IOT Based- Flood Monitoring And Alerting System

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Abstract- *The Internet of Things (IoT) have revolutionized the way we interact with our environment. One application of IoT is in the domain of flood monitoring and alerting systems. This system uses sensors to detect water levels in rivers, lakes, and other bodies of water, and sends real-time data to a central server. The data is then analyzed and alerts are sent out to the public in the event of a flood. This paper presents an overview of an IoT-based flood monitoring and alerting system, including its architecture, sensors, and communication protocols. The system can provide timely and accurate flood alerts to residents in flood-prone areas, allowing them to take necessary precautions to protect themselves and their property. With the increasing frequency of natural disasters due to climate change, such a system has become more important than ever.*

Keywords- IoT, Central Server, Sensors, Communication Protocol

I. INTRODUCTION

Floods are a natural disaster that can cause significant damage to property, infrastructure, and even loss of life. With the increasing frequency and severity of floods around the world, it has become crucial to develop effective flood monitoring and alerting systems. Internet of Things (IoT) technology has emerged as a promising solution to monitor and mitigate the impacts of floods. By using IoT-based sensors and communication protocols, flood monitoring systems can detect and analyze real-time data on water levels in rivers, lakes, and other bodies of water. This data can then be used to provide timely and accurate flood alerts to residents in flood-prone areas. In this paper, we present an overview of an IoT-based flood monitoring and alerting system that can help mitigate the effects of floods. The system's architecture, sensors, communication protocols, and alerting mechanisms are discussed in detail. The paper also highlights the importance of such a system in the face of climate change-induced natural disasters and its potential to help save lives and reduce the damage caused by floods.

II. BACKGROUND HISTORY

Flooding occurs when water rushes over normally dry ground. There are floods almost everywhere. They may transport a few inches of water to cover an area or enough water to cover the roof of a home. Floods that last for days, weeks, or months may endanger communities.Severe flooding is caused by meteorological circumstances such as strong rain or rapid melting of snow and ice. The topography of a region may also enhance its vulnerability to flooding. For example, flash floods are common in areas near towns and rivers. Flash floods are highly than the land can withstand, the excess water quickly overflows storm drains and ditches and rushes into rivers and streams, resulting in a flash flood. Flash floods may cause water levels to increase drastically in a short period of time. Weather satellites, such as NOAA's Geostationary Operational Environmental Satellite-R (GOES-R) series, monitor atmospheric conditions that might lead to floods. The Advanced Baseline Imager (ABI) onboard the GOES-R series of satellites, for example, can detect and follow the formation of atmospheric rivers. The ABI may also be used to compute the entire quantity of moisture in the atmosphere, from the surface to the high atmosphere. This provides essential data to weather forecasters, allowing them to improve their predictions of heavy rain and flash floods and help keep people safe. Once flooding has occurred, weather satellites may be used to determine severely flooded areas from space. "Flood maps" are created using data from the GOES-R and the NOAANASA Suomi NPP satellites, and they help officials decide where to allocate relief and resources after a flood.

III. EXISTING SYSTEM

The current systems that have been created are exclusively focused on a few areas. Apart from that, the bulk of the people is unable to monitor and has no clue when the flood will occur since they lack access to meteorological information and data. By implementing a Smart IoT Flood Monitoring System, all of the shortcomings of the current system will be addressed. If a sensor module is cost-effective, a high number of sensor modules may be placed for the samecost, and a bigger number of surveillance systems. Additionally, the low cost of sensor modules makes them less prone to theft and easily replaceable if damaged.

IV. PROPOSED SYSTEM

Several advanced systems are extensively used by various companies and responsible authorities to monitor

flood levels in a specific place. The majority of these gadgets are quite expensive to use and maintain. Other from that, these devices are often exclusively utilized for monitoring between the flood-prone site and the monitoring station. With a real-time detection and alarm system, all responsible organizations may stay attentive when there is a strong desire for a specific activity connected to their core function during a flood. Such a mechanism allows both commercial and public sector entities to collaborate on emergency evacuation and mitigation strategies in order to make a more prudent decision before the flood scenario worsens. The rescue team and fire department must plan for the best feasible evacuation and rescue efforts during a flood with limited time and manpower.

V. LITERATURESURVEY

1] B. Shankar, "IoT BASED SMART FLOOD FORECASTING AND EARLY WARNING SYSTEM", January [2021].

Flooding is often seen as an unavoidable natural event. Floods also inflict significant human losses and economic devastation. Using different sensors and an Arduino UNO, researchers constructed a flood level detecting device. Theproposed model can aid in the prediction of coming disasters and the planning of critical activities by rescue and recovery personnel to save thousands of lives before this essential condition happens.One of the most major technology advances, the Internet of Things (IoT), is used to monitor flood and human-made resources to aid in anticipating and detecting key occurrences such as flood, fire, gas leak, and water leak that can endanger human life. The Flood Detection System with Arduino is intended to be one of the quickest flood monitoring solutions.

