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Solar Based Floating Pond Cleaner

Ms. M.S. Aarthi [1], Ms. AB. Jaychandhirikha[2], Ms. S. Anshiya[3], Ms. S. Pooja[4], Ms. N. Sandhiya[5]

[1]Professor, Dept. of Electrical and Electronics Engineering, P.A. College of Engineering & Technology, Tamil Nadu, India,
[2,3,4,5]Student, Dept. of Electrical and Electronics Engineering, P.A. College of Engineering & Technology, Tamil Nadu, India

ABSTRACT

Pond water quality is often compromised due to the accumulation of dust, debris, and other pollutants, which can negatively impact aquatic life and overall ecosystem health. This project aims to develop an automated dust removal system that operates efficiently using IoT and renewable energy sources. The system is powered by a solar panel integrated with a buck-boost converter, ensuring stable and efficient power supply to the components. A Node MCU microcontroller serves as the central control unit, managing the operation of BO and gear motors, which drive a mechanical mechanism designed to remove dust and floating impurities from the pond surface. A motor driver regulates the motors' speed and performance, while a voltage sensor and charging circuit ensure optimal power management and battery storage. The integration of IoT technology enables real-time monitoring and automation, reducing the need for manual intervention and improving operational efficiency. By utilizing solar energy, this system provides a sustainable and cost-effective solution for maintaining pond cleanliness. The project aims to enhance water quality while minimizing environmental impact, making it an ideal solution for eco-friendly water conservation.

Keywords: quality, aquatic life, dust, eco-friendly, conservation

INTRODUCTION

The Pond Janitor is used in that places where there is waste debris in the water body which are to be removed. This Janitor consists of cleaner mechanism which collect & remove the wastage, garbage& from water bodies. This also reduce the difficulties which we face when collection of debris take place. A machine will lift the waste surface debris from the water bodies, this will ultimately result in reduction of water pollution and lastly the aquatic animal's death to these problems will be reduced. It consists of Belt drive mechanism which lifts the debris from the water. The use of this project will be made in rivers, ponds, lakes and other water Waste bodies for to clean the surface water debris from bodies. Similarly, they are water lots of problems of water pollution under river. Water is defined as the flow of used water from homes, business industries, commercial activities and institutions which are subjected to the treatment plants by a carefully designed and engineered network of pipes. The biggest impact of cleaning the chemical wastes can cause respiratory diseases and it plays a challenging issue for the municipality officers. Water damage is classified as three types of contaminated water. They are clean water, gray water and black water. Clean water is from a broken water supply line or leaking faucet. If not treated quickly, this water can turn into black water or gray water, depending on length of time, temperature, and contact with surrounding contaminants. The municipality workers are only responsible to ensure that the sewage is clean or not. Though they clean the ditches at the side of buildings, they can't clean in very wide sewages. The municipality workers need to get down into the sewage sludge to clean the wide sewage. Use a high-pressure cleaner to remove dirt and algae from the pond liner, rocks, and other surfaces.

PROBLEM STATEMENT

Solar energy is one of the most sustainable and widely used renewable energy sources. However, the efficiency of solar panels is significantly affected by the accumulation of dust, dirt, bird droppings, and other debris. Studies show that dust accumulation can reduce solar panel efficiency by 20-40%, depending on the environment. This issue is particularly severe in arid and dusty regions, where frequent cleaning is required to maintain optimal performance. Traditional cleaning methods involve manual cleaning, water-based washing, or mechanized cleaning systems, all of which have significant drawbacks. Manual cleaning is labor-intensive and inefficient for large solar farms. Water-based cleaning leads to excessive water wastage, which is not sustainable in regions facing water scarcity. Mechanized cleaning systems often require an external power supply, increasing operational costs and complexity. To address these challenges, this project aims to develop an automated, solar-powered dust removal system that keeps solar panels clean without external energy or water. The system will be designed to be self-sustaining, cost-effective, and efficient, ensuring maximum energy generation from solar panels .

LITERATURE SURVEY

S. V, Akshaya, A. S, S. S. Ponnaganti, V. G. Pillai and P. P. K, "Solar-Powered Trash Collecting Boat with Solar Power Prediction using Machine Learning and Human-Computer Interface," 2021.

