Flood Monitoring and Alerting System based on IOT

Harshali S. Mali (IT Third Year), Ashwini R. Marathe (IT Third Year), Priyanka K. Patil (IT Third Year)

Guide name: Mr. Harshad Patil

G.H.Raisoni College of Engineering and Management Jalgaon

Department of Information And Technology

ABSTRACT

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.

I. INTRODUCTION

Flood occurs when water overflows from the river, lake or from heavy rainfall and it can happen at any time of the year. Flooding can be very dangerous, when floods happen in an area that people live, the water carries along objects like houses, cars, furniture and even people. It can wipe away property, trees and many more heavy items. For years, flooded roads have been a problem in Metro Mumbai. It causes heavy flow of traffic. Both motorists and commuters are getting stuck in a flooded areas and getting lost in finding possible routes just to go to their destinations. When traffic happened, people's money, time and effort are wasted. Through the local government unit flood control has been extending their efforts to inform the commuters regarding the situation in flooded areas during rainy season, still the dissemination of information to the locals are not enough. For this reason, the "Arduino Flood Detector System" is been develop, to help the road user to avoid this problem happened. It was invented based on problem faced by motorists and commuters when flood occurred. This will avoid the traffic jam because the users have a time to find a possible routes before they are going to be stuck at the flood area. The system will function when the admin activate the system and when water along the road detected by distance over ultrasonic sensor. When the flood occur, the ultrasonic sensor will sent signal to the microprocessor circuit and the sense water level will be display in the user interface and it will automatically send a Short Message Service (SMS) to those recognized residents and it will continue update until the water level detected returns to normal. The process repeats as the water level continuous to rise. The idea of an SMS based warning system was proposed because mobile phones have become a popular communication device among people all over the world. All mobile phone are able to communicate because it comprises of a GSM. This system used to detect the current water level of flood around the road and will give real-time information to the motorists or commuters that has still not passing through the flooded areas to avoid problem.

II. MOTIVATION

This flood monitoring system is designed and developed to warn and alert both authority and the owners of the vehicles about the flood almost immediately. A water level sensor will be set at two points of water level which is at 0.05 m and 0.09 m. When the water reaches this point, it will light on the Light Emitting Diode (LED) and trigger the buzzer that acts as an alarm to alert both authority and owner. All the readings of water level are shown in an application called Blynk that will connect through the connection of a Wireless Fidelity (Wi-Fi) for reference. This project applied both, hardware and software programming. The hardware components of this system is divided into three (3) main parts which are: i) the water level sensor as the input system, ii) an Arduino Mega 2560 as the main microcontroller which control all inputs and output of the system and an ESP 8266 Wi-Fi module as an interface with the output and connection to application respectively and, iii) an LED and a buzzer as the output system. Meanwhile, for software programming, Arduino software IDE is used for hardware coding. Hence, a system and mechanism for real-time surveillance of the potential flooding at the car park should be established. Other researchers also implement this type of project to overcome the flood crisis. The project as reported in [7-8] is quite similar with this project, but was more focused more on the detection of water level. Unfortunately, the system cannot send any notification directly to the users. Besides that, researchers in [8-9] also developed roughly the same system, where the system can warn and alert users through a technology called Global System Messaging (GSM) technology. System which is used in this research possesses advantages compared to these two systems where it can send notifications prompt, direct and fast, in fact the fastest to the users. Users can receive this notification through an application called the Blnyk Application that has been installed in each user's smartphone. This system has been implemented with the latest technology called the Internet of Things (IoT), that have this amazing capability of sending any information wirelessly. The objective of this project is to design, develop and build a flood warning system especially for parking spaces that will alert and warn the vehicle owner apart from developing an application that can be monitored effortlessly via a newest technology of wireless connection.

