SMS Gateway-Based Early Flood Detection Warning System Design

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ABSTRACT
Natural disasters that are familiar and often occur around the world, including our country Indonesia one of which is flooding, and not infrequently this also often occurs at night and when the home occupier is not in a place that usually often causes material losses and not infrequently also causes fatalities. This study aims to implement a prototype system that allows to know the possibility of flooding before water enters the area or area of people's homes by using alerts in the form of alarm sounds or sms messages. Which is where this flood-cutting early warning prototype system will use Arduino as a microcontroller that will thoroughly control the ultrasonic sensor as a water level detector and buzzer sensor as a sounder or alarm when the water level has reached a certain limit, Where sms will be directly sent by the SENSOR SIM800L to the citizen's mobile phone or contact number that has been adjusted by the system. So the final result of this small study is that a prototype system of early warning of SMS Gateway-based flood detection will be very helpful for residents to know how the water level will be when entering people's homes.

Keywords : Arduino, Alarm, Catastrophic Flood.

INTRODUCTION

Natural disasters that are familiar and very often occur in Indonesia are flood disasters and one of them always occurs in one Manyabar Village, Panyabungan Subdistrict, Mandailing Natal Regency-North Sumatra. Sometimes this flood often occurs at night and when the occupants of the house are not there that usually often cause losses in the form of material. With the development of technology that is now increasingly sophisticated and developing so as to make IT developers able to continue to strive in improving various kinds of innovations in various aspects and aspects. One of them is by looking for new technologies that will be very helpful in the event of flood disasters. Technology that is growing rapidly with science makes people start to think about how to be able to anticipate the flood situation. So the ultrasonic sensor is one of the supporting tools that will be used to become an early lighting parameter before the flood disaster (Aryza, 2011).

Flood detection tools are made very useful, so that with the tool makes it possible for people who are near flood centers or places that are often affected by flooding can be early to know the occurrence of flood disasters. But the manufacture of such tools is very much in need and not even a little, can take time and testing a long time and of course the price is not cheap even very high, and not everyone can have it because it requires special skills to operate it or can be said to be quite complicated. Therefore, a simple flood detection tool is required to be used by the community independently and able to function effectively (Furqan, 2018).

By using tools in the form of tools for flood detection, which serves to anticipate the occurrence of flood disasters. This simple flood detection tool can detect possible flooding and notify the occupants of the house in the form of sms messages. The message will send an early

notice to the homeowner as an alternative before the flood. The warning contains a notice that the water in the river or trench of the house has overflowed and potentially entered the house that could cause flooding (Aryza et al., 2018). With this tool is expected to be very able to help the homeowner to know early on the occurrence of floods so as to save valuables (items that are vulnerable to damage if exposed to water) to be placed or dismpan in a safer place (Aryza, 2017).

LITERATURE REVIEW
Arduino

Arduino can also be defined as an open source electronic platform, based on flexible software and hardware and very easy to use. And sometimes it is also intended for an artist, designer, hobbies and everyone who is interested in the creation of interactive objects or environments (Faroqi, Adam Hadisantoso et al., 2017). Arduino is also an open source physical computing platform on the input output board that is simple, while the computing platform is a highly interactive physical system with the use of software and hardware that can detect and respond to a situation and conditions that are happening (Aryza et al., 2019).

Arduino Uno

Arduino Uno is a microcontroller board based on an ATmega328 system. Arduino Uno also has 14 digital input/output pins (6 of which can also be used as PWM output), 6 analog inputs, a 16 MHz Crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino Uno can also load everything needed to support a microcontroller, easily connect it to a computer with a USB cable or supply it with an AC to DC adapter or use a battery to start the system (Nanang Kurniawan, 2018). "Uno" means one in Italian and is named to signify the next output (product) of Arduino 1.0. The Arduino Uno and version 1.0 will be references to later versions of the Arduino. The Arduino Uno is the last series of the Arduino USB board and a reference model for an Arduino board.

Ultrasonic Sensor

Ultrasonic sensor is a sensor that serves to convert the magnitude of physic (sound) so that it becomes the amount of electricity and vice versa. The workings of this sensor are based on a principle of reflection of a sound wave so that it can be used to interpret the existence (distance) of an object with a certain frequency that has been determined. It is referred to as an ultrasonic sensor because it uses ultrasonic waves (ultrasonic sounds). Ultrasonic waves are sound waves that have a very high frequency of 20,000 Hz. Ultrasonic sounds cannot be heard by the human ear. Ultrasonic sounds can only be heard by dogs, cats, bats and dolphins. Ultrasonic sounds can propagate through solids, liquids and gases. Ultrasonic sound reflectivity on the surface of solids is almost the same as ultrasonic sound reflectivity on liquid surfaces as well. However, ultrasonic sound waves will be absorbed by textiles and foam.

