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# Design of Information Monitoring System Flood Based Internet of Things (IoT)

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## Abstract

**Purpose** – The purpose of this paper is to develop prototype of the information system of the flood monitoring based internet of things (IoT). This prototype serves to assist users in accessing flood levels through water levels and rainy weather conditions.

**Design/Methodology/Approach** – This paper presents the design of information system of flood monitoring based internet of things (IoT). This prototype study acquires water level and rainfall data using ultrasonic sensors HC-SR04 and rain sensor. Data of flood height and rain levels detected by sensors are processed using Arduino Uno Microcontroller to produce output data in HTML format. Flood altitude information system and rainy weather from the microcontroller are distributed using ethernet module as web server integrated with Wireless N Router TL-MR3020 as a gateway path to the user.

**Findings** – This research produces a prototype of web-based flood monitoring information system that has been able to distribute data of flood height and rainy weather in real time.

**Research Limitations/Implications** – In the implementation of measurement, the information system only accesses one flood detector or one flooded location.

**Practical Implications** – This research produces a prototype of web-based flood monitoring information system that has been able to distribute data of flood height and rainy weather in real time.

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## 1. Introduction

Flood disaster is one of the most common national disasters in Indonesia. The occurrence of floods has taken many victims. Flood disasters occur due to environmental imbalances carried out by humans such as forest destruction with forest exploitation irrespective of boundaries. The information system of the flood in the middle of society is still done by the conventional way that is by verbal delivery of related parties such as Regional Disaster Management Agency (BPBD) and the police. A delivery system that has been applied by the community by using communication methods of communities is considered to still have weaknesses in terms of time and information.

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. It aims to be able to mitigate and reduce disaster victims in general (Mercado, 2016).

## 2. Related works

The development of disaster information and communication system has been conducted by research by previous researchers. System research and development has undergone many developments beginning with analog technology up to web-based digital technology to mobile applications (Nasution *et al.*, 2017). Technological switches have made step-by-step shifts like flood early warning systems that transmit flood height data onto real-time (Satria *et al.*, 2017b). In the study using a single sensor that is ultrasonic sensors as input components and output components using Ethernet as a web server. In addition to the use of web-based output, there is GSM-based disaster information system including prototype fire monitoring information system Building Based GSM Module (Dewi *et al.*, 2017). The research produces output in the form of sending fire data sent through GSM module with output in the form of fire location information in the form of google maps. Other studies have done similar things in the use of Google Maps location-based information systems in flood detection systems (Satria *et al.*, 2017a). Research using GSM has been built by (Azid *et al.*, 2015) (Kuantama *et al.*, 2013) and (Piller *et al.*, 2015). In the study, the flood height data is sent to the flood information system server through the GSM network module. In the study sent SMS in the form of landslide symptoms of the disaster information system station. The use of disaster communication and information technology has built several studies using GSM. In contrast to the current emerging technology has made the service of the internet-based communication system of things (IoTs). It is seen that the current warning system has been using an integrated internet technology model with disaster detection equipment (Poslad *et al.*, 2015).

Based on previous research, it is necessary to develop and other innovations for a flood early warning system concept internet of things (IoTs). Therefore, this study presents a flood early warning system that can send flood height information, rainfall and

temperature conditions via the internet using Ethernet module as a web server and Adriano microcontroller as data water level processing.

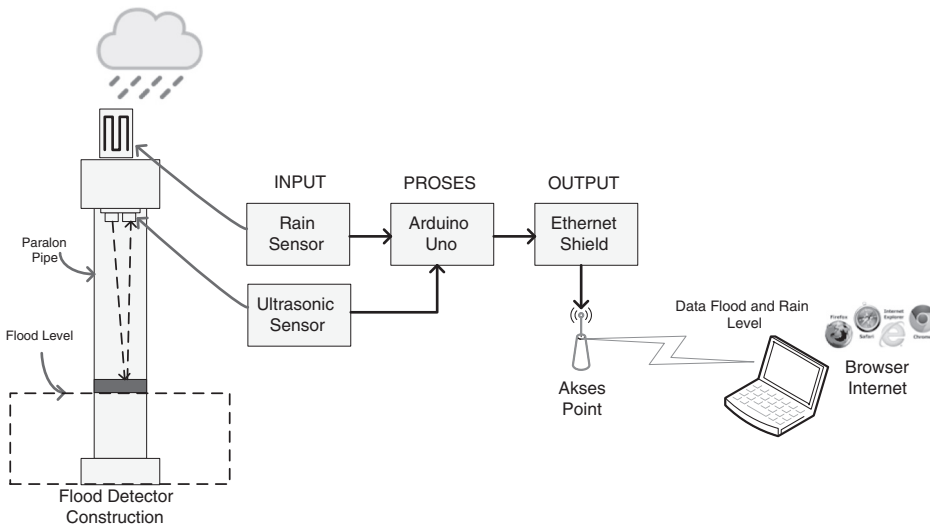
### 3. Design prototype

In this research, the research methodology used is SDLC (Software Development Life Cycle- which is software development cycles which consist of the cycle from analysis, design, implementation, testing and maintenance (Bahagia *et al.*, 2017).

The research uses several supporting components such as Arduino Microcontroller that is ATMEGA238 based processing with 8 bits processing power, process capacity 2 KB RAM and clock density are 16 MHz (Pham *et al.*, 2013). An Ethernet component that acts as a web server using TCP / IP based communications media (Satria & Yanti 2017), Rain Sensor as rainfall detector (Xu *et al.*, 2016), Wireless Router used in this research is Wireless N Router TL-MR3020 that is Wireless Broadband Router which has basic function as Access Point and GSM modem, Switch consisting of 4 Ethernet port and as Router which function to arrange and share internet network connection(Pham *et al.*, 2013). Ultrasonic sensors used in this study are Ultrasonic Sensor HC-SR04. Ultrasonic sensors are used as a measure of flood height. The HC-SR04 sensor as shown in Figure 3 detects the object's distance by emitting ultrasonic waves (40 KHz) during  $t = \text{min } 10 \text{ us}$  and then detecting the reflection (Asadullah *et al.*, 2017).

In the prototype design of flood monitoring system built by integrating 5 components such as system block design Figure 1.

In Figure 1 it is seen that in the input section there is an input section consisting of an ultrasonic sensor, rain sensor on the process part there is Arduino Uno Microcontroller and output part there is ethernet shield, access point, and computer by integrating it. While the construction of flood height constructed using 5-inch paralon pipe by putting ultrasonic sensor and rain sensor on the upper side. On the inside is placed a cork float as a cross-section to reflect the echo signal echo that will be received by the trigger component of the ultrasonic sensor. The higher the flood the higher the buoy.



**Figure 1.**  
Block Diagram  
Prototype System

#### 4. Results and discussion

The design of the prototype system generated in accordance with the design in the series of Figure 1 has been built so as to produce a web-based flood information system with information in real time. In Figure 2 it is explained that the system has been integrated into a flood detector with a series of systems and web-based information systems. The prototype work begins with an ultrasonic sensor detecting the water level inside the pipe and the rain sensor to detect the rain conditions. Further data height and rain are processed by Arduino Uno microcontroller which is integrated with ethernet shield. The results of data processing will be distributed over the web server as shown in Figure 2. To access the flood monitoring information system, the user accesses the website address using the IP number of the web server and in this case, the IP used is 192.168.0.4. The information generated by IP address access generates web flood information about the rainy conditions as seen in Figure 2. Flood early warning system in real time is built using HTML and Javascript programming which is discussed with C language embedded in Arduino Uno. While the construction of flood height constructed using 5-inch paralon pipe by putting ultrasonic sensor and rain sensor on the upper side. On the inside is placed a cork float as a cross-section to reflect the echo signal echo that will be received by the trigger component of the ultrasonic sensor. The higher the flood the higher the buoy.

The content of flood early warning information generated in the form of flood information and rain conditions informed in real-time and hazard status. Besides that, there is also content with animation of the height of the water that moves according to the height of the water produced as seen in Figure 2 where the flood height is 32 cms with the danger status and is accompanied by the information about the rainy conditions.

