Chapter 22

Water Tunnel Clogged Detection Tool to Help a Flood Mitigation

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Abstract

Checking sediment and monitoring the clogged water tunnel is often overlooked. The difficulties of the terrain drainage makes this escaped attention from officer. In fact, checking is very important, to map out the sediment and prevent a flood of it early. The purpose of this research is to make a APESAT to help mitigation flood early. This method to making this tool using Research & Development (R&D). The steps taken in the development of the means of referring to the model of the research development of the Borg and the Gall consists of: (1) analysis system, (2) Designing tools, (3) building the prototype, 4) commissioning , 5) implementation the prototype. Our research showed that the prototype tool for tackling a closed aqueduct with sonar can work as our plan. With the effectiveness of the tool is capable of reading distance sediment up to 7 meters and displays the information directly on the LCD in a fast and accurate.

Keywords: APESAT, Floods, Sediment, Sonar

Introduction

The recent globalization has had a tremendous impact, for a developing country like Indonesia, it does continue to push society doing urbanization en masse. Difficulties in the city's economy make people indifferent to the surrounding natural environment. This is bad because it creates slum areas that are very vulnerable to indiscriminate community behavior in waste management. Ineffective waste management has an impact on the environment's reaction one of the consequences is flooding. During the period 2000 to 2011, of the many national disasters, 77 percent of the disaster that occurred was a *hydrometeorological* disaster, such as flood, tornado, land-slide. In January 2013, there were about 120 disaster events in Indonesia. As a result of the disaster 123 people died, 179.659 people suffered and displaced, 940 homes were severely damaged, 2.717 houses were damaged, 10.798 houses were slightly damaged, damage to other public facilities (BNPB, 2013).

Based on data from BNPB 2016 states 53.1% of the disaster is a *hydrometrological* disaster in which floods contribute with the percentage of disaster reached 31.1%. Until January 2016, out of a total of 174 disasters, floods caused 56 incidents that caused 730,914 victims, 10,578 houses and public facilities damaged. Kodoatie and Syarief (2006) explain the factors cause flooding is changes in land use, waste disposal, erosion and sedimentation, the slums along the River, the flood control

system, high rainfall, physiographic of river, the capacity is not adequate, the influence of tide, soil degradation, and damage to the building of flood control.

Flood mitigation can certainly be handled easily, if the factors causing the floods can be seen with the invisible, but the water channel is closed enough to make it difficult if the supervision of the feasibility of the water channel. One of the difficult cases of checking the feasibility of water channel is done by former Jakarta governor, Joko Widodo who did not hesitate to enter into the ditch half meter wide. Initially, Jokowi only saw the condition of the ditch connected to Jalan Raya Lenteng Agung. Suddenly, Jokowi half jumps into the ditch as he bows. Jokowi also showed a pile of garbage in the sewer and sludge ditch that should reduce the capacity of water reservoirs in the closed water channel (http://megapolitan.kompas.com).

From the facts in the field, the authors innovate to create a control system to help monitor the height of sediment and the distance of blockage in closed water channels. With water tunnel clogged detection tool which is managed digitally and directly can be monitored through LCD screen, so it will accelerate the manager in overcoming the closure of water channel and will improve the welfare of society because the flood can be anticipated earlier.

Content

This tool controlled by a microcontroller that receives input from sonar. When the sonar is directed to the blockage, the sonar will reflect the signal to the clogging block, then the reflection of the signal will be received by the receiver so that the distance to the block is known. Data from sensors in the form of clogged distance information sent to the microcontroller in the form of electronic data and displayed on the LCD screen that has been attached to the handle. This system is very portable, does not require large space, and easy in operation. To ensure the design is working, simulation with the Proteus software can be done, thus reducing errors in the making.

Fig. 1. Application Project Design

Fig. 2. Water Tunnel Clogged Detection Tool

Based on the tests that have been done, the tool is able to work well. Sonar as the main module that will detect the distance of the sediment is able to work well by sending a signal and reflecting the signal back to the reciever. From this information the controller device will process this data and display the distance on the LCD.

No.	The actual distance (cm)	Distance indicated by tool (cm)
1	25	22.6
2	50	47.4
3	100	97.6
4	250	247.8
5	500	498.2
6	750	748.9
7	1000	9460

In the first test the device was tested in a moderate flow of water, an effective measurement result was obtained with ranges ranging from 20 cm to 10 meters. However, the effective spacing of approximately 7,5 meters by percentage:

$$\frac{750 - 748,9}{750} x\ 100\% = 0,14\%$$

The largest percentage difference occurs when the blockage distance closer to the tool with a range of 20 cm – 100 cm, the largest percentage reaching from 2,4% to ,.6%. Above 100 cm, the tool works quite effectively with the range of difference below 2,3%.

Conclusion

From the results of the discussion above, it can be concluded that with this checking and controlling system, can minimize the flood, facilitate the maintenance and controlling water channels, and reduce the loss of both material and non-material impact of flooding because the system is automatic and the data generated quickly update, accurate so that it can anticipate the flood disaster earlier.

This LCD-equipped system will provide more accurate and clear information for drainage personnel, so officers can estimate when drainage should be done. A closed water catchment system runs automatically with the microcontroller as the brain of the whole system. With the use of microcontroller numbers in real time for 24 hours can remain accurate. The use of sonar in this system is considered more precise than other based systems because it has good resistance to temperature, humidity, and the accuracy of the resulting output.

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