WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Flood Monitoring and Alerting System

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A B S T R A C T

Flooding is one of the major disasters occurring in various parts of the world. The system for real-time monitoring of water conditions: water level; flow; and precipitation level, was developed to be employed in monitoring flood in Nakhon Si Thammarat, a southern province in Thailand. The two main objectives of the developed system is to serve 1) as information channel for flooding between the involved authorities and experts to enhance their responsibilities and collaboration and 2) as a web based information source for the public, responding to their need for information on water condition and flooding. The developed system is composed of three major components: sensor network, processing/transmission unit, and database/ application server. These real-time data of water condition can be monitored remotely by utilizing wireless sensors network that utilizes the mobile General Packet Radio Service (GPRS) communication in order to transmit measured data to the application server. We implemented a so-called VirtualCOM, a middleware that enables application server to communicate with the remote sensors connected to a GPRS data unit (GDU). With VirtualCOM, a GDU behaves as if it is a cable directly connected the remote sensors to the application server. The application server is a web-based system implemented using PHP and JAVA as the web application and MySQL as its relational database. Users can view real-time water condition as well as the forecasting of the water condition directly from the web via web browser or via WAP. The developed system has demonstrated the applicability of today's sensors in wirelessly monitor real-time water conditions

Keywords:Flood, Monitoring, Alert, Sensor Network, GRPS

1. INTRODUCTION

1.1. Project Overview

Floods are common and most occurring natural disasters in India. When rivers overflow their banks they cause damage to lives, property, infrastructure and crops. Floods usually are local, short-lived events that can happen suddenly and sometimes with little or no warning. Rivers can also flood its surroundings when the dams fail, when ice or a landslide temporarily block the course of the river channel or when in some cases snow melts rapidly. When rivers overflow, they normally channel water flow over the land where people live it causes a flood. Again, when the river overflows a land where people do not live then it is not that danger to any sort of property or harm to human life. The flood may be due to heavy rain at the catchment, melting of snow, cloudburst etc. Some reason can be cloudburst it generally takes place in hilly areas and results in flash floods. Floods can also occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends or meanders in the waterway. Floods often cause damage to

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homes and businesses if they are in the natural flood plains of rivers. While riverine flood damage can be eliminated by moving away from rivers and other bodies of water, people have traditionally lived and worked by rivers because the land is usually flat and fertile and because rivers provide easy travel and access to commerce and industry. Flooding can lead to secondary consequences in addition to damage to property, such as long-term displacement of residents and creating increased spread of waterborne diseases and vector-borne diseases transmitted by mosquitos. As floods can cause all this damage to the environment and people the project idea is brought to implementation.

1.2. Objectives of Project

- To monitor the changes in water levels from rains and other reasons.
- To predict the upcoming final water increase in certain reservoir.
- To save life by alerting people, support and emergency services to prepare for flooding.
- To reduce the property loss caused by floods.

1.3. Scope of Project

In order to solve the problems brought about by floods, the project aims to develop a device that would contain the following features: It will utilize ultrasonic sensors to measure the level of water in certain reservoirs. It will also include sensors that will display the actual water levels, we can view real-time data of flooding through the application, including communication to send warning notifications with the content of date, time, water level, and rain. The system has three modules including receiving sensor data, posting data from microcontroller, and receiving data from the server. The position of the sensor must be placed perpendicular to the flood water; otherwise, there will be an imperfect reflection of ultrasonic waves and cause measurement errors. The sensor is suggested to be placed on a pole with a height of about 3 to 3.5 meters. The flood sensors and the raspberry pie will be powered by a battery of 12v or higher and a Solar Panel to charge it without any external charge for the benefit of continuous operation of water level detection from that certain height subtracting the most highest-level water, sending data via network data transmission.

