

An Autonomous Robot to Sustain the Pond or Lake Clean and Pollutant Free

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Abstract

Nowadays everyone is alert to save Rivers and water but no one cares about surrounded water sources like a pond or lake. Everyone should not forget that kind of water sources also have their ecosystem. We just use those water sources as a garbage dump place or something else that poisons the water. We develop a robot which will be less costly than the others and it can be simply controlled by any common people and can automatically sort dirt, non-biodegradable elements and all other materials from water to clean the water source. Our robot is for those water sources where we cannot do such tasks to save those water sources. This robot can clean those water sources with maximum efficiency. This device 'Automatic Fire Fighting Robot' has been designed with one HC-05 Bluetooth module, one Arduino UNO, two water pumps, one servo motor MG-995 and one motor driver module L293-D. This robot has an airtight structure that protects electronics from outside water. In addition we can attach one basket on the top of the robot to collect more garbage. The robot is so well designed that it has perfect balance and buoyancy.

Keywords: Arduino UNO, Bluetooth Module, Servo motor, Water pump, Motor driver module, Buoyancy.

I. INTRODUCTION

Waste is an environmental issue that persists year after year and cannot be completely resolved. We frequently discovered waste dumped into rivers, streams, or reservoirs from various locations. The garbage can restrict the flow of water, causing it to become unclean and stinky, causing it to overflow and cause calamities such as flooding. Cleaning waste from water regions necessitates substantial resources, such as cleaning crews and excavators. This research intends to provide an alternate solution to the waste problem in water areas by developing robotics technology that can operate in water areas. The suggested applied research is expected to provide an alternate solution to catastrophe prevention, particularly flood prevention. Robotics technology evolved in the form of an eco-robot, whose primary function was rubbish collection. The robot is supposed to be operated manually via remote control. This study's development process is referred to as ADDIE. This approach includes analyzing the robotic cleaning system, planning the robot, constructing the robot, deploying the robot to clean waste in limited water regions, and evaluating the robot's performance in cleaning up garbage for a larger area. Our robot is designed ^[1] by interfacing the Arduino module with the Bluetooth module and water driver module. The Bluetooth module makes the robot remote controllable ^[2]. The water driver module is connected to the servo motor and the two mini water pumps which help the smooth movement of the robot in water and also the movement of the arm connected with the servo motor. The mini water pumps help the robot to move in left, right and forward directions. The architecture of the robot is so designed that it can efficiently float on the water's surface. The electronic section is made waterproof by a plastic casing to avoid the failure of the robot. The uniqueness of our project is its cost-effectiveness and easy control by the Bluetooth RC car driver android application. The battery backup is sufficient to operate the robot for at least 2 hours. This design provides simple and effective waste removal and accommodates large amounts of trash within a small space.

II. PROPOSED PROTOTYPE AND SCHEMATIC APPROACH TOWARDS SYSTEM MODIFICATION

The design of our proposed system is cost effective and working method is very simple ^[6]. At first when we switch on the power supply, the Arduino will check for Bluetooth device connectivity. After successfully connecting the Bluetooth device with the android application RC car the device is ready to use. When we click on the forward button our device sends a signal to the Bluetooth module. Then this signal is collected by the Arduino and later processed. By fetching our

code Arduino will understand ^[3] what to do next. So, as per the code Arduino set one of the digital pin HIGH and this caused to start the motor driver module and open two channels. Through motor driver channels power will go into pumps. The Left and right movements is following the above principle, but the difference is for the right movement we open only the left pump and at that time left pump will be inactive. Same and opposite is for left movement. Finally pulling garbage is the servo motor's job. When we click the button in the app the mobile sends a signal to the Bluetooth module and it will go to Arduino. Then as per the code, the servo will rotate and equally the hand ^[5] attached to the servo will also pull up collecting the garbage.

