IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2025

DOI: 10.17148/IARJSET.2025.125218

IOT BASED FLOOD MONITORING AND ALERTING SYSTEM

Sushma M P[1], Namith R[2], Nirmitha P[3], Prajwal K T[4], Prathiksha M Y[5]

Assistant Professor, Electronics and Communication, P.E.S College of Engineering, Mandya, India[1]

Student, Electronics and Communication, P.E.S College of Engineering, Mandya, India[2]

Student, Electronics and Communication, P.E.S College of Engineering, Mandya, India[3]

Student, Electronics and Communication, P.E.S College of Engineering, Mandya, India[4]

Student, Electronics and Communication, P.E.S College of Engineering, Mandya, India[5]

Abstract: The increasing frequency of extreme weather events and floods has necessitated the development of real-time monitoring systems to mitigate risks and enhance disaster preparedness. This project presents an IoT-based Flood and Weather Monitoring System designed to detect environmental parameters such as water levels, rainfall, temperature, and humidity, providing early warnings to authorities and communities. The system employs an Arduino Uno microcontroller as the central processing unit, integrating multiple sensors including a DHT11 sensor for temperature and humidity measurement, a water level sensor for flood detection, and a rain sensor for precipitation monitoring. When the water level exceeds a predefined threshold or rainfall is detected, the system triggers an SMS alert via a GSM module (such as SIM800L) to notify relevant authorities, enabling timely intervention. Additionally, an audible buzzer is activated to alert nearby residents. For remote monitoring, sensor data is transmitted to the ThingSpeak cloud platform using an ESP8266 Wi-Fi module, allowing real-time visualization and analysis of weather and flood conditions through a web-based dashboard.

Keywords: IoT, Flood Monitoring, Water Level Detection, Arduino, SMS.

I. INTRODUCTION

Floods can happen at any time of year when water overflows from a lake, river, or from intense rainfall. Flooding can be extremely dangerous because when it occurs in a residential area, the water carries people, cars, furniture, and even houses. Trees, property, and many other heavy objects can be destroyed by it. It results in a heavy traffic flow. In an effort to reach their destinations, commuters and drivers alike are becoming disoriented and stuck in flooded areas. People's money, time, and effort are wasted when traffic occurs. Even though the local government unit in charge of flood control has been working hard to alert commuters to the situation in flooded areas during the rainy season, there is still insufficient information being shared with the local population. The "Arduino Flood Detector System" was created in order to assist drivers in avoiding this issue.

The ultrasonic sensor will send a signal to the microprocessor circuit when the flood happens, and the water level will be displayed in the user interface. It will also automatically send a Short Message Service (SMS) to the residents who have been identified, and it will keep updating until the detected water level returns to normal. As the water level continues to rise, the procedure is repeated. Since mobile phones are now a common form of communication among people worldwide, the concept of an SMS-based warning system was put forth. Since all mobile phones have a GSM, they can all communicate. In order to prevent issues, this system, which measures the water level of floods around the road, will provide drivers and commuters with real-time information if they haven't yet passed through the flooded areas. Iot flood monitoring systems are crucial during floods; a highly effective system will assist society and the government in effectively managing the situation of flood victims, thereby minimising the impact of the disaster.

II. RELATED WORK

[1] The paper “IoT Based Flood Monitoring and Alerting System with Weather Forecasting” by authors Garima Singh, Nishita Bisht, Pravesh Bisht, Prajjwal Singh, 2020. The aim of this project is to develop a certain system which is efficient enough to predict the weather conditions, level of the water and water flow. So that preventive measures is to be taken in prior.

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[2] The paper "Survey on Flooding Detection System Using Internet of Things" by authors Anusha. A, Bharani.I, Bharathi.J, Hemavathi.V and Venkatesan.M, 2018 .This paper aims to realize the security requirement and security architecture of internet of things technology for urban flooding prevention management system and discussed the demand and overall design of urban flooding prevention management system.

[3] The paper "IOT-based Flood Detection, Monitoring, Control & Alerting System using Fuzzy Logic" by authors Pooja Kumbhar, Sonali Aswale, Pooja Dange, Komal Palse , Dr. K. P. Paradeshi, 2022. Flash floods and massive traffic jams on roads are also cussed by heavy rain. Thus, it is important to be able to warn the people who are most at risk, so that the effects of these disasters can be reduced

[4]From the paper "A Framework to Assess Remote Sensing Algorithms for Satellite Based Flood Index Insurance" by authors Mitchell Thomas , Elizabeth Tell- man , Daniel E. Osgood , Ben DeVries , Saiful Islam , Michael S. Steckler , Maxwell Goodman, and Maruf Billah,2023 . Focuses on utilizing satellite data to monitor floods and sup- port flood index insurance.