SIM800L V2

GSM GPRS SIM800L V2 module is a QUAD BAND GSM/GPRS module that is compatible with Arduino, MCS-51, STM32, AVR, and compatible Microcontrollers. This

module is also commonly used for voice calls, SMS and GPRS. SIM800L V2 one of the GSM GPRS module that is widely used for hobby purposes and other professional projects. The advantage of this module with other modules is the price is relatively cheaper, for the previous version sim800L V2 voltage on the VCC input system is still 3.7V-4.2V, if able to get a direct voltage of 5V it will directly cause damage to the GSM MODULE SIM800L V2, so it is necessary the role of DC to DC stepdown to be able to make voltage reduction from 5V DC to 3.7V-4.2V earlier. For module SIM800L V2 VCC can already go directly to the number 5V DC so that it can be directly connected with VCC 5V DC from arduino, so it no longer needs a stepdown regulator as before. So to be able to send SMS to the citizens or users, the SIM800L V2 must be installed GSM SIM card first.

Buzzer

Buzzer is an electronic component that serves to convert electrical vibrations into sound vibrations. Basically the working principle of buzzer is almost the same as loud speakers, so the buzzer also consists of a coil attached to the diaphragm and then the coil is supplied with an electric current so that it becomes an electromagnet, the coil will be directly drawn inwards or out, depending on which direction the current and magnetic polarity, because the coil is mounted on the diaphragm then every movement of the coil will move the diaphragm back and forth so as to make the air gelombnag vibrate a will produce sound. Buzzer is commonly used as an indicator that the process has been completed or an error occurred on a device (alarm).

An electric buzzer is an electronic component that can convert electrical signals into sound vibrations. In general, buzzers that are an audio device are often used in anti-theft circuits, alarms on watches, bells at home, reverse alerts on trucks and other dangerous warning devices. The type of buzzer that is often found and used is a piezoelectric buzzer, this is because piezoelectric buzzers have various advantages such as the price is relatively cheaper, relatively lighter and will be very easier in combining it into other electronic circuits. Buzzer belongs to the transducer family is also often referred to as Beeper.

Adapter 12V

An adapter is a device in the form of an electronic circuit to convert a large electrical voltage into a smaller electrical voltage, or a circuit to convert alternating current (AC current) into direct current (DC current) this tool is an Adapter with a voltage of 12 Volts 1 Ampere. The adapter that we know most of which is changing from pln 220 Volt (AC current) to a much smaller electrical voltage (DC current) that is to 5 Volt DC, 12 Volt DC, 19 Volt DC, 24 Volt DC and so on depending on the needs of what device to use. There is also an Adapter that changes from PLN 220 Volt AC to a smaller voltage but the current remains AC, for example to 9 Volt AC, or 24 Volt AC. Adapters are also called chargers

METHODS

In the design of this tool, it takes several specifications that must be met in the application of the system, both in terms of technical and user. This design is designed to produce a prototype system to find out how likely the flood is before entering the house using a warning in the form of text messages or sms gateways. This prototype flood detection early warning

system will use arduino sensor as a microcontroller that will control ultrasonic sensors as well as buzzers in detecting floods and their height. Sms will be sent immediately by the system depending on the condition of the water sensor and water level sensor.

RESULT AND DISCUSSION
Circuit Assembly

The system to be tested will use the Arduino Uno, ulrasonic sensor, buzzer, and SIM800L V2 connected as shown in figure 1.
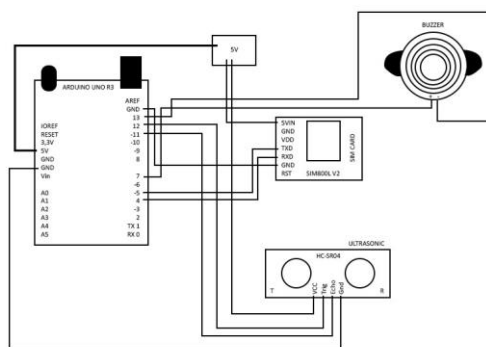
Figure 1. Circuit System

The picture above is a design of the components needed to project the design of the flood detection early detection system. The configuration of the above pins are:

a. Arduino 5V pin paired with 5 Vin SIM800L V2 pin
b. Arduino GND Pin paired with GND SIM800L V2 pin
c. Arduino -5 pin paired with TXD SIM800L V2 pin
d. Arduino Pin 4 paired with RXD SIM800L V2 pin
e. Pin 12 Arduino paired with Trig Ultrasonic pin
f. Arduino -11 Pin Paired with PinEcho Ultrasonic
g. Pin 7 Arduino paired with Positive Buzzer pin
h. Negative Pin Buzzer paired with pin 13 Arduino
i. Vcc Ultrasonic Pin paired with Arduino 5V pin
j. Ultrasonic Gnd Pin paired with Arduino GND pin

Minimum Hardware and Software Specification Requirements

In the project of designing early warning systems of flood control is required some minimum specifications of hardware (hardware) and software (software).

