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AN ENHANCE QUALITY FISHERMAN PRODUCT AND FISHING PERFORMANCE BASED ON IOT

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ABSTRACT

Fishermen can benefit from using technology in their profession, especially in the field of fisheries. Instead of relying on traditional methods based on tides and moon phases, fishermen can now use technology to locate fish efficiently and effectively. One such innovation is the use of a system that utilizes sonar and marine acoustics to detect fish in any location. The system is designed using an Arduino Uno microcontroller and an echo sounder, which is connected to an Android smartphone to display the results. The objective of the research was to detect every movement of fish using this system. However, the research yielded inaccurate results, indicating that the Arduino Uno microcontroller did not function optimally for initializing fish objects in water.
Keywords: Fisherman, Fishing Performance, IOT

1. INTRODUCTION.

Technological advances in the field of control systems are growing rapidly in all aspects of life. Starting from aspects of agriculture, industry to marine also utilize technology in an effort to increase the productivity of a job to make it more efficient and effective. The ocean floor has the characteristics of reflecting and scattering sound waves as well as the surface of the ocean waters. The resulting effect is more complex due to the nature of the seabed which is composed of various elements ranging from hard to smooth rocks and layers that have different compositions (Aryza et al., 2018).

Fishing activities are activities carried out to obtain a number of catches, namely various types of fish to meet demand as a food source using various types of fishing gear. So far, a fisherman has used his experience to find out which areas have a lot of fish sources in the sea. As time goes by, the demand for fish needs also increases, there is an increasing demand and need for fish and the lack of knowledge about the existence of fish makes it difficult to find fish. This is one of my supporting ideas for designing a fish finder (Omax et al., 2020).

Fishfinderor a fish detection device is a device whose mechanism uses a detection sensor in water that can be used to detect fish detect fish in water (Eddy et al., 2018) The concept offered in this fish detector utilizes high-frequency ultrasonic waves by utilizing sonar. Just as dolphins emit ultrasonic waves to find out their surroundings, the reflection of the waves back from sonar will be used to detect the presence of fish (Choi et al., n.d.).

The author's goal is to raise a thesis entitled initialization of fish objects in an area based on arduino in increasing fishing results. a fish initialization tool using an echosounder which will be designed as well as possible so that it can detect fish in the water, to find out whether there are fish in the water (Solly & Lubis, 2019).

II. LITERATURE REVIEW.

2.1. Definition of Initialization

Initialization, is the provision of initials to programs that are made to find out the status of each command in the program. The existence of initialization is expected to shorten the command in the next program. (Inkubator et al., 2012)

Initialization is the initial setting process to use the facilities in the microcontroller such as UART, input/output and time. Initialization is done by creating an initialization program that is placed before the main program. The initialization stage is the most important stage because it greatly affects the clustering results.

2.2. Underwater Acoustics (Marine)

Marine acoustics is a theory that discusses sound waves and their propagation in a seawater medium. Marine acoustics is a marine field that detects targets in the water column and water bottom by using sound as the median. The problems discussed in this marine acoustics are, the speed of sound waves, time (when the waves are emitted until the waves are reflected back), and the depth of the waters. The things that underlie us to study marine acoustics are the oceans so broad and deep (dynamic), humans have been to the farthest planets but never to the deepest ocean, so tools and methods are needed to describe the columns

and seafloor, and currently the best method is to use acoustics. (Nurillah, 2014) Acoustic is divided into two types, namely:

1. Passive acoustics is an act of listening to sound waves coming from various objects in the water column, usually sound received at a certain frequency or specific frequency for various analysis. Passive acoustics can be used to listen to underwater explosions (seismic), earthquakes, volcanic eruptions, sounds produced by fish and other animals, ship activity or as equipment to detect underwater conditions (hydroacoustics to detect fish).
2. Active acoustics means that it can measure the distance from the detected object and its relative size by generating sound pulses and measuring the travel time of these pulses from the time they are emitted until they are received back by the device and calculating the return amplitude. Active acoustics uses the basic principles of SONAR for underwater measurements.

Acoustic methods are processes of detecting targets at sea by considering sound propagation processes, sound characteristics, environmental factors, and target conditions. The advantages of this acoustic method are high speed, direct estimation of fish stocks, and processing data in real time, precisely and accurately (Lubis, 2018).

Hydroacoustics is based on a simple principle, sound waves are emitted through a device that generates sound energy (transducer) in the water column or the water bottom. This converts electrical energy into mechanical. The speed of sound energy in water reaches 1500 m/s. When the energy hits a target, it will be returned in the form of an echo which will later be returned to the receiver. By determining the time interval between the emitted and received pulses, the transducer can estimate the distance and orientation of an object it detects. The speed of sound depends on temperature, salinity, pressure, season and location. The farther the sound is from the source, the echo activity will experience changes in terms of space and time.

