

## