

## ✦ ABSTRACT

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**ABSTRACT:** Water plays an important role in our day to day life in various fields. Introduction of new methods to solve the water related problems includes adaptive management, remote sensing with the new concepts such as water security, global integration of information, etc. Recently, we can see an increasing amount of dam damage or failure due to aging, earthquakes occurrence and unusual changes in weather. For this reason, dam safety is gaining more importance than ever before in terms of disaster management at a national level. Therefore, the government is trying to come up with an array of legal actions to secure consistent dam safety. Other dam management organizations are also taking various institutional and technical measures for the same purpose.

When it comes to dam safety issues, there is hardly a set of rules for how and when water can be released and what should be the standard operating procedure in case sudden release is required. This project proposes an IoT based dam management system. In this, four ultrasonic sensors namely, temperature sensor, humidity sensor, water level sensor and rain sensor are used to monitor the state of dam. Node MCU is used to interface all the sensors and send the data to the cloud. Machine learning algorithm is designed to control the opening of doors of dam via a servo motor.

**Keyword:** Flood detection, IoT, Python, Embedded C, Node MCU, DNN

1. INTRODUCTION

Far ago, human based resistive mechanisms towards flood control open up multitude problems like dynamic reactions of prior alien about the risky situations and stage of current water level. The growth of Internet of Things (IoT) paved the significant attention in all fields. Today, droughts and floods are a common feature and their co-existence poses a potent threat, which cannot be eradicated but has to be managed. Transfer of the surplus monsoon water to areas of water deficit is a potential possibility. This would also help create additional irrigational potential, the generation of hydropower, as well as overcoming regional imbalances. From the recent floods in Kolhapur, Satara, etc we observed the severe conditions people had to face due to improper management of the Almatti dam situated on the Maharashtra - Karnataka border. Ample people and animals lost their lives, all the living standard was disturbed. Generally, local people lose their important contact with the river once a dam comes up on it. They are scared to go near it fearing for their lives. Dams can easily become a weapon of terror unlike the temple of development they are projected to be as they have the capacity to suddenly release a lot of water downstream. Keeping this scenario and recent incident in mind, there is a need to develop some proper dam management system. An IoT based dam management system is being developed in this project to avoid floods occurring due to improper management of opening and closing of doors of dam. An attempt to make a system to sense the temperature, humidity, water level and rain precipitation is made, depending on which the opening door percentage will be decided.

Node MCU is an IoT based platform which plays an important role in the project. Ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011.

Servo motor is used to control the opening and closing of doors of dam. Node MCU is an open source IoT platform, whose firmware is developed for ESP8266 wifi chip. This is used to interface the ultrasonic sensors the data from these sensors is sent on cloud for decision making stage that is designed using machine learning algorithm using python. The output of machine learning algorithm will be sent back to Node MCU which then will decide how much extent the doors of the dam should be opened. **LITERATURE REVIEW** As India faced recent devastating flood in Kerala, there arise a need of efficient flood monitoring system. Flood forecasting and the issuing of flood warnings are effective ways to reduce damage. The proposed system will be efficient because it has better coordination of monitoring, communication and transmission technologies which are adaptable to background condition. The proposed system in [1] also ensures increased accessibility for assessment of emergency situations and enhances effectiveness and efficiency in responding to catastrophic incidents. In summary, the proposed system would be beneficial to the community for decision making and evacuation planning purposes.

Flooding is a natural phenomenon which has attracted global attention because of its negative impact on the world. Developing nations such as Nigeria have been predicted to experience increased flood occurrence in the coming decade. The events of flooding are unlikely to change, however, its impact on our society can be very well reduced. Paper [2] focuses on providing early warning to areas likely to be ravaged by flood even using Wireless Sensor Network (WSN). The system involves the deployment of sensor nodes at specific flood vulnerable locations for real-time flood monitoring and detection. Flood events relating to flash flooding and run-off water or overflow are successfully monitored in real time which gives individuals plenty of time to prepare against predicted flood occurrence, saving them from the aftermath of flood disaster. The system was tested via simulation of different flood scenarios, and the outcome was efficient and accurate.

Flood is an unavoidable natural disaster in Mahanagar, India. Due to heavy flow of traffic and can also cause severe damage to properties and lives. For this reason, Kalpesh et al [3] created a flood detection system to monitor rising water in roads using ultrasonic sensor and a microcontroller. The sensor sends the level of water to Node MCU which converts the sensor's analog signal into a digital value of distance. The

User can get real-time information about monitoring flooded roads over SMS based service. Flood height is determined by subtracting the sensor's height from the flow meter's distance between the sensor and the hot water. Updates on the height of the water level will be texted to the rescue team (Local Government) and to the



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## IIL PROPOSED SYSTEM

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be in place for downstream and technical infrastructure should be invented and adopted to ensure the safety of the dam and the life and property of people downstream by identifying vulnerable points and setting up signboards, hooters, sirens and mobile vans equipped with a Public Address (PA) system.

For detecting changes in humidity and temperature the system has a DHT16 Digital Temperature Humidity Sensor. It is an advanced sensor module which consists of resistive humidity and temperature detection components. The sensor is always under observation by a float sensor, which works by opening and closing circuit (dry contact) as water level rises and falls. Normally, it is in the closed position, meaning the circuit is intact and no electricity is passing through the wires yet. Once the water level drops below a predetermined point, the circuit completes itself and sends a signal through the microcontroller to trigger an alarm. The flow sensor on the system keeps a check on the flow of water. The water flow sensor consists of a plastic body, a wheel rotor, and a hall-effect magnet. When water flows through the rotor, the rotor rolls. Its speed changes with different rate of flow. The system also consists of an HC-SR04 Ultrasonic Range Finder Distance Sensor. The Ultrasonic sensor works on the principle of SONAR and is designed to measure the distance using ultrasonic wave to determine the distance of an object from the sensor. Flow sensor calculates flow of water in dam and from whose value Arduino decides width for opening of gates of dam. All the sensors are connected to Node MCU controller, which is a Raspberry Pi 3. The system has Wi-Fi feature, which is useful to access the system and its data over IoT.

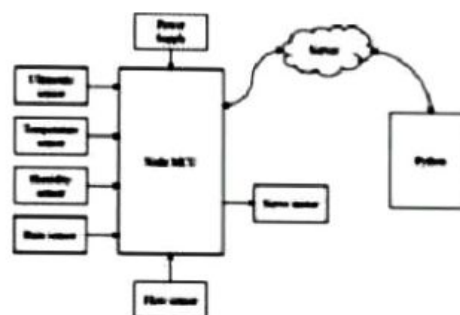


Fig block diagram of proposed system

Firestore server is used as a mediator between hardware (Node MCU) and software (Python). Node MCU sends data to server. Python fetches different values of sensor from server. MATLAB levelling algorithm is used to predict flood condition and accordingly gate of dam or other remains closed or open.

IV. CONCLUSION It has been observed that wireless sensor network based dam monitoring systems are low cost, until it is not easily reliable. But the system cannot be used for large area because each node is usually energized by energy limited battery. This paper performs survey of various environmental and flood disaster detection & monitoring systems and different communication technologies which help to improve upon the effective flood detection and flood warning problem. So in the near future, these systems with highly reliable sensor and effective IoT cloud platform will certainly be used for large scale environmental monitoring and disaster prevention.

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