

Integrated Automatic Flood Warning and Alert System using IoT

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Abstract – In India there is no alert system when the doors of the dams are opened or when there is high possibilities for a flood to occur. The system in India is manual which is one the biggest problem. Due to sudden opening of doors the villages near the area are highly affected. It costs financial issue as well as lives. The proposed system is a prototype system which can be installed in the catchment areas of dam which will effectively work as alert system which will inform the pedestals about the doors position as well as flood due to water rise in the catchment areas. This system will consist of SMS alert system, Public announcement system. A centralized website will be proved efficient and useful for the Government authority which will show the status of door all over the dams in India.

Keywords: Dams, Doors, Centralized Website, Sensors, IOT, Humidity, temperature, water level, Arduino

1. INTRODUCTION

Currently in India there is no automated system for dams. As when necessary the dam doors are opened without any prior alert to the people living in that vicinity. Flood causes in dams damages crops and also entire family. According to a article, dams played a crucial role in number of floods in Kerala in 2018. There are many factors confined with these floods like access rainfall, cloud burst but poor

2.1 Public Address System

ZS6010 Water Level Sensor will be the primary sensor for overall operation. Arduino Development Board #1 (ADB#1) will continuously fetch the data from Water Level Sensor to sense changes in water level of the reservoir of the Hydro Projects upstream (HPS) or through the river in case of flash floods. Threshold level will be defined and programmed in ADB#1 and it will produce output if the water level rises beyond that threshold level. This output will be transmitted to Arduino Development Board #2 (ADB#2) which is acting as a core of Public Address System. ADB#2 will take action as per the input from ADB#1 and will drive Sirens as well as control the speakers and displays.

provision and implementation of these man-made dams are having a great impact on foods. They need to be controlled carefully in order to control these not so natural floods. The Tiger Dam in India saw a failure due to overloaded water in the catchment area. The Panshet Dam in pun, India caused a flood due to pressure to rain water. The proposed system is a fail proof system which will initially check on the water level of catchment area, if the water level rises above threshold level a Public alert system will be initiated which will include SMS to the people in dam vicinity and siren as well as LCD screen. The mobile number will be fetched using a login credential which everyone has to do while entering the city. This system will continuously monitor the flow of water, humidity, temperature and display it on the LCD screen.

2. PROPOSED SYSTEM

The proposed prototype will be automatically controlled using multiple open-source hardware. Here, we will be using Arduino boards to implement our idea. As described in the structure above, there will be a Centralized Control Unit (CCU) which will control overall operation and handle the communication between cloud and itself. Further, this prototype is divided into 4 sections, each section will work as a crucial part and will perform specific task as programmed. All sections are described as below:

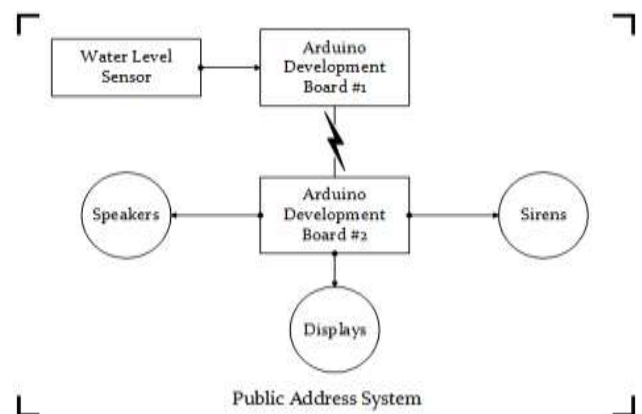


Fig: 2.1

Connection between ADB#1 & ADB#2 is implemented using the pair of 433MHz ASK RF Transmitter/Receiver modules. ADB#1 will only send a control signal to ADB#2. All the data which is to be displayed and driven by speakers will be programmed in ADB#2. After the duration of 10 minutes post-indication (actual time after

implementation of real scale project will be more), doors of the dam will be opened automatically. As the water level goes below the threshold level then doors will be closed automatically. Siren and Speakers will shut down post-event. If the concerned authority wants to open or close the doors of the dam, they can use a manual switch provided for this purpose.

2.2 Telecom Network for SMS Alerts.

With inclusion of Public Address System, SMS Alerts will be broadcasted to the users among the vicinity of the HPS or flash flood area. The idea behind this is that, people present at the HPS, those who possesses smart phones will have to login to our central server using a simple web interface provided to them which will record their mobile numbers. These mobile numbers will be stored on the central database. If HPS doors operations or any other fatal events occur then the SMS alerts will be sent to the mobile numbers stored in the central database.