2]J JJijesh and Mahaveer Peena, "EARLY DETECTION OF FLOOD MONITORING AND DETECTING SYSTEM TO SAVE HUMAN LIVES", November [2020]

Climate change has a detrimental influence on a variety of natural phenomena such as temperature, humidity, and rainfall, among others. Furthermore, during monsoon seasons, certain locations see increased rainfall owing to convective activity, which may cause surrounding areas near rivers or dams to flood. Floods are exacerbated by cyclones. While cyclones appear to be natural disasters, nature really need them to keep the temperature stable. As the waters become overheated, cyclones form to cool them down. We should expect more severe weather and stronger storms as a result of human actions that disrupt the natural order. Climate change is a severe problem that must be addressed. What really matters is balance and our engagement with nature. This article addresses preventative measures used to avert flood damage and to notify the general population. The current weather and other water-related indicators are updated on a regular basis.

3] J M Mendez and J G Natividad, "FLOOD MONITORING AND EARLY WARNING SYSTEM USING ULTRASONIC SENSOR", January [2020].

As a consequence of this project, a real-time flood monitoring and early warning system will be established, particularly for villages near the Cagayan River in Isabela's northern area. Current ultrasonic sensing techniques are widely employed in a variety of engineering and basic research fields. Since ultrasound can pass through a variety of substances, including solids, liquids, and gases, it has the unique ability to probe into objects without causing damage. The topic of this study is just the water level detection and early warning system (through website and/or SMS) that alerts concerned organizations and people to a probable flood occurrence. The study's purpose is to better prepare and notify the public in the event of a flood. The study's novel component is how the Arduino, ultrasonic sensors, GSM module, web-monitoring, and SMS early warning system are used to aid stakeholders in minimizing flood-related fatalities. The paper will specifically aid local populations in the province in flood-prone locations, which are common in the Philippines. Moreover, it is relevant and significant in light of the community's needs for safety and well-being.

4].SatvikDasari, "A NOVEL ALERTING SYSTEM FOR FLOOD, FIRE ANDAIR QUALITY", December [2020]

According to the NHTSA, driving-related drowning kills 384 people in the United States per year. The California wildfires killed 46 lives, caused $13 billion in property damage, and wounded hundreds of others in 2017. The bulk of existing warning systems are expensive and lack the ability to monitor air quality, wildfires, and floods near road crossings. The current fire alarm systems are costly, but they are not adaptable to smart city infrastructure and are not multipurpose. The current radio frequency-based flood alerting systems, which cost tens of thousands of dollars, also require large antennas and have a restricted range. The solution includes a smartphone app and a Red-Yellow-Green light system, as well as local notifications for fires, air quality, and dangerous water levels. Cerberus' data is stored in the cloud and used to send emails, voice calls, and text alerts, among other alert kinds. Cerberus' warning system is scalable to thousands of sites, precise, inexpensive, simple to operate, and dependable. The warning system is also linked to an analytics platform that displays trends and historical data. The prototype was

validated in the field using real-world data. The findings illustrate Cerberus's usefulness as a tool for sending precise and dependable flood, wildfire, and air quality alerts.

HARDWARESPECIFICATIONS

1. ARDUINO UNO ESP8266:

The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P.The ATMEGA 328P has 32kB of flash memory for storing code. The board has 14 digital input and output pins, 6 Analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed with the Arduino software.

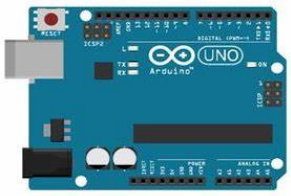

Fig1Arduino Uno

2. WATERFLOW SENSOR:

Fig2ImageofWaterflow Sensor

Monitoring septic systems for discharges. Measuring levels of nutrients in surface waters. Detecting chlorophyll, a which can in turn be used for predictions (e.g., harmful algal blooms and/or cyanotoxins in watersheds) Measuring the use and effectiveness of wastewater and drinking water.

3. NodeMCU:

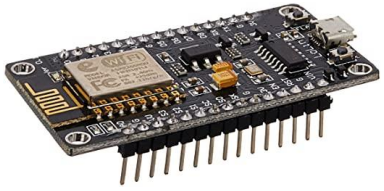

Fig 3ImageofNodeMCU

Node MCU is an open-source platform based on the ESP8266 that can link items and transport data using the Wi-Fi protocol. Furthermore, by offering some of the most significant microcontroller functionalities like as GPIO, PWM, ADC, and so on, it may handle many of the project's demands on its own.

