# Unmanned Dam Monitoring System Using Wireless Sensor Networks

**P. Rajesh, N. Manjunathan, A. Suresh**

***Abstract:*** ***Water is the most essential and foremost constituent for all the organisms living in the earth. Sometimes it would be the major reason for the demolishment of lives when the needed level is increased. This resource is available through low, moderate and high level rainfall and it is preserved in various places for future usages. In this paper we discuss about the disaster caused by water stored in dam. When the storage level of the dam is increased, it is expelled or released without any alarm as a result it squashes many of the lives. Our main focus is to issue alarms before releasing the water from dam. We use an unmanned method using wireless sensor technique to monitor the water level continuously, if it reaches the saturation point (extreme storage level), we propose 3 alarming facilities, as 1. Sending message to the people located in the area, 2. Provide audio alarm which is battery enabled 3. Make drone alarming (UAV) to all the people. After the alarming process is done the shutters of the dam is released to expel the water.***

***Index Terms*****: *Dam monitoring, Drones, Shutters, Unmanned***

## I. INTRODUCTION

Dams are ordinarily developed with a deplete or comparative system to control water levels in an impoundment for ordinary maintenance or emergency purposes. By definition, a calamity is any occasion that causes awesome mischief or harm, genuine or sudden setback. Dams require certain subordinate structures and offices to empower them to release their operational capacity securely and adequately. Now a days regrettable state of dams may prompt serious dangers to living creatures. So here we present an auto control, unmanned dam level observing mechanism to control the dam. The present Lake Vigilant method always needs human intervention .They cannot work in self-governing method and never permit any prearranged process and always needs an official to work with them constantly A smart emergency system for calamity monitoring and evacuating people during disasters is a vital application area in wireless sensor networks technology. Using sensors, such a framework can give more essential and reliable warning to all going to face disaster and furthermore lessen the episodes of false cautions.

A few savvy observing and cautioning methods do as of now exist, however they show key shortcomings, for example, a fall in network coverage during heavy and dense rainfall restricts in sending and receiving alarm messages, which have not yet been adequately tended to.servicestrategy for people by using Unmanned Aerial Vehicles (UAV).

## II. ARCHITECTURE OF PROPOSED WORK.

Our article proposes a viable and productive way to save living creatures living around water reservoirs, dams and lakes. This proposed system can be implemented in all areas which do store water during dense rainfall. During water disaster many of the lives are wasted due to un infirmity of the disaster or improper communication. This improper communication may be due to wrong prediction or due lack of time for prediction.it is proposed that Unmanned and quicker prediction and sending alert may save numerous living cretaures. For that to achieve we choose WSN-Wireless sensor networks to be deployed in the place where alert to be needed. This method of monitoring is purely unmanned

Let us consider a Dam throughout this paper for our understanding purpose. If the dam is full its storage capacity has to reduced else it would cause a very serious flaw. While reducing or releasing water from the dam, it has to be properly intimated to the people in advance for evacuation. We deploy a WSN around the dam area , these sensor networks are combined with various components involved in this experimental case study. We get the guidance and usage of some basic components like a DC motor to pull the shutters ,alarming devices like wireless battery and wi fi enabled speakers, assistance of nearby radio stations, Mobile communication network, and specifically a Drone.

Actually the monitoring system involves a WSN which is designed to send signal to the motor which is connected to the shutters of the Dam. It monitors the water level in two levels Safety Level (SL) and Warning Level (WL).During dense rainfall the level of the dam will abruptly increase where no human can monitor the water level even though it during day time. As a traditional method a Scale is used to mark the water level, monitoring and calculating it is a tedious process.

