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# Early Flood Monitoring System Through AI, IOT and Thing Speak Cloud

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## ABSTRACT

**One kind of natural disaster that can cause significant property damage and even fatalities is flooding. It's critical to diagnose floods early to reduce their effects. In this study, we describe a novel early flood detection technique utilizing the Thingspeak cloud platform, Artificial Intelligence (AI), and Internet Of Things (IOT) technologies.**

**The system consists of a network of Internet Of Things (IOT) sensors positioned in flood-prone areas to detect water levels in real time. These sensors collect and transmit water level data to the Thingspeak cloud platform. The AI algorithms running on the cloud platform examine the data to look for changes in water levels that could indicate an impending flood.**

**Keywords:** Artificial Intelligence, Internet of Things, Thingspeak, esp32 microcontroller, water level sensor, Flood, Detection, alert.

## I. INTRODUCTION

Flooding is a devastating natural disaster that can have severe consequences on communities, infrastructure, and the environment. Early detection of floods is crucial for timely response and mitigation efforts. Recent technological developments have made it possible to create creative solutions for early flood detection.
Human activities leading to extreme climatic changes, such as pollution and deforestation, contribute to natural disasters globally, with flooding being a major concern due to its impact on life, property, and economies. This text discusses a project using sensors to collect flood data like water levels , which is then transmitted to an IOT cloud thingspeak via esp32 sensor and message in whatsapp for real-time alerts to local populations, aiding in disaster preparedness and response[1].

This study focuses on the implementation of an early flood detection system that leverages artificial intelligence (AI), Internet of Things (IOT) technology, and the ThingSpeak cloud platform. By combining these technologies, we aim to create a robust and efficient system for monitoring water levels in flood-prone areas and detecting potential flood events in real-time.

Flood disasters are prevalent in India due to heavy rainfall and poor waste management. Mitigation efforts include structural measures like real-time river level monitoring using IOT technology with ESP32 microcontrollers and water level sensors. This system provides data to the public through audio, Whatsapp, images, Google map location and Thingspeak website, enabling quick response to potential flooding. By utilizing technology for early warning and data dissemination, the goal is to enhance flood management, reduce impacts, and improve community resilience against flood disasters in India[2].

## II. COMPONENTS

### *A. Microcontroller (ESP32)*

ESP32 Wi-Fi module is a latest wifi development board of ESPs that use the ESP32 chip. Besides give connection wifi, module it also gives Bluetooth connection BLE equipped with a dual core 32bit MCU. This Wi-Fi Module has voltage 3.3V so that to make electronic using ESP32 user must notice that the electricity supply in the circuit cannot more than 3.3V

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[4].

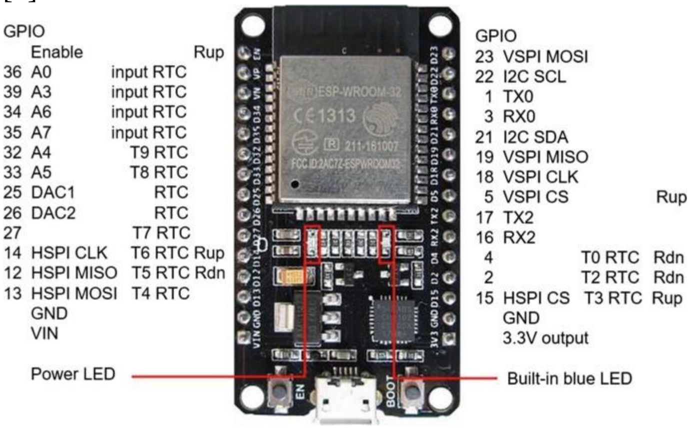


Figure 1. Microcontroller (ESP32)

### *B. Water Level Depth Sensor*

The water level sensor is a device that measures the volume of liquid in a fixed container that is too high or too low. The height of the liquid level is translated into an electrical signal for output by the input type water level transmitter, which we refer to as a contact measurement. As of right now, it's a common water level transmitter.

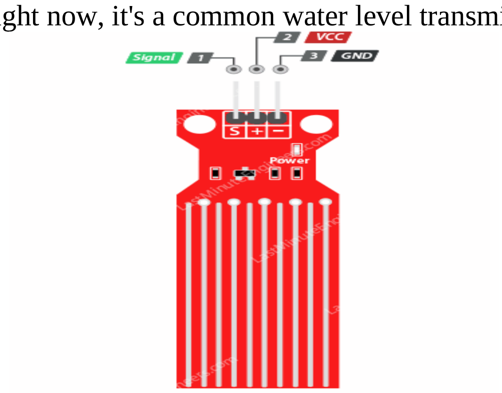


Figure 2. Water Level Depth Sensor

### *C. 3Pin ribbon jumper wire cable*

This cable has three wires and is of middling quality. The 7" (18cm) long cable is excellent for connecting the esp32 microcontroller to the water level depth sensor. On both ends, there is a 3-pin JST female connector that is plated in tin and has
a 0.1" gap.

