Flood water monitoring and early warning

Abstract: *When the flood came, the floods affected both individuals and communities, and they had social, economic, and environmental consequences. So we're designing that kind of system that gets floods before the flood comes. The purpose of the flood warning is to detect and predict flood events so that the public can be informed in advance. Thanks to flood warnings, the effects of major floods can be reduced and flood protection can be strengthened. The warning system will monitor nearby dams, rivers and collect data i.e. water level in the river and river flow rate in relation to floods and the surrounding environment from different sensors. There are three main components of this program. The first part of the system is to detect the water level using the ultrasonic sensor and the water flow rate obtained using the flow sensor as well as the temperature and humidity using the DHT11 sensor and the rain detection by Rain Sensor. The second part of the system sends data to the Thing speak cloud and the third part of the system receives the data from the cloud and displays it in the valley again when a flood situation occurs and an announcement is made to this. Part 3. The structure of the system can be expanded to include a fully functional system to inform the public of the impending flood disaster.*

Keywords IoT, Flood Detection

I. INTRODUCTION

Floods can also occur in rivers if the flow rate exceeds the capacity of the river channel, especially in curves or river channels. Floods often cause damage to homes and businesses when they are in floodplains. Although river flood damage could be eliminated by staying away from rivers and other water sources, people traditionally lived and worked along rivers because the area was generally flat and fertile and because the rivers provided easy travel and access to trade and industry. The flood system is a system that considers various aspects of the environment, including water quality, flow rate, temperature and humidity and precipitation. In order to collect data for natural objects the system contains various sensors that collect individual parameter data and send it to the Thing speak cloud. In the cloud data will be analyzed and produce different results. Ku type of graphs. The first sensor is an ultrasonic sensor that measures the distance to the target by measuring the time between output and receiver. The water flow sensor is used to provide information about the stability of the water flow. A water rotor and a hall effect sensor are available to sense and measure water flow. When water flows through the valve around the rotor. With this, the change can be seen at motor speed. This change is calculated as the output as the signal sensor of the hall effect. Thus, the flow rate can be measured. By using a rain sensor we can calculate the percentage of rainfall and All values can be collected and sent to the Raspberry Pi to process these values and send to the clouds. From the cloud provide instructions regarding Precautionary measures in a reputable environment.

II. LITERATURE REVIEW AND OBJECTIVE

1. Aziyati Yusoff, Intan Shafinaz Mustafa et al [1] Proposed This article discusses one of the most common disasters that occur in urban or rural areas and neighborhoods namely floods. This article suggests that flood management and early warning findings can be resolved through a cloud computing platform. With the emergence of cloud computing, the center is expected to align with Green Cloud technology to improve the green space for better living in smart cities.

2. Dolly Kumaria et al. [2] explained. The plan includes sending sensors to specific areas at risk of flooding to monitor flooding in real time and detection. Flood events associated with floods and flowing water or flooding are successfully identified in real time which saves individuals a lot of time to prepare themselves against predictable floods, saving them from the effects of flood disaster.

6. Dola Sheeba Rani et al. [7] explained The Flood is usually caused by changes in water conditions or by the overflowing of rivers, dams, etc. As a result of improved civilization and improved human life, environmental problems are also increasingly common. This paper covers an effective and flexible method of flood detection and a warning system. Advanced technologies such as machine learning (ML) provide great benefits in the field of technology are extremely effective in monitoring the common and unusual character traits of any machine. The purpose of this project is to investigate flood issues. Neural networks are very popular, widely used to predict rain and work well.

7. Uyioghosa B. Iyekekpolo et al. [8] proposed The plan involves sending sensors to specific areas at risk of flooding to monitor floods in real time and visually. Flood events associated with floods and flowing water or flooding are successfully identified in real time which saves individuals a lot of time to prepare themselves against predictable floods, saving them from the effects of flood disaster. The system was tested by imitating different flood conditions, and the result was efficient and accurate.

8S Vara Kumari et al. [9] specify the data collected by ultrasonic sensors will be transmitted to the Thitspeak web application. To determine the flow rate using a water flow meter that records the flow rate in the Thitspeak app. Thitspeak automatically stores data in private channels, but there is an opportunity for data sharing within the community through a public channel. The findings therefore indicate that the designed system is able to monitor flood-prone areas.

9. Pallavi C et al. [10] Proposed system using N-mote and N-gateway, sensory data such as temperature, humidity, rainfall and water level can be sent to the clouds and if the environmental limit levels increase, a warning message can be sent to the authorities and people live in flood prone areas. Such a system allows private and public organizations to work on their own emergency evacuation plans and mitigation plans so that safe action can be taken before the flood situation worsens.

