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IMPLEMENTATION OF MICROCONTROLLER-BASED CURRENT SPEED MONITORING SYSTEM

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ABSTRACT

In this research, the designed system consists of two parts. First, the hardware consists of a power supply, display, optocoupler sensor, LCD and mechanical measuring instrument. The microcontroller used is ATMega 8535 which serves as a controller. The software used on the microcontroller chip functions to read, process data received from the input port and send the processed data through the output port. On the ATMega8535 microcontroller, the system has been designed with an accuracy rate of 97%, precision 96%, error 3.8%, the resolution of the measuring instrument can be used as a measurement reference. Additional software used is a delogger, which is set to read the river current velocity every minute, which is stored every 10 minutes.

INTRODUCTION

Indonesia is an archipelagic country that has many rivers flowing into the sea where the currents are quite strong. Rivers are an energy source that can be utilized for the availability of electrical power for the surrounding community if managed properly. With current technological advances, the swift current flowing by the river can be used as a source of electrical energy. By using technology and electronic devices that exist in everyday life such as controlling, regulating, measuring in measuring the speed of river currents.

In this study, a measuring instrument was made to measure the speed of river currents with a microcontroller-based automatic monitoring system for river currents. The system designed has the main output, namely a display that displays the value of the river current velocity in meters/second on the LCD, then the documented value of the river flow velocity data is stored in a memory in a DataTaker DT80 software.

In designing this final project, data logging and storage will be carried out using DataTaker DT80. DataTaker DT80 is a tool that functions to store analog or digital output signals from sensors, convert data into desired information, and perform arithmetic operations on inputs received from sensors. The DataTaker DT80 has a CMOS analog component as a switching device and analog input channel selection. The main function of the Datataker in research is as a data storage medium resulting from the rotation of the propeller, so that the optocoupler sensor is detected and will produce data, namely digital data. This installation can be done in a way, the Data Taker DT80 will be connected to the propeller output in the form of a digital voltage that changes according to changes in the speed of the river current. Articles that also implement monitoring systems such as Heartbeat Monitoring and Stimulation with Internet of Thing (IoT) Based Al-Quran Recitation (Ilham et al., 2019). Rain monitoring system for drying nuts based on internet of things (Ilham et al., 2021).

LITERATURE REVIEW

A set of programs will then be prepared using programming rules from DeLogger. DeLogger is a special software for programming the DataTaker DT80. With this program, DataTaker will be set to read the river current speed every minute, but is displayed and saved every 10 minutes which is the average value of the readings per minute. The program will also instruct the DataTaker DT80 to store the average value of the river flow velocity every hour, day, and year. The data stored by the DataTaker DT80 can be saved on a NotePad or MS file. Excel both in internal memory and in external memory added by the user. To perform data analysis and make graphs of river flow velocity per day, or per month, or per year, the data can be transferred to Ms Excel for analysis.

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METHOD

In designing a system, it takes a block diagram that can explain the system as a whole, below is a block diagram of a digital river flow measurement system. As for the block image of the diagram, the block diagram of the system can be seen in Figure 1.

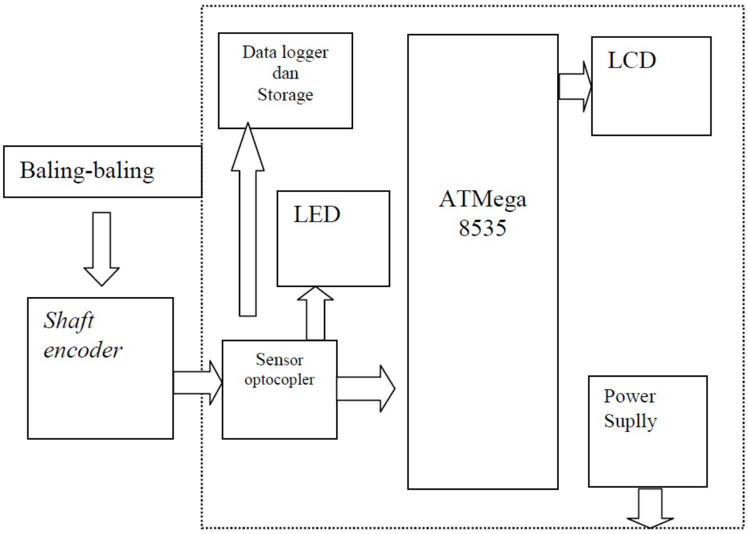

Figure 1. System Design Block Diagram

The explanation of the block diagram of the system above is as follows:

1. After all the circuits are turned on or placed on the surface of flowing water and the propeller rotates, as well as the disc, and when the sensor hits the hole in the disc, it produces a pulse which will be input to the ATMega8535 Microcontroller.
2. Before the signal from the sensor enters the microcontroller circuit, it must first be passed to the sensor driver circuit.
3. After the calculation process is carried out by the microcontroller using such a program, the measurement results will be displayed by the LCD.
4. This measurement process will take place repeatedly if there is water flowing and turning the propeller. Microcontroller-based digital river flow meter design

RESULT

For a variable voltage of 12V, regulator IC LM7812 is used, this 12V voltage is needed by the Atmega8535 microcontroller circuit. While the voltage of 5V is taken from the active microcontroller output, this voltage is needed by the sensor circuit optocoupler, and LCD. The output voltage of the IC Regulator can be seen in Table 1.

Table 1.Regulator IC Output Voltage

Test	**Test Conditions**			**Unit**
	Ideal Voltage	**With Load**	**No burden**	
Input Voltage	220V	220V	220V	air conditioning
Output Voltage 12V	12 V	11.87 V	12.3 V	DC

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Then from the results of testing the sensor circuit, the results of the optocoulper voltage measurement are obtained in Table 2.

Table 2. Optocoupler Voltage Measurement

Sensor Circuit Condition			
With Load		**No burden**	
No Barriers	There are Obstacles	No Barriers	There are Obstacles
2.5 V	-0.4V	4.9 V	-0.4V

DISCUSSION

The data in Table 3 is the speed of the river flow which is measured based on the flow velocity in a river that has been tested.

Table 3 Measurement Result Data

No	**Time (S)**	**Measuring Distance (m)**	**district. Manual (m/s)**	**LCD Data Display**	**Error (%)**	**Accuracy (%)**	**Precision (%)**
1	9.85	5	0.51	0.49	4.0	96	94
2	10,11	5	0.51	0.47	4.1	96	94
3	10.23	5	0.49	0.47	6.1	94	94
4	9.55	5	0.49	0.47	5.8	96	94
5	10.55	5	0.52	0.48	4.2	96	98
6	11.11	5	0.47	0.45	4.0	96	98
7	10.32	5	0.50	0.48	2.0	96	98
8	10.41	5	0.48	0.46	2.1	98	98
9	10.35	5	0.49	0.47	4.9	98	98
10	9.82	5	0.51	0.49	4.2	96	98
11	10	5	0.49	0.47	4.0	98	98
12	10.05	5	0.46	0.44	4.5	96	98
13	11	5	0.47	0.45	4.3	98	96
14	10.55	5	0.47	0.45	4.0	96	96
15	10.41	5	0.47	0.45	4.0	98	96

The results analyzed from the results of river flow measurements consist of several aspects, namely: accuracy, precision, percent error and resolution of measurement results. The percent error generated in the table above is due to several factors including the improper installation of the shaft encoder on the conveyor pulley (berring), the infrared LED beam (receiver on the optocoupler) that is not very focused, and the measurement resolution.

CONCLUSION

Based on the results of the design that has been carried out on a solar cell-based garden watering device, it can be concluded that:

1. This river flow meter can work properly with an average of 97% accuracy, 96% precision, and 3.8% error.
2. Sensor response to the object being measured is close to the maximum.
3. Errors that occur are more caused by mechanical factors such as the movement of the encoder shaft that is not parallel to the movement of the propeller shaft, the emission of infrared LED rays on the optocoupler that is not too focused, and differences in irregular water flow patterns.
4. The error that occurs is also because the measurement calibration has not used the actual river current velocity meter and only uses manual measurements.
5. Based on the data that has been obtained from the measurement results of the tool, and based on the programming system, which can be displayed on the LCD display, which was carried out previously, it is obtained, the reading ability of this measuring instrument is from 0.23 m/s to 99.99 m/s.

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