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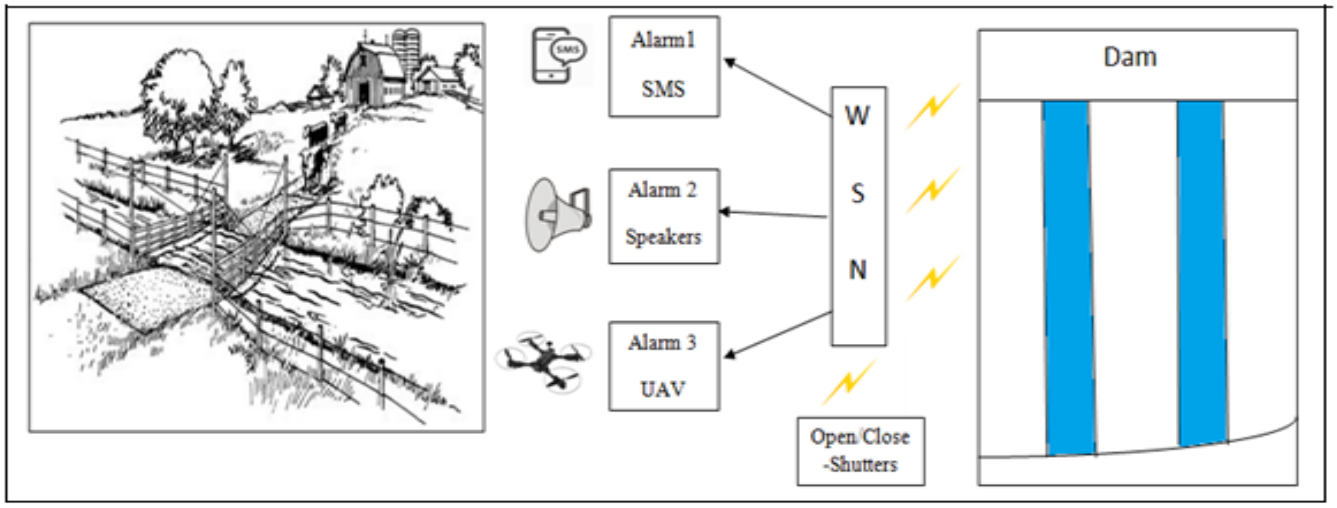


**Fig: 1 Architecture of the proposed Framework**

### III. FLOW DIAGRAM

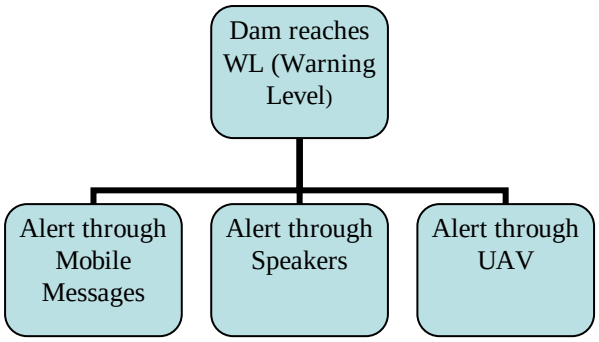


**Fig: 2 Flow diagram for Alarming**

This WSN monitors the level until SL no alarming is issued to public to avoid un necessary panic and havoc. But preliminary information are forwarded regarding the dam capacity and possibility of disaster to the Communication network, we use mobile and radio communications to set the process ready.

As soon as the water level reaches the Warning level the WSN issues alarm to Mobile Communication network, where the network may send alert to all its registered mobile users (Alarm1). Since a heavy rainfall would cause failure of network, hence a WSN is enabled and connected with Wi-Fi enabled Battery Speakers to intimate the disaster (Alarm 2). We are aware that the speakers connected are prone to failures and since utmost responsibility is to secure the people from disaster we include an UAV technology (Alarm 3).

The Unmanned aerial vehicle (UAV) is an open-source multirotor mechanical device capable of vertical takeoff and landing on both solid terrain and water for alarming. The propulsion system of UAV is designed in such a way it may drift along the water surface to enable the active control .This low power locomotion method, novel to such a vehicle, it aims to extend the available operation on the required surface and location.Now the WSN issues signals to the motor connected to the dam shutters. Now the shutters are released for expelling the water stored.

### IV. RELEASE OF SHUTTERS

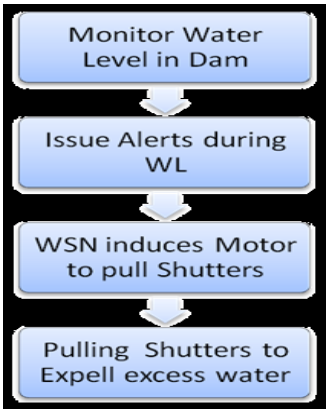


**Fig:3 Flow Diagrams for Pulling the Shutters**

Hence this is a Novel approach to handle the dam when it reaches the unsafe level. This method of evacuation and expelling the dam water does not need any human intervention. Life of human can be saved without the intervention of Human.

