



Robotic Pool Cleaner Boat

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ABSTRACT

The use of plastic, thermocol, and metals is generating water blockage, which is problematic and encouraging bowel illnesses and typhoid sickness. Manually cleaning the wastes would not be sufficient because it frequently entails a large amount of work and effort and there is a chance that the irresistible germs present in the sewage could cause various illnesses. A workable and effective waste collecting system design for clearing debris from rivers, channels, and lakes is included in this study. The trash collection system is specifically made to function with applications that take up different kinds of materials, such as abandoned propeller, trash bags, and gliding litter. The integrated system makes use of IoT technology, which can monitor and manage the entire process. The necessity to remove pollutants from the rivers' territory and to work in areas other than the seaward zone prompted the development of the watercraft, which offers a wider range of possibilities for removing garbage and rubbish from the aquatic environment.

Keywords: Introduction to the Project, Working, Block Diagram, Circuit Diagram, Flowchart of Code, Conclusion

1. Introduction

India's burgeoning population poses a significant challenge to environmental cleanliness, particularly in regions where villages and cities are situated near lakes or rivers. Unfortunately, these water bodies often remain underutilized due to human-induced pollution, particularly from plastic, thermocol, and metal waste. This pollution not only harms aquatic life but also contributes to the spread of diseases like typhoid and intestinal illnesses. Traditional method for collecting water surface floating waste is manual basis, by means of boat trash skimmer. These methods are costly, risky and time consuming. To eliminate the drawbacks of these mentioned methods the remote-controlled water cleaning machine was designed which helps in cleaning the water surface efficiently and eco-friendly. The objective of this project is to, instead of hiring someone to clean your pool or using a more labor-intensive machine, a pool cleaner is the best option for the budget conscious pool owner. It is a one-time investment meaning it will be beneficial in the long run period of time. This means that it lets you save on energy, right after finishing. It also requires minimal maintenance. Most automated cleaners in the market have a built-in function that automatically turns off after its job. It is to give emphasis on decreasing the consumption of time and manpower. Most importantly to have clean water bodies. To provide with the resource so that the pollutants can be removed from the water bodies. To provide performance which is fast and very reliable during the river cleaning operation. The most objective of this project is to develop a system to clean the thrash from surface of water bodies using Arduino Uno to ease the method for cleaning and also result in saving of time and work requirement. Status of the robot is controlled by Bluetooth from a certain distance. Thus, it also reduces pollution due to garbage in water bodies. The pool surface cleaner using robotic machines can be designed by making use of Arduino. Which can connect with Bluetooth. Here we are focusing on less power consumption and more performance devices. So, we are using Arduino Uno which is more suitable with our requirement.

2. Literature Survey

This project aims to clean trash from the surface of water in a swimming pool using an Arduino Uno. Trash such as plastic, thermocol, and dead leaves that fall from trees will be collected and stored in the boat's trash storage compartment. Our project focuses on automating the process of cleaning the surface of a swimming pool by utilizing an Arduino-controlled boat. In swimming pool areas, dead leaves often fall onto the water, along with plastic and thermocol debris. Our boat is designed to collect these types of trash efficiently. Instead of cleaning the swimming pool manually, this boat can be controlled remotely via a smartphone. The boat is equipped with a rolling roller at the front, which collects the trash and deposits it into the onboard trash storage compartment. As the roller rotates, it pulls the trash towards the storage compartment. Once the roller completes its rotation, the collected trash is deposited into the storage compartment. The roller is made of plastic and features a grippy surface to prevent trash from slipping off and returning to the water. To control the boat, we have employed an Arduino microcontroller and a motor driver. This setup allows us to program and control the boat's movements through a dedicated app on a smartphone. The primary advantages of this project are its energy efficiency, user-friendliness, and the ability to clean the swimming pool more effectively and quickly than manual methods. Furthermore, the system can be upgraded with additional features such as solar charging and sensors for enhanced functionality. By automating the cleaning process, our project offers a convenient and efficient solution for maintaining the cleanliness of swimming pools.

