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Prototype of the Real Time Decision Support System for Flood Early Warning at Brantas River Basin

Arief Andy Soebroto
Informatics Department
Brawijaya University
Malang, East Java, Indonesia
Email: ariefas@ub.ac.id

Harry Soekotjo D.
Electrical Eng. Department
Brawijaya University
Malang, East Java, Indonesia
Email: harrysd@ub.ac.id

Ery Suhartanto
Water Resources Eng. Department
Brawijaya University
Malang, East Java, Indonesia
Email: erysuhartanto@yahoo.com

***Abstract* – Flood disasters still occur regularly and continuously in Indonesia. This purpose of this study is an attempt to suppress losses from floods, flood prevention and suppression of expenses incurred in monitoring tools that were made earlier. This study resulted in a prototype decision support system of early detection of flooding in real time using a data logger based on the Global System for Mobile Communications (GSM). Parts of the system hardware is a monitoring station watershed conditions that have sensor modules connected to the datalogger based on GSM. Sensor modules will monitor three parameters, elevation of river water level, temperature and humidity. Detection result of each sensor module data is processed by a datalogger and then the it will be sent to the master station server via SMS Gateway. Decision support information system is web-based so it can be accessed through the Internet by specific users and general users. The advantages of this system is designed to flood warning information dissemination can be done quickly because the spread through SMS and internet. The information system is named Flood Early Warning System (FEWS). Results from the study show that the data acquisition from the sensors and sent to the master station server and web graphic display shows the system to function properly.**

***Keywords* – Disaster, Early Waring, Flood, GSM.**

I. INTRODUCTION

Floods have become routine disasters that occur each year in Indonesia. Indonesia is a tropical country that has a lot of Watershed. The impact of natural disasters such as floods can be reduced through flood hazard mitigation activities [2], [3]. The intelligent Environmental Information Management (EIM) systems have been developed, able to collect, process, visualize and interpret geospatial data and workflows of addedvalue applications so as to intelligent support decision making in case of emergency [1], [4].

The floods caused a lot of damages that should be monitored early so that losses can be minimized. The system of monitoring that is required is that decision support systems can provide early detection of floods and decision-making and action for the competent institution. The increase in river water level can be quick and immediate surrounding area has been submerged in water. Residents usually know when floods inundated their homes already.

Design of an early warning system (EWS) requires developments in a number of technologies and areas of expertise such as sensor equipment design, ICT for sensor data transmission, development of a decision support system that will assist public authorities and citizens in choosing the right flood protection tactics and in managing emergency situations, and Internet-based or dedicated remote access to the early warning and decision support systems [5].

Therefore, this study aims to design a decision support system early detection of flooding that can be accessed by the public. This system will monitor conditions along the river basin and watershed upstream and downstream. Gadang station in Malang City is upstream and porong station in Sidoardjo City is downstream. Both locations are located in the Brantas River Basin of province of East Java Indonesia. The monitoring is done continuously to the level of the river water level, temperature and humidity weather around the river. These parameters are detected by the sensor modules are connected to the datalogger GSM-based. Data on each datalogger river conditions will then be sent to the master station which will process and analyze the data from each watershed. From the data received, the master station will provide information on the area where the candidate has to flood or not.

II. SYSTEM DESIGN

Based on the analysis of user needs the block diagram of the overall system consists of three sub-systems, namely monitoring station, the master station, and online information system applications (including web servers).

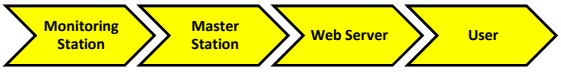

Fig.1. The block diagram of the overall system.

Monitoring stations send data to the master station in the form of the temperature, humidity and river water levels. The master station will manage the database of the data transmitted by the monitoring stations to display the graphs and tables. The master station also serves data requests by the user via an SMS to the master station GSM modem. The master station is connected through a computer network to a web server, so that data can be duplicated in the master station on the web server. Data on the web server to be processed by the decision support system.

The block diagram of sub monitoring station system consists of sensor block and datalogger block.

