



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 3, March 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

Smart Flood Detection and Notification System Musing IoT

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ABSTRACT: The objective of the proposed project is to develop an IoT-based flood detection system comprising a sensor, a transceiver for data transmission, and a computing device for flood monitoring and prediction. Vital statistics such as water level, temperature, and water velocity are crucial for anticipating flood occurrences. The system's core functionality involves sensors collecting flood data at specific locations. It autonomously assesses whether the measured parameters surpass predetermined threshold values indicative of potential flood risks. When readings exceed these thresholds, an alarm message is triggered. Utilizing DHT11 sensors, the system monitors humidity and temperature, displaying them on an LCD screen. Additionally, ultrasonic sensors are employed to detect waves. A water level sensor determines if water levels are elevated, activating a buzzer alarm if necessary.

KEYWORDS: IOT, Buzzer, Ultrasonic sensor, DHT11 Sensor, water level sensor, Temperature, Humidity, water range, Flood

I. INTRODUCTION

In recent decades, we've witnessed remarkable advancements in science and technology that have drastically transformed our lives, primarily due to the onset of the industrial era. However, this industrial progress has also led to a considerable rise in global warming and various environmental issues such as floods and earthquakes. The escalating carbon emissions and greenhouse gases have disrupted the natural rainfall and flood cycles, rendering us more vulnerable to flooding than ever before. Technology plays a pivotal role in both detecting floods early and addressing the problem. IoT offers a strategic solution by enabling remote monitoring and control, facilitating seamless data collection and exchange between devices.

Hence, a proposed solution entails developing a system to promptly detect floods and monitor the surrounding environment. Various sensors, such as those measuring temperature, humidity, water level, flow, and utilizing ultrasonic technology for wave detection, are employed. The system comprises an Arduino controller, a Wi-Fi module, an LCD screen, and a remote server-based IoT platform interconnected to the internet. Additionally, an Android application featuring a graphical user interface is included to visually present all pertinent data. These sensors continuously capture data on a diverse range of weather and environmental conditions. The collected data is then transmitted in real-time to an ESP32-based controller. Subsequently, the Arduino program analyzes sensor readings for any discrepancies or irregularities. And the associated values are calculated. The detector data is transmitted to a Wireless module is a viable option for achieving this goal. On the LCD, you can see the current readings from the sensors. When the value of a sensor hits or exceeds a user-defined threshold, an alert is sent to the user's Android device.

II.LITERATURE SURVEY

Our primary focus is on constructing a dependable model capable of combating floods in developing and underdeveloped nations. We have explored various models, energy-efficient systems, and diverse wireless sensor networking configurations utilized for flood detection. Some of the works we have reviewed for our survey include:

M. Madhumathi [1] has proposed the design of flood observatory system which provides alert to the surroundings when the water level increases the normal capacity by making use of ultrasonic and water level sensor.

Mahendra Saluke[2] provided a survey on urban flood prevention management system by monitoring the urban Drainage capacities.

B. kanaka Durga [3] proposed a flood warning system by monitoring the rising water level and providing alert in case of danger through GSM technology.

Wahidah Durga [4] provided an idea of implementing flood alert system by making use of measuring sensors. Gadede Megha[5] proposed a method of flood alert by monitoring the jackwell that are situated near the river. Inspired by the literature, this work aims to provide an early flood detection system using IOT.

III.BLOCK DIAGRAM

The system comprises an IOT-based remote server platform, an LCD screen, an LCD screen, an ESP32 Microcontroller unit (MCU) equipped with an integrated Wi-Fi module, and an Android application featuring a user-friendly graphical interface (GUI) for visually presenting essential information.

