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WATER CIRCULATION SYSTEM IN BIOFLOK CULTIVATION TECHNIQUE USING ARDUINO R3 MICROCONTROLLER

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ABSTRACT

Bioflok technology is a cultivation technology based on the principle of assimilation of inorganic nitrogen (ammonia, nitrite and nitrate) by microbial communiqués (heterotrophic bacteria) in the cultivation media which can then be utilized by cultivated organisms as a food source. In the cultivation of bioflok circulation, usually cultivators will turn on the aerator machine as an oxygen refiner for 24 hours. Because of the absence of a water pumping machine to carry out circulation and cleaning of dirt in the pool, this resulted in cultivators having to manually dispose of pool water. With the sensor and microcontroller, it is easier for the researcher to make an automatic water circulation tool as an indicator by using turbility sensors as indicators of water turbidity and water pumps that serve to flow water circulation will work in accordance with the level of water turbidity.

Keyword:
Microcontroller
Turbidity
Pump
Aerator

1. INTRODUCING

The incredible development of technology also allows us to shop from home, send money in real-time, school online[1]–[3]. With technology, we can connect with anyone anywhere in real-time, as if the distance is now not a barrier[4]–[6]. With technological advances, we can survive a pandemic like today, where physical encounters are not possible, with technology, meetings turn virtual, without reducing the value in them at all[7]–[9]. Bioflok technology is a cultivation technology based on the principle of assimilation of inorganic nitrogen (ammonia, nitrite, and nitrate) by microbial communiqués (heterotrophic bacteria) in the cultivation media which can then be utilized by cultivated organisms as a food source. Fish farming requires feed as support for fish growth. Feed provided is not all consumed some of the feed that is given only 25% is converted as a result of production and others are wasted as waste (62% in the form of dissolved materials and 13% in the form of impermeable particles).

Tilapia fish was chosen to be an advanced commodity of the bioflok system, as tilapia belongs to a group of herbivores. So that the enlargement process is faster. Tilapia fish are also able to digest folks composed of various microorganisms, namely bacteria, algae, zooplankton, phytoplankton, and organic matter as part of their feed source. It was beneficial in cultivation in bioflok ponds.

In the application of sewage treatment, organic materials in the form of sludge waste must continue to be stirred and decorated[10]–[12]. The goal is that the waste is always in a suspended condition so that it can be decomposed by heterotrophic bacteria aerobically into inorganic compounds. The necessity of stirring in this waste treatment technology is because if the organic

matter settles, then there will be anaerobic conditions where anaerobic bacteria are aroused to break down organic matter into simpler compounds and toxic.

In the cultivation of bioflok circulation, usually cultivators will turn on the aerator machine as an oxygen refiner for 24 hours. Because of the absence of a water pumping machine to carry out circulation and cleaning of dirt in the pool, this resulted in cultivators having to manually dispose of pool water[13]–[15]. With the sensor and microcontroller, it is easier for the researcher to make an automatic water circulation tool as an indicator by using turbidity sensors as indicators of water turbidity and water pumps that serve to flow water circulation will work in accordance with the level of water turbidity. In order for this program to function as desired, Arduino Uno R3 microcontroller is needed. So that this tool can be programmed to carry out water circulation based on predetermined commands.

The results of the design and creation of an automatic control system on Arduino Uno-based bioflok is expected to provide good benefits, among others, to be a new innovation in helping users both farmers and pool managers in cultivating with bioflok systems can control the water circulation process running efficiently so that there is no waste of water applied scheduled control in the bioflok process.

2. RESEARCH METHODS

A flowchart diagram is a type of diagram that represents an algorithm, work flow or process. This flowchart will display the steps in the form of graphical symbols in sequence.