4. Wireless Sensor networks (WSN)

WSN is a remote framework including spatially scattered self-decision gadget which is utilized to adequately screen physical or natural conditions. These independent gadgets, or hubs, join with routers, switches and a gateway to make a run of the mill WSN framework. The dispersed estimation hubs convey remotely to a focal portal, which gives an association with the wired reality where you can gather, process, investigate, and present the information

**Fig: 4.View of a WSN Installed around the Dam Location**

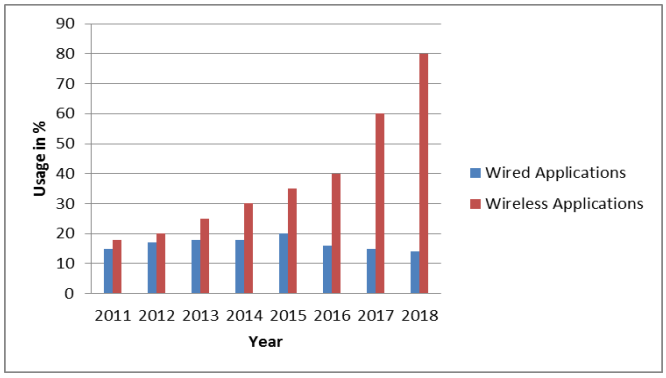


**Fig: 5 Graph predicting the increase in Usage of Wireless applications compared with Wired applications**

A WSN can be characterized as a system of gadgets, indicated as hubs, which can detect the earth and impart the data assembled from the observed field (e.g., a territory or volume) through remote connections. The information is sent, perhaps by means of various jumps, to a sink (at times meant as controller or screen) that can utilize it locally or is associated with different systems (e.g., the Internet) through a door. The nodes can be stationary or moving.

## V. DRONES

A drone is an inventive setting, and an unmanned carrier. They are all the more formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft System (UASes).Basically, an it is a flying robot. It may be remotely controlled or can fly self-rulingly through programming controlled flight structures in their introduced systems working identified with accessible sensors and GPS

**Fig:6 A Simple Drone Automaton**

A drone is a quadrotor. The mechanical structure contains four rotors appended to the four closures of an intersection to which the battery and the RF equipment are connected. Each match of inverse rotors is turning a similar way. One sets is turning clockwise while the other in its opposite direction

### *A. Drone Rotations*

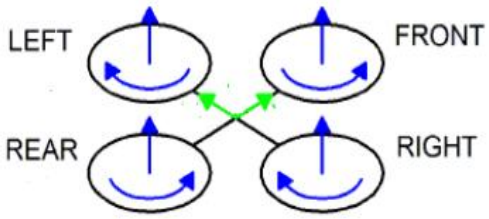


Fig 7: Drone Rotational Directions

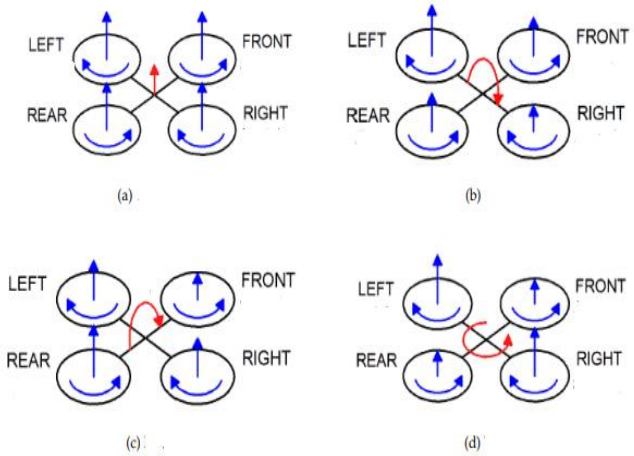


**Fig:8.(a) Throttle (b)Roll (c)pitch (d)Yaw**

## VI. DRONE TYPES

### *A Fixed-Wing Systems*

Fixed wing kind of drones are generally utilized in aeronautics industry to characterize air ship that makes use of fixed and static wings to expand the airspeed to lift the drone. A good example of this type is broadly used Raven , it is a lightweight automaton intended for rapid organization and high versatility for military applications which requires low-elevation observation and surveillance knowledge.

### *B Multirotor Systems*

Multirotor frameworks are a subset of rotorcraft. It is utilized in flight to improve the effiency of air ship that uses rotating wings to produce lift. Drones that utilize rotational frameworks are generally equipped with various little rotors, which guarantees greater stability; hence it is named as multirotor Systems. Normally, it utilizes something like four rotors to keep them flying. In view of the applications naïve users can also utilize the automaton. For example, multirotor drones can work without a runway, and it produces noise in lesser ratio than their fixed wing partners and could drift all around the air.

## VII. DRONE MODELS

### *A. Delfly Explorer*

The Delfly Explorer drone is an ornithopter The Delft University of Technology in Netherlands developed a drone which resembles a dragon fly while flying.

It can take-off and fly autonomously inside a closed environment. It utilizes two cameras to detect obstacles. The significant utilization of these kind of drones are it could be utilized for observation and air photography.

