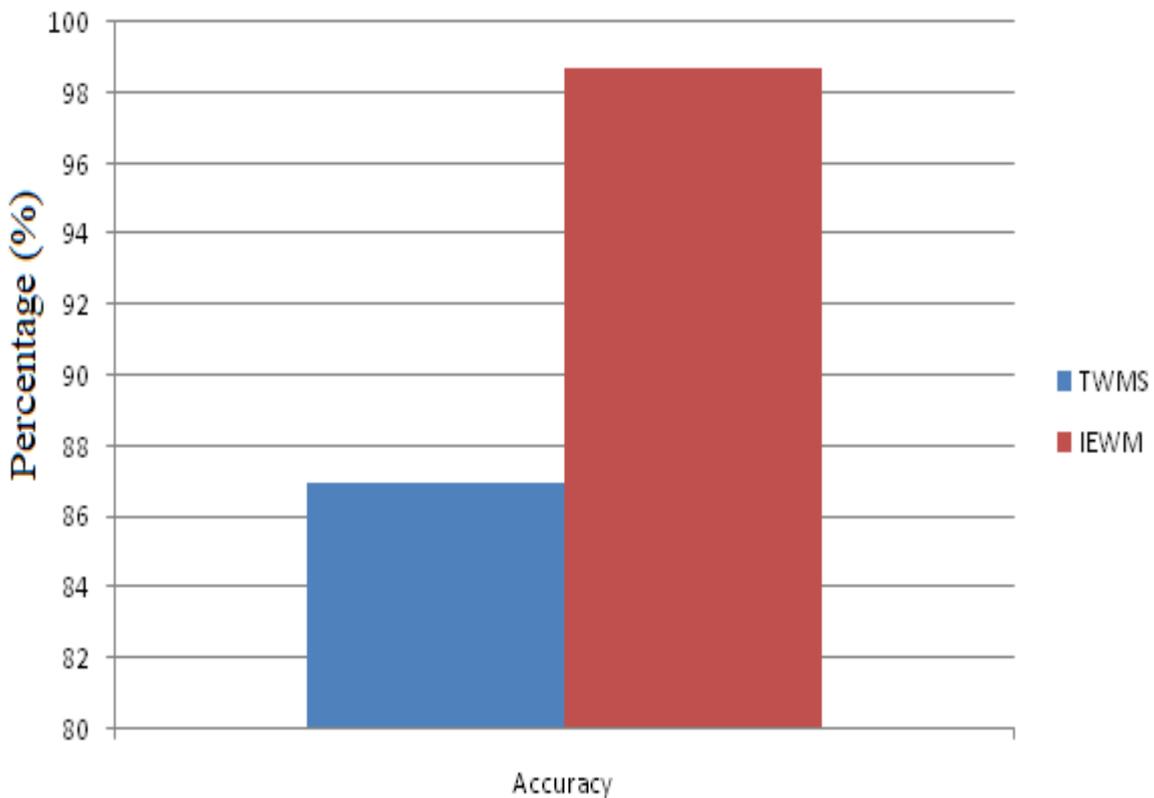


Figure: 4 accuracy of the result

IV. CONCLUSION

In this paper, an Integrated Expert Water Management (IEWM) is used to maintain the water management in various applications. The IEWM is the expert system which

is used to alert the various abnormal conditions identified in various applications. This is adopted and integrated with the IOT and AI expert systems. This is used anywhere which are used in many abnormal conditions.

REFERENCES

1. Michalski, R.S., Carbonell, J.G., Mitchell, T.M.: 'Machine learning: an artificial intelligence approach' (Springer Science & Business Media, Berlin, Germany, 2013).
2. Witten, I.H., Frank, E.: 'Data mining: practical machine learning tools and techniques' (Morgan Kaufmann, Burlington, Massachusetts, 2016).
3. Monostori, L., Kádár, B., Bauernhansl, T., et al.: 'Cyber-physical systems in manufacturing', CIRP Ann., 2016, 65, (2), pp. 621–641.
4. Lee, E.A., Seshia, S.A.: 'Introduction to embedded systems: a cyber-physical systems approach' (MIT Press, Cambridge, Massachusetts, 2016).
5. Hassan, Q.F., Khan, A.R., Madani, S.A.: 'Internet of things: challenges, advances, and applications. Chapman & Hall/CRC computer and information science series' (CRC Press, Boca Raton, Florida, 2017).
6. Fortino, G., Trunfio, P.: 'Internet of things based on smart objects: technology, middleware and applications' (Springer, New York, USA, 2014).
7. Yang, L.T., Di Martino, B., Zhang, Q.: 'Internet of everything', Mobile Inf. Syst., 2017, 2017, pp. 1–3.
8. Baheti, R., Gill, H.: 'Cyber-physical systems', Impact Control Technol., 2011, 12, pp. 161–166.
9. Gorman, M.M.: 'Database management systems: understanding and applying database technology' (Elsevier Science, USA, 2014).
10. Theodoridis, S., Koutroumbas, K.: 'Pattern recognition' (Elsevier Science, USA, 2008).