2. LITERATURE REVIEW

1. **Flood Monitoring and Alerting System .Author: Kavita Joshi, AmrutaJanugade, ShrutiWalikar, Anuja Padwal.**

   Natural disaster happens everywhere in the world, the can be Completely disturbing the human life and the economy of the Country. Economy and growth of any country depend upon Agriculture alert forecasting makes the farmer to protect the crop from flooding. The system is much advantaged for protecting lives of people and animal. The proposed model is very much utilized for monitoring of the water level, flow variance in rivers and the same can be used for measuring water level at dam or on river bridges .The project mainly constitutes a wireless sensor to monitor water condition.
2. **Flood Alerting System Through Water Level Meter.Author : Sophia S**.

   The IOT enables items to be detected as well as controlled remotely crosswise over existing system framework, making open doors for more , straightforward mix of the physical world into PC based frameworks, and bringing about enhanced effectiveness, precision and monetary advantage notwithstanding decreased human intervention.
3. **The Design And Implementation of a Wireless Flood Monitoring system**. **Author: YasirHashim, Abdul Hafiz Bin**.

   Electronics devices play an important role in our modern lives, especially the automated based electronics devices. Advances in electronics devices towards. Nano-dimensions leads to improve microcontrollers architecture and its ability in processing data. Climate changes are one of the major issues that have mind boggled the world leaders, it effects thinning of the ozone layer which causes melting of the polar ice cap that raises the sea level which leads to weather abnormality. Flash floods are one of the minor abnormalities that also causes damage, but the impact on human lives is preventable.

3. METHODOLOGY /SYSTEM DEVELOPMENT

3.1. Software Requirement

- Operating System : Microcontroller
- Language : Embedded C,java
- Front End : Embedded C.

- Think-speak : Server.
- Adroid studio : Application creation

3.2. Hardware Requirement

- Semiconductors:
  (1) IC1 - 7805, 5V regulator
  (2) IC2 - ATmega328 microcontroller
  (3) IC3 - LM1117-33, 3.3 voltage
- Regulator:
  (1) IC4 - HT12E, 212 series encoder
  (2) IC5 - HT12D, 212 series decoder
  (3) IC6 - L293D, dual H-bridge motor
- Resistors (all 1/4-watt, ±5% carbon):
  (1) R1 - 1-mega-ohm
  (2) R2 - 10-kilo-ohm
  (3) 750-kilo-ohm.
  (4) R4-R7 - 220-ohm
  (5) R3 R8 - 47-kilo-ohm

3.3. Functional Requirement:

1) Continuous collect data of water level to further calculation and send it to server.
2) Prediction of increasing water levels in reservoir from the rapid increase in water levels and with the help of rain data we collect.
3) Alert on increasing water level.
4) Alert about danger water levels and no risk water levels.
5)

4. Feasibility Study

The most important part of every system is feasibility study. The three major areas are considered while determining the feasibility of project are: -
1.Technical feasibility
2.Economic feasibility
3.Operational feasibility

1.Technical feasibility: It considers around existing computer system & to what extent it can support the proposed addition. The aim of technical feasibility study can provide to solution that is expected.

2.Economic feasibility: Economic feasibility mostly includes the profit if proposed system. When we are going to decide the economic feasibility. We must consider different points in accounts and they cost of computer hardware, software, system analysis and design, programming training, installing, operating cost, etc. In short this is related to economy. Economic analysis is the most frequently method for evaluation of the effectiveness system. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company.
3.Operational feasibility: - This focuses on willingness and ability of management, it others of an organization to operate. Use supports a proposed system that is this feasibility focuses capacity of users. Since the system will be computerized, it will help organization by reducing the voluminous manual proper work involved in the existing system. Retrieval of information will be easier as all information will be stored in a database. The system will also be user friendly