10. R. Aishwariya Lakshmi, M et al. [11]. The device detects its location using internal sensors, uploads its information to the cloud and sends the status to the controller where the flooding will occur. Based on the information collected in the event of a disaster, the regulator immediately sends a notice to people in the vicinity who will be affected by the floods.

11.J G Natividad et al.[12] The purpose of this study is to develop a real-time flood monitoring and early warning system in the northern portion of the province of Isabela, particularly the municipalities near Cagayan River. Ultrasonic sensing techniques have become mature and are widely used in the various fields of engineering and basic science. One advantage of ultrasonic sensing is its outstanding capability to probe inside objects non-destructively because ultrasound can propagate through any kinds of media including solids, liquids and gases.

12. M. Shoyeb Sayyad et al.[13] flood by making use of the concept of Internet of Things. For that purpose we are going to use an android Application to intimate the users. This Project focuses on providing early detection of flooding and the measures to minimise and avoid floods. 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 saves individuals plenty of time to prepare against predicted flood occurrence, saving them from the aftermath of flood disaster.

13. G. Sekar et al.[14] The purpose of flood warning is to detect and forecast threatening flood events so that the public can be alerted in advance. Flood warnings are highly adaptive where protection through large scale, hard defenses, is not

2.1 Objectives

1. As the main objective of this project, it aims to reduce the damage caused by floods by eliminating the impact of biodiversity.
2. Cloud computing allows access to accessible information. In addition, it provides preventive measures.

III. MATERIALS AND METHODS BLOCK DIAGRAM

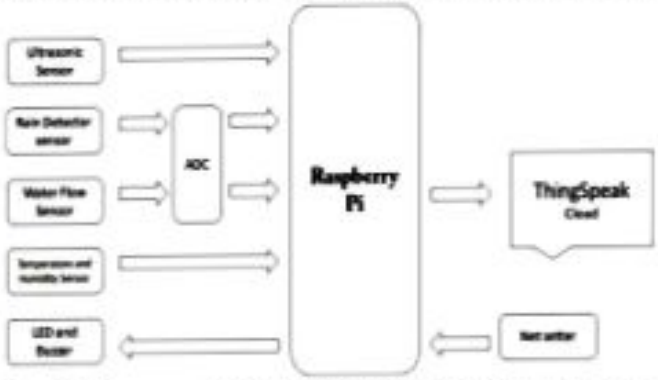

Fig: Block Diagram of IOT base Early Flood detection System

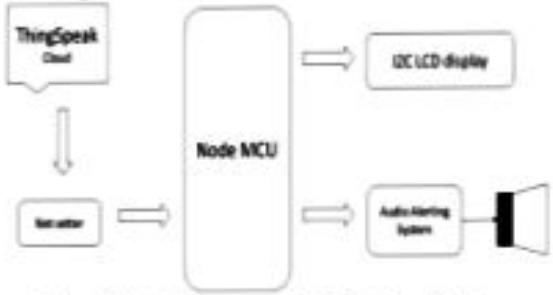

Fig: Block diagram of Alerting System

3.1 Ultrasonic Sensor

It's kind of a digital sensor; by using this sensor we calculate the water level and send the output to Raspberry pi. An ultrasonic sensor is a device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the resulting sound into an electrical **signal. Ultrasonic waves travel faster than the speed of sound (i.e. sound that people can hear).**

3.2 Rain Detector Sensor

A sensor used to monitor rainfall or rain is known as a rain sensor. This type of sensor acts like a switch. This sensor includes two components such as a hearing pad and a sensor module. Whenever rain falls on the sensor pad then the sensor module reads data from the sensor pad for processing and converts it into analog or digital output. The output of this sensor is therefore analog (AO) and digital (DO).

3.4 Temperature and Humidity Sensor

DHT11 is a basic, inexpensive digital sensor and moisture sensor. This sensor uses a capacitive humidity sensor with a thermistor to detect neighboring air and to pull a digital signal into the information pin where no analog input pins are required [13]. Easy to use but requires reasonable time to capture data. You can get new data on it once every 2 seconds, so if you use the Adafruit library, sensory reading is usually up to 2 seconds old [9]. It is used to monitor temperature and humidity, to check whether there is heavy rainfall or no rainfall in the area so that it will give us indications of a potential flood.

3.5 LED and Buzzer

- **LED:** Simply put, a light emitting diode is a semiconductor device that emits light through which electrical energy passes through it.
- **Buzzer:** Buzzer or beeper is a sound signing tool, which can be mechanical, electromechanical, or piezoelectric (short piezo). Common uses of buzzers and beepers include alarm devices, timers, and user input verification such as mouse click or key click. A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signature device. A piezoelectric buzzer can be operated by a dynamic electronic circuit or other sound source. Clicking, tapping or ringing may indicate that the button is pressed.

