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Automatic buoy system for position control based on global positioning system (GPS)

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Abstract. This study aims to design a buoy using an electric motor as a driver to maintain the position based on the coordinates of the Global Positioning System (GPS) that has been determined. This control system is designed to replace the existing buoy system, namely a buoy using a chain to maintain its position. The method used in the study is an electric motor control method using a microcontroller with GPS coordinates as the return point (home coordinates). The solar cell system that connected to the battery is used as a source of energy for the buoy control system. The result of this device is the distance between the return point and the stop point of less than 12 meters.

1. Introduction

The use of buoys is not new in Indonesia. Until now, the buoy system is still being developed for other needs. The development of this buoy has been utilized for various purposes, such as navigation, tsunami monitoring, research, fisheries, and energy [1]. According to Chandra, who developed the buoy for early warning of the pollution of the Pekalongan fishing port by using three sensors, namely temperature, salinity, and dissolved oxygen, as well as the telemetry system running well [1]. For other purposes, data collection on ocean currents and observations in Indonesian waters require data that can be directly identified in real-time by Purba et al. By examining GPS Drifter Combined (GERNED) with float tracking [2].

In other studies, Ranjith created an automatic limiting warning system for fishermen using Global Positioning Systems (GPS) and Global Systems for Mobile Communication (GSM) techniques [3]. In the conventional design, the buoy uses a chain and anchor to maintain its position so that the buoy is not carried away by ocean waves. This will be difficult if it will be used in deep water areas because it requires a long chain to place it. As did Joe et al. develop a buoy robot system that is always in position automatically without a retaining line. This prototype uses a wave glider platform to hold the buoy position without mooring and develops a power generation system using a self rectifying wave turbine (WTS) system [4].

From the description above, this research will discuss an automatic buoy system for position control using a global position system (GPS) and a driving motor to maintain the buoy position at a predetermined location.

2. Methods

This tool uses components that are easily available on the market. In designing this buoy, several steps are needed, including the following:

2.1. Planning System

The planning in this system can see in figure 1.

Figure 1. Planning of system

2.2. Design System

The design includes laying electric motors, control rooms, and solar panels. The design in this system can see in figure 2.

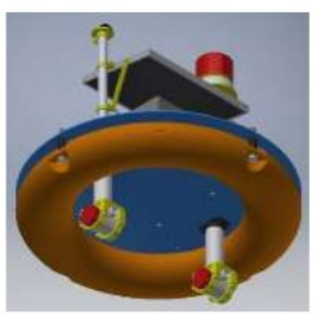

Figure 2. Design of system

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2.3. Hardware Design

Hardware design consists of solar cells, global position system sensors (u-blox 6), compass sensors (HMC5883L), Arduino UNO, and electric motors (MKGP-G1100). The hardware design can be seen in Figure 3 below:

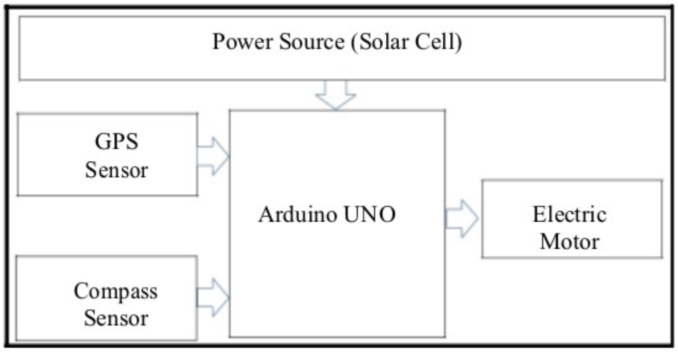

Figure 3. Hardware design

2.4. Selection of components uses, such as:

2.4.1. Global Positioning System (GPS) sensor. Is a navigation system or satellite-based positioning. The global positioning sensor system can see in figure 4.

Figure 4. Global Positioning System (GPS) sensor

*2.4.2. Compass Sensor. The s*ensor functions as a determinant or moves the buoy. This module requires a power of 5 volts with a current consumption of 15 mA. There are two ways to get compass data, from PWM or I2C connections. The compass sensor system can see in figure 5.

Figure 5. Compass Sensor

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2.4.3. Microcontroller Arduino. A microcontroller on duty receives the coordinates provided by the GPS, processes them, and issues command to the motor. Arduino UNO can see in figure 6.

Figure 6. Arduino UNO

2.4.4. Motor Direct Current. It is a lifebuoy that has the ability to be underwater. Motor Direct Current can see in figure 7.

Figure 7. Underwater Motor

3. Result and Discussion

3.1. System Analysis
In reviewing its components, in-depth identification and evaluation of problems, constraints, and needs are needed so that they can be incorporated into improvements to this system.

3.2. Problem Analysis
Waves that are common in water areas are a major problem. With so many waves, the frequency makes the buoy uneasy.

3.3. Discussion results
Tools in research still need the additional design so that the movement is more efficient. This design is mainly the bottom of this buoy. With the improvement of the basic design of the buoy, it is expected that the buoy can move well.
In this study, a buoy can survive at a distance of 12 meters from the specified coordinates.

4. Conclusions
In designing the buoy, it still needs some improvements in the design and control of the motor. In the float test, the average coordinates of the buoy are 12 meters from the coordinates set.

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Reference

[1] Chandra H, Sianturi D S A and Firdaus Y 2014 Uji Performansi Buoy Pluto Untuk Peringatan Dini Pencemaran Perairan *J. Kelaut. Nas.* **9** 151–60

[2] Purba N P, Harahap S A, Prihadi D J, Faizal I, Mulyani P G, Fitriadi C A, Pangestu I F, Atmoko P D, Alfath A and Sitio J T 2017 Pengembangan Instrumen Lagrangian Gps Drifter Combined (Gerned) Untuk Observasi Laut *J. Kelaut. Nas.* **12** 109–16

[3] Ranjith S, Shreyas K and Karthik R 2017 Automatic Border Alert System for Fishermen using GPS and GSM techniques *Indones. J. Electr. Eng. Comput. Sci.* **7** 84–9

[4] Joe H, Kim M, Wi S-M, Kwon H and Yu S-C 2014 Development of mooring-less robotic buoy system using wave powered renewable energy *2014 Oceans-St. John's* (IEEE) pp 1–6

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