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Solar Powered Sustainable Marrine Vessels

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Abstract: The design of a solar boat with a booster system is a pioneering concept for sustainable maritime transport. The design incorporates solar power to drive the boat's main propulsion system, supplemented by a booster function that boosts speed and performance, especially in situations where additional power is needed, for example, during adverse weather conditions or longer distances. The solar panels, mounted on the surface of the boat, collect sunlight and transform it into electrical power, stored in batteries to maintain flow continuously.

I. INTRODUCTION

The international shipping sector is under mounting pressure to minimize its environmental impact and costs of operation. The use of solar-powered boats, which utilize renewable energy from sunlight to power ships, is one such solution being touted. Solar boats usually have the limitation of speed and distance. To overcome this shortcoming, our project suggests the development and design of a solar boat with a booster system.

II. LITERATURE SURVEY

The increasing demand for environmentally friendly solutions in maritime transport has created more interest in solar-powered ships. These ships employ solar power as a clean and renewable energy source, decreasing dependence on fossil fuels and producing fewer adverse emissions. Solar-powered boats are usually fitted with photovoltaic (PV) panels that transform light energy into electrical power, which is stored in batteries and used to power electric motors as well as onboard systems. The construction of such boats usually employs lightweight and buoyant materials for the hull, improving energy efficiency and stability on water. New developments in battery storage, especially in lithium-ion technology, have also enhanced the energy capacity and operating range of such vessels. Moreover, most contemporary solar boats come equipped with microcontrollers, GPS modules, and sensors for automatic control systems to facilitate autonomous operation and optimal power management. Apart from supporting sustainability, such features are also beneficial practically in uses like waterway monitoring, transportation, and research within aquatic ecosystems. As the technology advances, solar-powered ships offer an exciting leap towards cleaner and more sustainable maritime methods.

III. SYSTEM REQUIREMENTS

- **Node MCU ESP32**

The ESP32 series utilizes either a variant Xtensa LX6 microprocessor in both dual-core and single-core configurations, an Xtensa LX7 dual-core microprocessor, a includes integrated antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules. a chip system that includes the following functionality: Wi-Fi (2.4 GHz band) Bluetooth. Dual high speed Xtensa 32-bit LX6 CPU cores. Ultra Low Power co-processor. It is usually placed either on device-specific PCBs or on a variety of development boards with GPIO pins and some connectors based on the model and manufacturer of the board.

Figure 3.1: Node MCU ESP32

- **ES CONTROLLER**

A sensor which is employed in detecting or measuring or monitoring the gases such as ammonia, benzene, sulphur, carbon dioxide, smoke, and other toxic gases are referred to as an air quality gas sensor. The MQ135 air quality sensor, which is one of the series of MQ gas sensors, finds extensive applications for detecting toxic gases and smoke in fresh air. This article provides a short overview of how one can measure and detect gases with the help of an MQ135 air quality sensor.

Figure 3.2: ES Controller

- **BLDC Motor**

BLDC motor (Brushless DC motor) is an electric motor type that consumes direct current (DC) electricity and has electronic commutation rather than brushes and a mechanical commutator, unlike conventional DC motors.

Figure 3.3: BLDC Motor

- **AC Servo Motor**

AC Servo Motor is an electric motor that is used to control position, speed, and acceleration accurately in automation systems. It is operated together with a servo drive (or servo controller), which provides the appropriate signals to the motor according to sensor feedback from devices such as encoders.

Figure 3.4: AC Servo Motor

- **SOLAR PANEL**

A solar cell is the primary element of a solar panel, converting the Sun's energy into electrical energy that can be used. The most prevalent type of solar panels is crystalline silicon-type solar cells. The solar cells are created by layers of elemental silicon and other elements like phosphorus and boron. The elements placed in the silicon layers create an n-type layer, which contains excess electrons, and a p-type layer, which contains a shortage of electrons. The two layers create a p-n junction. LiPo battery is a rechargeable battery commonly employed in RC devices, drones, airsoft guns, and electronic projects due to its high energy density, light weight, and high discharge rates

Figure 3.5: Solar Panel

- **LIPO BATTERY**

LiPo battery (short for Lithium Polymer battery) is a type of rechargeable battery widely used in RC (radio-controlled) devices, drones, airsoft guns, and electronics projects because of its high energy density, lightweight, and high discharge rates

Figure 3.6: LiPo Battery

- **BUCK CONVERTER**

A buck converter or step-down converter is a DC-to-DC converter which decreases voltage, while increasing current, from its input (supply) to its output (load). It is a class of switched-mode power supply. Switching converters (such as buck converters) provide much greater power efficiency as DC-to-DC converters than linear regulators, which are simpler circuits that dissipate power as heat, but do not step up output current. The efficiency of buck converters can be very high, often over 90%, making them useful for tasks such as converting a computer's main supply voltage, which is usually 12 V, down to lower voltages needed by USB, DRAM and the CPU, which are usually 5, 3.3 or 1.8 V.