3.6 ADC

An analog to digital converter (ADC) as its name suggests is an electronic device that converts flexible analog signals into real-time digital signals for easy reading with digital devices. ADC converts real-world values into digital language used in control systems, computer data processing, data transfer, and data processing.

3.7 Raspberry Pi

The Raspberry Pi is a small computer the size of a deck of cards. It uses the so-called system on the chip, which integrates the CPU and GPU into a single integrated circuit, as well as RAM, USB ports, and other components sold across the board for an all-inclusive package.

3.8 Power Supply

Its input is 170–230volt AC and provides a 12V DC @ 400mA output current. It is used to enable Arduino and GSM modules. All electronic circuits that use DC power supply have enough power for their operation. To obtain this DC voltage from 230V AC mains, we need

3.9 ThingSpeak Cloud

Thingspeak is an open source IoT application and API to read and write information from objects. Uses HTTP connection to communicate. At thingspeak we use graphs and numerical displays to monitor updated data from online hearing. Thingspeak has many benefits such as activating a specific link when certain conditions are met.

3.10 Net Setter

The new Idea Net setter allows for faster internet connection while on the go. While connected, you can transfer data, stream media, and send SMS messages. The Idea 21.6 Mbps network supports the HSPA network which allows downloads of up to 21.6 Mbps, uploads of 5.76 Mbps with minimal delay.

3.11 Node MCU

It is a hardware module that transmits the updated value to the cloud at a continuous rate. This is the amount of software category input. It is automatically updated when a new value is detected by the sensors. An Internet connection is required to transmit high-speed data.

3.12 LCD Display

The LCD screen (Liquid Crystal Display) is an electronic display module and offers a wide range of applications. The 16x2 LCD display is a basic module and is widely used in various devices and circuits. These modules are selected over seven segment and more LED segment segments. The reasons are: LCDs are economical; it is easily organized; they have no limit to display special and even custom characters (as opposed to seven segments), animations and more.

16x2 LCD means it can produce 16 characters per line and there are 2 such lines. On this LCD each character is displayed on a matrix of 5x7 pixels. This LCD has two registers, namely, Command and Data.

The command register keeps the instructions given by the LCD. Command is a command given to the LCD to perform a predetermined function such as launching, clearing its screen, setting the cursor position, display control etc. The data register stores data to be displayed on the LCD. Data is the ASCII value of the character to be displayed on the LCD.

3.13 Audio Alerting System

Audio Alert System prioritizes input channels and allows alarms to overwrite less important messages. In each channel, the saved audio file name provides customized configurations, some of which include: positive or negative input triggers, number of times the recorded message is repeated, message volume and time delays before activating it if necessary.

IV. WORKING OF SYSTEM

We use Raspberry pi. Initially Power supply is provided in the Raspberry pi module to open. The power supply takes on a 170-230-volt AC input and delivers 5V output. Whenever a raspberry is opened; Raspberry pi starts program development

Here we use an ultrasonic sensor to check the water level. The Ultrasonic sensor now sends the signal to the Raspberry pi. We use a flow sensor. It is a kind of Hall Effect sensor. Sends input to Raspberry pi to calculate water flow rate in L / min. We also use a rainbow sensor whenever it rains over the sensor area, the sensor module reads the data from the sensor pad for processing and converting it to analog or digital output. Therefore, the output of this sensor is analog (AO) and digital (DO) and the use of DHT 11 and humidity sensor to monitor temperature and humidity.

As soon as the Raspberry pi is connected to the Thingsspeak Cloud, Raspberry pi collects all the data from the sensor and sends it to its specific Field Graph. We use graphs and numerical displays within Thingspeak to monitor sensitive data. We are using data analysis techniques in this field to produce detailed flood graphs. These are known as flood graphs or FPG. FPG has several levels but there are three main levels. FPG goes from Extreme to Safe. If FPG is above this level, then the cloud sends data with flag code = 71, and below this level in the middle. The bottom inside is safe. A medium-level and secure cloud sends data and flag code according to different levels.

V. CIRCUIT DIAGRAM

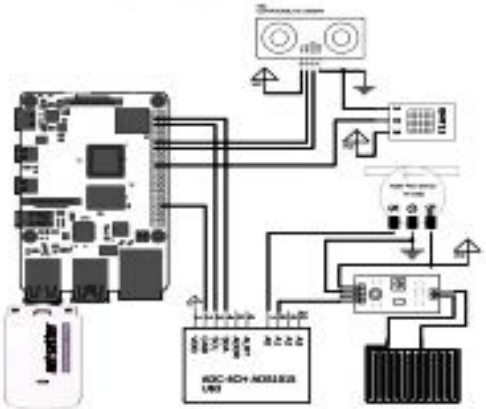

Fig: Circuit diagram of flood detection System

Above Fig. shows the entire circuit diagram of the system used. In the circuit above the Raspberry pi board is powered by a 5V power adapter. In the circuit diagram the Ultrasonic sensor is located in the right corner of the circuit diagram. It has four pins where two pins are VCC & ground and the other two are trig and echo. pin trig is connected to the GPIO PIN number. 17 Raspberry pi and pin echo connected to GPIO PIN number. 27 of Raspberry pi.