Figure 3. 3pin ribbon jumper wire cable

### *D. USB Cable*

The USB cable is used to connect esp32 microcontroller to our laptop for connect the thingspeak cloud platform.

Figure 4. USB Cable

## III. METHODOLOGY


Figure 5. Overview Diagram

The overview figure shows the most straight forward flow, in which the sensor sends measurements that are gathered and then used to inform decisions that result in a flood alert. Further information is given in the overview diagram, which shows how the user activates the sensor that is successfully used for sensor streaming. Following data collection, the preprocessing module receives the information, which is used for decision-making, trimming, and the removal of special symbols in order to produce the flood alert.

The most comprehensive diagram is the overview diagram, which shows how the user activates the sensor that is successfully used for sensor streaming. Socket programming is used for the data collection, and the preprocessing module receives the data after which it is used for special symbol and trimming.

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# IV. STATE TRANSITION DIAGRAM

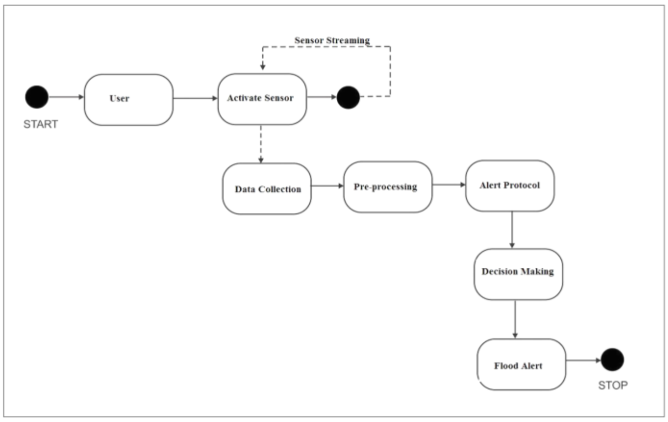


Figure 6. State Transition Diagram

The state transition diagram provides the various states that the proposed system goes through. Initially the start state where in the user activates the sensor which is effectively utilized for sensor streaming. The data collection is performed using socket programming then provided to the preprocessing module which are utilized for the trimming and special symbol removal along with Alert protocol creation and Decision Making to achieve the Flood Alert and then reaches the stop state.

# V. COMPONENT DIAGRAM

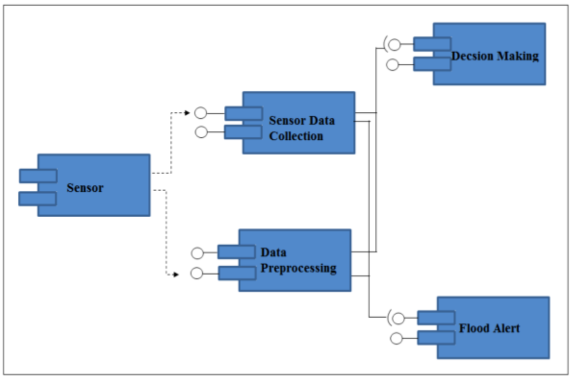


Figure 7. Component Diagram

The component diagram illustrates the important components in the proposed system. In our approach the important components consist of the sensor which is interlinked with sensor data collection and data preprocessing, these two modules are further linked to the Decision Making and flood alert.

# VI. RESULTS AND DISCUSSION

## 1. Taking the water level values

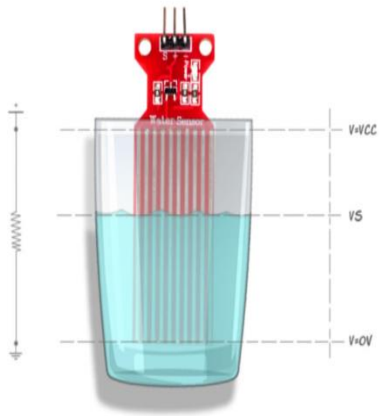


Figure 8. Deep water lavel sensor in Beaker

```
In [1]: runfile('D:/flood_detection/Flood_Engine.py', wdir='D:/flood_detection')
pygame 2.5.2 (SDL 2.28.3, Python 3.10.13)
Hello from the pygame community. https://www.pygame.org/contribute.html
value =  0
value =  0
value =  0
value =  0
value =  0
value =  0
value =  16
value =  16
value =  16
value =  16
value =  16
value =  50
value =  50
value =  50
value =  50
value =  50
value =  117
value =  117
Flood Image is Captured
The latitude of the location is:  18.521428
The longitude of the location is:  73.8544541
value =  77
value =  77
```

Figure 9. Water Level Current Values

In order to begin our project, we first execute our main program. After that, values are found using a water level sensor that measures in centimeters (cm).The esp32 microcontroller receives the results from the water level sensor and uses them for preprocessing, alert protocol verification, and conditional decision-making to determine whether or not a flood has been detected. For ex. when a value of 117 is detected, which is more than the threshold, the most likely event of a flood is indicated on the screen with the message "flood image is captured." The location's latitude and longitude are also provided, for example, 18.521428 and 73.8544541.

