DRMS-Disaster Response Mapping System

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***Abstract*—The increasing frequency of floods, particularly in rural and low-lying areas, has become a major concern due to heavy rainfall and poor drainage systems that lead to severe damage to homes, infrastructure, and human lives. One of the biggest challenges faced during such disasters is the delay in rescue operations caused by inefficient communication between affected people and authorities. To overcome this issue, the proposed IoT-Based Flood Rescue and Reporting System aims to provide an efficient, real-time, and community-driven solution that connects residents, NGOs, and government agencies through an online platform. The system uses IoT sensors such as a water level sensor and a heavy rainfall sensor to continuously monitor environmental conditions. These sensors collect data on rainfall intensity and rising water levels, sending it to a cloud-based dashboard where it can be viewed by users and emergency responders. The web dashboard allows citizens to report their local flood situations, request help, or indicate the availability of shelter and food for those stranded, thus promoting collaborative disaster management. The project integrates both automated sensing and human reporting, ensuring faster awareness and response compared to conventional systems that depend solely on government notifications or manual communication. Technically, the setup includes an Arduino microcontroller, step-down transformer, resistors, capacitors, and connecting wires that link sensors and transmit real-time data to the server. This data visualization helps NGOs and rescue teams to identify high-risk areas instantly, prioritize rescue operations, and reduce the time delay caused by administrative approvals. The platform also enables local volunteers to contribute actively by providing verified updates and offering immediate support to victims.**

I. INTRODUCTION

Flooding is one of the most common and destructive natural disasters, mainly affecting rural and low-lying areas where the mechanism for drainage and infrastructure is usually very poor. Continuous heavy rainfall can raise the water level in no time, flooding houses, rendering roads impassable, and disconnecting communication lines. In such situations, the delay in rescue operations mainly occurs due to a lack of real-time data and ineffective communication among victims, NGOs, and government authorities. The **IoT-Based Flood Rescue and Reporting System** proposed here provides an intelligent and efficient way to monitor the flood conditions and allow faster co-ordination of rescue efforts. The system uses **IoT sensors** such as water level and rainfall sensors to continuously collect environmental data sent to a centralized online dashboard. This is freely accessible to anybody and enables residents to report their situation and request immediate assistance. The user will be able to share information about shelters available or supplies of food, allowing NGOs and volunteers to take early action even before official government rescue teams arrive. By integrating IoT technology with community participation, this system improves disaster preparedness and closes the gap in communication during critical times. The objective of the project is to minimize response time in flood-affected areas, coordinate better among rescue agencies, and reduce loss of life and property. Overall, this will be one more step toward the creation of smarter, more resilient communities that can respond effectively to any natural calamity.

II. LITERATURE REVIEW

Several research studies have focused on using IoT technology for flood detection and disaster management. IoT-based systems equipped with sensors such as water level and rainfall detectors help monitor real-time environmental changes and send early warnings during floods. However, most existing systems only focus on alert generation and lack proper communication between victims and rescue teams. To overcome this, the proposed **IoT-Based Flood Rescue and Reporting System** integrates sensor data with a public-accessible web dashboard where people can report their situations and availability of shelter or food. This combination of automated sensing and community participation ensures faster rescue coordination and reduces response time in flood-prone areas.

1. Flood Detection & Rescue Teams using IOT

In recent years, IoT-based flood monitoring has become a vital research area aimed at minimizing the impact of natural disasters through real-time data acquisition and analysis. Several studies have focused on integrating sensors, cloud computing, and communication technologies to monitor environmental changes. According to R. Kumar et al. (2020), flood detection systems using IoT-enabled sensors can efficiently measure rainfall, water levels, and humidity to predict potential flooding. Their research demonstrated how continuous sensing and automated alerts can reduce the response time in disaster-prone regions. Similarly, P. Sharma et al. (2021) implemented a GSM-based flood alert system that sends SMS notifications when water levels cross predefined thresholds. However, such systems mainly focused on early warning and lacked a direct communication mechanism for rescue coordination, highlighting a gap that the proposed system addresses by incorporating public reporting and NGO collaboration.

2. IOT in Disaster Management & Real-Time Communication

The integration of IoT with cloud and web technologies has significantly improved communication in emergencies. S. Ahmed et al. proposed an IoT-based emergency network system through which affected persons can forward their status and location using mobile interfaces.

