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Article Title: Flood Monitoring System Based on IoT

Flood Monitoring System Based on IoT

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ABSTRACT

Flooding is one of nature's unavoidable calamities. It happens too quickly and affects far too many people and properties. Prior to this, the majority of previous systems exclusively focused on specific regions. Aside from that, the bulk of the people is unable to monitor and has no idea when the flood will occur since they lack access to weather information and data. By implementing an IoT (Internet of Things) based smart flood monitoring system, all of the shortcomings of the current system will be addressed. This project proposes a smart city flood monitoring and alerting system based on IoT. The open source Arduino electronic platform serves as the base for this project. This system uses water level and DHT11 sensors. Water level sensors were employed to measure the water level. This sensor will be in charge of sound navigation and range. It will function by sending out a short, high-frequency pulse, listening for the echo, and determining the level from there. A cheap digital temperature and humidity sensor is the DHT11. If the water level is unsafe, an alert message is sent and an alarm is activated to sound a flood alert. The water level and rainfall intensity in the area around the stream are monitored using NODEMCU. The LCD and LED functions are to display and signal the water level. The system will detect water level using a water level sensor and will automatically send a notification to the user's smartphone via IoT technology via the Blynk application.

Keywords: IoT (Internet of Things), DHT11 sensor, water level sensor, Alarm, Buzzer.

1 Introduction

The flood is currently one of India's most devastating disasters. India has been named one of the top ten food-threatening countries in the world. Flooding is a natural phenomena induced by severe rains generated by monsoons, hurricanes, cloud bursting, and glacier melting that surpasses the capacity of water bodies [1]. India saw exceptional rainfall in 2019, resulting in significant damages in 13 states, including the deaths of at least 200 people and the displacement of millions more. Karnataka and Maharashtra were the worst affected states [2]. Many of the current technologies are ineffective, too manual, and rely on attentive human

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resources. There are still many applications in Indonesia where dam doors are manually opened and closed by the operator or gate guard. This is inefficient and causes river overflow and flooding [3]. An integrated technology capable of remotely detecting rain and river water level is required to monitor this natural parameter. The Internet of Things is the solution. The (IoT) technology as a remote possible flood monitoring solution in the river [4]. Early detection of natural disasters, like floods, can significantly help people reduce the amount of damage that these tragedies inflict [5]. The development of self-driving cars has been the main driver of the IoT's widespread integration in the transportation sector [6]. The IoT is a dynamic network of technology designed to link different devices and commonplace items [7]. Because the majority of IoT devices are battery powered or run on low power, the mechanism for processing data at the edge will be considerably more effective if the processing platform is equally low power [8]. Possibly, the monitoring requirement, especially on a broad scale, is now best met by utilising Earth observation data [9]. The IoT is collecting exponentially more data due to exponential growth of sensor-based devices such wearable sensors, industrial sensor nodes, and environmental monitoring sensors [10].

Hence the achievements of the present techniques has to be improved in many ways. In this paper proposed a flood monitoring system based on IoT. The list below demonstrates how the paper is organised: Section II describes the most recent work. Section III describes the suggested work in detail. The outcomes are presented in Section IV. Section V provides a conclusion.

2 Recent Works

Lisa Landuyt *et al* (2019) [11] developed a thorough assessment and analysis of the pixel-based flood mapping methods now in use, including change detection, global and enhanced thresholding, and active contour modelling. The methods were assessed for accuracy and robustness using medium-resolution SAR photos of various flood occurrences and lakes located in the UK and Ireland. Tiled thresholding is a robust and highly functional technology that is well suited for automated, near-real-time flood detection and monitoring. But in the flood classification problem, the non-flooded class is a background class that is frequently substantially bigger than the flooded class.

Linyi Li *et al* (2019) [12] suggested a method based on the combination of a general regression neural network and a support vector machine (FSVMGRNN) was presented for super-resolution mapping of urban floods in order to enhance performance. An SVM-SMUF method was created, as well as a fusion criterion. This technique strengthens the tools for tracking and evaluating urban flooding disasters and increases the usefulness of median-low resolution remote sensing pictures in mapping urban flooding. The fraction value, on the other hand, does not provide the spatial distribution of flooded subpixels.

Jun Shang *et al* (2020) [13] proposed Exponentially attenuated component analysis (EACA) is a classification method developed because the majority of previously triggered alarms

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frequently have more crucial roles to play in a single alarm flood. The relative triggering timings of each alarm flood are stored as exponential attenuation, and each alarm flood can be recovered as a binary vector. Tennessee Eastman technique is used as a benchmark to validate the efficacy of the proposed method. Moreover, early classification is more challenging since the narrow horizon of early triggered alarms is shorter than the complete range of an alarm flood.

Fan Yan *et al* (2020) [14] presented the Schedule-based flooding trees and Network coding, which have been extensively used to enhance the flooding process's efficiency in low-duty-cycle wireless sensor networks (WSNs). When a mobile sink and network coding are combined with a scheduling tree-based flooding scheme, this method investigates new challenges. The flooding approach offered, which incorporates a movable washbasin, can significantly reduce flooding delay. The flooding process takes a significant amount of time.

Nadeem Akhtar *et al* (2019) [15] developed the Multi-Agent Hierarchical Coloured Petri-Net Based Flood Monitoring System. Since the suggested safety-critical FMPR system is multi-agent based, it is dispersed. Based on organisational abstractions, the Gaia multi-agent methodology is used to specify, analyse, and develop this system. Agent roles based on the Gaia role model are provided, together with safety properties derived from first-order predicate calculus and liveness properties derived from regular expressions. Following a flood, the system offers emergency and rescue services.

3 Proposed Work

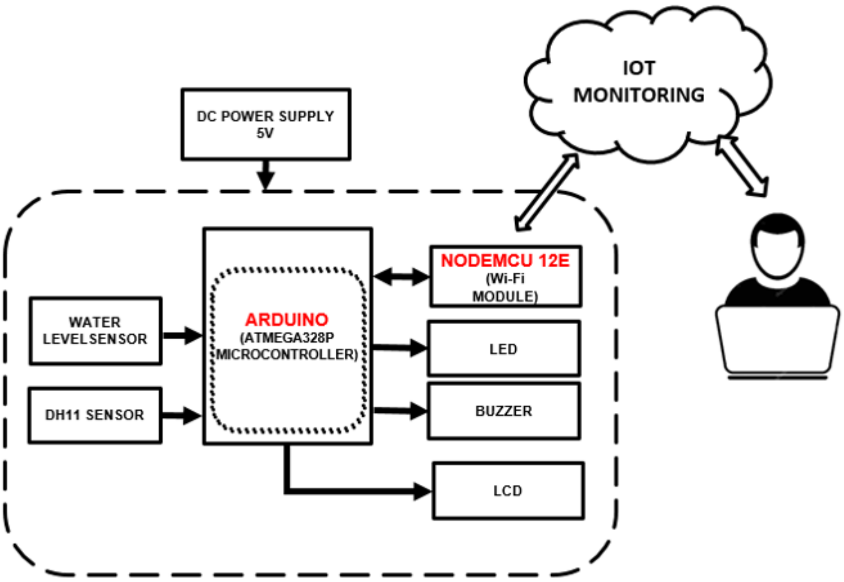

Figure 1: *Block Diagram for flood monitoring system*

Figure 1 represents the flood monitoring System's block diagram. The suggested system reflects the growth methods of an IoT-based system for monitoring and notifying floods that

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incorporates weather predicting using an open weather API. This work is built on the Arduino open source electronic platform. The Arduino Uno will be connected to a variety of devices, including a water level sensor for water level monitoring and a humidity sensor DHT11 for analysing moisture content and temperature. Additionally, values from several sensors must be delivered to the Android application created using the node MCU. If water level becomes dangerously high, an alert message is sent and a buzzer is actuated to sound a flood warning. The level of water is displayed and indicated via LED and LCD. The completed device will be installed in flood-prone areas to detect and prevent flooding.

3.1 Arduino UNO

A microcontroller board based on the ATmega328 is called the Arduino Uno (datasheet). It features a 16 MHz crystal oscillator, 6 analogue inputs, 14 digital I/O pins (six of which are PWM outputs), a USB port, a power jack, an ICSP header, and a reset button.

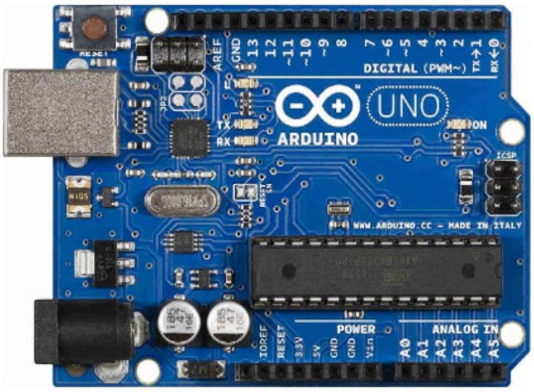

Figure 2: *Arduino UNO*

3.2 Node MCU

Any microcontroller may connect to Wi-Fi network due to the integrated TCP/IP protocol stack found in the self-contained ESP8266 Wi-Fi Module. Programmes can be run on the ESP8266, or it can take over full Wi-Fi networking operations from another processor. Pre-programmed with an AT command set firmware, each ESP8266 module gives you almost the same Wi-Fi capabilities as a Wi-Fi shield when you connect it to your Arduino device. The ESP8266 module is an inexpensive board that has a sizable and quickly growing user community.

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Figure 3: *Node MCU*

3.3 Water level sensor

The water's level is found using sensors that measure water level. This sensor will manage range and sound navigation. It will operate by generating a short, high-frequency wave, listening for the echo, and calculating the level from this.

Figure 4: *Water level sensor*

3.4 DH11 sensor

A cost-effective digital temperature and humidity sensor is the DHT11. A thermistor and capacitive humidity sensor are used to sense the surrounding air, and a digital signal is output on the data pin. Even though it's easy to use, exact timing is required to record data.

Figure 5: *DH11 sensor*

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3.5 Buzzer

A buzzer, often known as a beeper, is a type of auditory signalling device that can be piezoelectric, electromechanical, or mechanical. Alarm systems, timers, instructional materials, and confirmation of user input such as mouse clicks and keyboard keystrokes often use buzzers and beepers.

Figure 6: *Buzzer*

3.6 Blynk App

BLYNK is an important platform that is integrated with IOS and other automation apps in order to alter the Arduino, Raspberry Pi and therefore the advantages over the web continue to grow. The BLYNK App is used as a platform for controlling numerous controllers such as Arduino, Raspberry Pi, NODEMCU, and other internet modules via iOS and Android apps. The BLYNK programme is primarily intended for IOT-based applications. It can control hardware, show sensed data, store data, and read stored data, among other things. BLYNK Application requires initial setup; configure it according to project specifications. Create a project first, and then select the microcontroller utilised in the project. The toggle buttons are then constructed for each relay that is coupled with the microcontroller's digital pins.

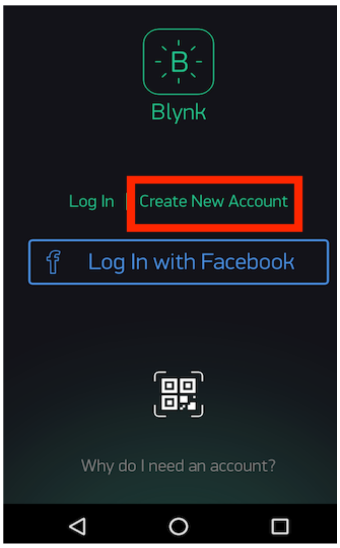

Figure 7: *Blynk App*

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4 Results and Discussion

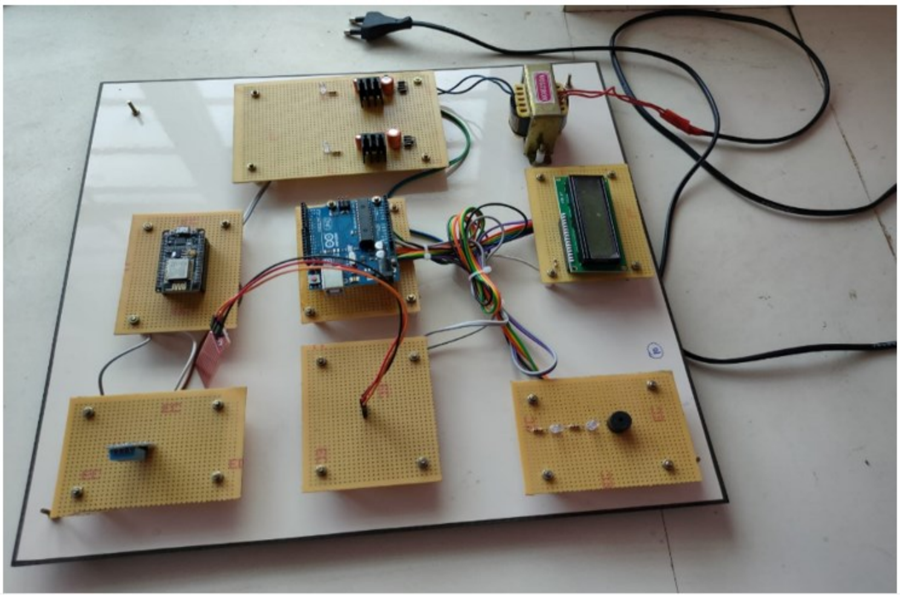

Figure 8: *Hardware View*

Figure 8 shows the hardware view for flood monitoring. This proposed system demonstrates the approaches for creating an IoT driven flood warning and monitoring system that includes weather forecasting. This hardware kit includes a water level sensor and a DHT11 sensor. The water level was measured using water level sensors. This sensor will handle range and sound navigation. It will function by sending out a short, high-frequency pulse, listening for the echo, and determining the level from there. The DHT11 is a reasonably priced digital temperature and humidity sensor. If the water level becomes dangerously high, an alert message is sent and an alarm is activated to sound a flood warning. NODEMCU is utilized to monitor the water level and rainfall intensity in the area surrounding the stream. The LCD and indicator functions are to display and signal the water level. Using a water level sensor, the system will monitor water level and automatically transmit a notification to the user's smartphone via IoT technology via the Blynk application.

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Figure 9: *Result obtained on BLYNK app*

Figure 9 illustrates the outcome of temperature, humidity received in the BLYNK app.

5 Conclusion

This research emphasises the idea of providing an alert system to mitigate flood danger. It can also help many government departments or authorities, ultimately assisting society and mankind in the event of a flood-like devastating natural calamity. This proposed model has already been tested, and it works as described in this project. It keep track of everything that could lead to a flood. It will instantly sound a warning if the water content increases in step with the speed. Additionally, it guarantees easier accessibility in handling and fixing this dire circumstance. In summary, it will help the community plan for the crisis and make swift decisions.

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