5. FLOW CHART

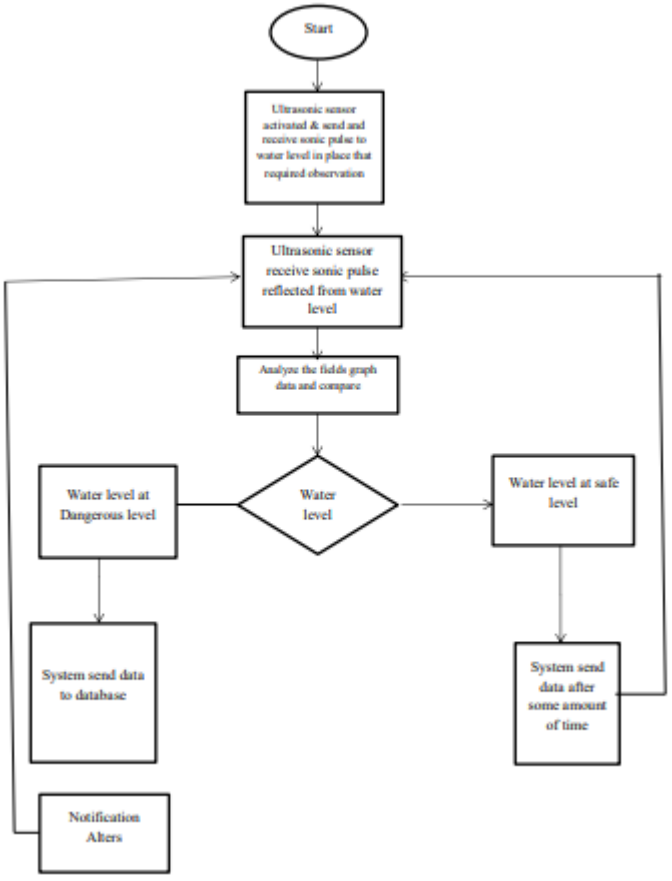

Fig.1. Flow Chart

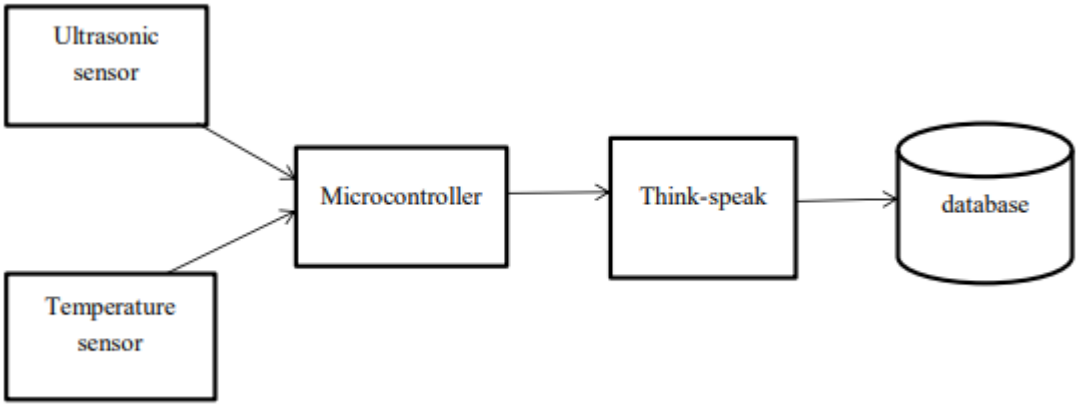

Fig.2. System Architecture

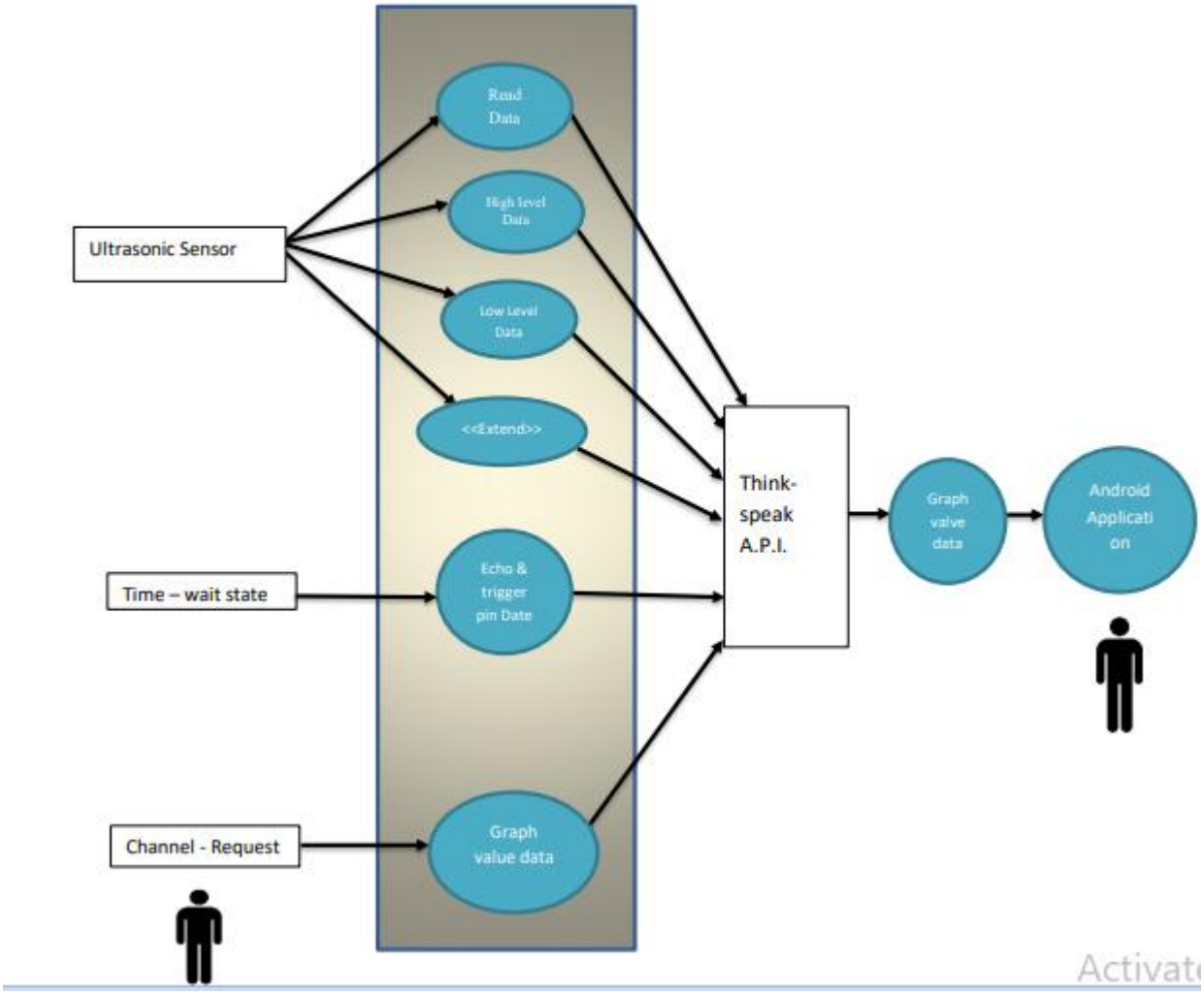

Fig.3. Use Case Diagram

6. RESULTS AND DISCUSSIONS

a) **Water level Monitoring Section:** Wireless Water Level Indicator Using Ultrasonic sensor & microcontroller is an amazing and very useful project. The objective of this project is to notify the user the amount of water that is present in the water reservoir. This project can be further enhanced to send data of level linked with some of the applications we are going to use. Thus, the water level indicator helps in detection of increase in water levels at water reservoirs. This project is wireless except if there is an ethernet internet connection so, it is easy to install. The trigger pin of the ultrasonic sensor is connected with microprocessor. While the echo pin of the ultrasonic sensor is connected to microprocessor pin 7 and 14 The VCC and GND pins of the ultrasonic sensor are connected with to microprocessor with ground pins.

b) **Data transmission Section:** This module in particularly deals with the steps that the data is produced and after that is transmitted to think speak which is raw point level data which will be formed in form of graphs the point will be added then next data taken after increase , steady or decrease in data occurred in added certain time will again be added to next field and the data will be next forwarded to the application where we linked the outputs of data i.e. the data will show on android application to the users.

c) **Level Status Prediction:** This is one of the most promising modules of our system. In this module, we use the data of rain and current water levels to calculate the forthcoming water level data that is recorded by our system along with any level changing water level manner to predict the water level that will go to a certain extent of that reservoir. The programming in microprocessor is done in python language and it sends the

data related to the water level to the server connected via Internet to the think speak server. The think speak will send the data to the application and the code designed will compare the levels of water the increasing speed of water and the if there is rain the rainfall water increase and make a prediction that will tell us upcoming water level there's also an notification alert if it detects any danger of flood it will notify an alert notification with a tone so that the people will get aware of the situation.

