DESIGN OF IOT BASED FLOOD MONITORING AND ALERTING SYSTEM

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ABSTRACT

Floods are a fundamental catastrophic event that can cause extreme devastation to any nation. They are typically caused by precipitation and the overflow of waterways, especially during the heavy storm season. This system aims to monitor flood conditions and send alerts if there is a risk through IoT. The measurement of rising water levels is conducted to detect floods. The system employs three sensors to monitor temperature, humidity, rainfall, and water levels at every stage. The detected sensor values are processed using a Wi-Fi microcontroller and transmitted to IoT via a Wi-Fi module. The system instantaneously uploads and broadcasts sensor values through the cloud. A decision tree algorithm is implemented to perform the classification process. Floods are among the most devastating natural disasters, often resulting in significant loss of life and property. Timely monitoring and alerting are crucial for mitigating their impact. This project proposes an Internet of Things (IoT)-based flood monitoring and alerting system designed to provide real-time data collection, analysis, and early warning. The system integrates various sensors, including water level, rain, and flow sensors, deployed in flood-prone areas to continuously monitor environmental conditions.

I INTRODUCTION

In a peninsular country like India, characterized by extreme weather and climatic conditions, heavy rainfall is a common occurrence. Often, the arrival of intense rains leads to significant water discharge or is exacerbated by the sudden melting of glaciers due to global warming. Particularly during the monsoon season, which typically begins in mid-June and lasts until October, thousands of people have lost their lives to drowning, and their homes have been destroyed. Those affected were evacuated by state and central disaster relief authorities. Severe waterlogging has brought daily activities to a standstill. To protect lives, homes, and the economy, a crucial step is to monitor data in real-time. If conditions reach a certain threshold, alerts must be issued to individuals living in at-risk areas. While it may be challenging to prevent natural disasters, government agencies must take necessary measures to relocate populations to safer regions, potentially reducing losses by up to 30%. In this modern era, various systems are operational at different locations; however, alert notifications are sent to government agencies, which can delay response efforts. This delay occurs because flooding is a spontaneous disaster, and government agencies must follow multiple procedures before making decisions. In this context, public awareness is essential, along with government predictions through weather forecasting.

II LITERATURE REVIEW

1) ThinagaranPerumal, Md Nasir Suleiman, C. Y. Leong. IoT Enabled Water Monitoring System.

IoT-based water monitoring system that measures water levels in real time. The prototype is based on the idea that water level is a crucial parameter concerning flood occurrences, especially in disaster-prone areas. A water level sensor detects the desired parameter, and if the water level reaches the threshold, a signal is sent in real time to social networks like Twitter. A cloud server has been configured as a data repository. The measurement of water levels is displayed on a remote dashboard. The proposed solution includes an integrated sensory system that allows for continuous monitoring of water quality. Alerts and relevant data are transmitted over the internet to a cloud server and can be accessed by user terminals owned by consumers. The results of water measurement are displayed on a web-based remote dashboard.

2) JaymalaPatil, AnujaKulkarni.Wireless Sensor Network Using Flood Monitoring.

A neuro-fuzzy controller for a flood monitoring system utilizing a wireless sensor network. The distributed sensor nodes employ the IEEE 802.15.4 protocol to gather sensor data, such as water level readings from the river. The sensor information is sent to a distributed alert center via an Arduino microcontroller and XBee transceiver. At the alert center, the XBee transceiver and Raspberry Pi microcomputer are used to generate flood alerts based on the sensor data, which is also stored in a database. This system is not cost-effective, and its performance is weak compared to our system.

3) Rankin, A.; Matthies, L. Daytime water detection based on color variation.

Rankin et al. identified the low-texture regions of the image as the water body. Low texture in an image can be determined by converting the red/green/blue (RGB) image to grayscale and convolving the grayscale image with a 5×5 intensity variance filter. The study employed the intensity data from the water body to extract the reflection coefficient from surface reflection, as opposed to relying solely on intensity information.

4) Pan, J.; Yin, Y.; Xiong, J.; Luo, W.; Gui, G.; Sari, H. Deep Learning-based unmanned surveillance systems for observing water levels.