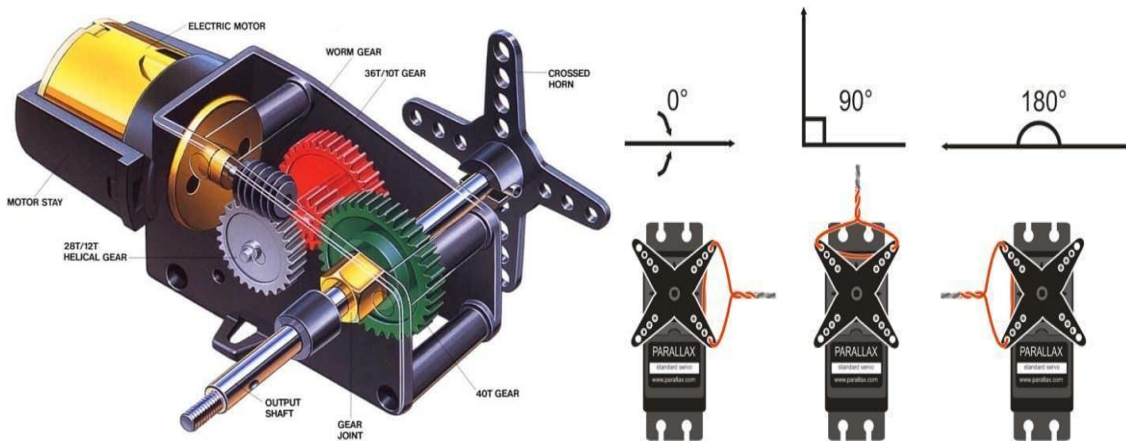


Fig 1: Servo Motor working principle diagram

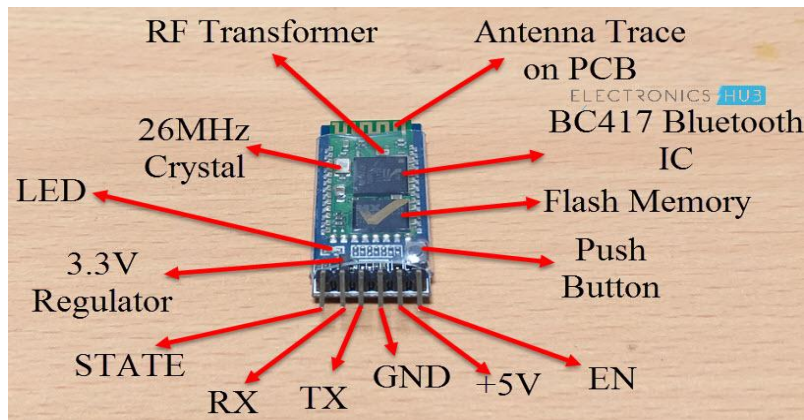


Fig 2: HC-05 Bluetooth Module

At first, we connect the Bluetooth module with Arduino. We connect the Bluetooth module's ^[4] transmitter pin(Tx) with the Arduino's Receiver pin(Rx) 0. After that, we will connect the Bluetooth module's receiver pin(Rx) with Arduino's Transmitter pin(Tx) 1. These all are digital pins. We are connecting the receiver with the transmitter because when the Bluetooth module wants to send some data to Arduino, Arduino should be able to receive the data. So that if we don't connect with the receiver pin, the Arduino will not be able to receive any kind of digital signal. As this follows, the receiver pins are also connected to transmitter pins. Then comes the motor driver module. The motor driver module has 4 digital pins. These 4 digital pins are basically connected with the H bridge of L298 H bridge^[8] IC. When we apply the 5v power supply to one of the digital pin, one channel will be HIGH and the current will be flow through that channel. There are 4 pins named In1 In2 In3 and In4. Apart from that 2 channels are there CH1 and CH2. When we apply 5v into In1, Channel 1 is high and the current will flow clockwise direction. When In2 is HIGH, current flow through Channel 2 in the anticlockwise direction. Same for In3 and In4 for Channel 2. So our pumps are attached to those channels. As per the code for a certain value, Arduino set one or more digital pins at a HIGH state. Those pins are connected with the motor driver module's digital pins.

