

## **FLOOD MANAGEMENT SYSTEM USING A SOUND SENSOR ARDUINO BASED**

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### **ABSTRACT**

Natural disasters are events that arise due to careless human actions. Natural disasters such as floods cause a lot of material or psychological losses. Floods often cause people to lose their homes, livelihoods, and even cause trauma due to the loss of family members. So we must prevent floods from occurring in order to achieve a safe and peaceful life. In this research, a Sound Sensor was used as a detection tool combined with the Arduino Water Level System so that the movement of water flow can be seen, especially in areas that are prone to flooding. The results of this research showed that there was a low scale with a small sound on the red light, then there was a medium scale with a medium sound on the green light, and also a high scale with a large sound on the blue light.

**Keywords:** Arduino, Flood, Water Level Sensors, Speaker Buzzer

### **INTRODUCTION**

Natural disasters are events that arise due to careless human actions. Natural disasters such as floods cause a lot of material or psychological losses. Floods often cause people to lose their homes, livelihoods, and even cause trauma due to the loss of family members. So we must prevent floods from occurring in order to achieve a safe and peaceful life.

Floods are a seasonal threat that occurs because waterways overflow and inundate certain areas. Apart from that, floods are natural disasters that often occur and are dangerous. Tidal flooding occurs almost daily, depending on tidal oscillations, when sea levels rise to critical heights over coastal lands. Land subsidence and rising sea levels as a result of climate change are making tidal flooding worse. [6].

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Disasters that often occur during the rainy season are floods, such as in the city of Bekasi in 2022. Thousands of residents' houses were affected by flooding and dozens of residents were forced to evacuate, especially in Bekasi sub-district due to high rainfall and also the Bekasi river which was unable to accommodate the rainwater discharge. Officers have monitored the flooding that occurred at that point for immediate response to residents.

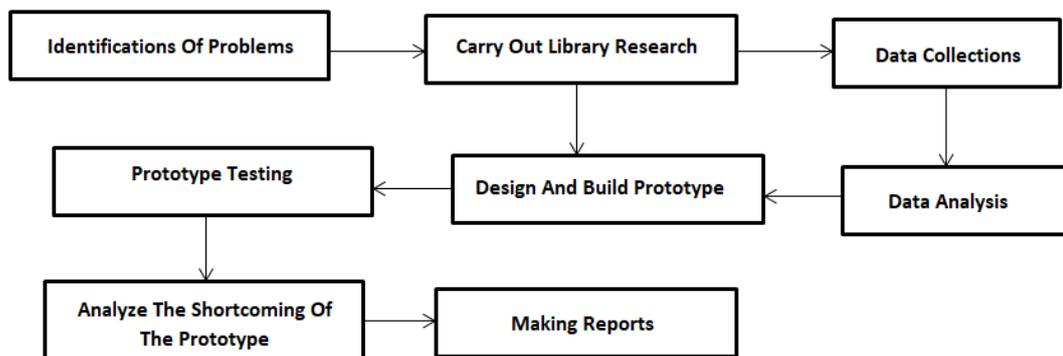
Many studies in the field of automation utilize sensors as part of the series of automation tools under study. For example, [12] has carried out automation testing regarding the Arduino Uno, Max 6675 and GSM SIM 800L temperature sensors. By using the Fritzing application which is used to design a temperature control device for the R301 stirrer to prevent overheating using QFD and UML which can provide information quickly. The physical circuit created was successfully operated with a temperature control output. [3] has conducted research on the results of design using AHP and QFD methods, visualization of tool systems created with the Internet of Things (IOT) concept and based on Node MCU using several components and succeeded in showing the viscosity in the tank during the production process. [13] has conducted research on a breakthrough new solution for a temperature control system that prevents overheating using Arduino Uno and IoT-based Thingspeak. The Arduino Uno device with a microcontroller can also control the temperature increase so that the product does not get too hot.

The sound sensor used in combination with Arduino is used as a detection tool in this research. The movement of water discharge, especially in areas prone to flooding, is very important for local residents to prevent flooding. This is expected with the tools used to overcome flooding. To reduce or suppress losses caused by floods, an integrated flood management system is needed, involving the government, private companies and society as a whole. [7].