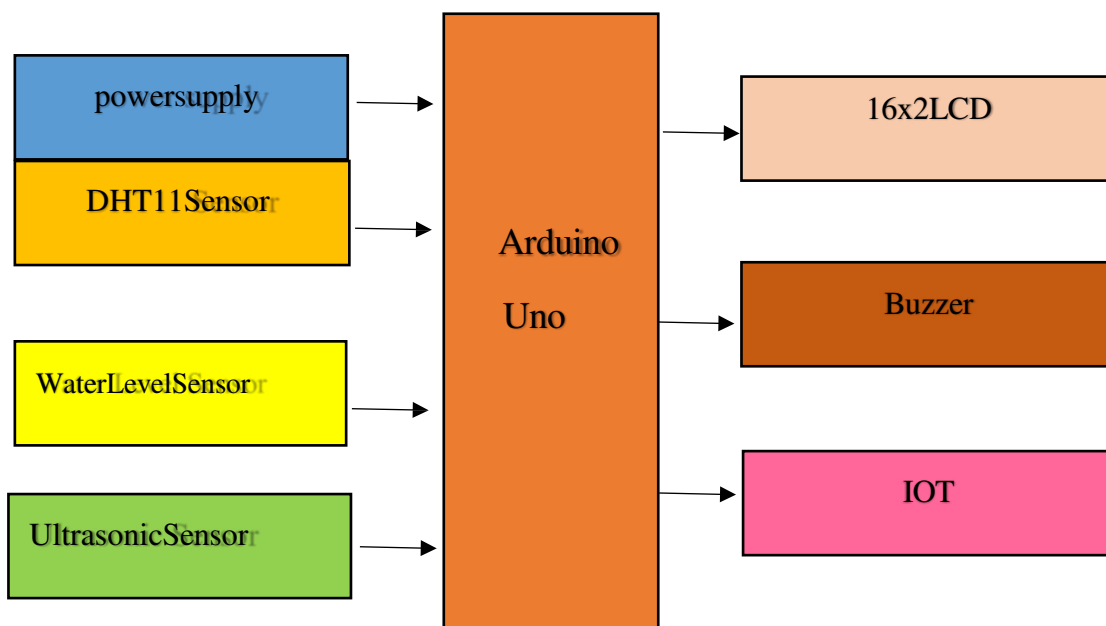


Fig3.0.1 Block diagram of flood detection system using IOT

Arduino Uno

The Arduino Uno stands as a cornerstone within the Arduino family, boasting immense popularity among makers, learners, and experts alike. Its core comprises the ATmega328P microcontroller, delivering 14 digital I/O pins (including 6 PWM-capable), 6 analog inputs, and a 16 MHz quartz crystal. Equipped with a USB interface, power jack, ICSP header, and reset button, the Uno offers a user-friendly platform for a myriad

of projects. With its straightforward design and extensive compatibility with shields and modules, the Uno serves as a gateway for exploration in electronics and programming. From introductory tutorials to sophisticated ventures like smart home systems and interactive installations, its adaptability and simplicity make it an ideal choice. Furthermore, the Uno seamlessly integrates additional functionalities like WiFi, Bluetooth, and motor control through a diverse range of available expansions.



Fig3.1.1:ArduinoUno

ESP8266 and Sensors

The ESP8266 functions as the WiFi component facilitating the transmission of sensor data to ThingSpeak. Upon linking it to a nearby wireless network, the module gains internet connectivity, enabling IoT operations. The DHT11 sensor gauges both humidity and temperature, relaying this data to the Arduino before forwarding it to ThingSpeak.

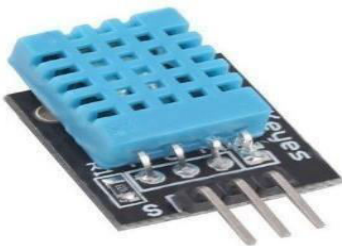


Fig3.2.1:DHT11Sensor



Fig3.2.2:UltraSonic Sensor



Fig3.2.3:WaterlevelSensor

The system integrates various sensors for monitoring temperature, humidity, water level, flow rate and ultrasonic detection. The software governing the Arduino device initially sensor readings and then processes the identified patterns. Additionally, a Wi-Fi module is linked to Arduino, enabling it to transmit sensor data to a remote IOT platform using IOT protocols over the Wi-Fi connection. The measured sensor data is displayed on the LCD screen. And also DHT11 sensor is used to identify the temperature and humidity in the atmosphere. If the water level increase, then automatically generate buzzer and it shows the danger condition.

Software used Arduino IDE

In order to program our Arduino boards, we require a software known as the Arduino IDE (Integrated Development Environment), which must be downloaded and installed on our computers. This IDE enables us to write code that can be uploaded directly to the Arduino board. It includes a convenient integrated library manager and offers support for all Arduino boards. The Arduino IDE is designed for ease of use, catering to a wide audience of users. Moreover, it is a cross-platform tool compatible with various operating systems including Windows, macOS, and Linux, facilitating programming across different environments.