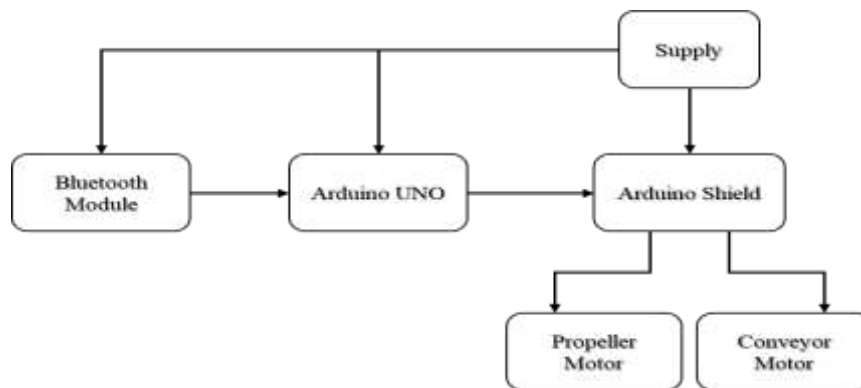


Fig 2.1 Block Diagram

3. Hardware aspects and working

1. **Bluetooth Module (HC-05):** These are small electronic modules that enable wireless communication between devices over short distances using Bluetooth technology. In the context of the described system, the Bluetooth module is connected to the Arduino, allowing the robot to communicate wirelessly with external devices such as smartphones or tablets for remote control or data monitoring.

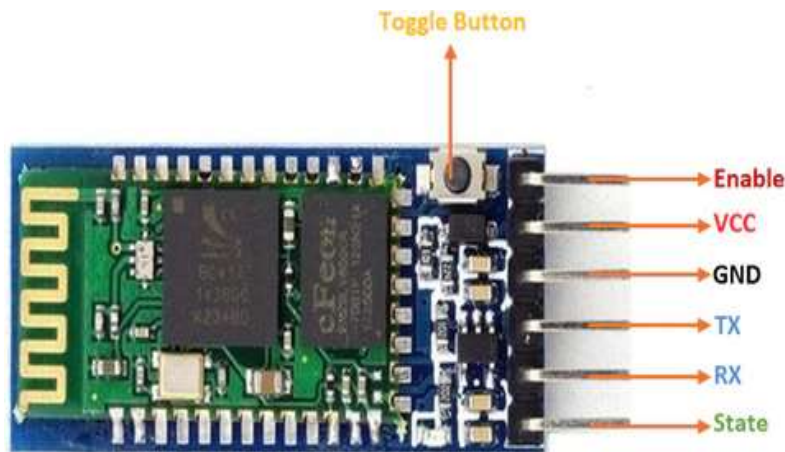


Fig 3.1 Bluetooth Module (HC-05)

2. **Arduino:** The Arduino serves as the central control unit of the robot. It is a microcontroller platform that processes sensor data, executes programmed instructions, and manages the overall operation of the robot. With the help of the Bluetooth module, the Arduino can receive commands or send data wirelessly, making it a versatile control system for the robot.

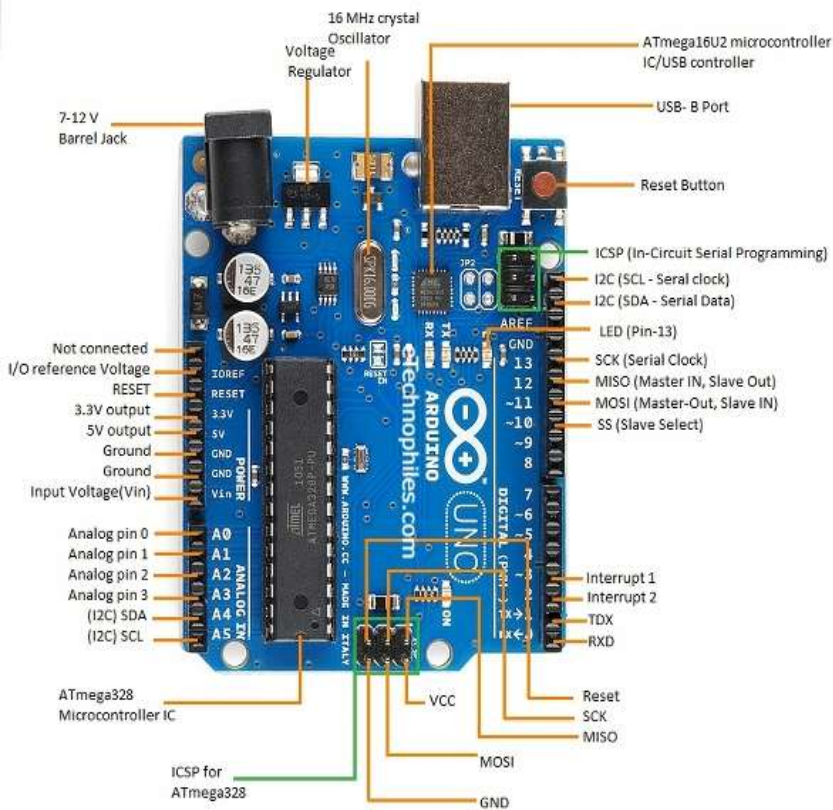


Fig 3.2 Arduino Uno

3. **Motor Driver:** This electronic component is used to control the speed and direction of the motors. It interprets signals from the Arduino and adjusts the power supplied to the motors accordingly, allowing precise control over the robot's movement. Motor drivers are essential for driving motors efficiently and protecting them from damage due to over current or voltage spikes.

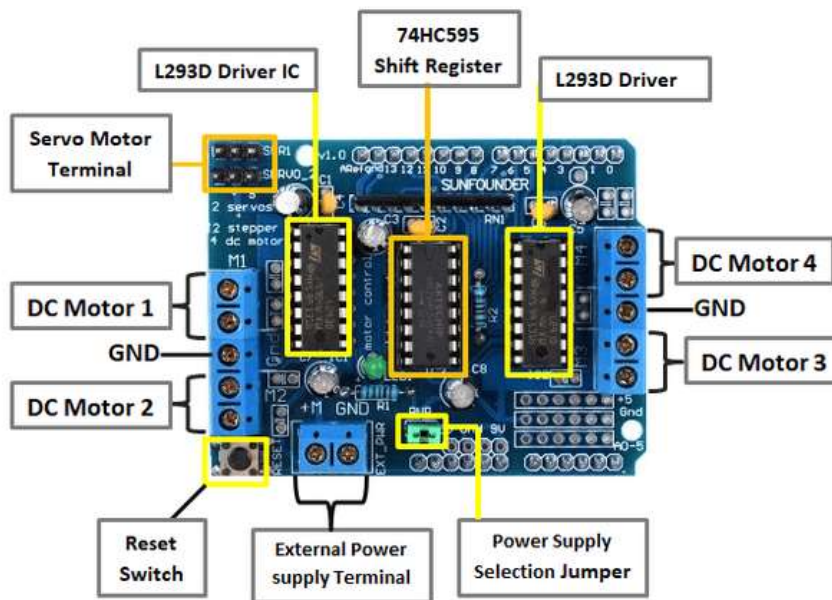


Fig 3.3 Arduino Motor Shield

4. **Dual Shaft BO-Motor:** These components provide propulsion for the robot, allowing it to move around the pool. The motors convert electrical energy from the battery into rotational motion, which is then transferred to propellers or other propulsion mechanisms to generate thrust. Depending on the design of the robot, different types of motors and propellers may be used to achieve the desired performance and maneuverability in water.



Fig 3.4 Dual Shaft BO-Motor

5. **Gear Motor:** A conveyor motor uses Gear Motor. A gear motor is a motor designed with an integrated gearbox. Gear motors function as torque multipliers and speed reducers thus requiring less power to move a given load. The gear motor is used to operate a conveyor belt mechanism designed to remove debris from the pool surfaces. The Arduino can send commands to the motor driver to control the speed and of the conveyor belt, facilitating efficient cleaning of the pool.