1. Specifications of hard-core (hardware) used in the design of early warning system sms gateway-based flood detection by using: Arduino Uno, Breadboard, Buzzer, Resistor, Ultrasonic Sensor, Jumper, LED, Adapter 12 Volt 1 Ampere, SIM800L V2, Container containing water.
2. The software specification used in the design of sms gateway-based early warning system is arduino IDE.

Flowchart

In the process of creating this flood detection early warning design project, good structural design techniques are needed. Which usually begins with the creation of a flowchart. Flowcharts are used to describe first what to do before starting a design or creating a system as described below. Here is a flowchart created as shown in figure 2.
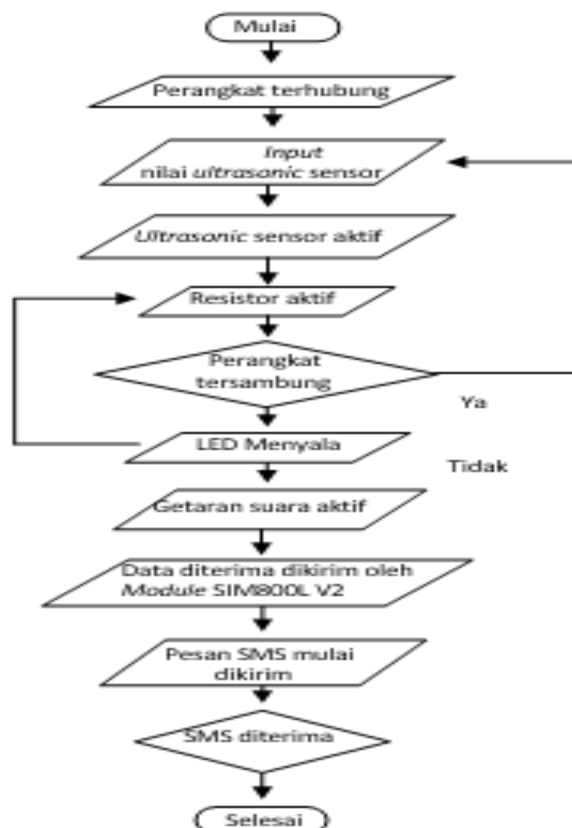
Figure 2. Flowchart

The flowchart algorithm flow for this flood detection early warning design project begins by connecting all the components of the device to the sensor, so that the connected program will process data from the sensor input. When the ultrasonic sensor is active, it will directly calculate the distance between the sensor and flood water or rain. If the distance is known, then the LED light will light up according to the color and water level that passes through the ultrasonic sensor. So the vibration or alarm sound will also be active and sound if indeed the data received by the sensor is valid. Furthermore, SIM800L V2 will start looking for signals to be able to send messages, if the data received is invalid, meaning there are constraints with the ulrasonic sensor. When the SIM800L V2 has successfully obtained the signal (with or without help using the adapter) then a text message will be received by the surrounding residents and the information is completed.

System Testing

At this stage, all available components have been assembled and connected very well and have had programs inside the microcontroller have also been connected with arduino as well as adequate laptops. This test will use a simulation model using a jar container filled with water to activate the ultraonic sensor in detecting the active water distance. As in figure 3.

Figure 3. System Testing

When all sensors have worked and started to activate, Arduino IDE software will program in Arduino which serves as a text editor to create, edit and also validate program codes. It can also be used to upload to arduino boards. Here is the installation of coding-an on the Arduino series figure 4 below:

Figure 4. Coding Arduino IDE Program

CONCLUSION

Based on the results of the testing of tools that have been conducted against the design of a flood detection early warning system based on sms gateway, the conclusion is obtained, among others:

1. Design of early warning application system of flood detection through SMS Gateway application as an information media has worked in accordance with its functions as expected.
2. mplementation of early warning application system of flood detection through SMS Gateway application as an information media has been able to work in accordance with what is expected.
3. That the hardware design used in this project uses the help of breadboard as a medium platform or electronic circuit temporarily with the purpose of trial or prototype without having to solder. Where there are several sensor pins connected with breadboard without having to be connected to arduino Uno. As long as porgram readings are not an issue when "uploading" data is performed, this is not a problem.
4. Breadboard board has also been connected with 3 LED lights (red, yellow, and green) where the LED will light up when the program has been uploaded using ide Arduino.
5. Adapter is needed when SIM800L V2 has problems when searching for signals to send text messages to nearby residents. So when the program has been uploaded using the Arduino IDE, then the 12 Volt 1 Ampere Adapter is connected with the Arduino Uno to facilitate the process of searching for signals for sim800L V2 to send the text message.
6. The program used to run the Arduino Uno microcontroller uses the Arduino IDE as a coding program that uses the C programming language.

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