OPTIMIZATION OF THE EARLY WARNING SYSTEM IN FLOOD DISASTERS

Helmy Faisal Muttaqin
Esa Fauzi

DOI: https://doi.org/10.37178/ca-c.23.1.073

Helmy Faisal Muttaqin, Informatics Departement, Faculty of Engineering Widyatama University, Bandung
Email: *helmy.faisal@widyatama.ac.id*

Esa Fauzi, Informatics Departement, Faculty of Engineering Widyatama University, Bandung

---

Abstract

Flood is a natural disaster that threatens all residents who are always active in the river, especially in the area around the river. Flash floods are natural disasters caused by overflowing river water that leaks due to river water runoff that exceeds the capacity of the river and enters low-lying areas of the earth's surface such as river valleys, basins and usually carries material or garbage in the river. . In the era of globalization, the development of this technology is increasingly rapid, where there is an early warning system. An early warning system is a series of systems that notify you when things have a negative impact and can minimize those impacts. It would be dangerous to reach the existence of this resident. So that the occurrence of flash floods can endanger the watershed. So with a technology called the Internet of Things that can be built into the system, it can provide an early warning system that provides warnings in the form of sirens and LED lights and sends early warning information so that more serious disasters can be avoided.

INTRODUCTION

A number of communication systems between information and sensors, detect events and make decisions through the system. These phases work together to predict an event that could disrupt and affect the stability of the physical world, giving the system time to prepare for an upcoming dire event and to minimize its impact. In critical situations, early warning generally manifests itself, namely the transmission of information, in the form of sirens, gongs, etc.

This system uses ultrasonic sensors and rotary encoder sensors. The ultrasonic sensor can detect the water level and use a rotary encoder to detect the speed of the river water flow, as well as the water level and river flow speed information, which can be sent via the ESP8266 module and displayed graphically on the form[1]. Then, when the sensor

detects the water level and the water flow rate exceeds the specified safe limit, flash flood information in the form of ultrasonic sensor detection and rotary encoder sensor sends information to sound the siren on the siren lamp and sends a warning. There is a flash flood on social media like Twitter. In order for Arduino and its sensors to be able to constantly detect flow without a power supply, solar cells can be used as a source of energy for Arduino and the sensor.

There are several systems that have been proposed to detect Flash Floods and alert everyone so that they can immediately move from their current location to a safer location[2]. The system uses the Net Duino Plus 2 as a microcontroller to detect the water level with an ultrasonic sensor and sends flood information to the server via D-LINK Dir-600 and provides early warning through the website with color indicators. When discussing flood early warning with Android and IoT (Internet of Things) using the Arduino Uno R3 microcontroller, ultrasonic sensors to detect water levels and send flood information via ZigBee, and two ways to send warnings via website and SMS notifications. Although website and SMS alerts are issued in this investigation and smartphones can monitor the system to provide early warning via website and SMS alerts in case of flash floods, other issues are needed that can be accessed in real time.

Therefore, the early warning system can use other outputs in the form of alarms and social media when sending warnings, and when sending early warnings, the system quickly disseminates information to the public with the sound of sirens and LED lights that provide flood early warnings. that it happened. Flash flood in this place

STUDI LITERATURE

In general, runoff is closely related to hydrology and is a large volume of flowing water, including solid sediments (sand), dissolved minerals (magnesium chloride), and other biological materials such as algae that flow together through a certain cross-sectional area. Meanwhile, water runoff can be interpreted as a measure of the amount of water that can flow through a location or be absorbed at a location per unit time. It turns out that the term runoff not only refers to water, but can also be found in other areas such as gas flows[3].

An operating system (OS) or operating system is a software or software that is responsible for regulating or controlling the work of hardware or hardware and for running applications or software in a computer system[4]. In other words, the operating system is the system that controls the basic operations and ensures that the system can run properly on the computer. The operating system allows an application to function, so the operating system is also referred to as an essential component. The computer and its system can only function with one operating system unless the computer boots up

METHODE RESEARCH

The analysis of the system used in this study uses a data flow-oriented method. Conducting analysis based on functionality and system requirements, looking for references in research journals that have been done previously. In addition to developing a system with a waterfall model which is divided into several stages, tools to create an early warning system and flood disaster prediction are designed based on the analysis and system requirements.