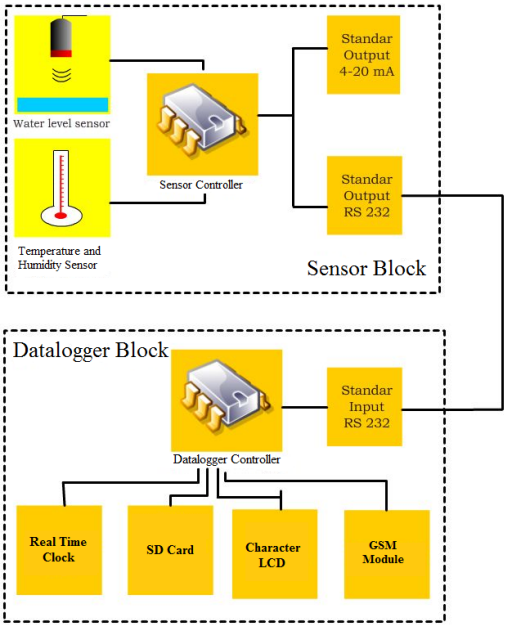

Fig.2. The block diagram of sub monitoring station system.

Sensor Block Specifications

Specifications sensor block planned are as follows:

- The output voltage is 5 Volt power supply with input voltage of 12 volts switching adapter.
- Data communication between the ATmega8 ATmega128 using data communication with RS-232 serial with data format such as 1-start bit, 8-bit data, 1-stop bit, no parity, and transmission speed (baudrate) 19200 bps.
- The standard output 4-20mA output.

Datalogger Block Specifications

Specifications datalogger block planned are as follows:

- The output voltage is 5 Volt power supply with input voltage of 12 volts switching adapter.
- Data communication between the ATmega8 ATmega128 using data communication with RS-232 serial with data format such as 1-start bit, 8-bit data, 1-stop bit, no parity, and transmission speed (baudrate) 19200 bps.
- IC RTC (real time clock) for a marker of time in measuring and sending data to the master station.

Decision support information system design includes the design of the station master data retrieval, data storage on a web server, and processing data in a web-based information systems. At the system is divided into several levels of users who have access rights to the different services. It affects what information can be received by several different users such as Public, Operator, Administrator.

III. RESULTS

The results of the data acquisition and processing by the master station will be displayed in the web information systems application with features:

Status of flood monitoring, Water level monitoring, Map area, Frequently Asked Questions, Management of News, Charts Monitoring, Documentation of Print log water conditions. Data from river water levels in the vertical axis. Data from the date of delivery of the water surface elevation data on the horizontal axis. River water surface elevation data will be sent every hour in regular conditions, as shown in figure 3.

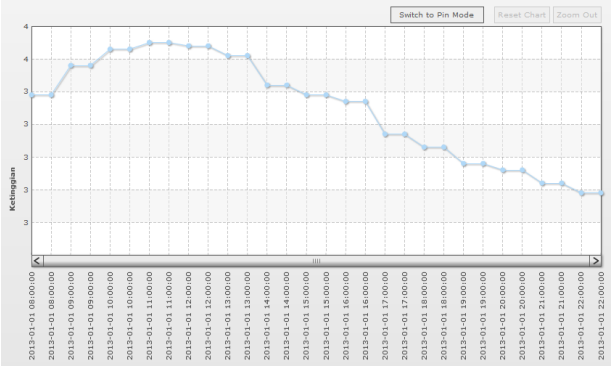

Fig.3. Screenshot of FEWS web application-Indonesian version.

River water surface elevation data will be sent every 30 minutes and 15 minutes when there is an increase in water surface elevation data row exceeds 3 meters and 5 meters.

Fig.4. Module of Monitoring Station.

The main box of the module monitoring station consits of datalogger boxes, power supply voltage regulator box and battery. The rectangular box with dimensions of 40 cm × 30 cm × 15 cm. Made from fiber glass and has a plastic cover on the front that can be opened and closed with the principle hinges, as shown in figure 4.

III. CONCLUSION

Results from the research show that the data acquisition from the sensors and sent to the master station server and web graphic display shows the system to function properly.

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AUTHOR’S PROFILE

Arief Andy Soebroto
Lecturer of Informatics Department
Brawijaya University, Malang, East Java, Indonesia
Email: ariefas@ub.ac.id

Harry Soekotjo D.
Lecturer of Electrical Eng. Department
Brawijaya University’ Malang, East Java, Indonesia
Email: harrysd@ub.ac.id

Ery Suhartanto
Water Resources Eng. Department
Brawijaya University
Malang, East Java, Indonesia
Email: erysuhartanto@yahoo.com