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MONITORING SYSTEM OF FISH POOL WATER TURBIDITY WITH ESP32 AND BLYNK

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Abstract

Technological developments in all aspects of life today are urgently needed, this can be seen from the many technologies that have replaced human jobs. As with the fish column at home, the work that is routinely done in the fish column is to replace the water in it if it is too cloudy so that it looks clean and creates good conditions for the development and health of the fish. Usually, fish farmers will make a schedule to check water quality and replace it. This work can sometimes take up time, especially when busyness increases and if you are late or forget to change the water in the pond, it can harm the condition of the fish in it. To help overcome this problem, equipment has been designed to monitor the turbidity level of the water that can be monitored from anywhere and at any time. This study aims to produce a tool that can monitor and control the condition of the level of water turbidity in fish ponds so that fish growth can be maximized. This monitoring is carried out regularly in real-time using IoT (*Internet of Things*) so that it can facilitate monitoring without the need to come directly to the pond location. This research succeeded in creating a monitoring system that can detect the turbidity of aquarium water using the ESP 32 tool and display on the Blynk application automatically in *real-time*.

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INTRODUCTION

Water is an important source both for consumption and for industrial purposes and the habitat of some living things. Water is incredibly required for the existence of all established organisms; nevertheless the population is growing hence excess water is required for domestic and further purposes[1]. Currently, many people are starting to raise fish in ponds behind their houses, both for personal consumption and for trading. In that case, the quality of the water must be considered so as not to endanger the health of the fish themselves.

One example that is done by the community is to maintain the cleanliness of the pool and the quality of the water. If you don't change the water for a long time, moss will grow, moss which can infect fish by sticking to the fish's fins. The development and growth of moss that has reached the fish gills will disturb the respiratory system in fish[2].

Over time and period, technological developments in all aspects of life today are urgently needed, this can be seen from the many technologies that have replaced human jobs. Technology such as Artificial Intelligence was used for assisting in the control of the water quality of lakes and reservoirs[3].

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As in a fish pond at home, the work that is routinely done in a fish pond is to replace the water in it if it is too cloudy to make it look clean and create good conditions for the development and health of the fish. Usually, fish breeders will routinely make a schedule to check water quality and replace it. This is sometimes very time-consuming, especially when busyness increases and if it's too late or forgets to change the water, it can have bad consequences for the condition of the fish in it[4].

To help solve the problem. Equipment is designed to monitor the turbidity level of the water that can be monitored from anywhere which can be accessed through the application. *Blink* on the phone to determine the level of turbidity of water in fish ponds.

The Internet of Things, also known as IoT, is a technological development that utilizes internet connectivity that is always connected. The Internet of Things has a very big influence in all fields because almost all fields of knowledge can be applied to the Internet of Things technology. Therefore, the Internet of Things is called "The Next Big Things" in the world of information technology. A simple example of the Internet of Things is that users can turn on or turn off lights via the Internet from a great distance[5].

One of the applications of IoT is in the field of pool sanitation. Pool sanitation is usually done by keeping the pool and water used clean. In general, ponds that have poor environmental conditions or are poorly maintained will more easily grow algae or other types of parasites, which can reduce the quality of cultivated products. Therefore, in order not to become a source of spreading disease or parasites, ponds are always kept clean, especially the quality of the water. Because of the poor quality water, many parasitic organisms also cause algae and so on to grow quickly in ponds[6].

Like IoT, Microcomputer-Based Laboratory (MBL) is a computer-based experiment in which experiments are conducted with the use of computers and software, connected with interface and probe ware such as a sensor[7] and Drozda et al. applied a negative selection algorithm to misbehaviour detection in sensor networks [8]. Even sensors have been widely used in data collection to describe the spatial variability of chemical and physical things[9] and give providing real-time reliable information[10].

Previously several studies have been carried out, including research se on sensors and controlling the temperature and turbidity of catfish pond water based on fuzzy logic catfish pond[11]. Another study is the control system for turbidity and seawater temperature using the Arduino Mega microcontroller, as a controller with turbidity sensors and temperature sensors to detect seawater turbidity levels so that the water quality matches its natural fish habitat[12].

The research showed that an automated sensor-based system can be developed and linked with clouds to record water quality parameters, such as temperature, DO, pH, and ammonia in a fish culture pond. This study addressed the design and development of a smart water quality monitoring (SWQM) system based on the IoT in aquaculture, taking into account the current benefits of smart technology[13].

Research solves the problem of the penchant for maintaining ornamental fish in aquariums is increasing and there is no monitoring of fish feeding and manual replacement of aquarium water. The method used is the method waterfall. The results of this study are to design and manufacture a microcontroller-based tool that functions to replace water and feed fish in the aquarium automatically, where water replacement is based on the level of turbidity and pH acidity[14].

Research[15] solved the problem of developing a low-cost IoT-based monitoring system model to provide information on pH parameters and water turbidity at any time to ornamental fish owners. The system is built using open-source components and low-cost sensors. Monitoring data is used to activate the

actuator in the form of a water filter. The filter will activate when the water turbidity level exceeds the turbidity limit. Plus this tool is also designed to instantly turn on the filter if the level of turbidity in the aquarium does not match the specified vulnerability.

Fish farmers with many activities provide feed that is prepared automatically so they don't have to worry about shortages to feed the fish every time. support planning It would be very interesting to study this device or use the NodeMCU ESP8266 microcontroller. remember to give food every time to feed the fish. Supporting the design of time developments and technology can make it easier to determine the clarity or turbidity of the water in the fish aquarium area at any time. IoT (Internet of Things) is a network of physical goods contained with electronics, software, sensors, and network connectivity, which allows goods to accumulate information and exchange information. A microcontroller is a chip that functions as an electronic circuit controller and can store programs and consists of a certain CPU, memory and I/O. At this time the microcontroller is often used to facilitate various things in everyday life. The microcontroller in this case is used to dictate the information needed to be able to identify the water conditions in the fish aquarium[16].

Based on the problems above in this study, the authors designed a Water Turbidity Detection Tool in fish ponds using ESP32 with the aim that fish breeders or farmers would be more practical and cost-effective compared to existing systems in monitoring water turbidity levels in real-time. In this study, it was concluded that a fish pond water turbidity monitoring tool was successfully created.

METHOD

Research Methods

The research method used in this study are:

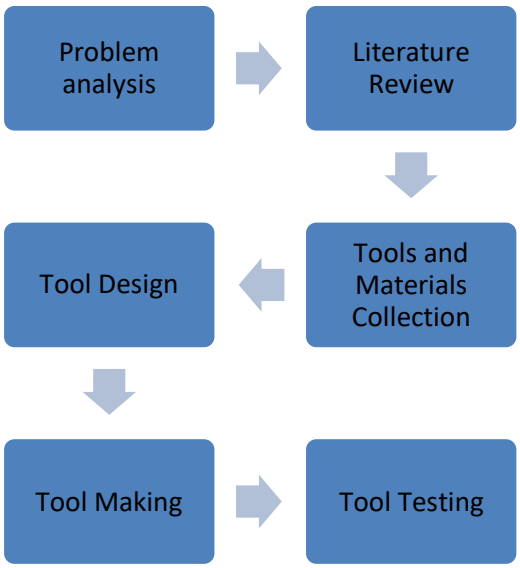

Figure 1. Framework

1. Problem Analysis
   This stage is to analyze the needs needed for research and manufacture of tools. Such as writing needs, and data collection.
2. Study Literature
   The literature study stage is to find out the solutions used in solving problems, such as finding reference sources from books and journals.
3. Collection of Tools and Materials
   Level of collection of tools and materials using Laptop, Esp32, led, LCD 16X2, *Turbidity Sensor*
4. Program Implementation
   This stage carries out temporary tool designs and focuses on presentation (for example making input and output formats). And how the appearance of the tool is to be built.
5. Tool Making
   The stage where the tools will be assembled and the materials prepared according to the logic that has been programmed in C language and displaying *Blink.*
6. Tool Testing
   When finished with making the tool, it is necessary to test it first, to re-check the tool that has been made whether it is running as planned

Tool Planning And Manufacturing

This study aims to produce a tool that can monitor and control the condition of the level of water turbidity in fish ponds so that fish growth can be maximized. This monitoring is carried out in real-time using IoT (Internet of Things) so that it can facilitate monitoring without the need to come directly to the pool location. The level of water turbidity can be directly monitored from a smartphone. The design of this water turbidity monitoring system can be seen in the block diagram as shown in Figure 1.