The HC-SR04 sensor is a sensor device that can detect the distance of an object in front of it with a range of 2 centimeters to 400 centimeters. How the HC-SR04 sensor works When we apply a positive voltage to the trigger pin for 10uS, the sensor sends out

an 8-step ultrasonic signal with a frequency of 40 kHz. Next, the signal is received on the echo pin. By measuring the distance of the object reflecting the signal, the time difference between sending and receiving the signal is used to determine the distance of the object.

Therefore, the HC-SR04 sensor is the most important component when designing this flood disaster early warning and forecasting system. If the sensor knows the state of the water level, it will reflect waves towards the water and then the sensor

The first block is an input consisting of inputs from three sensors, namely ultrasonic sensors, rain sensors, and water flow sensors. The input data received from the three sensors is processed by the microcontroller as a process block, which acts as a control center that receives and executes commands and sends feedback. This last block is then output as a feedback receiver, which is sent by the microcontroller, which contains the application as software for monitoring and LED and buzzer as tool indicators. get back the reflection produced by water reflection

IMPLEMENTATION SYSTEM

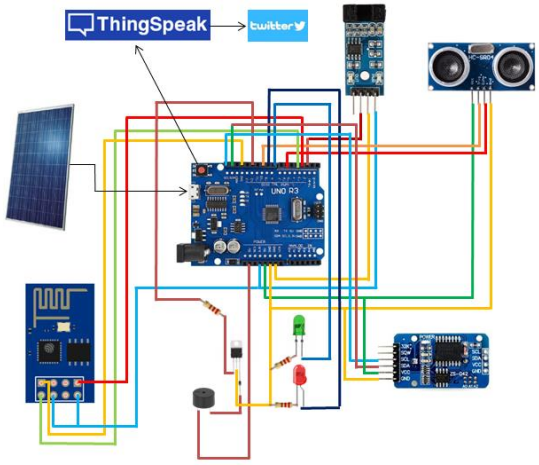

Figure 1 sensor device

Starting with the initialization of the sensors used, namely ultrasonic sensors, rain sensors and water flow sensors. Then the sensor reads the sensor value generated from the water level, rainfall and water flow[5]. Each sensor value is recorded and sent to the microcontroller for later processing. If the generated data meets the specified limits, the microcontroller sends real-time data to the Blynk server to display the condition as it occurs via the dashboard, and sends notifications automatically. Pop-up or broadcast via *registered email*

CONCLUTION

The development of the early warning system was carried out with an ultrasonic sensor as a water level detector at in the form of a prototype, lm393 rotary encoder sensor as a water velocity detector with the esp8266 module via Wi-Fi communication (Wireless

Fideality) for connection between microcontroller devices. Arduino with IoT platform and alarms in the form of buzzer sounds and LED lights to provide on-site warnings and automatically tweet warnings on social media Twitter or use live alarms installed in areas along the river.

REFERENCE

1. Adarsh, S., et al. *Performance comparison of Infrared and Ultrasonic sensors for obstacles of different materials in vehicle/robot navigation applications*. IOP publishing.
2. Lazrus, H., et al., *"Know what to do if you encounter a flash flood": Mental models analysis for improving flash flood risk communication and public decision making.* Risk analysis, 2016. **36**(2): p. 411-427.DOI: https://doi.org/10.1111/risa.12480.
3. Musavi, S.H.A., et al., *Optimization of efficient communication technology in designing seismic early warning system for Pakistan.* Australian J. Basic Applied Sci, 2010. **4**(6): p. 1419-1431.
4. Peter, S., et al., *Arrakis: The operating system is the control plane.* ACM Transactions on Computer Systems (TOCS), 2015. **33**(4): p. 1-30.DOI: https://doi.org/10.1145/2812806.
5. Mousa, M., X. Zhang, and C. Claudel, *Flash flood detection in urban cities using ultrasonic and infrared sensors.* IEEE Sensors Journal, 2016. **16**(19): p. 7204-7216.DOI: https://doi.org/10.1109/JSEN.2016.2592359.