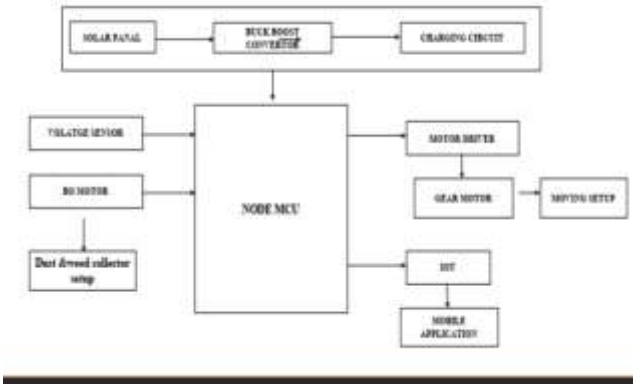
The power from the sun is contemplated to be one of the most apt renewable energy sources to replace fossil fuels in the marine field. Also, the growing pollution due to trash deposits in the water bodies of our neighbourhoods has increased for the past few years, endangering aquatic life and freshwater resources. This work aims to build a solar-powered boat with maximum efficiency, to inculcate a cleanup system to collect the trash on the water surface using a conveyor belt mechanism within the boat and to develop a user-friendly website for the consumer in order to provide them with the necessary energy details. travel between islands and for cleaning heavily polluted backwaters and adjacent ponds. The implementation of such boats can lead to reduced pollution across the water bodies.

R. Choudhary, R. Jadhav, H. Rokde, R. Kalaskar, B. Rokade and S. Rupnavar, "Machine Learning-Enabled Robotic Trash Collector," *2024* Water pollution poses a serious threat to aquatic life. To address this challenge, this research presents the design and construction of a that MLRTC can remove floating trash from river banks, lakes, or ponds. The "MLRTC" is specifically designed to collect waste such as plastics that predominantly float on water bodies. Some major challenges that we have faced while working on this robot are: first, the robot's reliance on solar power that is it may face difficulties in rainy or low light conditions. Over time, batteries may degrade and lose capacity, reducing the robot's lifespan and efficiency. Lakes can have unpredictable water conditions like waves or high currents which can affect the robot's stability. Also, there are obstacles like rocks and aquatic animals and therefore the robot needs to have reliable sensors to detect these obstacles in real-time. Even with automation, some human intervention is maintenance and empty debris collection units. The inclusion of the webcam and YOLOv3 algorithm enhances the robot's capability to detect and navigate around obstacles efficiently. The integration of these technologies underscores the effectiveness of AI -driven robotic systems in combating environmental pollution, thereby contributing to sustainable waste management practices.

Ranya M. M. Salem, M. Sabry Saraya, and Amar M. T. Ali-Eldin "An Industrial Cloud-Based IoT System for Real-Time Monitoring and Controlling of Wastewater",2021

Wastewater treatment is considered the most important process for reducing pollutants in wastewater to levels that nature can cope with. At many sewages treatment plants, industrial wastes cause more difficulties in the treatment process than any other single problem where the plant operators have to deal with. These plants may not be designed to handle these types of wastes and the accelerated deterioration of sewage treatment plant structures. In this paper, we propose a new industrial IoT cloud-based model for real-time wastewater monitoring and controlling. The proposed system monitors the power of hydrogen (pH) and temperature parameters from the wastewater inlet that will be treated in the wastewater treatment plant, thereby avoiding impermissible industrial wastewater that the plant cannot handle. The system collects and uploads real-time sensor readings to the cloud via an IoT Wi-Fi Module. Additionally, it reports observed or identified unexpected industrial wastewater inlets via SMS notifications and alarms and controls the valves of the gates. This is needed to change the path of the water to the industrial wastewater treatment plant that can treat this type of wastes. work shows the effectiveness of the proposed system compared to related work.

BLOCK DIAGRAM



. **Figure 1**: Block Diagram of solar based floating pond cleaner

The block diagram outlines a system powered by solar energy for dust and weed collection, controlled by a microcontroller and accessible via a mobile application. Solar Panel Captures solar energy and converts it into electricity. Buck Boost Converter regulates the voltage from the solar panel to a suitable level for charging and operation. Charging Circuit manages the charging of the battery, ensuring it's charged safely and efficiently. BO (Battery operated) Motor powers the dust and weed collector setup. Dust and Weed Collector Setup is the physical mechanism for collecting dust and Mobile Application allows users to monitor and control the system remotely. The Node MCU controls the BO motor for the collector and the motor driver/gear motor for movement, based on user input from the mobile app via IoT connectivity.