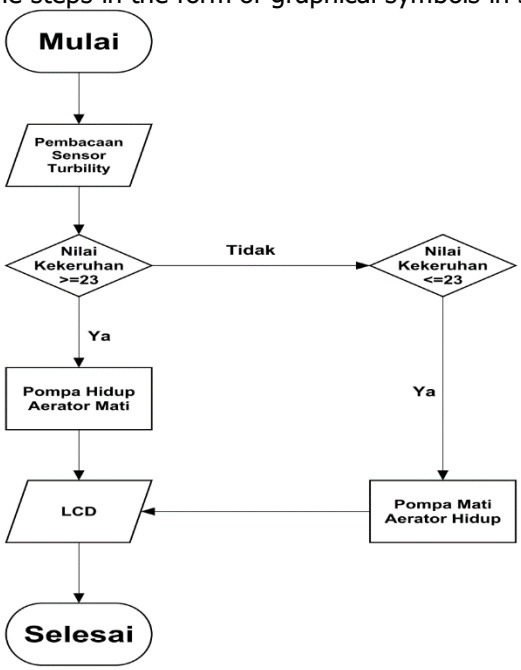

Figure 1. Flowchart Sensor Turbidity

At the beginning the system began preparing the initialization of the reading turbidity sensor. Turbility sensor will provide data according to the instructions of arduino. Then the turbility sensor that has been given a water clarity command with a value of >23 sends data to arduino to set the relay module that serves to turn on the water pump and the aerator off. If the clarity of the water <23 then the pump dies the aerator is alive.

3. RESULTS AND ANALYSIS

3.1. Tool Planning

The design of the entire suite of tools consists of four important elements that are integrated into each other. These important elements are input circuits, controller circuits, output sets, and also integrated program software. A circuit consisting of electronic components either in the form of inputs or outputs needed by microcontrollers in order to function properly. The entire suite of tools can be seen in the following image

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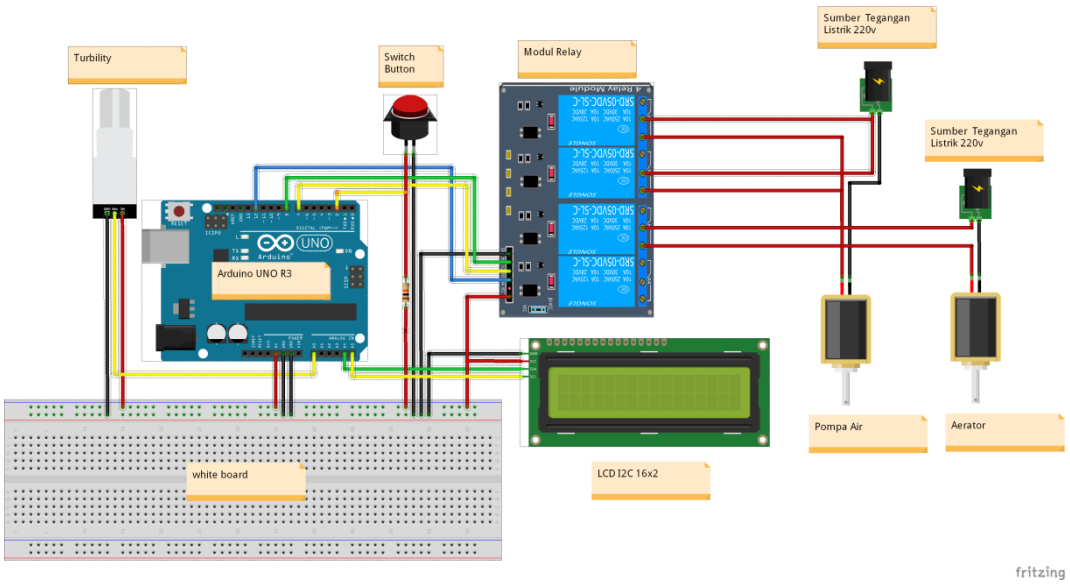

Figure 2. Planning of The Whole Tool

3.2. Turbidity Sensor Design

Turbidity Meter is one of the common tools commonly used for the purpose of analyzing the turbidity of water or solution. A turbidity meter is a turbidity testing device with optical properties due to the dispersion of light and can be expressed as a comparison of reflected light to incoming light. The intensity of light reflected by a solid suspension is a function of concentration if other conditions are constant. This tool is widely used in clean water treatment to ensure that the water to be used is of good quality judging by the level of turbidity.

