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ENHANCING VILLAGE POND CLEANER EFFICIENCY WITH RASPBERRY PI TECHNOLOGY

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ABSTRACT

Rapid advancements in technology are reshaping human life in numerous ways, yet it is essential to harness these developments for the betterment of the environment. One of the critical issues faced by wetlands and aquatic ecosystems is water contamination. This pollution not only harms marine life but also threatens its survival, as waste debris accumulates in water bodies. Additionally, some marine species unknowingly ingest surface debris, leading to their death. In response to this issue, this research project proposes an innovative solution in the form of a village pond cleaner model designed to reduce water contamination. The village pond cleaner is an automated device that collects waste from the surface of the water and safely disposes of it. It utilizes Bluetooth technology to remove pollutants such as trash, plastic, and drainage debris from the water's surface. The cleaning mechanism of the machine is engineered to gather and eliminate contaminants, significantly reducing the need for manual cleaning efforts. By removing surface waste from water bodies, this system helps reduce water contamination and mitigates the adverse effects on marine life. The device uses a belt drive mechanism to extract debris, offering an efficient and environmentally friendly solution to water pollution. The primary objective of this project is to clean surface debris from lakes, ponds, and other water bodies.

Key Words: Arduino UNO, Bluetooth module, DC motor, Motor driver, Water contamination, Marine life protection.

I. INTRODUCTION

Water is the primary source of life on Earth, with about 70% of the planet's surface covered by water. However, despite the abundance of water, nearly 97% of it is saline and unfit for human consumption, primarily found in oceans. The remaining 3% is freshwater, stored in lakes, rivers, glaciers, and aquifers. Rivers play an essential role in supporting agriculture through irrigation and preserving the local ecosystem. Unfortunately, these water bodies are increasingly polluted due to both natural and human activities. Polluted water can be categorized into three types: grey water, black water, and clear water. Grey water is slightly contaminated, whereas black water contains sewage, posing significant health risks. This pollution often occurs due to a combination of natural and man-made factors. The proposed project focuses on cleaning polluted water by using a

robotic arm, conveyor belt system, and cutting blades to effectively remove contaminants and reduce water pollution. The system will provide an automatic and efficient solution to clean waste and debris from water surfaces, improving the quality of water bodies and reducing marine life mortality.

II. LITERATURE REVIEW

- M. Mohammed Idris : In the proposed system, a remote-controlled machine is used to clean sewage by using a wiper motor and power window motors connected to wheels. The machine's arm collects sewage waste, which is then lifted and placed into a bin. The system works even in sewage-contaminated water, efficiently collecting waste debris floating on the surface.
- Mr. Abhijeet M. Ballade : This proposed system focuses on addressing water pollution caused by waste debris, which endangers aquatic life. The "River Cleanup Machine" is designed to remove waste, plastics, and garbage from water surfaces. Powered by hydropower, the machine extracts debris from the water, making it safer for aquatic animals and reducing pollution levels.
- Mr. P. M. Sirsat : This paper discusses the design and fabrication of a river waste cleaning machine, which is remotely operated to clean river surfaces. The system utilizes DC motors, RF transmitters and receivers, and a conveyor system to efficiently remove waste, garbage, and plastics from water bodies. The system is eco-friendly and operates without harming the environment.
- Mr. Pankaj Singh Sirohi : This design focuses on a river cleaning machine that uses a turbine-driven alternator to generate electricity. The alternator powers vertical and horizontal conveyor belts through timing chains and sprockets. The system's conveyor belts collect debris, plastics, and other waste from rivers, helping to keep water bodies clean.
- Mr. Prof. N.G. Jogi et al : This paper highlights the severe pollution in the Ganges River in India, which receives millions of liters of sewage and toxins. The proposed solution is a pedal-operated boat with an attached conveyor system that collects waste such as plastic bags, bottles, and marine debris. This eco-friendly solution does not rely on fuel and is designed to clean rivers and lakes effectively.