7. SNAPSHOTS

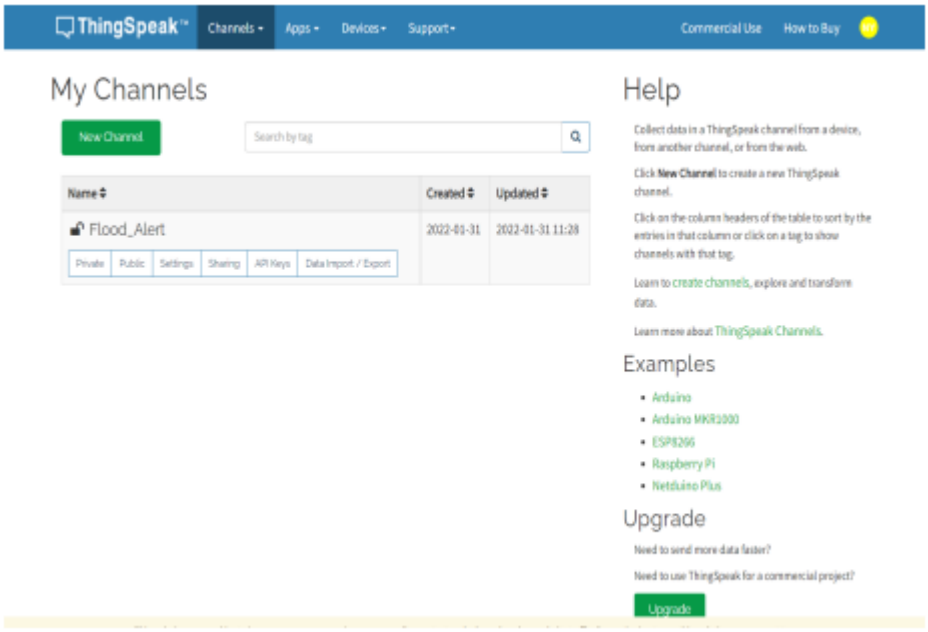

Fig.4. Snapshot 1

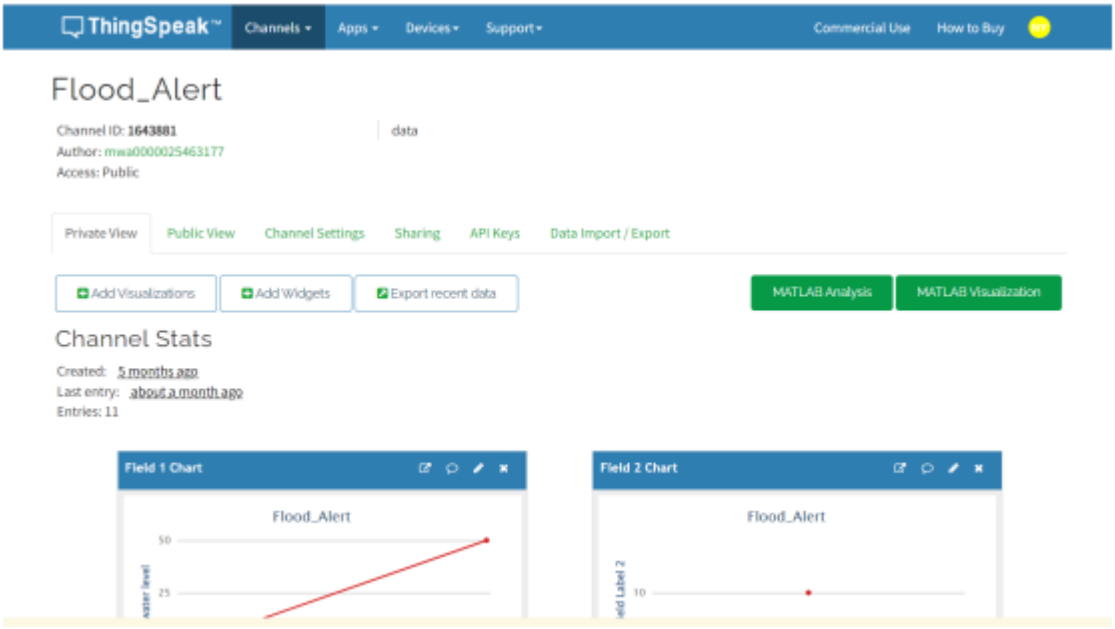

Fig.5.Snapshot 2

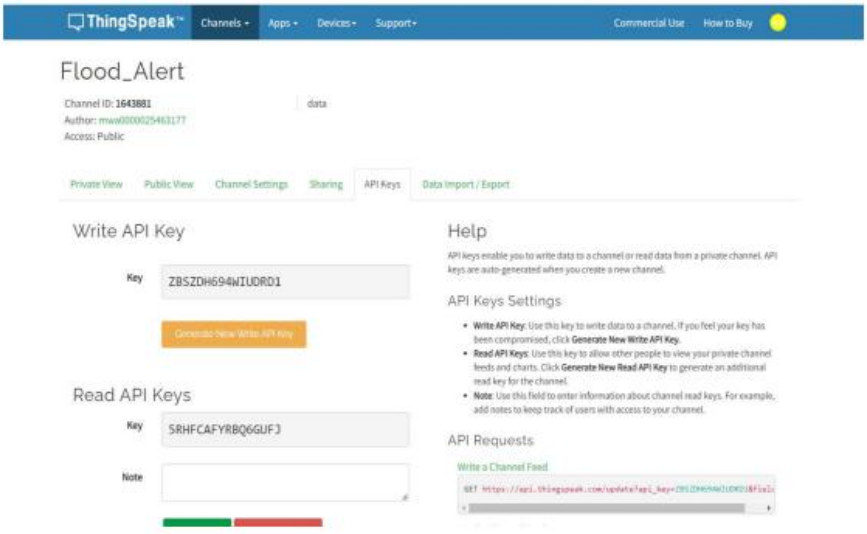

Fig.6. Snopshot 3

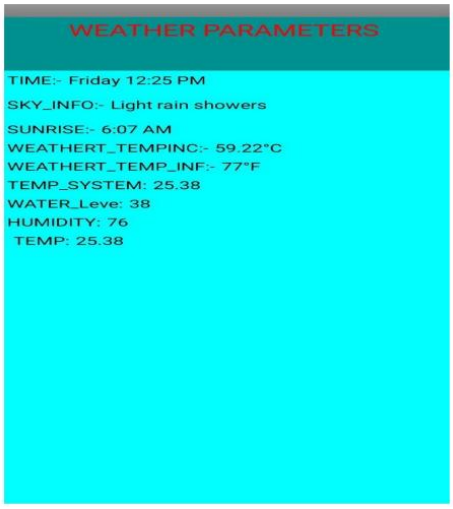

Fig.7. Snapshot 4

8. CONCLUSION

This product is designed such that it can cater the general public which is not aware of the scenario and need assistance in the time of flood. The application does not require any bulky technical knowledge prior to use it. Area code knob and frequency generation for signal transmission is done via the help of internet we can say with the help of IOT. Receiver receives the data and decrypts the information for upcoming water level predictions. People will be able to analyze the level of water through this application, and the system will alert them if the water level rises dangerously

9. FUTURE SCOPE

Further studies on wireless sensor technology will be best to replace the current sensors. Precise and accurate detection of water level will improve the data collection system for the monitoring station. The flood alert information's can be displayed on LED display boards for road users and for safety reasons could be placed at strategic locations. Such information's should be in real time and transmitted wirelessly from the measured location. A possible means of power supply for the sensors and centralized control unit is via solar cells. The Flood Monitoring and Alerting System will be easy to install and maintained if it is powered by solar cells. The use of solar energy will also provide cheaper source of power to the entire system.

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