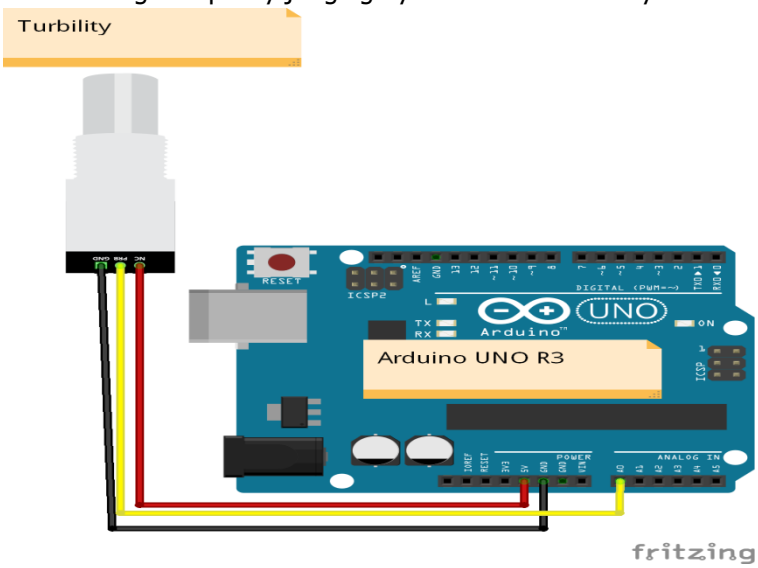

Figure 3. Turbidity Sensor Design

3.3. Liquid Crystal Display Design

LCD (Liquid Crystal Display) is a type of display media or display of crystal liquid material as the main viewer. A 16x2 LCD can display as many as 32 characters consisting of 2 lines with each line displaying 16 characters. In the design of this tool LCD serves to display the date and time data to monitor the tool that works in real time.

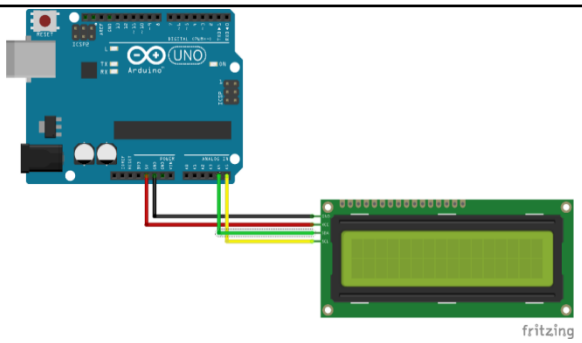

Figure 4. Liquid Crystal Display Design

3.4. Relay Design

Relay is an electrically operated Switch and is an Electromechanical component consisting of two main parts: Electromagnetic (Coil) and Mechanical (a set of Switch Contacts). This relay is used as a switch to turn on the water pump and aerator in the design of this tool.