Fig 3.5 Gear Motor

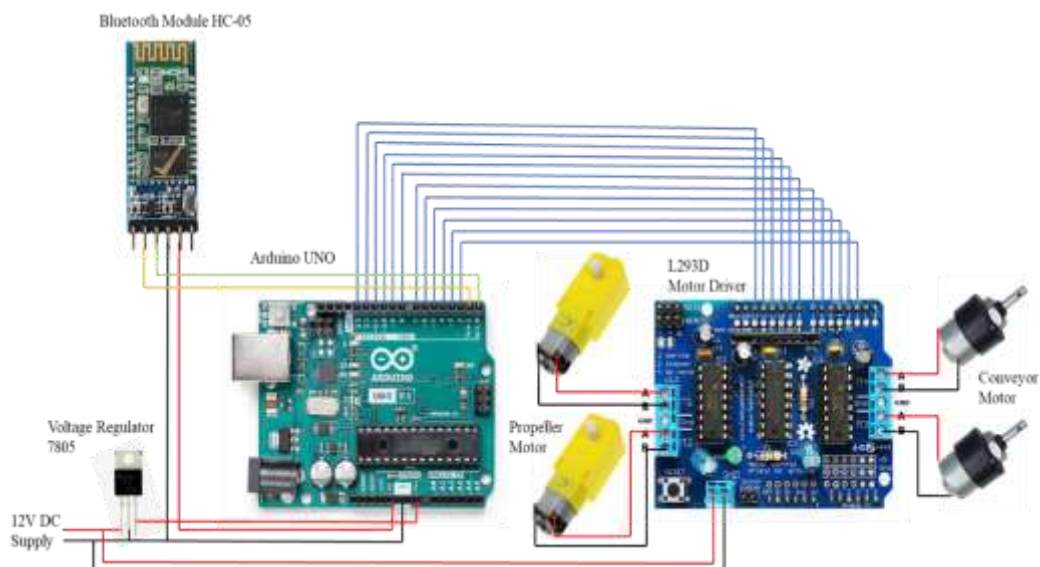


Fig 3.6 Interfacing diagram

The Arduino microcontroller processes commands from the Bluetooth module and adjusts the speed and direction of the motors and propellers accordingly. It can vary motor speeds to control forward, backward, left, and right movements of the boat through the water. By adjusting the power supplied to the motors, the Arduino can navigate the boat smoothly and precisely in different directions. The Arduino also controls the activation of the

cleaning mechanism, which consists of a conveyor belt driven by a stepper motor. When initiated through the mobile app or software interface, the Arduino sends signals to the stepper motor to start the conveyor belt's motion. As the boat moves along the pool surface, the cleaning mechanism collects debris, dirt, and algae, improving the cleanliness of the pool. A Bluetooth module integrated with the Arduino enables wireless communication with a paired device, such as a smartphone or computer. This allows users to remotely control the boat's movement, initiate or stop the cleaning process, and monitor its status through a dedicated mobile app or computer software. The mobile app or computer software provides a user-friendly interface for interacting with the boat. Users can easily control the boat's movement, start or stop the cleaning process, and receive real-time status updates and alerts. The interface may include intuitive controls, visual feedback, and notifications to enhance the user experience and facilitate efficient operation of the robotic boat for pool cleaning purposes.



Fig 3.7 Actual model

- **APPLICATION**

1. Used to collect trash like leaves, plastic etc. From swimming pools.
2. If the size of the boat increases, then it can be used for cleaning the rivers and drains.
3. We can use it for small lakes and rivers.

- **ADVANTAGES**

1. It is time saving.
2. It reduces the manpower.
3. It is energy efficient.
4. It can be used very easily.
5. User interface is easy.

- **DISADVANTAGES**

1. It cannot be used for long scale application like river cleaning, sea cleaning etc.
2. The trash which is collected in the boat so we have to remove it manually so it is time consuming.
3. It is connected through Bluetooth so it has only 10 Meters range.

- **FUTURE SCOPE**

In the future we can expand the project by adding multiple functions to it. Multiple functions like Autonomous Navigation, Water Filtration & purification, Increase in Durability, Compatible to Environment. The main upgrade that can be done is, to make it compatible for large scale application like for sea, large rivers, large lake. We can also upgrade the trash handling capacity of the boat. We can increase the size of the boat by which we can collect more trash as well as add more functions, like GSM with camera so we can navigate it properly. This project will help to clean all the sea trash, due to which the labor work, manpower will reduce. Due to which the aquatic life of animals will be in safe. So, to maintain a good balance between the aquatic life, this automatic water cleaning machine will help.

4. Conclusion

Cleaning of water bodies is always been a huge problem. This machine is easy in operations and its manufacturing cost is also low. Hence this water cleaning machine is very useful. Water cleaning machine is designed to make system very much economical and helpful to remove water impurities like plastic, trashes and other day to day waste which is floating on the surface of water bodies.

If we upgrade it more, so we can use it for large scale application like big rivers, lakes & sea also. So, the damage which is harming the aquatic life due to trashes in the sea, lake and river it will be reduced by this cleaner boat.

In conclusion, this study presented the design of an autonomous swimming pool robot. All project objectives met successfully and with minimal error. The first step involves studying literature and other people's research, followed by the second stage, which involves analyzing data obtained from the literature review. The third stage begins with the design planning of the robot, and the last step is the simulation of the robot's movement. The fourth step is finding and purchase all the instruments and equipment required to build the robot, followed by programming the robot. The fifth step is to build and test the robot.

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