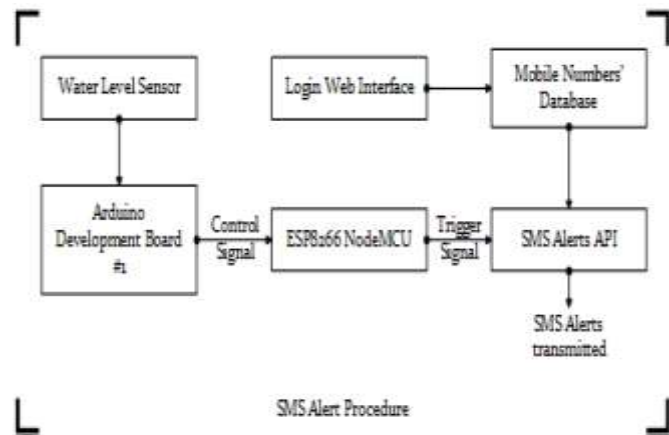


Fig: 2.2

SMS alerts operation will be implemented on software basis. Means, only control signal related to event will be used from the ADB#1 to trigger the API of SMS alerts procedure which will be initiated by ESP8266 NodeMCU followed by the execution of Simple API of SMS procedure, contains PHP Script. At the end of the day, Central database will delete the stored mobile numbers during the active period so that SMS alerts will not be broadcasted to those who left the vicinity of HPS.

2.3 Central Database connecting all HPS in the country.

This section comes under the Communication Unit and Local Database Block (CULDB). ESP8266 NodeMCU is used as a CULDB. ESP8266 NodeMCU is kind of Arduino Development Board with the WIFI Module included which will be utilized to connect CCU with the Central Database on the cloud.

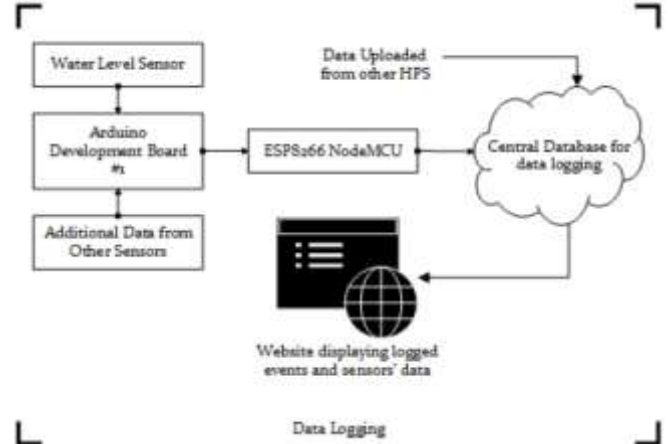


Fig: 2.3

All the events occurring in the CCU like raising water level in the HPS reservoir, event of Dam door opening and closing, Humidity and Temperature of the atmosphere as well as temperature of water around the HPS will be logged into the central database connecting all HPS in the country. Real time clock module DS1307 will be used to append all the events with the exact time of event occurrence. This recorded data will be used for the future research or statistical purposes. A website will be created in which the logged data will be displayed to the Government Bodies or to the Citizens of the Country. Application Programming Interface (API) will be created to parse the data from the CCU with the Server. PHP which is a Hypertext Preprocessor language will be used to create different APIs.

2.4 General Data

The proposed warning system will also have a prediction of rise in water level due to rainfall happening in the catchment of dam or river. PCR800 wireless rain gauge will be used to track the volume of the rainfall at the catchment and the output of this rain gauge will be used to calculate the expected rise in water level at the reservoir of dam. This expected volume of water will be released from the reservoir with low velocity which will prevent the flood like situations. During this event, people around the catchment of the dam or river will be warned about the situation at the earliest so that rehabilitation steps can be taken. Also, event will be logged on the central database.

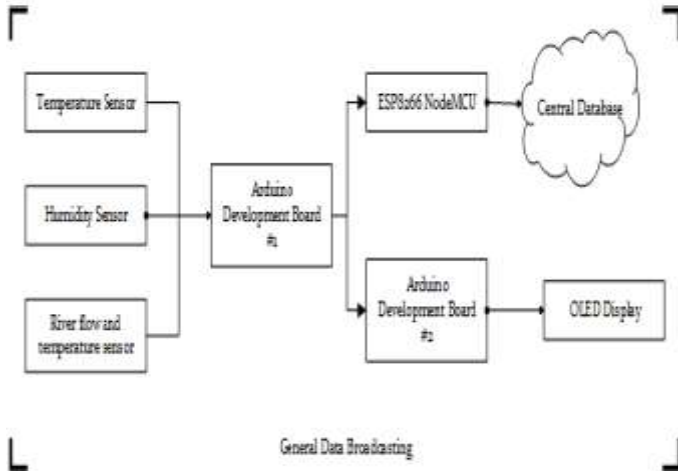


Fig: 2.4

In addition to the mainstream prototype, some of the additional data will be displayed on OLED display as well as it will be sent through SMS alerts to the people or tourists within the vicinity of HPS. Additional data will be the humidity and temperature of atmosphere as well as the temperature of water from the stream. The flow of water will also be recorded to avoid accidental drowning in the river stream. All sensors will be connected to the ADB#1 for processing and recording purposes.

3. CONCLUSION.

This proposed flood warning system is prototype and can be further modified using AI system. In future the person doesn't have to logging in any website and his/her number will be detected automatically and SMS will be sent as long as the person is in the area. The SMS will be stopped as soon as the person leaves. AI can be used to predict future rains and Water level rise so that early precaution could be taken. A system can be designed to send updates via SMS like temperature, Flow of water whether it is safe for tourist to down and take a swim.

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