2.3. *Attenuation* Sound wave

*Attenuation*is the decrease in the level of some quantity, for example the intensity of a sound wave. From another source, attenuation means signal attenuation (communication science). However, the correct attenuation for sound waves is the reduction in the amplitude and intensity of the waves as they travel through the medium. When a sound wave propagates through a medium, energy is also propagated. This energy will decrease along with the sound wave propagation process since the sound comes out of the sound source (this is closely related to the Doppler effect). Because sound waves spread out over a wide field, their energy is spread out over a wide area. So the farther the listener is from the sound source, the smaller the sound will be heard. This phenomenon is called attenuation.

The events that occur in this attenuation consist of absorption, reflection and scattering. The unit of attenuation is decibels (dB). Meanwhile, the attenuation coefficient is the attenuation that occurs per unit wavelength in decibels per centimeter (dB/cm).

If the attenuation coefficient increases, the frequency will also increase. Each network has a different attenuation coefficient. This coefficient represents the amount of attenuation per unit length, that is, the higher the frequency used, the higher the attenuation coefficient.

2.4. *Shadow Zone*

*Shadow Zone*is a region where sound waves cannot propagate or are so weak that they can hardly propagate in a medium. In this area, the temperature and salinity of the sea in this layer can reflect incoming sound waves. According to Urick (1983) in the water column there is deflection of sound waves (refraction) which occurs due to differences in depth, salinity, and temperature of sea water. The most obvious effect is that if there is an increase in sea water temperature by 1°C it will cause an increase in the speed of sound by 1m/sec. As a result, if the temperature increases with depth, the emitted sound waves will tend to be deflected towards the surface of the water. Conversely, if the temperature decreases due to depth, sound waves will tend to be deflected to the surface and to the bottom of the water. then there are areas where sound wave propagation does not occur. The distance from the sound source to the shadow zone is determined by the rate of change of temperature with depth, the depth of the sound source and the depth of the sound receiver.

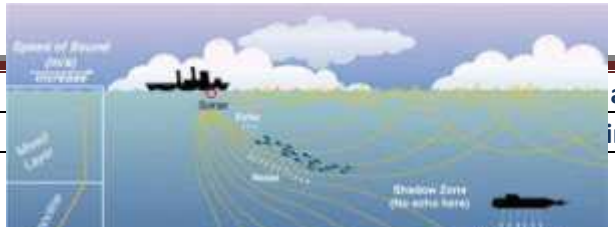

Figure 1. Shadow Zone Formation

*Shadowzone*or "shadow zone" is an area impermeable to the transmission of sound waves. This zone is usually formed in the ocean. This area is often used by submarines so that it is not detected by SONAR (Sound Navigation and Ranging). This happens because the temperature and salinity of the sea in this layer reflects the sound propagation that comes.

*Shadowzone*which is formed in the sea due to the nature of the sea itself, namely the existence of 3 layers: the mix layer, the thermocline layer, and the deep layer. In the mix layer zone, the speed of sound increases as the pressure increases as the depth increases. The second zone is the thermocline zone, in this zone the speed of sound decreases rapidly compared to the increase in pressure so that the speed of sound in this zone

decreases with depth. While the third zone is the deep sea zone, the speed of sound increases with depth due to increased pressure. In seawater, the speed of sound waves is close to 1,500 m/s (generally, it ranges from 1,450 m/s to 1,550 m/s, depending on temperature, salinity, pressure, and season). In the thermocline layer there is a drastic temperature drop so that two mediums are formed due to the temperature difference. Because there is a boundary between these two mediums, it causes deflection of sound waves (refraction). The most obvious effect is seen if there is an increase in sea water temperature of 1 C° will cause an increase in the speed of sound by 1m/s. As a result, if the temperature increases, the sound waves emitted will tend to be deflected towards the surface of the water. Conversely, if the temperature decreases due to depth, sound waves will tend to be diverted to the bottom of the water. Due to the deflection of sound waves to the surface and to the bottom of the waters, there are areas where sound wave propagation does not occur, which are called shadow zones.

2.5. *Absorption*,Target Strength, Scatter Volume, Sofa Layer

When sound waves are emitted into the water column, they will experience ABSORBTION or absorption of sound wave energy resulting in lost transmission when echo from the transducer. The absorption process is highly dependent on temperature, salinity, pH, depth and frequency. One of the characteristics of the wave is that when it moves away from the transducer, it will experience a weakening of its energy and reflection speed. After the sound waves hit a target, the sound waves will be reflected back to the transducer. The strength of the reflected echo returned by the target and relative to the sound intensity that hits the target is called TARGET STRENGTH. Or target strength can be defined as ten times the logarithmic value of the intensity that hits the fish or target.*BACKSCATTERING STRENGTH*is the ratio between the intensity reflected by a single target group measured from the target. Meanwhile, the SCATERING VOLUME (SV) is the ratio between the sound intensity reflected by a single target group that is in a certain volume of water (1m3).