The DHT11 sensor has three pins where the PIN 1 is connected to the ground, the PIN 2 is connected to the Raspberry pi pin no.10 and the PIN 3 is connected to the VCC.

In the circuit diagram the water flow sensor is displayed above the LCD display. This sensor has three anchors. PIN 1 is connected to the An DC 0 (A0) PIN code and the remaining two pins are VCC & ground respectively.

In the rainbow sensor it has four pins, of which two pins are VCC & ground and the other two are A0 & D0. The A0 PIN is connected to the ADC PIN number. 8 (A1).

ADC is connected to the raspberry pi via I2C communication protocol where the SDA (GPIO 2) Raspberry pi pin is connected to the ADA SDA pin and the SCL (PPIO 3) Raspberry pi pin is connected to the PIN. -SCL ADC connected to raspberry pi.

In ADC A0 the pin is connected to the Flow sensor and the A1 pin is connected to a rain sensor.

In the circuit diagram a set of nets is connected to the Raspberry pi USB port.

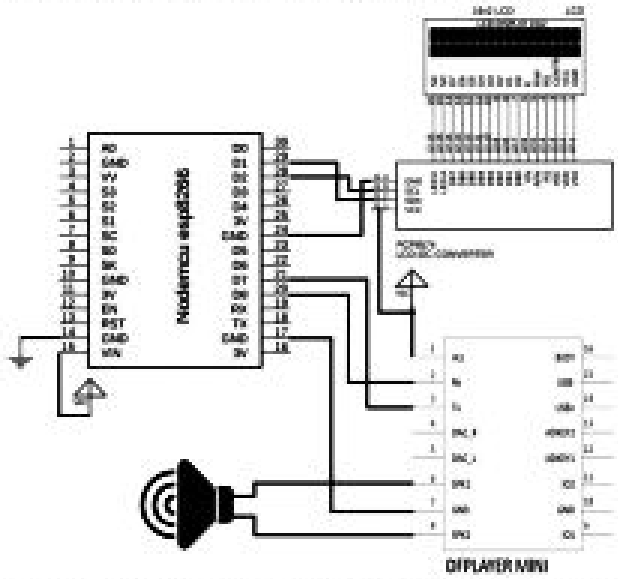

Fig: Circuit diagram of Announcement System

In above circuit diagram 16X2 LCD display having 16 pin and it is connected with an I2C converter. It has four anchors where two anchors are vcc & ground and the other two are SCL & SDA. pin SCL is connected to the Node MCU pin no.28 (D2) and the SDA pin is connected to the Node MCU PIN number. 29 (D1).

The mini DF player has 16 pins. DF player Rx (2) PIN is connected to the Node MCU PIN number. 20 (D8) and DF player Tx (3) pins are connected to the Node MCU PIN number. 21 (D7). and the remaining two anchors are VCC& ground respectively. In circuit diagram the speaker is connected to DF player mini pin no.6 (spk1) and pin no.8 (spk2)

Fig(c): Data display at Thing Speak cloud

Fig (d): Flood Prediction Graph

VII. CONCLUSION

Those areas near the floods the proposed early flood detection plan is trying to help people who are not affected by the floods the system can give a shocking word to the people who will be affected by the floods. So the proposed system is helping people to save their lives. life because of the flood.

REFERENCES

[1]. A. Yusoff, I. S. Mustafa, S. Yussof, and N. M. Din, "Green cloud platform for flood early detection warning system in smart city," 2015 5th National Symposium on Information Technology: Towards New Smart World (NSITNSW), Feb. 2015.

[2]. D. Kumari, L. Mahato, G. Kumar, G. Kumar, K. Abhinab, J. Kumar, P. Acharjee, and A. Dutta, "Study on IOT Based Early Flood Detection & Avoidance," SSRN Electronic Journal, 2020.

[3]. E. Basha and D. Rus, "Design of early warning flood detection systems for developing countries," 2007 International Conference on Information and Communication Technologies and Development, Dec. 2007.

[4]. J. Maurya, H. Pant, S. Dwivedi, and M. Jaiswal, "FLOOD AVOIDANCE USING IOT," International Journal of Engineering Applied Sciences and Technology, vol. 6, no. 1, May 2021.

[5]. A. Silva Souza, A. M. de Lima Curvello, F. L. dos S. de Souza, and H. J. da Silva, "A flood warning system to critical region," Procedia Computer Science, vol. 109, pp. 1104–1109, 2017.