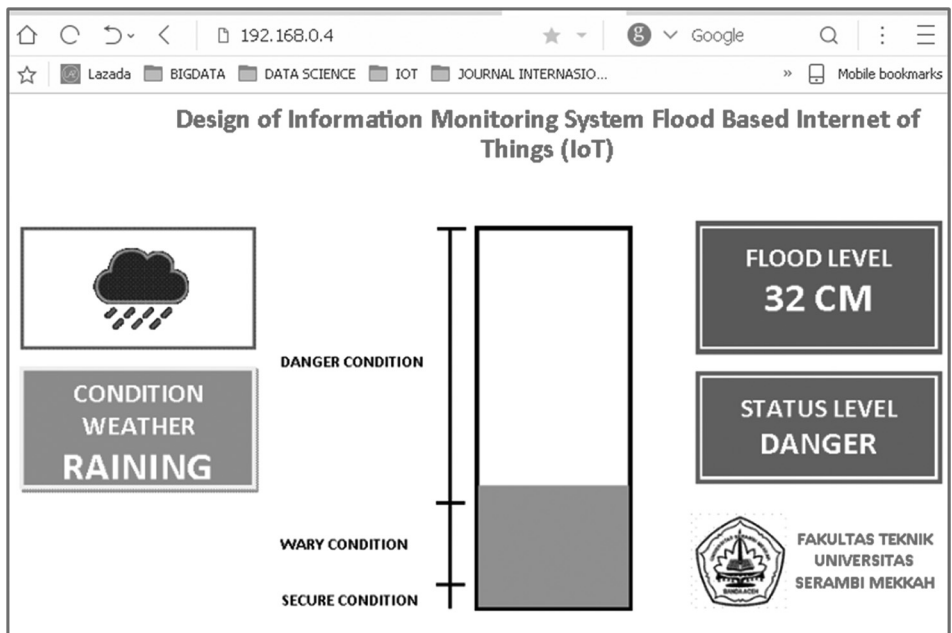
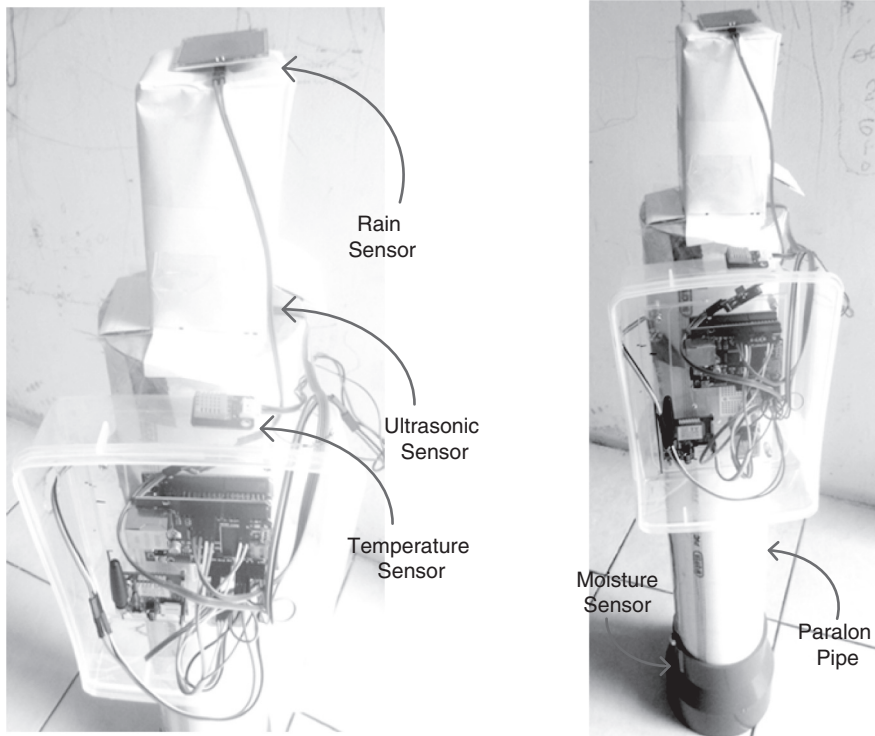


Figure 2.  
Content of flood  
information  
systems and rain  
conditions



**Figure 3.**  
System Prototype  
Circuit

## 5. Conclusions

Based on the designed results, the real-time web-based flood monitoring system has been working as expected. Using ultrasonic based flood sensors, rain sensors, Arduino Uno, ethernet shield and wireless routers have been able to transmit water and rainfall water data to Internet browser-based users. The information displayed is water height, rain and flood status consisting of safe, alert and danger status. With this prototype is expected to help information about the public in the form of information flood height and status.

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