III. OBJECTIVE

The main objective of this project is to develop and design a flood detection system that will detect flood automatically and send data to the Local Government Unit and to residents using an Arduino. Specific Objectives

- To design a circuit and create a programming code using the microcontroller.
- To apply the Serial Communication in transmitting the data from one place to another place.
- To detect the current level of the flood where the system sensor will be divided into four levels.
- To warn residents of Barangay Marulas, Valenzuela City about the flood water level.

IV. SCOPE

This study is conducted to solve the problems brought about by floods. The device shall contain with the following features: It has ultrasonic sensor to sense the distance of water level of flood on the road. The system provided a camera that will display the real-time image of the flood that can view via livestream. It includes Serial Communication to send warning text message with the content of date, time, water level and road accessibility. The system has three (3) modules which are Users, Logs, and Contact Numbers. It can be modify by the admin. The unit containing the sensor is suggested to be place in front of Our system. 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 microcontrollers will be powered by a Solar Power Bank with 80, 000 Ampere Ampere-Hour (mAh) for the benefit of continuous operation of water flood height detection and network data transmission.

V. DATA FLOW DIAGRAM

Data Flow diagram (DFD) is a traditional demonstration of the view of information flowing within a system. A clean and clear DFD can clearly show the right amount of system requirement. It can be manual, automatic, or a

combination of both. Indicates how data enters and leaves the system, what changes the data, and where the data is stored. The purpose of the DFD is to indicate the size and parameters of the entire system. It can be used as a communication tool between a program analyst and any person who plays a role in an order that serves as the starting point for program rebuilding. DFD is also called data flow graph or bubble chart