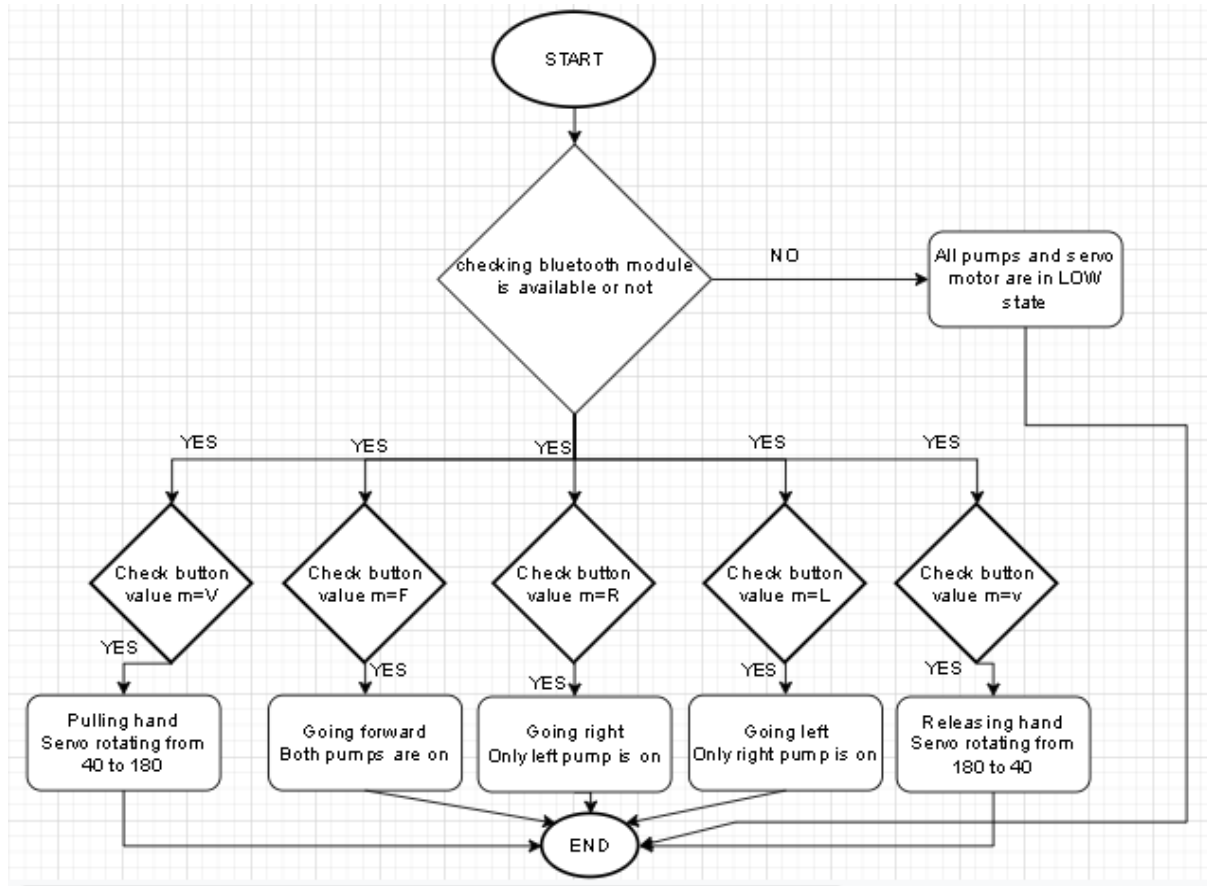


Fig 3: Flow chart

So now when we click the Forward button the signal goes to Arduino through the Bluetooth module and then Arduino takes the decision and set pin no. 9 HIGH. Pin no. 9 is connected with channel 1. So as per the above discussion, Channel 1 should be high so that the pump will be also on. The same is also done with pin no.11. So for moving forward both pins are HIGH and for moving right digital pin 9 will be HIGH and for left digital pin 11 will be HIGH. So according to that for forwarding movement both pumps^[7] are on and for right movement left pump will be on. For the left movement, the right pump will be on. The pumps are taking water and spray it in force and that's how this robot moves.

