Water Temperature Monitoring Device in Catfish Breeding Based on the Internet of Think

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Article Info :	**ABSTRACT**
Article History : Received : 01 Juny 2022 Revised : 28 July 2022 Accepted : 07 August 2022 Available Online : 30 August 2022 **Keyword :** Sensor, Detection, Temperature, Microcontroller, IoT	*The Internet of Things is a development of today's internet-based technology which has a concept to expand the benefits of objects connected to an internet connection continuously. For example, electronic objects, one of which is Arduino. This technology can provide information automatically and in real-time. One use of this technological development in the fisheries sector is a pond water monitoring system. In practice, catfish farmers still monitor conventionally, namely by visiting fish ponds. This affects the time efficiency and effectiveness of fish cultivation work. In this research, a tool was developed to help monitor and control the water quality of catfish ponds based on the Internet of Things. The device needed is a temperature sensor. Data from these sensors is recorded by Arduino and then processed into information according to user needs via the internet automatically. Furthermore, this data can be displayed on various platforms, including the mobile web model. The test results show that the development of Internet of Things technology in this system can help farmers monitor water quality automatically. The developed automation system promises to increase success in catfish cultivation.*

1. INTRODUCTION.

With The Developments of today's technology, a technological innovation called the Internet of Things has emerged. Internet of Things (IoT) refers to the use of sensors, actuators and communications technologies embedded in physical objects that enable those objects to be tracked and controlled over networks such as the Internet. Using this device will involve three main steps: data collection using sensors, data collection via the network and decision-making based on data analysis. Making these decisions can result in increased productivity of current processes. This will also enable new types of products and services to be offered in various application areas (Bansal, et al., 2015).

Catfish (Clarias gariepinus) is a superior commodity which is currently being developed by the Indonesian government to increase production in the fisheries sector. This moustachioed fish from the catfish family is one of the leading fisheries commodities in Indonesia, especially freshwater aquaculture. The Director General of Fishery Product Processing and Marketing (P2HP) said that 60% of fishery production which has a very high domestic market is freshwater fishery which includes catfish. (East Java Province Fisheries and Maritime Service, 2014).

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Various efforts to develop aquaculture, especially intensive systems, are still being carried out considering that this system is still hampered by various problems, including water quality. (Apriyani, 2017). In catfish cultivation, fish growth conditions will be optimal if the temperature is 26℃-30℃. Unstable temperature changes can cause a decrease in water quality, even during the hatchery and nursery processes it can cause fish fry to die. Therefore, it is necessary to monitor regularly to maintain stable water temperature. (Ghulam Imaduddin & Andi Saprizal, 2017). In practice, fish farmers still measure water quality manually, namely by visiting fish ponds and using simple measuring instruments. This affects the effectiveness of fish farming.

2. METHOD.

2.1. Research Design

The research method consists of several processes that will be carried out sequentially. The model for developing this application is the Waterfall model, which will carry out requirements specifications, design analysis, implementation and testing.

The following are the stages in system development using the Waterfall model:

a. Engineering, the author collects information which will later be used to create a temperature monitoring tool.

b. Analysis, the author describes the definitions of software and hardware. System requirements, applications used, interfaces, forms of information processing, and the tools needed.

c. Design, The Author Explains the analysis through data structure stages, software design, and detailed algorithms for monitoring water temperature.

d. Code generation: The author translates the design into machine readable.

e. e. Testing, the process of testing a tool that has been assembled to ensure testing and re-analyzing existing errors, then re-testing continuously until accurate results are found.

2.2. Research Subjects

a. The test subjects in this research used the black box method where the application was tested to see ease of use.

b. The type of data used in this research is qualitative data collected using document analysis including analysis of articles and previous research regarding the research object.

2.3. Data Collection Techniques

Data collection was carried out in several ways, namely: literature study and field observation or direct observation.

a. Literature review

This method is carried out by collecting some data related to the discussion in the research. This data is taken from relevant sources such as books, and national and international journals.

b. Field observation

At the observation stage, the researcher made several observations at the places and sources that were the focus of the research.

