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Design of Early Warning System Flood and Landslide Mitigation Sensor Based on Internet of Thing

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Abstract. Disaster mitigation is very important in order to reduce the number of victims of both life and material. Alertness in disaster mitigation is urgently needed in every area in all countries of the world, especially in Indonesia. Embedded device technology specifically designed and programmed to detect disasters such as earthquakes, tsunamis, floods and landslides, storms and hurricanes. The sensors are used according to the type of disaster will be detected. The system will be built this serves as an early warning system that will provide early warning against floods and landslides were predicted would happen. The system can detect floods and landslides in accordance with a sensor mounted on a disaster-prone locations. Device technology development mitigation sensors embedded as floods and landslides integrate hardware and software and Internet networks. Hardware in the form of microchip controllers and software applications of information and communication technology based internet of things. Microcontroller programmed so that it can control the data with computational algorithms can predict natural disasters will occur. With the development of technology these devices could be detected early disaster. For Embedded system could be produced more cheaply with a local content of 60%. This support government programs in the field of technological independence. Microcontroller programmed so that it can control the data with computational algorithms can predict natural disasters will occur. With the development of technology these devices could be detected early disaster. For Embedded system could be produced more cheaply with a local content of 60%. This support government programs in the field of technological independence. Microcontroller programmed so that it can control the data with computational algorithms can predict natural disasters will occur. With the development of technology these devices could be detected early disaster. For Embedded system could be produced more cheaply with a local content of 60%. This support government programs in the field of technological independence.

1. Introduction

Indonesia is an archipelagic country is a country with a high level of disaster risk. Especially earthquakes, floods and landslides. This is due to the condition of the Indonesian archipelago are at lingkara volcanoes were still plenty active [1].

This situation is forcing Indonesia has advanced technology in the early detection of natural disasters. Need to install sensors in disaster-prone areas, especially in areas prone to flooding and landslides. Installation of the sensors is intended as disaster mitigation to reduce casualties and great material in the event of such disasters [2].

Design of sensor flood and landslide mitigation based internet of things this as a solution to solve the above problems. With this technology the sensors can detect the signs of nature as early signs of impending floods and landslides. With the early warning system or disaster mitigation could be faster. Reliability in disaster mitigation as a key to reducing the number of victims of both soul and matter [3].

2. Literature Review

2.1. microcontroller

A microcontroller is a functional computer system on a chip. It contains a processor core, memory (a small amount of RAM (Random Access Memory), program memory, or both), and supplies the input / output. In other words, the microcontroller is a digital electronic device that has inputs and outputs as well as control with a program that can be written and erased in a special way [4]. Microcontroller is in the computer chip used to control electronic devices, which emphasize efficiency and cost effectiveness. The microcontroller used in the products and tools that are controlled automatically, such as engine control systems, remote controls, household appliances, heavy equipment, and toys. By reducing the size, cost, and power consumption compared to designs using a microprocessor memory and a separate input device output, the presence of a microcontroller makes electrical control for various processes to be more economical. With the use of this microcontroller then:

- Electronic system will be more concise
- Design of electronic systems will be faster because most of the system is software that is easily modified
- Search disorder more easily traced because the system is compact.

In order for a microcontroller to function, the microcontroller requires external components are then referred to the minimum system. To make the most minimal system is not needed and reset the system clock, although in some microcontrollers already provide the system's internal clock, so without any external circuit microcontroller already operation.

What is meant by minimum system is a microcontroller circuit that can already be primarily used to run an application. An IC (Integrated Circuit) microcontroller would be meaningless if the only stand-alone.