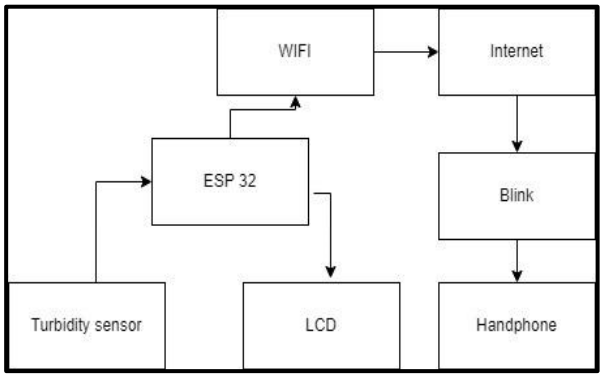

Figure 2. Tool Block Diagram

The block diagram in Figure 2 above explains that the Turbidity Sensor is used to measure the turbidity level of water. ESP 32 is an electronic suite that is equipped with Wi-Fi and Bluetooth devices in it. LCD to display the results that have been detected by the Turbidity Sensor and linked to the application *Blink*.

A. Network Tools

The toolkit is a component image of a process. The picture of the series of tools is as follows.

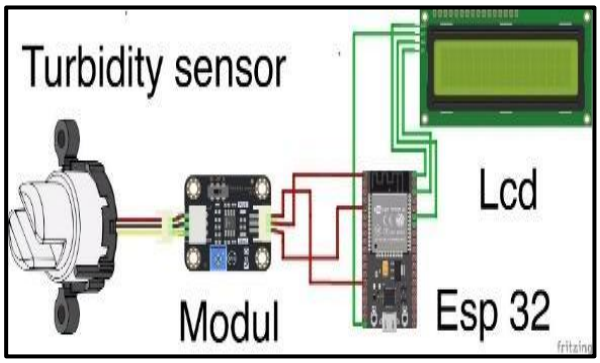

Figure 3 Network tools

Arduino sends data to LCD I²C through a sensor connected via ESP32 with GRD pin to GRD pin, VCC pin to VIN pin, SDA pin to D21 pin, SCL pin to D22 pin. *Turbidity* The sensor will be connected to ESP32 with pin G to pin GND, pin A to pin VP, pin V to pin analogue 3V3.

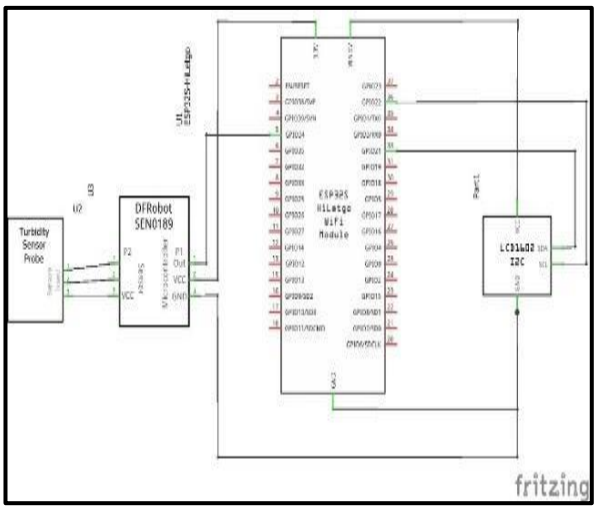

Figure 4. Schematic of a series of tools

The device network schematic in Figure 4. above is the network or port used in the planning of this device.

B. Flowchart

The flowchart is in Figure 5. below illustrates how the tool works, where the workflow is the sensor*Turbidity* read data, *ESP32* connect to*Wi-Fi* then connect to server *Blink*, if water turbidity is detected then, *LCD* show the word "*The turbidity of the water has reached the safe limit*", *notification* enters to *Smartphone*. If the turbidity of the water is not detected (clean), then *LCD* shows the word "Clean" and shows no notification.