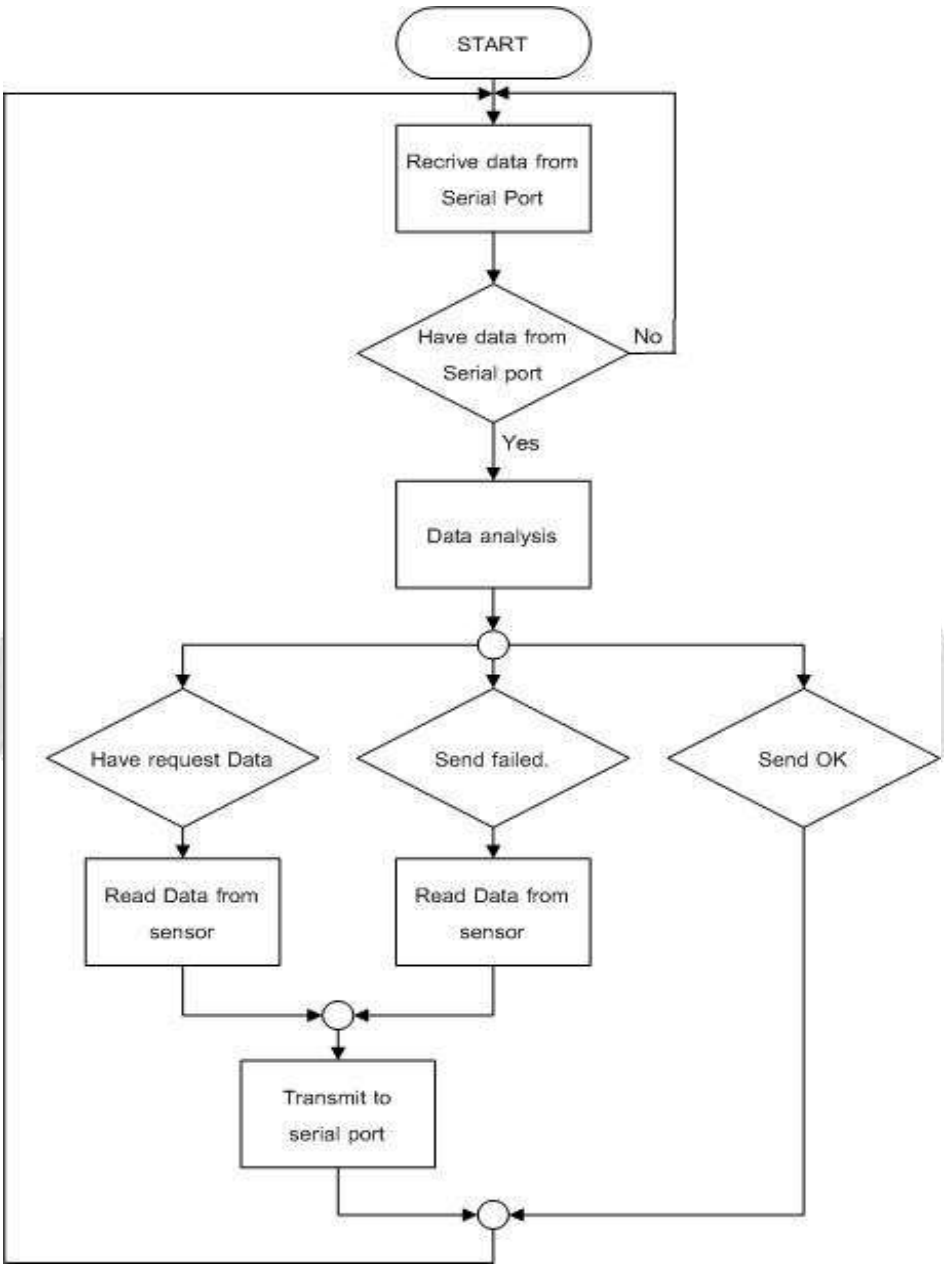

Fig. Data Flow Diagram

VI. SYSTEM ARCHITECTURE

System design defines its main components, their relationships (structures), and how they work together. Software design and construction incorporates a number of contributing factors such as Business strategy, quality attributes, human capabilities, design, and IT environment. System Architecture serves as a blueprint for a system.