CIRCUIT DIAGRAM

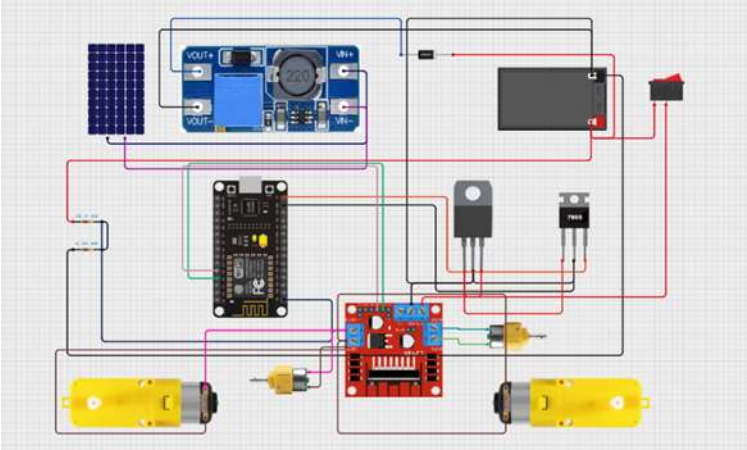
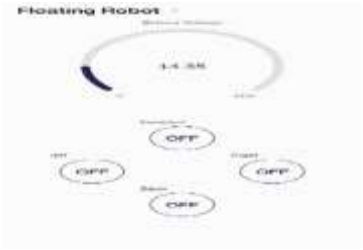


Figure 2: Circuit Diagram

The pond dust removal system is connected systematically to ensure smooth operation. The solar panel is wired to a charge controller, which regulates the voltage and prevents overcharging of the 12V battery. A voltage regulator is used to step down the voltage to 5V for low-power components. The microcontroller receives power from the 5V regulated output and is connected to multiple input sensors that monitor water quality and system status. When the microcontroller detects high turbidity or floating debris, it activates the corresponding relay to power the pump or motorized cleaning system.

CONTROLLED BY BLINK APPLICATION



The Blynk app is used as a remote control interface for a pond-cleaning kit designed to remove dust and debris from the water surface. The kit is equipped with DC motors or servo motors, which enable it to move forward and backward within the pond to ensure effective cleaning. The Blynk app, installed on a smartphone, serves as the user interface, allowing real-time control over the system via Wi-Fi or Bluetooth connectivity. This setup makes it easy to remotely control the pond-cleaning kit without requiring manual intervention. The system is powered by a rechargeable battery, ensuring mobility and efficiency in cleaning operations.

CONCLUSION

The solar-powered floating pond cleaner presents an innovative and sustainable solution for efficient water management. By harnessing solar energy, the system eliminates the need for external power sources, ensuring continuous operation with minimal environmental impact. The integration of ESP32 and motorized navigation enhances the efficiency of data collection and analysis, allowing for real-time monitoring and long-term storage of crucial water parameters. This approach not only helps in maintaining optimal pond but also aids in the conservation of resources by reducing the wastage of water and excessive use of chemicals. Furthermore, the automation of data collection and transmission reduces manual labor and human error, making the system a cost-effective alternative to conventional monitoring techniques. The floating design ensures adaptability to various water bodies, making it a versatile solution for different agricultural and industrial applications. Overall, the proposed system contributes to improved agricultural productivity, better water resource management, and sustainability in irrigation practices.

REFERENCE

- S. V, Akshaya, A. S, S. S. Ponnaganti, V. G. Pillai and P. P. K, "Solar-Powered Trash Collecting Boat with Solar Power Prediction using Machine Learning and Human-Computer Interface," 2021
- R. Choudhary, R. Jadhav, H. Rokde, R. Kalaskar, B. Rokade and S. Rupnavar, "Machine Learning-Enabled Robotic Trash Collector," *2024*
- Olasupo O. Ajayi, Antoine B. Bagula, Hloniphani C. Maluleke, Zaheed Gaffoor, Nebo Jovanovic, and Kevin C. Pietersen “A Network for Monitoring and Assessing Water Quality for Drinking and Irrigation Purposes”,2022

- Nibi Kulangara Velayudhan, Preeja Pradeep, Sethuraman N. Rao, Aryadevi Remanidevi Devidas, and Maneesha Vinodini Ramesh **"**Hybrid Control Architecture of an Unmanned Surface Vehicle Used for Water Quality Monitoring",2022
- Ranya M. M. Salem, M. Sabry Saraya, and Amar M. T. Ali-Eldin **"**An Industrial Cloud-Based IoT System for Real-Time Monitoring and Controlling of Wastewater",2021
- D. Ray *et al*., "Solar Powered Portable Water Purifier for Use in Under- Resourced, Emergency and Mobile Situations," 2024 4th Interdisciplinary Conference on Electrics and Computer (INTCEC), Chicago, IL, USA, 2024.
- Odeh, Y.G. Yohanis, B. Norton, Influence of pumping head, insolation and PV array size on PV water pumping system performance, Sol. Energy 80 (1) (2016).
- T.D. Short, P. Thompson, Breaking the mould: solar water pumping-the challenges and the reality, Sol. Energy 75 (1) (2023).