[5] From the paper "Heirarchial Coloured Petri-Net Based Multi-Agent System for Flood Monitoring,Prediction,and Rescue(FMPR)" by authors Nadeem Akhtar, abdul rehman mujtaba hussnain ,saad rohail ,malik saad missen ,mehwish nasir, alina hayder ,nadeem Salamat ,and maruf pasha , (Published on December 6,2019) . The studied discrete, continuous, and hybrid Petri-nets and we have found Hierarchical CP-Nets ideal to develop a multi-agent model of the FMPR. These CP- Nets are then model-checked using toolkit cpn tools.

[6] The paper, "Assessing a Model-of-Models Approach for Global Flood Forecasting and Alerting" by authors Bandana Kar , Guy J.-P. Schumann , Marina T. Mendoza , Doug Bausch , Jun Wang , Prativa Sharma , and Margaret T. Glasscoe, 2024 .Discusses a new flood forecasting system called the Model of Models (MoM). The MoM integrates multiple global flood models and Earth observation (EO) datasets to enhance flood risk prediction. The ensemble approach, utilizing models such as GloFAS and GFMS, aims to generate flood risk forecasts every 24 hours at the sub watershed level globally.

[7] In the paper,"IOT BASED FLOOD AND MONITORING AND ALERTING SYSTEM" by authors Kiran Jadhav, Aniket Patil, Ajay Yamkar, Mrunmai Nag- tode , (Publised on April 4,2022) .A real-time-based Flood Monitoring and Alerting System has been developed in Arduino UNO enabled environments using rigorous mathematical models. Internet of Things (IoT) is an emerging platform and broadly used worldwide, this system will dis-play the data of the water level measured on an LCD display. This device can save lives and properties and reduce hazards to a great extent.

[8] The paper "Flood warning and monitoring system utilizing internet of things technology" by authors Mohamad Syafiq, Mohd Sabre , Shahrum Shah Abdullah , Amrul Faruq, 2019 .By implementing the Internet of Thing technology into the system, it could help the victim to get an accurate status of flood in real-time condition. This system is based on NodeMCU based technology integrated using Blynk application. this paper present a prototype to help communities affected by flood in high prone areas by providing interactive and real-time information on the current water level and rain intensity with alert notifications by using Blynk Application

[9] The paper "Design of Information Monitoring System Flood Based Internet of Things (IoT)" by authors Dedi Satria, Syaifuddin Yana, Rizal Munadi, Saumi Syahreza, 2017 .

Based on the information and communication system that has been applied by the society today, the government has implemented the development of monitoring system and early detection of natural disasters in general in the form of encouragement to the government and private research institution to be able to develop disaster early warning system This prototype study acquires water level and rainfall data using ultra- sonic sensors HC-SR04 and rain sensor. Data of flood height and rain levels detected by sensors are processed using Arduino Uno Microcontroller to pro- duce output data in HTML format. Flood altitude information system and rainy weather from the microcontroller are distributed using ethernet mod-ule as web server integrated with Wireless N Router TL-MR3020 as a gateway path to the user.

[10] The paper "Design and Implementation of IoT based flood alert monitoring system using microcontroller 8051" by authors Kavitha Chaduvula, Kranthi kumar K, Babu Rao Markapudi, Rathna Jyothi Ch, 2023 .The Internet of Things (IoT) is a technological development that connects everything and everything to the Internet . IoT can be of immense benefit in day-to-day life to address the challenges of physically dis- abled or specially challenged individuals. IoT devices can interconnect and also provide services jointly supported by back-end systems .To enhance the standard of modern life, the idea of the popular Internet of Things (IoT) notion is intended. For example, peoplecentric Iot.

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III. PROPOSED MODEL

A. Methodology:

The Arduino Uno microcontroller, the system's central processing unit, interacts with a range of sensors to gather and evaluate environmental data in real time. Important meteorological data is provided by the DHT11 sensor, which has an accuracy of ±2°C and ±5% relative humidity. While a rain sensor detects precipitation by measuring changes in conductivity when raindrops land on the water's surface, an ultrasonic or submersible water level sensor measures the distance to the water's surface to determine flood conditions. When certain thresholds are surpassed, such as hazardous water levels or excessive rainfall, the system uses a SIM800L GSM module to notify authorities via SMS. Additionally, sensor data is transmitted to the ThingSpeak cloud platform via an ESP8266 Wi-Fi module, allowing for remote monitoring via a web-based dashboard

B. Working Principle:

Initially, data from every sensor is continuously gathered at preset intervals (e.g., every 5-10 seconds). The Arduino processes this data and then compares it to preset safety thresholds. If the water level climbs above a critical threshold or the intensity of the downpour suddenly increases, the system instantly triggers an alarm mechanism that includes turning on a siren for on-site warnings and sending a GSM SMS to emergency contacts. The data is simultaneously uploaded by the ESP8266 to ThingSpeak, where it is stored and displayed in real time, enabling decision-makers to monitor patterns. The system can be powered by an AC supply or a backup battery for continuous operation, and it is housed in a weatherproof enclosure (IP65-rated) to ensure durability in harsh conditions.