IV.RESULTS AND DISCUSSION

The experiment's goals are to verify the code accuracy and to validate the sensor's functionality. In fig 5.1 sees the water level sensor being used to detect the water level. For example, If the water level high, then automatically buzzer will be generated and it displays on the LCD.



Fig4.1 Display the water level high or not

If the water level below the value of range, then System will display on LCD water level is Low so it is safe condition.



Fig4.2 Display of surrounding temperature

Temperature readings are essential for assessing the local climate. To do this, this could utilize Google or another weather prediction website; however, these sites rarely provide accurate and DHT11 sensor will detect the temperature and Humidity in the atmosphere and results will display on LCD. DHT11 can measure temperatures from 0 to 50 degrees.



Fig4.3 Display the distance (incm) of water level

The ultrasonic sensor can be trusted because the computed inaccuracy for waves and water level of more than 40 cm, then it is safe condition and between 10 cm to 40 cm, then it will be moderate condition, if the value below 10 cm, then it shows the danger condition.

It mainly depends on the distance whether the condition safe or not fig 5.3 indicates the distance of waves, then it displays output on 16x2 LCD



Fig4.4Scenario shows the danger condition when below the 10cm

The experiment will proceed with varying amounts of water, to test the Ultrasonic sensor's and the system mainly controls of Arduino and preformthe output and alreadycode dump into the kit and give certain instructions.

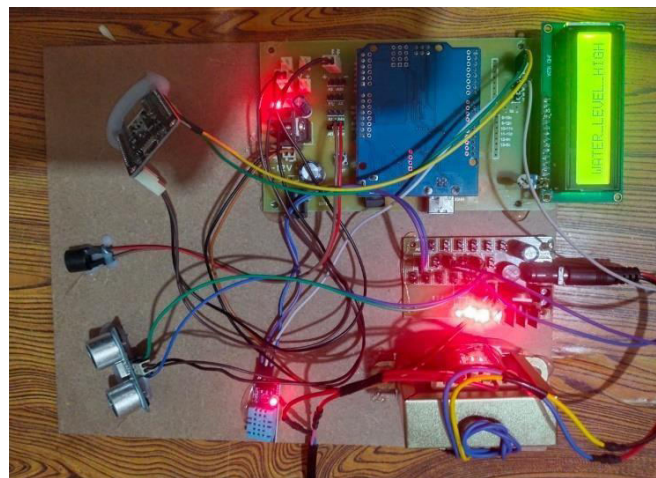


Fig4.5Scenarioshowsthetotaloutputkitofthesystem

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OT DETECTED"}]}
```

Fig4.6 Display the all outputs through Wi-Fimodule in think speak

In this website shows the all ouputs through wi-fi module and update the values in every second. When we operate the system it shows the value whether the water level high or not and it is the one of the advanced technology and operating through mobile applications. And the measured values willstorein cloud whichwill no terased and mainly it isuse ful many people and share the information of measured values to the respective authority.

V.SCOPE OF ENHANCEMENT

The system offers a live-stream camera feature for real-time flood monitoring, enabling users to view flood conditions as they occur. It employs Serial Communication to transmit warning text messages containing date, time, water level, and road accessibility information. The future prospects for flood detection systems utilizing IoT technology are promising. As IoT advancements progress, these systems can achieve greater efficiency and accuracy. Integration with AI and machine learning algorithms holds potential for enhancing predictive capabilities, enabling early detection and warning mechanisms. Furthermore, the utilization of data analytics can refine emergency response and disaster management strategies. As IoT technology evolves, there is significant potential for improving flood detection systems to effectively mitigate risks and safeguard communities.

VI.CONCLUSION

This research introduces a flood detection system aimed at mitigating the considerable damage floods inflict on ecosystems and communities. The system relies on various sensors to assess critical factors such as flow rate, indicating the volume of water passing through a river at a given point. Additionally, it incorporates sensors to measure reservoir temperature and humidity, assessing water suitability for aquatic life and alerting nearby industries of any concerns. Through timely alerts to relevant stakeholders and communities, the system aims to minimize potential consequences. The project's future prospects involve developing a flood prevention mechanism featuring an emergency switch capable of promptly notifying local authorities in the event of impending floods.

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