A Survey Paper on Dam Management

Aishwarya S Rao[1], Aishwarya T[2], Jahnavi S Athreya[3], Mandakini H[4], Nagesha Shivappa[5]

[1,2,3,4]*Student, Dept. of Electronics and Instrumentation, JSS Academy of Technical Education, VTU, Bengaluru, India.*
[5]*Assistant Professor, Dept. of Electronics and Instrumentation, JSS Academy of Technical Education, VTU, Bengaluru, India.*

--***---

Abstract - *Dams play a very important role to hold and conserve water for optimal usage based on seasonal needs. Water Management plays a very important role in mitigating the current issues of water distribution and utilization. As there are lot of hazards related with the existence of the dams, it has become a necessity to develop a proper monitoring system regarding the opening of the dam gate to retain a safe water level in dams. Exploring usage of IoT for improving the safe utilization of dams, water flow and prevention of dam gate corrosion. This paper intends to use microcontroller for monitoring and controlling the water distribution management by usage of various sensors, control valves, automatically & proactively manage outflow during crisis by using statistical data of the environment.*

Key Words: **Control valves, corrosion, IoT, Microcontroller, sensors.**

1. INTRODUCTION

Nowadays Water management is an issue of growing concern, as there is limited availability of consumable water. Owing to unforeseen weather conditions such as heavy rainfall, sudden change of tides and other natural forces leads to natural calamities which causes problems like increase in mortality rate, contamination of consumable water, agricultural problems which may negatively impact the economy of the country. Construction of dams provides water bodies for future, protect the available water from pollution, prevents disputes and over exploitation. Therefore, dams play significant role in water management.

Dams play a prominent source of water supply to the urban networks. Apart from this, dams and reservoirs play an important role in agricultural system. In India we have many states and each state has its own dam to preserve water. Water bodies flow through different states before reaching the sea. The dispute arises between the states which share the water bodies regarding water distribution and the situation has become extreme in the recent years. Even today we have been using conventional methods for controlling the dam gates and gauging the level of water and other parameters.

Many factors contribute towards the failure of a dam, the most common being Overtopping which is caused due to heavy floods. This condition needs constant monitoring to avoid catastrophes such as Dam Failure, which is not efficient. Therefore, a concept is proposed to monitor the level of dam water automatically.

To overcome the Dam Failure and for the continuous monitoring of Dam Health, the enabling technology of Internet of Things (IoT) is used. Through this the authorities have continuous availability of data about the dam health and they can take appropriate decisions.

2. LITERATURE SURVEY

Gareeyasee Saha, Anjana Pama, Sushmitha R, Shilpa Bhat [1] are mainly paying attention on implementation of automated floodgates using Programmable Logic Controller (PLC). The aforementioned system can be achieved on future dams of different sizes and capacities.

Nikhil M. Dhandre, P. D. kamalasekaran, Pooja Pandey [2] are mainly paying attention on development of a web portal which will control and give accurate parameters related to dam and its surroundings like water level, rain fall, gate position, temperature, humidity etc. This system also builds a Graphical User Interface (GUI) which will provide two types of operation modes i.e. Autopilot mode and Manual data mode. All the information obtained by the sensors are uploaded to database. This data is monitored using web-portal and for required decision making. This concept works on Internet of Things (IoT), so that information sharing is possible using web data base.

Nitin Vijaykumar Swami, Vilas Malappa Jarali [3] has proposed the concept which comprises of float and motion sensors to monitor the information about water levels and earthquakes in water dam. The best results provided for monitoring is automation. From the experimental working of system, it is indicated that the proposed system can monitor water level and informs disaster like earthquake with higher transmission speeds.

Herman Yuliandoko, Subono, Vivien Arief Wardhany, Sholeh Hadi Pramono, Ponco Siwindarto [4] are paying attention on development of the flood detection system based upon the velocity and the water level of dam using a sensor network and a microcontroller (ESP8266). The microcontroller used here can be incorporated with internet networks, where the data gathered by the sensors is sent to web servers and also to the application developed in smart-phone called SWOD. Owing to which the authority can get the flooding notification prior.

S.M. Saifur Rahman Faisal, Iftekhar Uddin Ahmed, Humayun Rashid, Remon Das, Md. Mobarak Karim, S M Taslim Reza [5] has proposed the system to build a self-controlled dam system, where the dam gates are controlled automatically for the effective use of water in irrigation and flood control. The system uses Arduino Uno, which processes the data obtained by water level sensor and a switch and then sends the processed signal to driver card to run the motor which opens or closes the dam gate. The switch used here is to detect the gate position. An LCD display is also incorporated to display the level of the water. Apart from this, a push switches are also attached so as to open or close the gate manually. The level sensor used here is normal single strand conductors and transistors are used to amplify the signal so as to activate the microcontroller.