Another study utilized the physical measuring ruler along with different computational models in computer vision, including the differencing method, dictionary learning and convolutional neural network (CNNs).

5) Udomsiri, S.; Iwahashi, M. Design of FIR filter for water level detection

In a similar vein, Udomsiri et al. proposed edge detector finite impulse response (FIR) filters in conjunction with a bandpass filter to identify the boundary between water and ground. The water level was determined by detecting features of horizontal straight lines. The detection error was assessed by manually measuring the water level and comparing the results with the algorithm's output.

III EXISTING SYSTEM

- There will be a node in this existing method near river.
- This node is the independent flood monitoring node equipped with necessary sensors and connectivity modules.
- It has three major stages, Including Sensors, Controller, LCD interface to display the information.
- Data from various sensors are collected by the controller and is then computed and displayed on the LCD display.
- The data in LCD shows necessary information for the prediction of flood.

IV DISADVANTAGES

- It has just a display device to show the data which needs someone to monitor continuously to detect the prediction.

V PROPOSED METHODOLOGY

- We have introduced an engineering that give early warnings to the citizens and to the government agencies based on IOT technology .
- With the help of the online mobile application, real time data will be available to the individuals instead of depending on the government for analyzing the situation.
- With the help of the proposed hardware module for monitoring rain condition ,water level and temperature and humidity condition and sensor data can be updated in online webpage, online alert will be provided when values reach a pre defined threshold depending on the region.
- The idea is to develop a device which is going to save economy, society, lives and their habitat. Using various online thing speak and sensors will increase the precision.
- Keeping that factor in mind, we are developing a device which a user need to install in the smart phone, rest all the analysis work is done by the system online notification is provided to public etc.

VI BLOCK DIAGRAM

- "IoT Early Flood Detection & Avoidance System" is an intelligent system which keeps close watch over various natural factors to predict a flood, so we can embrace ourselves for caution, to minimise the damage caused by the flood. Natural disasters like a flood can be devastating leading to property damage and loss of lives. To eliminate or lessen the impacts of the flood, the system uses various natural factors to detect flood. The system has a wifi connectivity, thus it's collected data can be accessed from anywhere quite easily using IoT
- To detect a flood the system observes various natural factors, which includes humidity, temperature, water level and rain sensor . To collect data of mentioned natural factors the system consist of different sensors which collects data for individual parameters. For detecting changes in humidity and temperature the system has a DHT11 Digital Temperature Humidity Sensor. It is a advanced sensor module with consists of resistive humidity and temperature detection components. The water level is always under observation by a float sensor, which work by opening and closing circuits (dry contacts) as water levels rise and fall. It normally rest in the closed position, meaning the circuit is incomplete and no electricity is passing through the wires yet. Once the water level drops below a predetermined point, the circuit completes itself and sends electricity through the completed circuit to trigger an alarm