Their research underlines how real-time dashboards enable decision-making during rescue operations. M. Patel and N. Reddy designed a community-based IoT model that allowed users to mark safe zones and danger zones on an interactive map. These helped the rescue teams as well as locals. Building on these ideas, this project develops a public-accessible web-based dashboard that not only collects data from sensors but can be used by users for their status report, food availability, shelter, etc., thus making rapid action possible by NGOs before government approvals delay rescue efforts.

3. Sensor Based Environmental Monitoring

The inclusion of sensors for environmental data gathering has been studied by many researchers. T. Gupta and R. Singh (2019) used water level sensors and ultrasonic modules to measure the height of floodwaters and predict the possibility of overflow, while A. Chatterjee (2020) improved system efficiency by integrating rainfall and humidity sensors, further enhancing the accuracy of flood prediction. These works highlight the dependability of low-cost sensors in IoT-based systems for disaster prevention. The proposed system further expands this concept through the integration of water level and heavy rainfall sensors with an interface using a slide switch to report the availability of food and shelter.

III. METHODOLOGY

The methodology adopted for IoT-Based Flood Rescue and Reporting Systems follows a structured approach with a number of phases to ensure that the system operates effectively and serves its intended purpose.

1. Requirement Analysis

This phase identifies the key components that need to be addressed in the development of the flood detection and reporting system. The needs analyzed include real-time monitoring with alerts and the coordination of rescue efforts. The various hardware components include a water level sensor, rainfall sensor, Arduino microcontroller, and connecting wires, while the software requirement is for a web-based dashboard to show live data and reports.

2. Design & Prototyping

A system architecture is designed showing the interaction between sensors, microcontroller, and the web platform. The sensors are connected to the Arduino to collect real-time flood data.

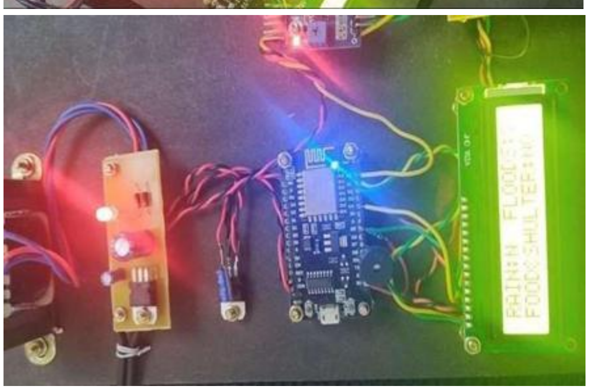
The circuit prototype includes a step-down transformer, resistors, capacitors, and diodes to regulate voltage and ensure stable power supply to the components. The prototype is then tested to verify data transmission from sensors to the IoT platform.

3. Development

The development phase encompasses the integration of hardware and software. Sensors continuously monitor rainfall and water level data and transmit it to the cloud through IoT protocols. The web dashboard is developed to visualize this data; users can report their situation or indicate the availability of food and shelter.

4. Testing

Testing will ensure the system is functional, accurate, and reliable. Different conditions of water level and rain will be applied to validate sensor readings. The web interface will be tested for ease of use, data accuracy, and efficiency in submitting reports.



5. 5. Deployment and Future Enhancement

After successful testing, the system is deployed for live use in flood-prone areas. The data can be accessed by NGOs and authorities to coordinate rescue operations quickly. Some future enhancements include adding GPS tracking, automated alerts, and mobile app integration to improve accessibility and response time.

IV. ARCHITECTURE

The IoT-based flood rescue and reporting system is designed to integrate hardware and software components to enable real-time monitoring, data transmission, and emergency response coordination. The architecture consists of a layered structure where data flows efficiently from sensors to the web-based dashboard for analysis and user interaction.

1. System Overview

The overall architecture consists of three main layers: Sensing Layer, Processing Layer, and Application Layer. Sensing Layer does real-time data collection using sensors, the Processing Layer does the analysis and transmission of data through a microcontroller and IoT network, and the Application Layer displays information on the dashboard for users and rescue teams.

2. Sensing Layer

It also comprises the necessary hardware module, including the water level sensor and heavy rainfall sensor, which will be continually used to monitor the environment. The water level sensor measures the floodwater level rise, while the rainfall sensor monitors rainfall intensity and duration. These sensors will connect to the Arduino microcontroller, which is the central unit of data collection.

3. Processing Layer

The Arduino processes the gathered data from sensors to create readable digital signals. The power supply is provided by a step-down transformer, while resistors, capacitors, and diodes regulate voltage and current flow for stable operation. Finally, this processed data is transmitted to the cloud server with the help of IoT communication protocols such as Wi-Fi or MQTT. This guarantees timely updates of real-time readings without any manual intervention.