Balaji. V, Akshaya. A, Jayashree. N, Karthika. T [6] has proposed the concept which uses the Wireless Sensor Network, Android application and ZigBee technology for early flood warning. An Android application is developed it is installed on the user phone and nearby hospital and police number are registered for emergency purpose. The sensor network will send details about the water level to the server through ZigBee communication. ZigBee is connected to dam and main server. A server is deployed to monitor and store all the information from the dam area as well as the information about the authenticated user. The concept also implements the safe zone notification. User can fetch safe zone live mapping with or without internet.

Bindu Shukla, Deepti P, Gowthami Vittal S, ManiDeepika JM, Lingaraj K [7] has proposed the system which is used to detect cracks on concrete structures at a beginning stage in order to prevent the future damage. This system can locate major cracks caused due to man-made errors and environmental changes such as flooding, thereby generating an alarm to notify the authorities. The system is capable of closely monitoring the conditions of a dam on a day-to-day basis and is fully automated. Authorities are notified of changes in actuator state thereby providing an option for manual override.

Yong Li, Yu Wang [8] has proposed an idea of an integrated monitoring platform, based on ASP.NET. A reservoir dam monitoring platform has been devised to boost emergency response capability. The system comprises of web management system, data acquisition system and database used for safety monitoring system and hydrological foretelling system.

Tibin Mathew Thekkil, Dr.N.Prabakaran [9] has proposed the system which uses a Wireless sensor network for early flood detection and monitoring, guaranteeing connectivity in low cost. The data obtained is in the form of images captured by CMOS image sensors and these images are transmitted to a remote monitoring centre via ZigBee network and GSM network. Main focus is on downstream flooding which might lead to loss of lives if the evacuation does not take place on time. A remote centre will gather the information, analyse it and give the necessary notification to the authorities.

Niteen Mohod [10] is paying attention on exploring the possibilities of IoT technology through its application in Dam Safety and water management. Here the entire dam and the main pipeline is monitored 24x7 using different sensors. These wireless sensor nodes communicate with each other and transmit data to the CLOUD, provides information to the authority. Here a concept is put forward for an electronic circuit design using Internet of Things concept for the same.

In this concept [11] the design phase of the automatic water level recorder (AWLR) in escorting water level observing at the dam gates. The application of AWLR sensor is to monitor and record the data and store it in a database.

The concept of this paper [12] is to check on the dams' health condition. Aimed at good maintenance of dam, the system comprises of various sensors that are used to oversee different components of a dam. The system checks for cracks in walls, increased levels of turbidity in the downstream, which could be a manifestation of internal corrosion within the dam, pipe deteriorations and erosion on the gates of the dam, and this measured data from related sensors is sent to server. This cohesive information can be displayed in an android application for further decision making by the authorities.

C Chellaswamy, J Nisha, K Sivakumar, R Kaviya [13] are paying attention on different methods to deal with water related problems comprises of supple management, remote sensing with the new concepts such as water security, global integration of information, etc. The proposed concept uses Internet of Things (IoT) for dam water management system in order to minimize the wastage of water. The data can be monitored using different sensors set up in the low lying areas and uploaded on to the cloud.

In this paper [14], the controlling of dam gates is done through the data collected with the help water level sensors deployed near the dam area. This idea will help us to efficiently control the dams all over the country by reducing the manpower for maintenance of the dam. A set of sensors are used to gather information regarding the level of water and then sends instructions back in order to control the dam.

V. Sathya, Kshitij Arun, Harshitaa Mahajan, Amit Kumar Singh [15] has proposed idea which uses IoT skeleton to make the functionality of dam automatic with the progressive remote sensing features. The proposed skeleton has the ability to notify regarding the present status of the dam and also alerts when the dam conditions have changed from the normal conditions. To detect the wear and tear in the structure of dams, a temperature sensor has been deployed. The proposed architecture aims to automate the functioning of dams regardless of their distinct conditions.

Albert Joshy Varghese, Abin Thomas Jolly, Astile Peter, Bhavana P Rajeev, K S Sajitha, Deepa Elizabeth George [16] are paying attention on development of a system to open the shutters by employing a mechatronics system at the heights which is pre-calculated. The system consists of sensor nodes, controller and a communication system. The proposed system is an application based IoT system which will monitor and send real time parameters associated with Dam and weather conditions.