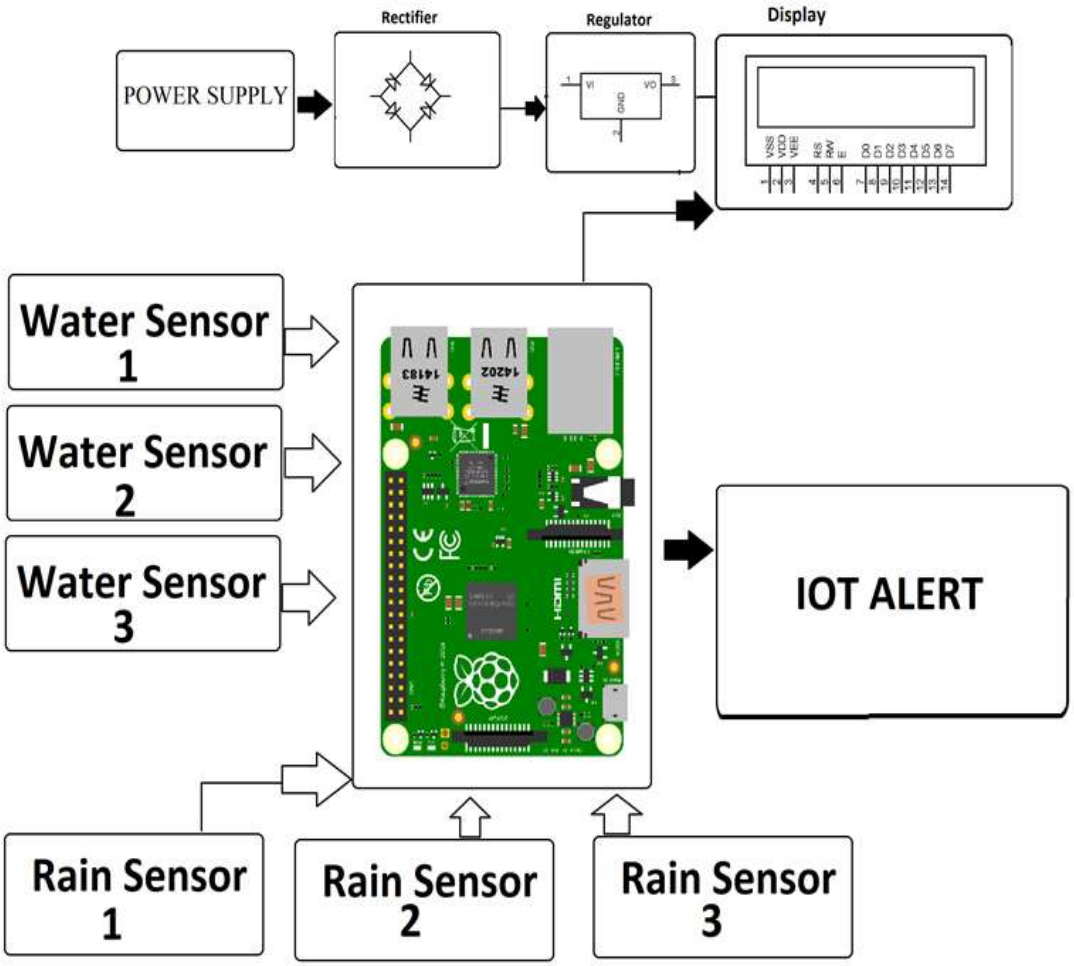

Fig. System Architecture

VII. HARDWARE REQUIREMENTS

1) **Arduino:** Arduino is a single-board microcontroller that is widely used to create various types of digital devices, block diagram shown in Figure. You can control and interact with various electronics components such as sensors, actuators and much more. It has its own fixed RAM and stores data quickly memory and EEPROM. It uses languages such as C, C ++, and Java.

Fig-Arduino

2) Buzzer: Buzzer or Beeper is an audio signing tool, which can be mechanical, electromechanical, or piezoelectric. Buzzer and beepers is widely used in include alarm devices, timers, and user input verification such as mouse clicks or keys

Fig- Buzzer

3) GSM Module: GSM module is a hardware device that uses telephony technology to provide a data connection in a remote network. From a mobile phone network view, they look exactly like a normal cell phone, including the need for a self-identifying SIM network. GSM modems typically provide a TTL-level serial interface to their Host. They are often used as part of an embedded system.

Fig- GSM Module

4) NodeMCU: NodeMCU is an inexpensive open source platform. Originally included firmware running on ESP8266 Wi-Fi SoC from Espressif Systems, as well as Hardware based module ESP-12.Later, support for ESP32 32-bit MCU was added.

Fig-NodeMCU

5) **Water Level Sensor:** A water level sensor is a sensor that relays information back to a control panel to indicate whether a body of water has a high or low water level. The water level sensor employs a simple mechanism to detect and indicate the water level in an overhead tank or any other water container according to Electronic Hub.

Fig. Water Level Sensor

VIII. FUTURE SCOPE:

This study is conducted to solve the problems brought about by floods. The device shall contain with the following features: It has ultrasonic sensor to sense the distance of water level of flood on the road. The system provided a camera that will display the real-time image of the flood that can view via livestream. It includes Serial Communication to send warning text message with the content of date, time, water level and road accessibility. The system has three (3) modules which are Users, Logs, and Contact Numbers. It can be modify by the admin. The unit containing the sensor is suggested to be place in front of Our system. 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 microcontrollers will be powered by a Solar Power Bank with 80, 000 Ampere Ampere-Hour (mAh) for the benefit of continuous operation of water flood height detection and network data transmission.

IX. CONCLUSION

The study is all about detecting the level of the flood. Based from the existing way of reporting flooded roads in India have concluded that the Flood Detector System using Arduino can measure the height of the flood; and measurement data can be distributed to officer in charge and to the residents. The system also indicate passable and impassable road that will help commuters to avoid getting stuck in an impassable road. The system also provides camera to easily monitor the flood.

X. REFERENCES

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