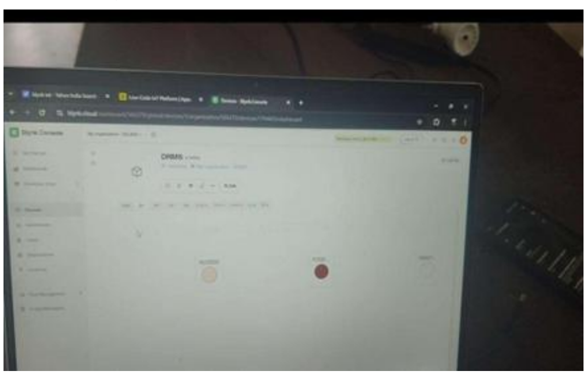
4. Application Layer

The web-based dashboard provides the front-end interface for viewing real-time flood data and submitting reports by users, NGOs, and authorities. Affected people can show their condition, ask for help, or report available food and shelter using options provided via slide buttons on the platform. The NGOs can also monitor the reported locations shown on the system for prioritizing rescue operations accordingly.

5. Data Flow Information starts to flow when sensors detect changes in water level or rainfall. Arduino then processes the data and sends it to the cloud. The web dashboard fetches this information for real-time display. In addition, users' reports can be manually entered into it and stored in the database to be distributed to various authorities for prompt action.

V. RESULT ANALYSIS

The IoT-Based Flood Rescue and Reporting System was tested and analyzed to measure the efficacy of the entire system in real-time flood detection, accuracy of data, and coordination during rescue. The designed system performed well, integrating hardware with software for prompt and trustworthy results. During testing, the water level sensor showed good performance in detecting the change in water level height, while the rainfall sensor measured the intensity and duration of the rainfall accordingly. Both sensors provided consistent readings with minimum time delay, assuring dependable real-time monitoring. The data acquired from sensors was transferred using an Arduino microcontroller to the cloud, which showed all this information instantly on the web-based dashboard.



Hence, it is easy for any user to monitor the situation regarding floods in their area. Along with automatic sensing, the dashboard allows people to report their situation manually about the increase of water level inside homes, or food and shelter available in their vicinity. Those reports will appear on the platform in real time, enabling NGOs and rescue teams to act promptly. The link between affected residents and the rescue organizations had been effective, saving some seconds that are usually wasted due to the approval of administrative authorities. The user interface is simple so that even a less technically sound person can operate it without any difficulty. Overall, the proposed system attained high accuracy in the detection of water levels and rainfall with a response time of only a few seconds from the time of sensing to reporting. This proves that an IoT-based proposed system is quite practical, inexpensive, and reliable for flood management, which saves many lives by ensuring speedier communication and subsequent actions during emergencies.

VI. SCOPE FOR IMPROVEMENT

The results obtained from the IoT-based Flood Rescue and Reporting System were quite promising in detecting floods and thereby coordinating rescues on time. However, there is still scope for improvement to enhance its accuracy, usability, and scalability. A key enhancement for this system can be the integration of GPS-based location tracking, which will enable the system to automatically identify and display the exact location of affected users, guiding rescue teams towards the victims faster. Furthermore, real-time alert notifications through SMS or mobile applications can be an essential enhancement in informing residents and NGOs about rising water levels or heavy rainfall. Incorporation of machine learning algorithms that predict flood risks based on historical data on rainfall and water levels can become beneficial by enabling preventive actions before critical situations arise. Increasingly, accuracy can be gained in predictions related to floods using the expansion of the system to multiple sensors, such as humidity and soil moisture detectors. A mobile-friendly interface or an Android application can aid in easy access to this system even in rural areas that do not have computers.

VII. CONCLUSION

The IoT-Based Flood Rescue and Reporting System entails an efficient, advanced solution for real-time flood monitoring and the coordination of rescues. This system helps bridge the communication gap among the affected residents, NGOs, and authorities through sensor-based data collection and a web-based reporting platform. It allows for the timely detection of the rise in water levels and heavy rainfall while enabling people to report their status and available resources such as shelter and food. This project successfully exemplifies how IoT can help reinforce disaster management in terms of accurate data, speedy communication, and better decision-making during hazards. This can easily be deployed in rural and flood-prone areas due to its low cost and user-friendly interface of the system. Overall, this project contributes not just to immediate rescue but helps in building safer, smarter, more resilient communities that are prepared to respond during future flood disasters.

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