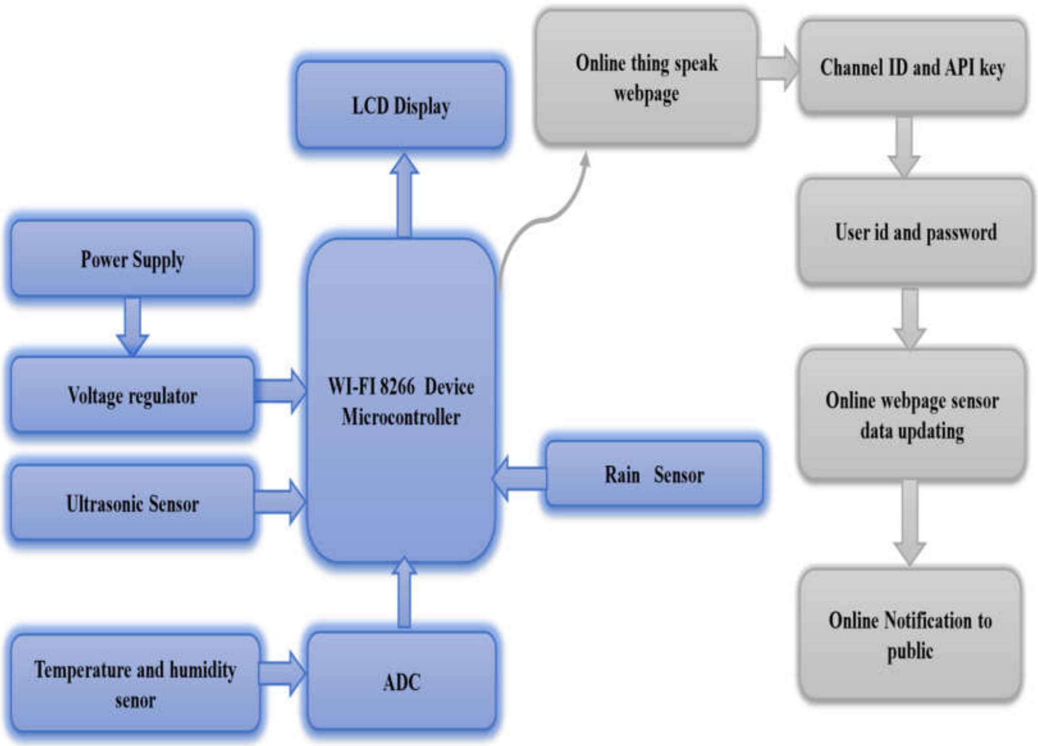

Fig no 4.1: block diagram for proposed system

VII APPLICATION

1. **Urban Flood Management**

   Monitor water levels in city drains, sewers, and canals. o Alert municipal authorities and citizens during heavy rainfall to prevent urban flooding.

2. **River and Dam Monitoring**

   Issue early warnings to nearby communities in case of overflow risk.
   Continuously track river or dam water levels.

3. **Disaster Management and Response**

   Integrate with emergency response systems to trigger automatic alerts via SMS, sirens, or mobile apps.
   Guide evacuation and rescue operations.

4. **Agricultural Land Monitoring**

   Detect flooding in farmland areas to minimize crop damage.
   Help farmers take timely preventive action.

5. **Smart City Infrastructure**

   Part of smart city initiatives to improve environmental monitoring and public safety.
   Data can be integrated with centralized dashboards for real-time decisionmaking.

6. **Highway and Railway Safety**

   Detect water accumulation on roads and tracks.
   Trigger alerts to divert traffic or stop train operations during dangerous conditions.

7. **Residential Flood Protection**

   Used in homes or apartment complexes near flood-prone areas. o Provide localized flood alerts for better preparedness.

VIII RESULTS AND CONCLUSION

As India faced a recent devastating flood in Tamil Nadu, there arises a need for efficient flood monitoring systems. Flood forecasting and the issuing of flood warnings are effective ways to reduce damage. The proposed system will be efficient because it has better coordination of monitoring, communication and transmission technologies which are adaptable to background condition. The proposed system also ensures increased accessibility for assessment of emergency situations and enhances effectiveness and efficiency in responding to catastrophic incidents. In summary, the proposed system would be beneficial to the community for decision making and planning purposes.

IX FUTURE SCOPE

Incorporating predictive analytics through machine learning algorithms can improve the system's ability to forecast flood risks based on historical and real-time data. The system can be integrated with broader smart city ecosystems to provide a more coordinated disaster response, including automated traffic control and public safety systems.A dedicated mobile application can enhance user interaction by providing real-time alerts, flood maps, and safety tips to users in affected areas.

Implementing solar-powered sensor nodes can ensure the system functions effectively in remote and off-grid areas without relying on conventional power sources.Integrating satellite imaging and drone surveillance can provide a comprehensive view of floodprone areas, improving situational awareness and response planning. Collaboration with local authorities and disaster management agencies can enable quicker evacuation and resource deployment during emergencies. The system can be scaled to monitor additional natural hazards like landslides, earthquakes, and heavy storms, creating a more versatile early warning system. Implementing blockchain technology can help secure and verify sensor data, ensuring data authenticity and transparency during critical situations.

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