The SOFAR (Sound Fixing and Ranging) layer is an area with accumulated temperature and depth, so that the speed of sound is reduced or commonly called the minimum layer C (speed of sound). At this minimum C layer, sound waves can propagate in a large enough motion so that not much energy is lost and will eventually be trapped in the SOFAR layer.

III. METHOD.

The research stages of this thesis are described by the RAD (Rapid Application Development) cycle.

Figure 2. RAD (Rapid Application Development)

1). Requirements Planning

In this phase, users and analysts meet to identify application and system goals and to identify information requirements arising from the purpose of the tool. The orientation in this phase is to obtain information on the use of echo sounders to increase fishermen's income.

2). RAD design workshop

This phase is the phase to design and improve what can described as a workshop. During the RAD design workshop, users respond to existing prototypes and analyzers improve them modules are planned based on user response.

3). Implementation

In this implementation phase, the implementation of the use of echo sounders in detecting fish and initializing sensor readings into the system that has been made. In the design and preparation of this paper, several methods were used to collect data, including the following:

- Literature (Library study)

Literature study was conducted to get references regarding the basis all the tools used in the system such as the working principle of the Echo Sounder, and the Arduino Uno Microcontroller. Literature study is also used to get ideas about further development in an effort to improve the existing system.

- Interview and Observation

Research instruments using interview and observation techniques were carried out by collecting a series of data related to problems that often occur in echo sounders. The system analysis offered aims to obtain new solutions in terms of responding to any problems and deficiencies that still occur in the current running system. The system offered answers every problem that exists with a computerized system by embedding a system on a microcontroller chip.

The system flowchart offered displays the activities to be carried out by a fisherman in searching for fish in the sea. In this flow chart, the first step that must be done by a fisherman at sea is to turn on the tool to be made. After the tool is turned on, the echo sounder will be in a stand-by position waiting for the reading. If the sensor from the echo sounder detects a movement with the identification of the movement as a fish, then the tool created will issue a sound output as a sign that the underwater situation is filled with fish. Figure 3.3 displays an overview of the flowchart of the offered system.

VI. RESULT.

4.1. Arduino testing

*Arduino Uno*is the main controller of the hardware that is made. Testing this Arduino is to find out whether this microcontroller can be used properly or not. The way to test this hardware is to check each input and output pin on the Arduino previously installed the program on each pin. The test results show that Arduino which has previously been programmed and connected to other hardware can run. The source code can be seen below:

```
#include <SoftwareSerial. h>

Software Serial bt(2,3);

#include <NewPing. h>

#include <Servo. h>

#define TRIGGER_PIN8

#define ECHO_PIN     7

#define MAX_DISTANCE 20

const int sensorMin = 0;

const int sensorMax = 15;

NewPing ultrasonic1 (TRIGGER_PIN, ECHO_PIN,

                                MAX_DISTANCE);

void setup() {

  Serial. begin(115200);

  bt. begin(115200);

}

void loop() {

  int US1 = ultrasonic1. ping_cm();

  int range = map(US1, sensorMin, sensorMax,0,3);

  Serial.print("Acoustic Sound Reflection Analog Value: ");

  Serial. print(US1);

  Serial. print("");
  delay(100);
}
```

In the source code above, a library is used which is intended to receive and send an echo sounder sound. The source code above also uses a serial software library with the intention of performing serial communication which will be transmitted to a Bluetooth device connected to a mobile phone. The results of the sensor readings will be displayed on the Android smartphone.

Figure 3 below is an image of the display of the Arduino IDE compiler software that has included an echo sounder source code.