2.1.1. Arduino Uno

Arduino UNO is a microcontroller board based on the ATmega328 (datasheet). Arduino UNO has a 14 pin digital inputs / outputs (6 of which can be used as the output PWM (Pulse Width Modulation)), 6 analog inputs, an oscillator crystal 16 MHz, a connection is USB (Universal Serial Bus), a power jack, an ICSP (In Circuit Serial Programming) header, and a reset button sebuat. Arduino UNO contains everything needed to support the microcontroller, easy to connect it to a computer with a USB cable or supply it with an adapter AC (Alternating Current) to DC (Direct Current) or use a battery [5].
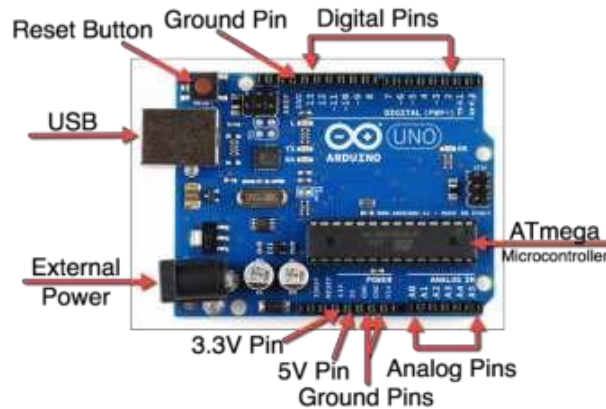
Figure 1. Physical Form Arduino Uno

2.2. *Sensors*

Sensors are devices used for converting a physical quantity into electrical quantities that can be analytical with a particular electrical circuit. Almost all existing electronic equipment has sensors in it. At this time, the sensor has been made with a very small size. This very small size greatly facilitates the use and save energy [6].

The sensor is part of the transducer that serves to sensing or sensing and capture any external energy changes that will go into the input of the transducer, so that changes in energy capacity was arrested immediately sent to the converter section of the transducer is converted into electrical energy [6].

2.2.1. **Srf-05 Ultrasonic Sensor**

SRF-05 is a sensor that uses ultrasonic rangefinders. Where the working principle Ultrasonic sensors are the transmitter (transmitter) sends a beam of ultrasonic waves, and then measured the time needed until the arrival of the reflection from the object. The length of time is proportional to twice the distance of the sensor to the object, in order to get the distance sensor and the object can be determined by the equation [7].

2.2.2. **Ultrasonic Sensor Specifications srf-05**

Working on a DC voltage of 5 volts

Load current of 30 mA - 50 mA

Produce waves with a frequency of 40 KHz

Distance range that can be detected 3 cm - 400 cm

Requires a minimum of 10 trigger inputs uS

Can be used in two modes, namely a trigger input and output echo installed on a different pin or trigger input and output echo pin mounted in the same one.
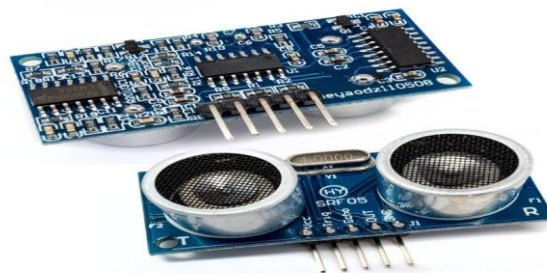

Figure 2. SRF-05 Ultrasonic Sensor

2.3. **The Internet of Thing**

Internet of Things (IOT) according to ITU-T Y.2060 [8] is defined as an invention capable of solving the existing problems through the integration of technology and social impact, while if the terms of the standardization of technical, IOT can be described as a global infrastructure for meet the information needs of society, enabling advanced services to interconnect both physical and virtual based on existing and development of information and communication technology (ICT).

To understand the definition of the Internet of Things can be seen from gabun- gan 2 the word "Internet" and "Things". Where is the "Internet" itself is defined as a computer network that uses Internet protocols (TCP / IP) used to communicate and share information within a certain scope. While the "Things" can be interpreted as if all the objects of the physical world are captured through sensors that are then sent over the Internet