### *B. Hubsan X4.*

The Hubsan x4 is a tiny multirotor drone created by the Chinese organization Hubsan. It is extremely basic in its structure pattern and in task. Four rotors with a controller is used to execute this type of drones. A few drones of these x4 accompany an inherent camera for making pictures and recording video. By and by these sort of automatons are moderately cheap for the drones to be developed in advance.

### *C Parrot AR.*

The Parrot drone is basically designed for recreational purposes. The multi rotor arrangement of this type can be controlled by a cell phone or tablet. It has two cameras, it could also pair with Bluetooth, Wireless Fidelity (WiFi) technology and uses global positioning system (GPS)-waypoints to fly in the customized or pre modified route or path. It is additionally joined with gaming programming, making its accentuation on entertainment more clear.

### *D Scan Eagle*

The Scan Eagle is a settled wing drift developed during 2004 and is fundamentally an observation gadget. These types of drones are furnished with an optic and infrared camera and can work for more than 20 h. It is 3.1 m in width, 1.2 m long, measures 18 kg and has a cruising speed of 89 km/h. The machine can be impelled by pneumatic weight and it could touch base with a skyhook structure, separating the drone out of the air. In this way, a runway isn't fundamental. Rather it requires little space to arrive or depart

### *E Drones with Speakers.*

The weight, model, and essentialness wellspring of the drones are the main issue influencing its most outrageous tallness, flight length, flight range, and most noteworthy payload. A basic characterization of payloads is sensors. Most drones are nowadays outfitted with cameras and Speakers. Cameras, receivers and speakers are the routinely used payloads for drones. Speakers can be associated with a wide range of drones to disperse messages.

## VIII. Advantages of the Prototype

Unmanned monitoring has many advantages:
*Unmanned:* The monitoring system works using wireless network and it can be operated without human intervention hence it saves time, money, and especially lives.
*Real time Implementation*: The set up can be implemented in real time.
*Robust:* WSN is robust when compared with wired cables when using cable sensors, if few cables connected fails or breaks the entire system stops working.
*Reduced cost:* This system reduces the number of people being to take part in this process. As a traditional method boats are involved and hired in hour basis to take measurements and hence it reduces the equipment cost. Without having the intervention of boat riders and life guard devices.
*Faster Reaction*: Wireless sensor networks can act once the warning level is sensed and it react faster for alarming
*Less prone to errors*: If system fails debugging is easier and could be replaced within less span of time.
*Reduced maintenance*: The system requires low maintenance on and off using it.
*Manageable:* The entire framework and the WSN can be more easily managed.
*Remote access:* Drones for alarming which can be used in all remote areas

## IX. Analysis and Discussion

A WSN based arrangement is proposed, for checking the water level, release of water from the reservoir and organize with the end goal of fiasco observing and saving lives. Our prototype introduces a WSN organized framework for dam control and its water level maintenance. The test set up is manufactured to check the achievability and through discussions it is discovered that framework is works effectively. The framework has minimal effort, low power, more extensive inclusion, and particularly the character of versatility on wiring to evacuate the confinement of customary wired system framework for dam checking.

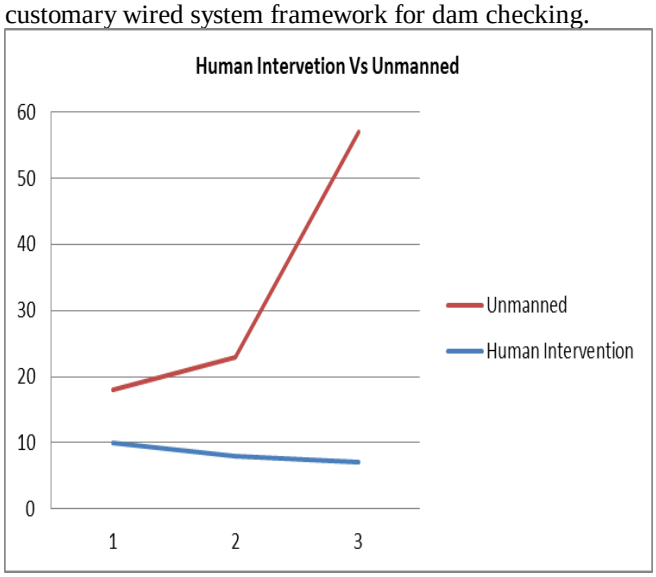


**Fig 9: Human Intervention Vs Unmanned. Increased line in Graph shows Human Intervention in the proposed framework is reduced**

## X. Conclusion and Future Enhancement.

Our upcoming invention will try to implement the WSN framework to be vigilant in monitoring various environments which are prone to human disaster like monitoring huge dams and pipelines which carries gas and oil for long distance in one end goal to save human lives from unexpected natural calamities

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