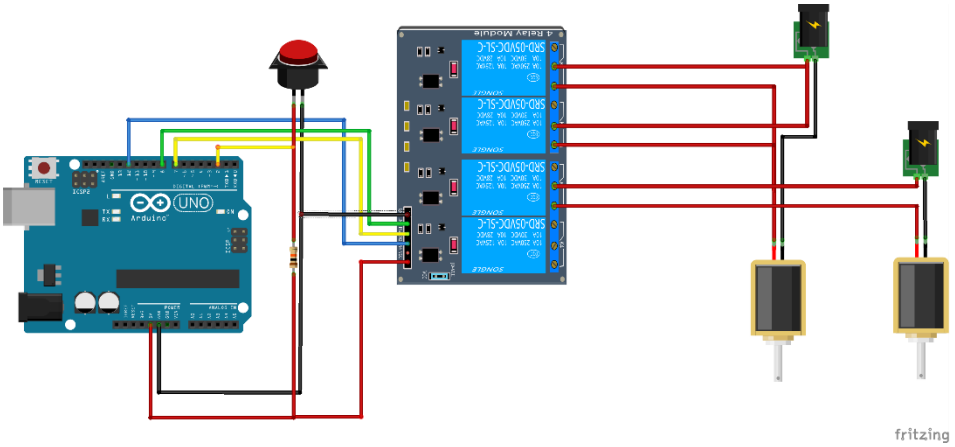

Figure 5. Relay Design

3.5. Use of Arduino IDE Software

Arduino IDE software is a very important software in the design of this tool, because it is used to insert programs that contain commands and uploaded to a microcontroller for its application. The following is the initialization of the arduino program using Arduino Uno as shown by the image below

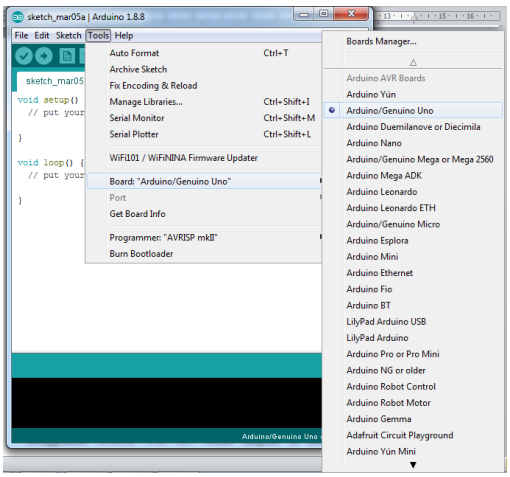

Figure 6. Coding of Arduino IDE

This step aims to choose the type of Arduino microcontroller that will be used to create the system. In the design of this tool use Arduino Uno R3. In addition to the above steps we also need to initiate a serial port so that the Arduino can connect to the computer usually using a USB cable so that the Arduino can connect to the computer.

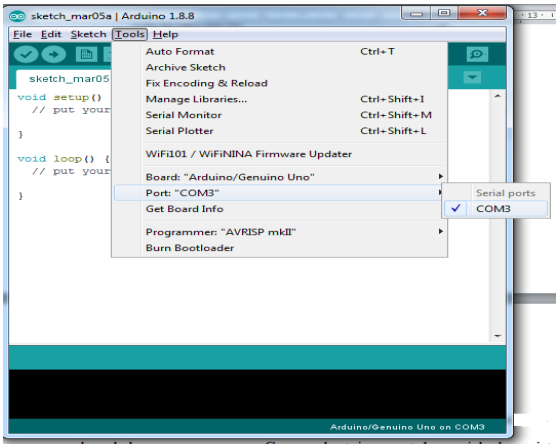

Figure 7. Arduino Serial Port Initialization

3.6. Component Testing

In component testing will be discussed about testing based on planning of microcontrollers made and testing carried out in accordance with the planning discussed[16], [17]. First the test is done separately, starting from the components used in the design of this tool so as to get the desired results. After that the test continued with the testing of the entire series of microcontroller components that have been installed[18]–[20].

4. CONCLUSION

The results of testing and analyst of the tool in full, can be concluded as follows have been successfully created an automatic system on bioflok that can regulate the clarity of water using turbidity sensors. The water circulation system in the bioflok, which uses turbidity sensors can determine the clarity of the water. The method of setting automatic circulation on bioflok, proved to be more effective and water efficient, compared to the method of circulation that has not been automatic in regulating the life and death of the pump. The entire system consisting of Arduino Uno, turbidity sensor, relay, water pump, push button and 16x2 LCD viewer can work and integrate well. Bioflok automation system can provide convenience in running a system and can be an alternative in fish farming on limited land.

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