### 2. Early Whatsapp Alert Screenshot

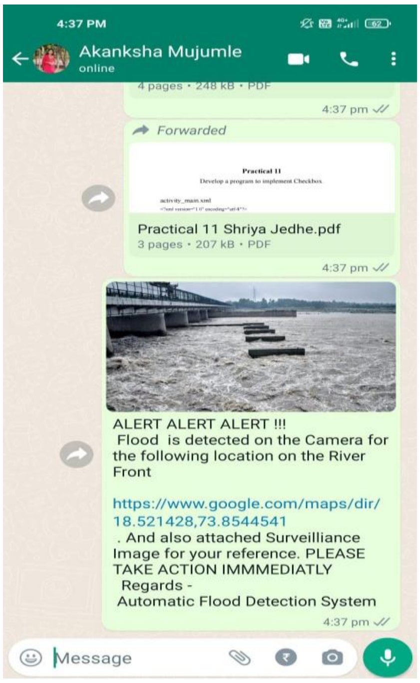


Figure 10. Whatsapp Alert Image

In this figure we have shown the Live captured flood image along with message and live google location. Which is received by the peoples who lived near river bed areas. we also send audio alerts to peoples when flood is detected. Peoples can save their life and properties by getting early alerts.

### 3. Google Maps Live Location

In given figure provides live location of the our prototype system to notify everyone who live near the river bed areas. This prototype placed in the Mutha river near the Shaniwar Wada in Pune District. This figure containing an information of where the prototype is placed. It gives current location of our prototype to the People who live near rivers should notify everyone using the our project.

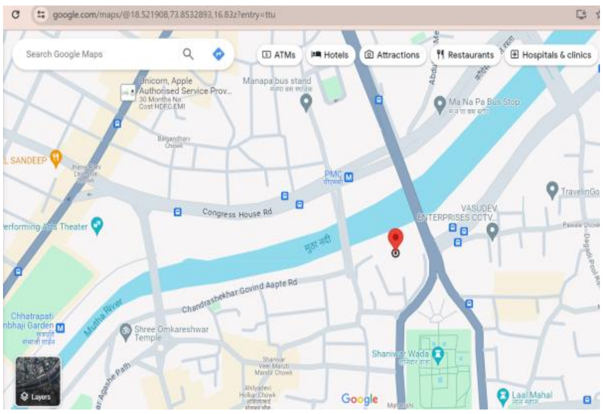


Figure 11. Google Maps Live Location

### 4. Real-time Thingspeak Graph

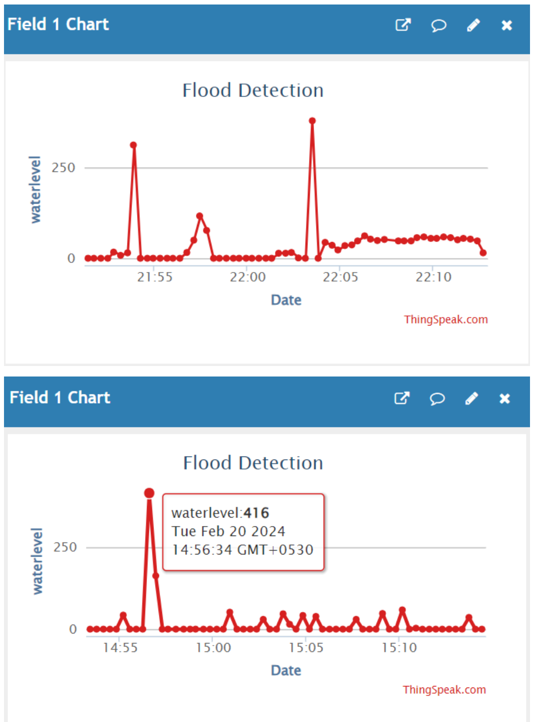


Figure 12. Thingspeak Graph

This graph is show the level of water, day and date , current time of detected flood in graph format.The Thingspeak cloud collects the predicted water level values in just 5 seconds and preprocessing it within time and take a decision alert is generated or not.

## VII. CONCLUSION

In conclusion, the integration of AI, IOT, and Thingspeak cloud in a flood detection system offers a powerful and efficient solution for early warning and monitoring of flood events. By leveraging real-time data collection, analysis, and communication capabilities, this system can help mitigate the impact of floods by providing timely alerts to authorities and residents. The seamless connectivity and automation provided by these technologies enable rapid response and decision-making, ultimately enhancing the overall resilience of communities in the face of natural disasters. The implementation of such an advanced system demonstrates the potential for technology to be indispensable in disaster management and emergency response efforts.

## VIII. REFERENCES

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