4. JUMPER WIRES & LED:

Fig4 ImageofJumper Wires and LED

Jumper wires are insulated wires with connectors at both ends that allow for easy connection of electronic components such as LEDs, resistors, and sensors. They are commonly used to make temporary connections between components during the prototyping and testing phase of electronic projects.

5. DHT11 SENSOR:

Fig 5 Image of DHT11 Sensor

The DHT11 is a simple, low-cost digital temperature and humidity sensor. It uses a thermistor and a capacitive humidity sensor to detect the humidity in the air, and it generates a digital signal on the data pin (no analogue input pins needed). Although incredibly simple to use, data collecting necessitates precise scheduling.

6. WATER SENSOR:

Fig6 Imageof Water Sensor

Septic system discharges are being monitored. Nutrient levels in surface waterways are measured. Identifying chlorophyll a, which may then be used to make predictions (for example, toxic algal blooms and/or cyanotoxins in

watersheds). Assessing wastewater and drinking water usage and effectiveness.

7. BOLT IoT BOLT WIFI MODULE

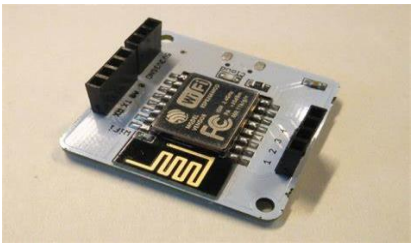

Fig7 ImageofBOLT IoT BOLT Wi-Fi Module

The BOLT Wi-Fi module is a hardware component developed by BOLT IoT that enables wireless communication between devices. It is designed to be used with microcontrollers, such as the Arduino or Raspberry Pi, to connect them to the internet and enable IoT (Internet of Things) applications.

8. RAIN SENSOR

Fig8 Imageof Rain Sensor

A rain sensor, often known as a rain switch, is a switching mechanism that is actuated by rainfall. Rain sensors have two primary applications. The first is a water-saving device that is linked to an automatic irrigation system and forces the system to shut down in the case of rain.

SOFTWARESPECIFICATIONS*:*

- OperatingSystem :Windows
- Platform :IA-32,x86-64
- Language :EmbeddedC

VI. METHODOLOGY

Water sensors are currently being mounted on nodes with microcontrollers and being developed based on the architecture. The water sensor for this project is being tested in real water in a basin. The authorized user or the head of society will then automatically receive a message alerting them of the water rise when the water rises and reaches the first sensor. A warning message will be issued to let people know that the water is now at a dangerous level when it reaches the second sensor. The power regulator (7805) receives the power supply, which is then utilized to convert the 12 volts to 5 volts. The node mcu is granted this authority. Through the analogue to digital conversion process, Pico obtains the readings from the rain sensor and water sensor. The values are then transmitted to a Wi-Fi device, which will transmit them to an LCD screen for display. All of the sensed data is transmitted wirelessly to the client users through the Wi-Fi module. The readings were kept in the cloud, and the processed data will be transferred to an ESP8266 module in the cloud where it can be used to forecast the likelihood of a flood. Finally, it sends warning messages to clients or anyone surrounding a river or lake.

VII. IMPLEMENTATION OF PROPOSED MODEL

Before sending an alert the conditions for trigger an alert should be decided. For example, if the water level in a river reaches a certain height, or if the rainfall exceeds a certain amount, an alert should be sent.Itwill need sensors or other monitoring devices to track the water level, rainfall, or other relevant data. This data should be transmitted to a central server for analysis.Analyze the data. It will need to use algorithms or other analysis tools to evaluate the data and identify when the predefined alert criteria are met.Integrate with an SMS gateway: Once an alert is triggered, it willsend an SMS message to the designated recipients. To do this, it will need to integrate with an SMS gateway service that can send messages on your behalf.The message should include relevant information about the flood conditions, such as the water level, rainfall amount, and any relevant safety instructions. Finally, it should regularly monitor the system to ensure that alerts are being sent when they should be, and that the recipients are receiving the messages in a timely manner. It may need to adjust the alert criteria or the monitoring system if issues arises.

VIII. CONCLUSIONS

It is founded on the design and deployment of a WSN-based Flood Monitoring and Detection System (FMDS) that employs temperature and water level flood indicators, the values of which are sensed by sensors in the sensor field. The flood monitoring and detection system analyses the likelihood of floods occurring and then sends flood notifications to residents of flood-prone areas so that they can take appropriate action. Because of their small size and low power consumption, WSN nodes are employed for flood monitoring. This project provides a method to improve the safety of trains

and vehicles on bridges against flood water, hence avoiding loss of life and property.

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