3. RESULTS AND ANALYSIS

3.1. Stages of Making Application Design

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The development of the Internet of Things-based catfish nursery water temperature monitoring application starts with the initial system design. The subsequent design stages build upon the previously created system. The outcomes of the application design are as follows:

a. Device Block Diagram

Image of block diagram of the device used by the author.

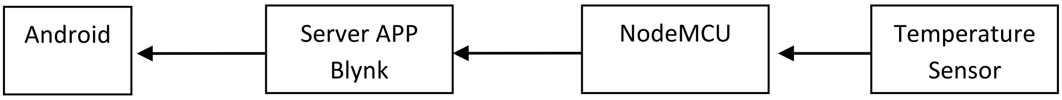

Figure 1. Device Block Diagram

The system diagram depicts a data flow originating from the temperature sensor, which is then transmitted to the NodeMCU for processing. Subsequently, the processed data is relayed to the Blink app server before being received by the Android application.

The system work process flow commences with initializing the sensor device readiness. Subsequently, the nodeMCU reads the water temperature data and transmits it to the Blynk server. If there is a variance in the water temperature, the Blynk application on the smartphone will issue a notification indicating the instability of the temperature.

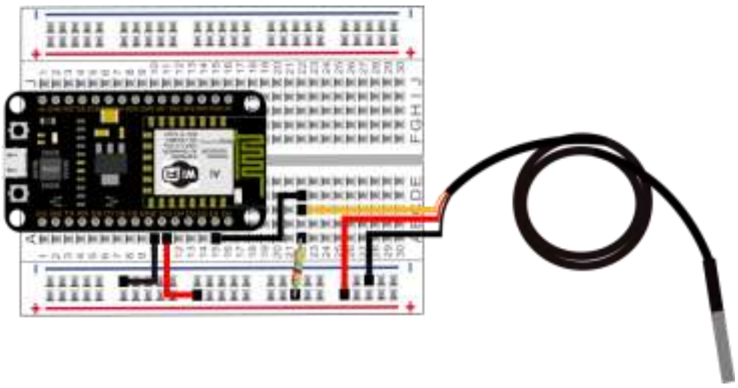

Figure 2. Device Circuit Design

In figure 2 above, it is explains how the device circuit is as follows, the pins are connected: DS18b20 sensor pin, D4 = DAT, GND = GND / G, VCC = VIN

b. System Test Result

On the first page, you can see numbers showing the temperature in Celsius, Fahrenheit and monitoring history. And for stable temperature monitoring, it is determined that fish growth conditions will be optimal if the temperature is 26℃-30℃. The initial display is as shown in Figure 3 below. If the temperature is stable, a notification will appear if the temperature is stable, starting from no less than 26℃, and no more than 30℃. The results of implementing the display when the temperature is unstable can be seen in Figure 4. If the temperature is unstable, a notification will appear if the temperature is stable, starting with the temperature being less than 26℃ and more than 30℃ as in Figure 5.

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Figure 3. Main page

Figure 4. Stable temperature display

Figure 5. Unstable temperature notification

3.2. Test Analysis

Results and discussion regarding planning testing of the tool to be made, the aim of testing this tool is to prove whether the system being designed meets the expected expectations or not, this test includes a table of test results which can be seen as follows:

Table 1. Result of Test Analysis

No	**Temperature read**	**Termometer**	**Internet Signal**	**Error**	**Notifications**	**Notification Response Time**
1.	25,4 C	25,8	Good (Morning)	0.4%	Exits	3 Second
2.	31,2 C	31,7 C	Good (Afternoon)	0.5%	Exits	3 Second
3	30,2 C	29,7 C	Good (Afternoon)	0.5%	Exits	3 Second
4	24,8 C	25,2 C	Good	0.4%	Exits	3 Second

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(Night)

4. CONCLUSION

Upon analyzing the test results, it can be deduced that the sensor exhibits an error margin of less than 1%. The sensor's position in the water depth significantly impacts its efficacy, with the ideal depth being 20 cm from the pool surface. The sensor is programmed to issue a notification upon detecting a temperature change, and the response time for these notifications should not exceed 3 seconds. For future research, it is recommended to consider incorporating additional output components such as pH sensors, salt levels, and turbidity.

5. ACKNOWLEDGEMENTS

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6. DECLARATION OF COMPETING INTEREST

We declare that we have no conflict of interest.

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