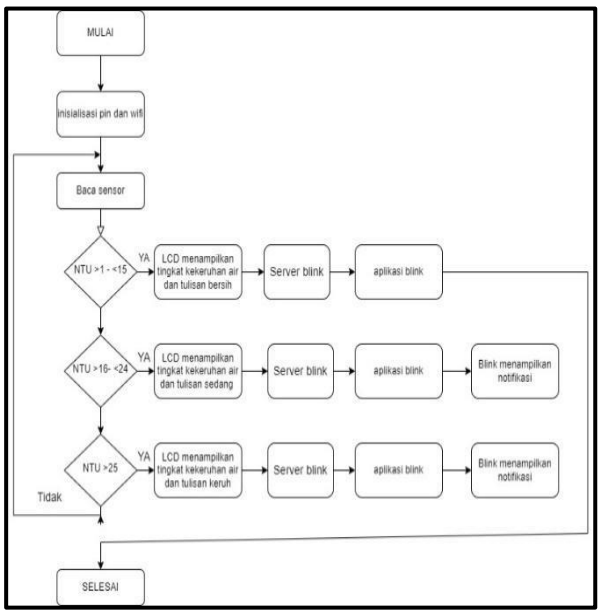

Figure 5. Flowchart

RESULTS AND DISCUSSION

This test is carried out using a pool for trials. This test aims to determine whether the sensor can detect water turbidity or not. And will display the results in *Blink*. If the water quality is moderate and cloudy, a notification will appear on the smartphone user. Pictures from testing the *Turbidity sensor* can be seen in Figure 6 and the display of the application *Blink* in Figure 7 below.

Figure 6. System Testing

Figure 7. Display on the software link connected to *the smartphone*

System test results are the results given by the system that has been made, the results of the tests can be seen from Table 1 and Table 2 below. And testing notifications in Table 2.

A. Sensor testing in the test pool that was created

Below are the results of sensor testing, which is divided into 2 tests, inside the aquarium and outside the aquarium. And with the results of testing notifications on the Blink application.

a. The results of sensor testing in the pool

Table 1. Test results in the pond.

Status	NTU value	detected
Clear	13.71	Of
Currently	18.00	Of
cloudy	84.19	Of

In Table 1 are the results of testing the water in the test pond, from the test results it can be seen that the results with NTU values from 1.00 – 15.00 then the results said to be clear, if the NTU is 16.00 – 24.00 then the turbidity is medium, and if the NTU that

appears NTU can be from 25.00 then the pool water is cloudy

b. Sensor results outside the pool.

Table 2. Test results outside the test pool

Status	NTU value	detected
Clear	22.55	No
Currently	2.03	No
cloudy	31.65	Of

In Table 2 are the results of testing outside the test pool, in this detection with the NTU value in Table 2, the data received is not the same as the previous data, then the sensor turbidity It is better if the test is carried out directly with water without any obstacles.

c. Notification test results

Table 3. Notification on *Blink*

Status	NTU value	Notifications
Clear	14. 00	No
Currently	21. 03	Of
cloudy	44. 64	Of

Table 3 is the input from Figure 5. This notification will only appear if the turbidity level is moderate with a Nephelometric Turbidity Unit (NTU) of 16.00-24.00 and cloudy with a large NTU of 25.00. This notification is intended so that the water in the aquarium remains stable and does not reach very turbid turbidity levels.

B. Tool Recapitulation Results

From all the tests that have been carried out, it can be concluded that all the components of the tool comply with the specification's original design and working fine. Table 4. below is the result of the tool recapitulation.

Table 4. Tool Recapitulation Results

No	Tool	Works
1	*Turbidity Sensor*	Of
2	*ESP32*	Of
3	*LCD16x2*	Of
4	*2C*	Of

Table 4. above is a test of all tools. In this test, the tool functions properly and has obtained the data that should be desired.

CONCLUSION

Based on the manufacture and testing of the system, the following conclusions can be drawn:

A. This research managed to implement a system that can detect turbidity-based aquarium water microcontrollers.

B. In research, I have successfully used the application *Blink* as a result displays a warning notification if the water has reached a moderate level and is cloudy.

C. *The turbidity* sensor will retrieve valid data if it goes straight into the water without any obstacles.

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