To simplify the model peny- impanan and exchange of information necessary to Semantic Technologies. Therefore, to realize the Internet of Things needed 3 components supporting the Internet, Things and Semantic [9].
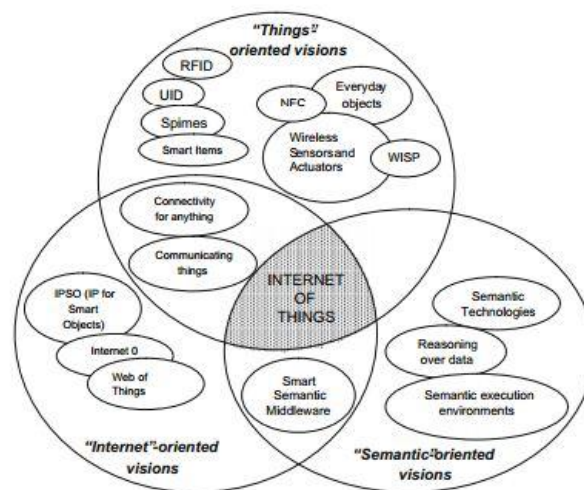

Figure 3. The Internet of Thing

3. Result And Discussion

Early warning system will provide accurate information of impending disaster so that mitigation can be done quickly and accurately. With the Internet of Thing technologies make all sensors can be controlled from a remote location.
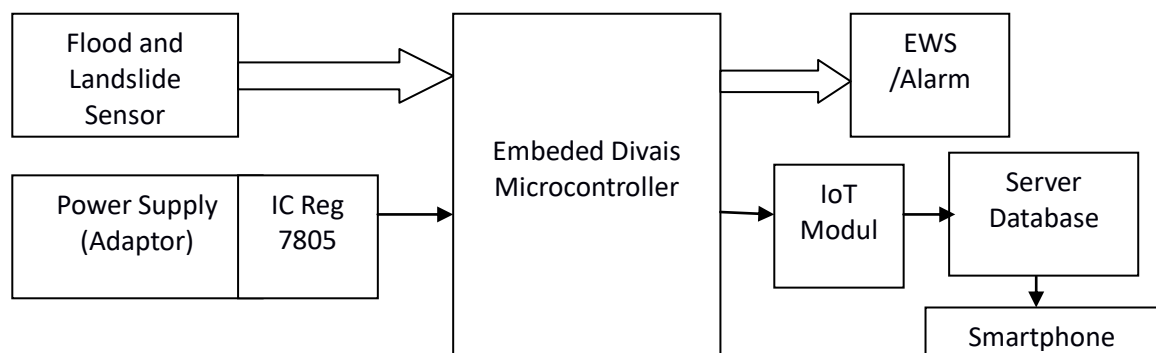

Figure 4. Block Diagram Flood and Landslide Disaster Mitigation

Based on the block diagram in Figure 4 can be explained system work is as follows:

Sensor adapted to disaster mitigation to be detected. For landslide detection sensor using vibrations. For flood sensor sensor using a water level sensor. Data from the sensors will be processed by the embedded microcontroller firmware device using computational algorithms that application software be developed with disaster mitigation. Data processing results will be sent to the server using the Internet module of thing (IOT). Ews active when detected will be a disaster. Ews will send data to all stakeholders in disaster mitigation through smartphones.

This tool uses power supplay unit (PSU) 220 volts to enable the device embedded and 5 volt voltage regulator IC 7805 to provide 5 volts to the microcontroller and sensor circuit.

Devais technological superiority sensors embedded as an early warning system on disaster mitigation are as follows:

- Installing multiple sensors to detect various kinds of disasters in this study were the floods and landslides.
- Delivery of sensor data to the server is done in realtime.

The following will describe the voltage measurement HC-SR04 ultrasonic sensor and testing program of HC-SR04 ultrasonic sensor:
Settings Altitude Air On Reservoir Simulation

This tool can work under the provisions of the table below:

Table 1. Testing Sensor Flood

Air circumstances	Altitude Air (cm)	Voltage (V)
Danger	<23	3.2
Secure	<14	2.1

Table 2. Sensor Testing landslide

Soil state	Soil Erosion (cm)	Voltage (V)
Secure	> 4	1.4
Danger	> 5	2.3

4. **Conclusion**

Flood detector function detects the water level on the surface of a river or reservoir for flood prevention. If the water level data shows a high then the warning will be activated immediately. Likewise, the sensor landslides or erosion of soil by rain water, will be detected by sensors that measure soil surface height is reduced so that it can be seen that there has been an erosion of the soil.

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