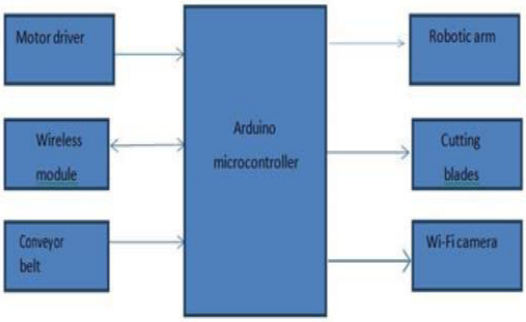

Fig1: BLOCK DIAGRAM

III.WORKING PRINCIPLE

The conveyor system in this project is designed to efficiently remove floating waste from the surface of the water. This is achieved by controlling the rover across the water's surface, positioning the conveyor belt to face the waste. The belt-driven conveyor system collects debris as it moves through the water. To address mature vegetation, cutting blades play a crucial role in removing plants from the water's surface. The rotating force generated by the cutting blade motor provides sufficient torque to lift shrubs and plants from the water. Additionally, the robotic arm is integrated to clear any obstacles or vegetation that may obstruct the rover's path, or it can serve as a collection tool for gathering trash.

The system also includes sensors placed in the pond to monitor pollutant levels, water quality, and accumulated waste. These sensors relay data to the Arduino microcontroller, which processes the information and activates the appropriate cleaning mechanism. When pollutant levels reach a threshold, the system triggers the robotic arms to effectively remove the waste. Bluetooth technology enables remote monitoring and control, allowing users to interact with the cleaning system through a mobile app. The app provides real-time updates on the pond's condition, and users can control the cleaning processes and adjust settings from a distance.

To optimize the cleaning operations, the system integrates optimization algorithms that consider factors such as pond size, pollutant levels, and water flow patterns. These algorithms ensure that the cleaning process is both effective and tailored to the specific needs of the pond. By implementing this system, several benefits can be realized:

- **Improved Cleaning Efficiency**: Automation and optimization lead to a more efficient and thorough cleaning process.
- **Time and Labor Savings**: The system reduces the need for manual labor, saving time and effort, while enabling more frequent and effective cleaning cycles.
- **Enhanced Water Quality**: The complete removal of contaminants and debris improves the overall water quality, benefiting aquatic life and the surrounding community.
- **Remote Monitoring & Control**: Bluetooth functionality allows users to monitor and control the system remotely, offering convenience and the ability to take timely action when needed.
- **Data-Driven Decision Making**: The sensor data collected from the pond provides valuable insights, allowing users to optimize maintenance schedules, improve pond management, and make informed decisions about the cleaning process.

Turn ON the power supply. After that all the components gets activated. In the next step Bluetooth module is opened and device gets connected with the Bluetooth. By opening this service UUID came on the screen. Once the byte stream mode is selected, it shows the keypad on the screen to give command. And we type forward to move the device forward. After checking the forward direction we moved on to check the backward direction. Then give the command as backward then robot will move backward. If we want to stop the device by moving, we can type ‘s’. By using this command we can stop the device. After stopping the device we it start again to collect the garbage at the right side. For that ‘R’ is given as a command. To collect the garbage at the left side we have to give the command to the device as ‘L’. Then the robot will move left and collects the garbage. The garbage is collected when we give command as ‘CA’ to the device. Than the cleaner will collect the garbage in anticlockwise direction.

IV.CONCLUSION

The proposed automated village pond cleaner system offers an innovative and efficient solution for cleaning water bodies, particularly ponds. By integrating advanced technologies like Arduino, Bluetooth control, and optimization algorithms, the system ensures enhanced cleaning efficiency, improved water quality, and convenience in monitoring and control. The automated

process reduces manual labor, saves time, and ensures more effective removal of pollutants and debris. The system's data-driven approach helps optimize maintenance cycles and pond management, making it a sustainable and effective solution for managing water contamination in rural areas. The use of mobile applications for remote monitoring adds another layer of accessibility, ensuring users can manage the system effectively even from a distance.

V.FUTURE SCOPE

The future scope of this project can expand in several areas to improve efficiency and adaptability. For instance, the inclusion of solar power could make the system more sustainable by reducing reliance on external power sources. Enhancing the optimization algorithms with machine learning could lead to more adaptive cleaning methods based on real-time data, further improving the system's responsiveness. Additionally, expanding the system to handle larger water bodies, like lakes or rivers, could help address water contamination on a larger scale. Integration with more advanced sensor technologies, such as those capable of detecting specific types of pollutants (e.g., oil or heavy metals), would improve the accuracy of the cleaning process. Furthermore, the system could be adapted for urban water bodies or used in larger-scale environmental projects.

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