C. System Design Approach:

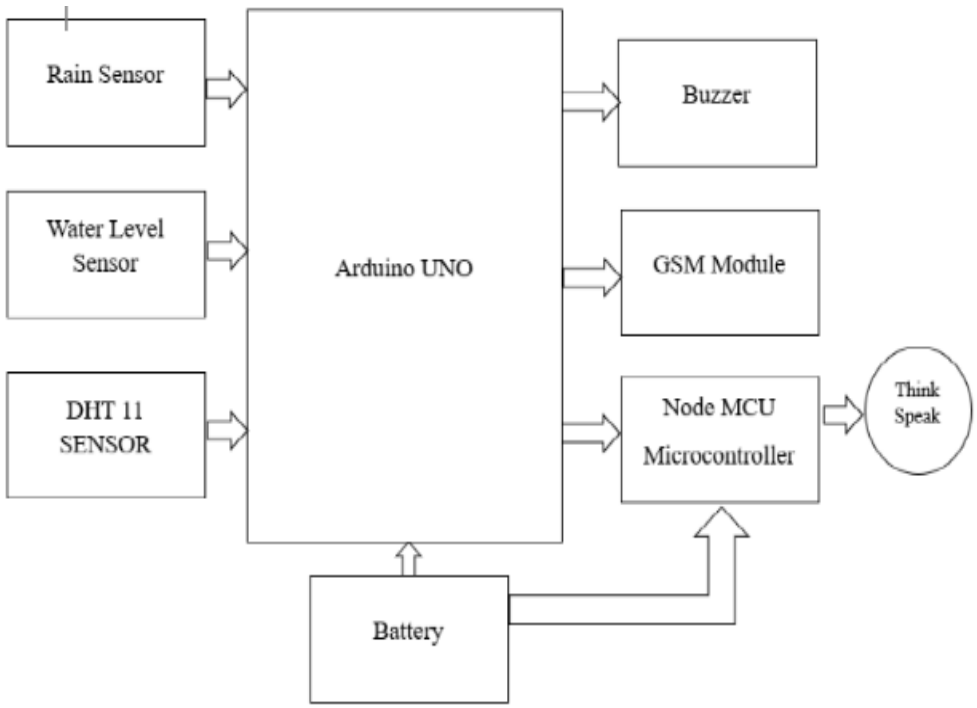

Fig. 1 Block diagram

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D. Proposed Workflow:

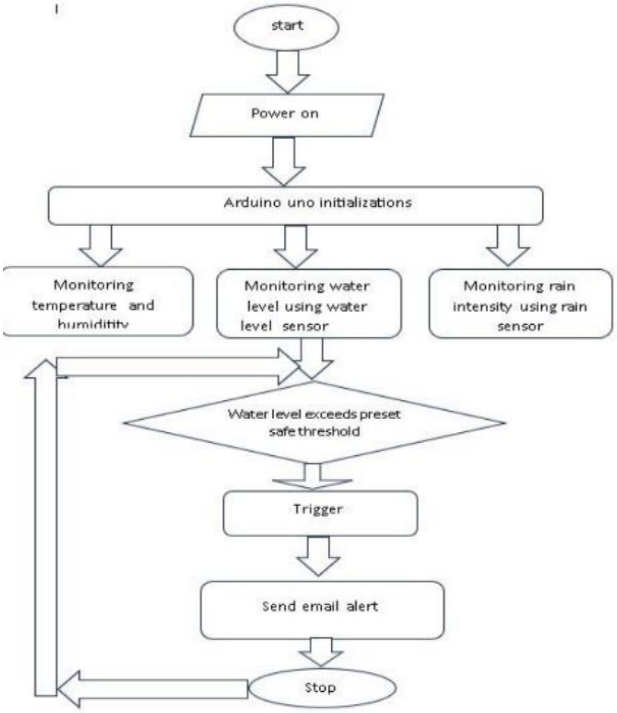

Fig. 2 Flow chart

IV. RESULT

We have effectively created a flood monitoring and alerting system that can notify authorities by phone and SMS if predetermined thresholds (like dangerous water levels or excessive rainfall) are exceeded. This system is made possible by an Arduino UNO, an ESP 8266 Wi-Fi module, a SIM800L GSM module, a DHT11 (temperature and humidity sensor), an HC-SR04 (ultrasonic sensor), a rain sensor, and a SIM800L GSM module.