## RESEARCH METHODS

### Research Stages

Research stages are the steps or stages that must be passed so that the research can get results that are in line with what is expected. The following image shows the research stages carried out to achieve the expected results: [8]:



The author identifies problems by observing via the internet regarding complaints that often occur during natural disasters in the form of floods. After observation, it was found that the most common problems experienced were the individuals themselves who liked to throw rubbish carelessly. The researcher reviewed the tools and materials needed in the flood sensor device prototype. It was discovered that the author chose to make a flood sensor circuit (increase in water flow) using an Arduino Uno-based water level sensor as a microcontroller. Manufacturing and testing was carried out at Bhayangkara University, Jakarta Raya, after being tested several times so evaluation was needed. After the prototype is successful, it continues with making a report on the experimental results.

### Software and Hardware

Software is a device in the form of information contained on a computer. Software is digital data that is not physically visible but can be seen when used by a computer user. Examples of software objects are operating systems or operating systems, Microsoft Office applications, Antivirus, etc. Meanwhile, hardware is the part of a computer device that is visible or has a physical form. Examples of hardware include mice, keyboards, displays, printers, etc. that can be touched. The tools needed in this prototype are based, among other things, on analysis of prototype design models from previous research.

Table 2.1 Tools

| Component                    | Amount | Function   |
|------------------------------|--------|--|
| Arduino Uno R3               | 1      | It can be used to create various electronic projects, such as robots, sensors, and IoT devices |
| Breadboards                  | 1      | A board that functions to design an electronic circuit   |
| Water Level Sensors          | 1      | Can be used to detect an increase in water discharge   |
| USB cable                    | 1      | Can be used to transfer data, charge, or control electronic devices                            |
| Speaker Buzzer               | 1      | Can be used to produce sounds, such as alarms, tones, or sound effects                         |
| Female to male jumper cables | 5      | Can be used to connect two electronic components with different connector types                |
| LEDs                         | 3      | Can be used to determine the level of the process that is occurring                            |
| Resistors                    | 3      | Used to regulate the electric current in an electronic circuit                                 |
| Male to male jumper cables   | 4      | Can be used to connect two electronic components that have the same type of connector          |

## Flow diagram

A type of diagram, also known as a Flowchart, displays the algorithm or sequential instruction steps present in a system. [15].

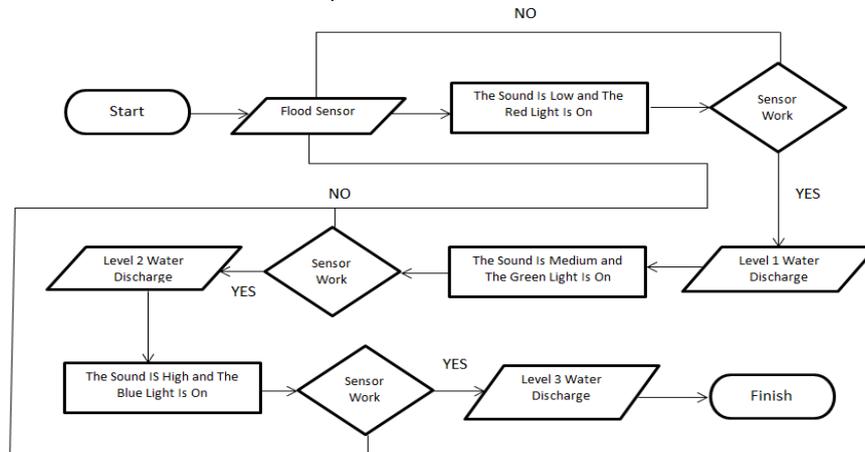


Figure 2.1 Research Flowchart

Based on the flowchart image above, it explains how the sensor works. The sensor will work when it detects water at a certain height. When it reaches a certain category, the sensor will make a sound and the color of the light will turn on. When the water discharge is at a certain height and causes the sensor to make a low sound and the red light turns on, the water level will be in the level 1 category. Furthermore, if the water at a certain height causes the sensor to make a moderate sound and causes the green light to turn on, then the water level is included in the level category. 2. Then for the water level that causes the sensor to emit a loud sound and the blue light to turn on, the water discharge level is included in level 3.

## RESULTS AND DISCUSSION

The process of testing the automatic item counting sensor circuit is carried out in stages for each component to ensure that each component has the appropriate minimum performance or that there are no installation errors or component damage.