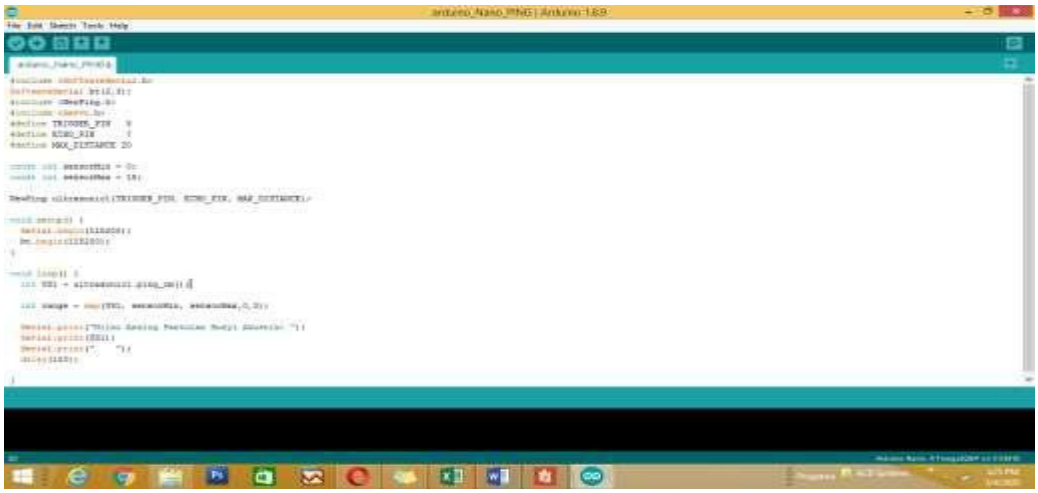

Figure 3. Source Code

In the test results above, Arduino is intended to initialize fish in the water by reflecting ocean acoustic sound waves which are then translated by Arduino and displayed on an Android smartphone.

4.2. Echosouder Testing

*Echo sounder*can be used to search for the existence of an object that is in or on the seabed. In sonar equipment there is a device that emits sound waves that propagate in water, these sound waves will bounce back when they hit an object. The echo sounder emits high frequency sound waves. These sound waves will propagate in water. If it hits an object such as fish, metal, seabed or other objects, the sound waves will be reflected. The reflected signal will be received by the hydrophone and displayed by a display that describes the characteristics of objects under water.

To find out the location (distance) of an object underwater, the time it takes for the sound wave can be used to find the wavelength distance traveled by the sound wave. While the actual distance (position) d from the object is obtained by dividing the two wavelengths λ traveled. The sonar used in this study is passive sonar where it only receives sound waves. This passive sonar is an early type that is only able to listen to sounds such as the sound of ships (vessels). The workings of this passive sonar only receive sound waves from sound sources such as ships, fish, or other objects that emit sound.

In principle, sonar is a good tool to use underwater because sonar does not experience attenuation of electromagnetic waves under water because it utilizes the concept of marine acoustics. But that doesn't mean that sonar is the perfect tool for today, the application of sonar also has weaknesses, such as the speed of signal return is affected by temperature and seawater

Figure 4. Testing the Echo Sounder

In the picture above a test is carried out by utilizing a catfish pond as a testing medium. The test is carried out with an echo sounder device that has been sold by the manufacturer and then in a series of devices connected in parallel to a multimeter to see the results of reading the voltage value when fish are detected around it. This value will be initialized on the Android smartphone to indicate that the fish movement is detected at that location.

In the above test the read value is 6.5 mV where this value is the lowest value read and still detects fish movements. If the reading value is more than 6.5 mV, it is certain that the number of fish is more than what is being read at this time.

Figure 5. Working Voltage Testing

In Figure 5 above, it can be seen that the working voltage of the Echo Sounder is 3.59 Volts.

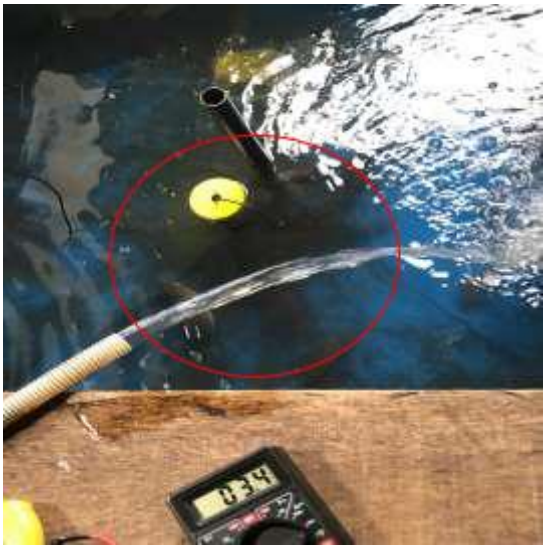

Figure 6. Sensor Testing

The sensor test in Figure 4.4 above shows the results of reading the value on the sensor driver of 3.4 mV. The red circle above is a photo of a crowd of fish around the sensor.

4.3. Application Testing Androids

In this study, an Android application was created using a website page ai2.appinventor.mit.edu with an application design as shown in the image below. The site in question is a platform that can be used for free, with the requirement to log in with a Google Mail account.

Figure 7. Application Design

V. CONCLUSION.

Based on the results of research conducted by the authors, the authors can draw several conclusions.

1. The fish object initialization tool has been well designed but its function is not optimal.
2.Fish detection uses an echo sounder by reading the voltage value on the echo sounder driver, when the application gives a notification "there are fish" then it can be ascertained that there is movement of fish under the sensor.

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