The ThingSpeak cloud platform receives sensor data from an ESP8266 Wi-Fi module, enabling remote monitoring via a web-based interface.

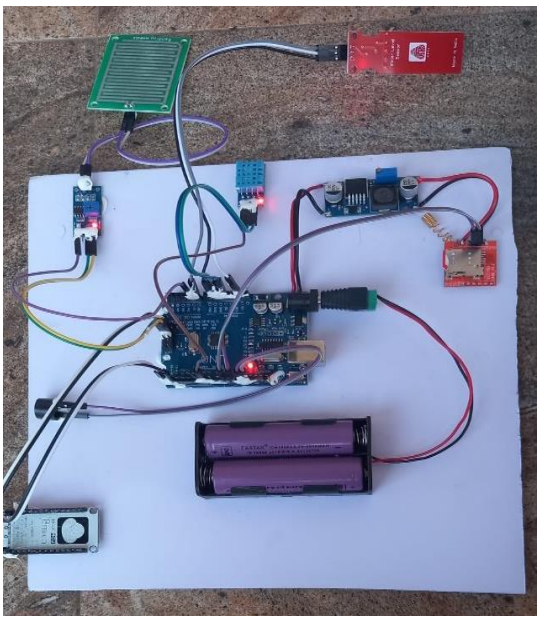

Fig. 3 Hardware setup

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Fig. 4 Real time sensor data for flood monitoring (water level, rain, temperature, humidity)

These charts display real-time sensor data for flood monitoring, including water level, rain sensor, temperature, and humidity readings. All parameters show a significant spike around 16:00, indicating a potential flood event.

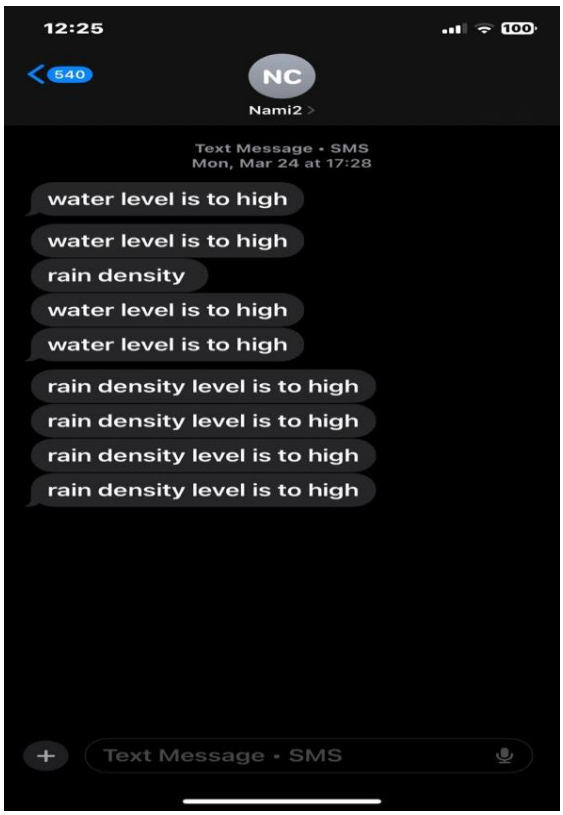

Fig. 5 SMS alerts

V. CONCLUSION

The IoT-based Flood and Weather Monitoring System presents an innovative, cost-effective, and scalable solution to address the growing challenges of flood disasters and extreme weather conditions. By integrating Arduino Uno, DHT11, water level, and rain sensors, along with GSM and cloud connectivity, the system enables real-time monitoring, instant alerts, and remote data access—significantly improving disaster preparedness and response times.

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The project successfully demonstrates how low-cost IoT technology can bridge gaps in traditional flood monitoring methods, offering automation, accuracy, and accessibility to both urban and rural areas. While the system has limitations like network dependencies and maintenance needs.

The future scope of an IoT-based flood monitoring and alerting system is highly promising. With advancements in sensor technology and real-time data analytics, these systems can provide more accurate and early warnings to minimize flood damage. Integration with AI can enhance predictive capabilities for better disaster management. Cloud connectivity and mobile alerts ensure timely communication to authorities and the public. Moreover, scalable networks can expand monitoring to remote and high-risk areas efficiently.

ACKNOWLEDGMENT

We sincerely acknowledge the support and facilities provided by the Project Lab and the Embedded System and Application Lab (Microchip), Department of ECE, PESCE, Mandya for carrying out our project work related to this publication.

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