3. CONCLUSION

From the aforementioned literature survey, it is understandable that IoT has increased the quality and productivity of dam management system and also conferred to the public issues. The of aim these papers is to ensure that no Dam Failures occurs due to which there might be a loss of life, agricultural problems and inefficient water management. Hence by using these concepts will not only reduce Dam Failures but also a provide an efficient method of water management.

REFERENCES

1. Gareeyasee Saha, Anjana Pama, Sushmitha R, Shilpa Bhat "Automatic Floodgates Control Using PLC with Added Focus on Human Safety" 2015 International Conference on Control, Instrumentation, Communication and Computational Technologies (lCCICCT).

2. Nikhil M. Dhandre, P. D. kamalasekaran, Pooja Pandey "Dam Parameters Monitoring System" 2016 IEEE.

3. Nitin Vijaykumar Swami, Vilas Malappa Jarali "Performance Measurement of Laser Communication Prototype in Free Space for Water Dam using ATmega328 and Comparison with ZigBee Technology" 2017 International Conference on Big Data, IoT and Data Science (BID) Vishwakarma Institute of Technology, Pune, Dec 20-22, 2017.

4. Herman Yuliandoko, Subono, Vivien Arief Wardhany, Sholeh Hadi Pramono, Ponco Siwindarto "Design of Flooding Detection System Based on Velocity and Water Level DAM with ESP8266" 2017 2nd International Conferences on Information Technology, Information Systems and Electrical Engineering (ICITISEE).

5. S.M. Saifur Rahman Faisal, Iftekhar Uddin Ahmed, Humayun Rashid, Remon Das, Md. Mobarak Karim, S M Taslim Reza "Design and Development of an Autonomous Floodgate using Arduino Uno and Motor Driver Controller" Proceedings of the 2017 4th International Conference on Advances in Electrical Engineering 28-30 September, 2017, Dhaka, Bangladesh.

6. Balaji.V, Akshaya.A, Jayashree.N, Karthika.T "Design of ZigBee based Wireless Sensor Network for early Flood Monitoring and Warning system" 2017 IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2017).

7. Bindu Shukla, Deepti P, Gowthami Vittal S, ManiDeepika JM, Lingaraj K "IoT Based Crack Detection and Protection for Dams" Proceedings of the IEEE 2017 International Conference on Computing Methodologies and Communication (ICCMC).

8. Yong Li, Yu Wang "Design and Implementation of Reservoir Dam Safety Monitoring Platform Based on ASP.NET*" 2017 IEEE

9. Tibin Mathew Thekkil, Dr.N.Prabakaran "Real-time WSN Based Early Flood Detection and Control Monitoring System" 2017 International Conference on Intelligent Computing, Instrumentation and Control Technologies (ICICICT).

10. Niteen Mohod "Usability of Internet of Things [IoT] For Dam Safety and Water Management" International Journal of Research in Advent Technology, Vol.5, No.1, January 2017.

11. Aniessa Rinny Asnaning, Septafiansyah Dwi Putra "Flood Early Warning System Using Cognitive Artificial Intelligence: The Design of AWLR Sensor" 2018 International Conference on Information Technology Systems and Innovation (ICITSI) Bandung - Fadang.

12. Mrunalini Bajare, Shraddha Kawade, Manali Kamble, Apurva Deshpande, Jayant D. Bokefode "Preventive Maintenance System for Dam Using IOT and Cloud" 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT).

13. C Chellaswamy, J Nisha, K Sivakumar, R Kaviya "An IoT Based Dam Water Management System for Agriculture" 2018 International Conference on Recent Trends in Electrical, Control and Communication (RTECC).

14. Sai Sreekar Siddula, P.C. Jain, Madhur Deo Upadhayay "Real Time Monitoring and Controlling of Water Level in Dams using IoT" 2018 IEEE 8th International Advance Computing Conference (IACC).

15. V. Sathya, Kshitij Arun, Harshitaa Mahajan, Amit Kumar Singh "Automate the Functioning of Dams Using IoT" 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC).

16. Albert Joshy Varghese, Abin Thomas Jolly, Astile Peter, Bhavana P Rajeev, K S Sajitha, Deepa Elizabeth George "IoT based Disaster Monitoring and Management System for Dams (IDMMSD)" 2019 1st International Conference on Innovations in Information and Communication Technology (ICIICT).