Figure 3.7: Buck Controller

IV. ARCHITECTURE

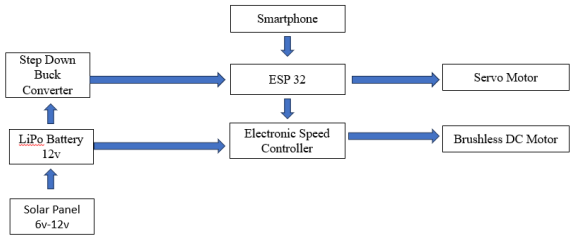

Figure 4.1 Indicates the structure of a Solar Powered Sustainable Marrine Vessels.

Figure 4.1 shows the architecture of a Solar Powered Sustainable Marrine Vessels Block diagram describes a system in which a smartphone wirelessly controls a Brushless DC Motor (BLDC) and a Servo Motor using an ESP32 microcontroller. Here's a step-by-step description of all the components and their connections, This system is a wireless motor control system that includes renewable energy (solar panel), a rechargeable power unit (LiPo battery), and an IoT-capable microcontroller (ESP32) to drive a servo and BLDC motor through a smartphone. It is often employed in robotics, drones, or remote-controlled cars. The circuit indicates a solar-powered motor control system using an ESP32 microcontroller. The battery is charged by a solar panel, and it drives the system using a DC-DC converter.

V. CIRCUIT DIAGRAM

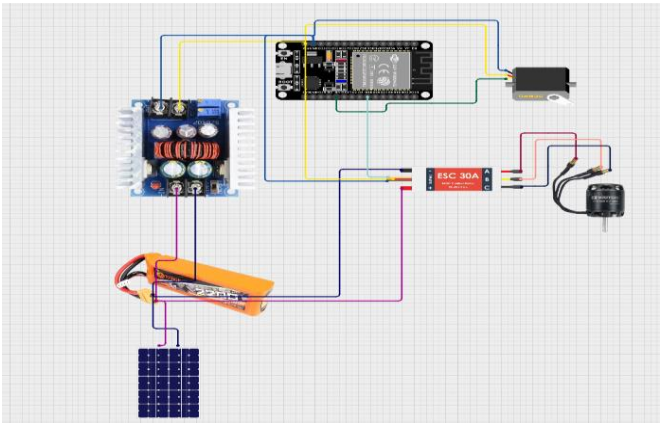

Figure 5.1: Circuit Diagram of Solar Powered Sustainable Marrine Vessels

The BLDC motor and servo motor are controlled by the ESP32 through an Electronic Speed Controller (ESC) and for accurate movements. The servo and BLDC motors can be utilized to make fingers and arm move in a prosthetic hand. The system offers a cost-effective, portable, and renewable energy-based control system for assistive devices. This is a creative design specific to autonomous aquatic operation. The boat has a yellow hull made from lightweight and buoyant material like foam or plastic, which keeps it afloat with stability.

VI. RESULT & DISCUSSION

Figure 6.1: Solar Powered Sustainable Marrine Vessels Model

This is an innovative design. Sitting atop the hull is a rectangular-shaped solar panel, which converts sunlight into electrical energy to drive the boat's systems. This use of solar technology not only encourages sustainability but also enables longer, off-grid capabilities. In the back of the boat, a white electronics case holds critical electronic components such as visible wiring and a tiny servo motor that suggest it probably has a key role in controlling power distribution and guiding movement or steering. While not evident in the photo, the propulsion is likely provided by a miniature motor-powered propeller or water-jet device, fueled by the captured solar power. As well, there is a traveling water wheel on the right side of the arrangement that seems to be part of a demonstration area—perhaps modeling river flow or creating water circulation to simulate the operating environment for the vessel. Together, these features highlight the model's practical approach to combining renewable energy with intelligent marine technology. This project highlights the integration of renewable energy with modern electronics to create a reliable, remotely controlled marine system, promoting greener technologies in aquatic transportation and research.

VII.CONCLUSION

This project demonstrates the marriage of renewable energy and cutting-edge electronics to design a stable, remote-controlled marine system with the encouragement of more environmentally friendly technologies in marine transport and research.

VIII. REFERENCE

- Karatug C & Durmusoglu Y. (2020). "Design of a solar photovoltaic system for a Ro-Ro ship and estimation of performance analysis: A case study". Solar Energy, 207, 1259-1268.
- [2] Lee, K. J, Shin, D. S, Lee, J. P, Yoo, D. W Choi, H. K, & Kim, H. J. (2012, October)."Hybrid photovoltaic/diesel green ship operating in standalone and grid connected mode in South Korea-Experimental investigation". In 2012 IEEE Vehicle Power and Propulsion Conference (pp. 580-583). IEEE.
- Al-Alawi, A, M Al-Alawi, S, & M Islam, S.(2007). "Predictive control of an integrated PV diesel water and power supply system using an artificial neural network". RenewableEnergy,32(8),1426–1439. https://doi.org/10.1016/j.renene.2006.05.003.