### Flood Sensor Circuit Design

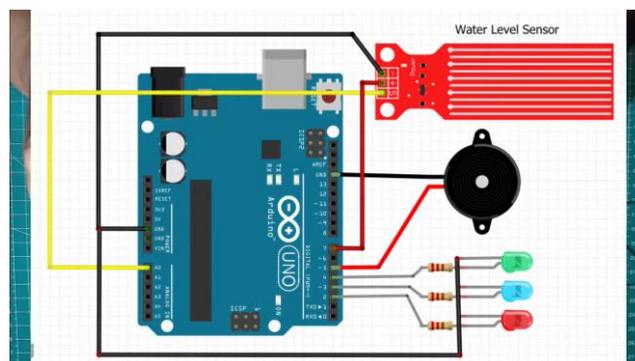


Figure 3. 1 Circuit Schematic

Figure 3.1 is a prototype scheme in this research. The design scheme is used to make it easier for researchers to assemble a circuit, starting with designing the composition of the circuit before the circuit is implemented in physical form [14]. The author made a flood sensor circuit to detect an upcoming flood by sounding a sound using an Arduino Uno R3 microcontroller as the main chip of the robot, a flood sensor circuit tool. The input from the sensor that is assembled uses a controller input using a sensor that produces light from an LED lamp indicating that the water has flowed. detected, the water level sensor is a sensor that detects rising water. Below the circuit of each component is explained in more detail.

### Arduino UNO R3 Testing

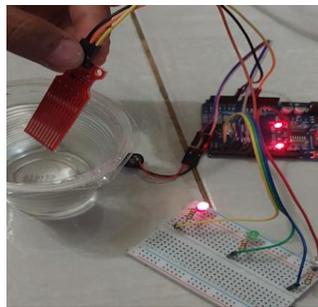


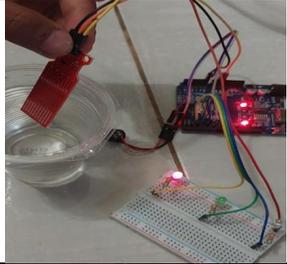
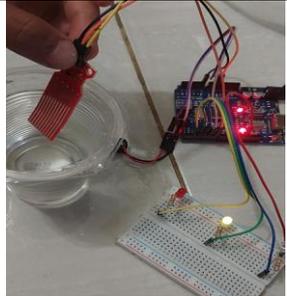
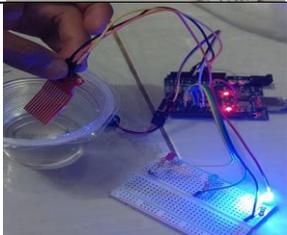
Figure 3.2 Arduino Testing

Figure 3.2 is the test result of a breadboard connected to the Arduino UNO R3 microcontroller. The indicator light on the Arduino lights up red, a sign that the microcontroller is working is when the indicator light on the Arduino lights up when voltage is applied or program data is input via the Arduino IDE software [4]. Similar to the Arduino UNO above, the breadboard is indicated to be functioning when the indicator light is on as in Figure 3.2.

### Flood Sensor Circuit Test Results

Purposeful circuit testing to ensure whether the circuit created is functioning properly or not. In this research, the object used is water in a glass which is dipped in a water level sensor to a certain height. The circuit power source comes from a laptop connected by a USB cable. The experiment was carried out 3 times with the same distance conditions. The testing process will be described in the table below:

Table 4.1 Data Test Results

| No. | Condition                              | Test results | Attachment  |
|-----|--|--------------|---|
| 1   | Sensor detects low water level         | Succeed      |   |
| 2   | The sensor detects medium water levels | Succeed      |   |
| 3   | The sensor detects high water levels   | Succeed      |  |

**CONCLUSION**

Based on the process of making and testing a flood sensor prototype using a water level sensor type (increase in water discharge), it can be concluded that this sensor can detect an increase in water discharge, where when the water level sensor detects an increase in water, the speaker buzzer will sound louder according to the water level. then the water level is already high or it is already the big flood alert time. This flood sensor works by touching the italics when the water rises, the speaker will sound and the LED light will light up according to the water level, for example if the level is low the LED light will be red, medium level will be is green, and high altitudes will be blue. This flood sensor is useful when the rainy season arrives to anticipate the dangers of natural disasters, but it is not known for certain how high the incoming water discharge will be.

**THANK-YOU NOTE**

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