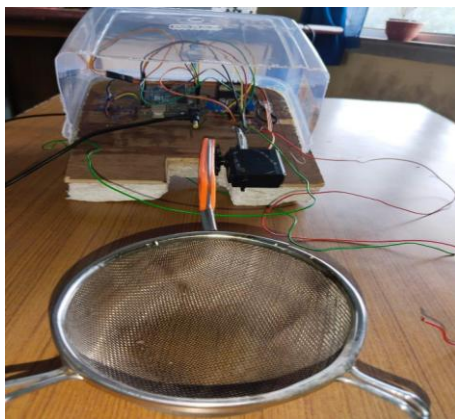


Fig 4: Installed Prototype Upper-front View

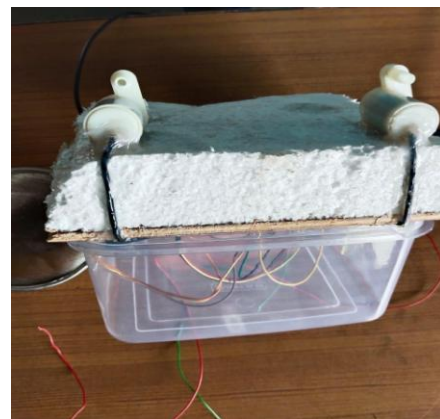


Fig 5: Installed Prototype Lower-back View

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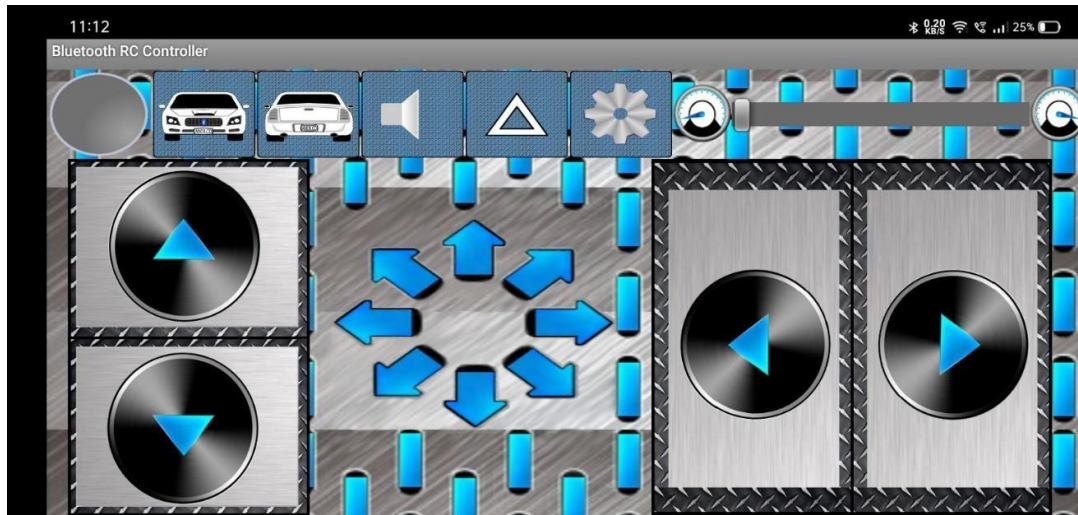


Fig 7: Interface of the Android Application

At first we need to download Bluetooth RC car android application in our device. This application is generally made for controlling Bluetooth controlled Arduino robots. We can see that there are 9 switches in the application, but we have used only 5 buttons [(Forward ^), (Right >), (Left <), (Arm upwards) Horn on, (Arm Downwards) Horn off] to control our robot. These switches are assigned specific values in the backend part of this android application.

III. RESULT :

| Bluetooth Module Value received (m) | Servo Position | Motor | Left DC Pump | Right DC Pump | Hand Position |
|-------------------------------------|------------------|-------|--------------|---------------|---------------|
| F | NULL | ON | ON | ON | NULL |
| R | NULL | ON | ON | OFF | NULL |
| L | NULL | OFF | OFF | ON | NULL |
| V | From 40° to 180° | NULL | NULL | NULL | Upward |
| v | From 180° to 40° | NULL | NULL | NULL | Downward |

In this system if we use the forward switch then the two water pumps are active, so the prototype of our project moves forward and the hand will be inactive. If we use the right switch then the left pump will be on and the right pump will not work, in this situation the prototype of the project will move towards right. If we use the left switch then the right pump will be on and the left pump will not work, in this situation the prototype of the project will move towards left. When we use upward switch then the servo motor will turn from 40 to 180 degree angle. So the hand position will be upward at that situation. When we use the downward switch then the servo motor will turn from 180 to 40 degree angle. So the hand position will be downward at that situation.

IV. CONCLUSION

The device will help to clean any water places. Cleaning any kind of medium water places those are very harmful and dangerous occupation. So, we reduce the Complexity of the cleaning procedure by developing this robot.

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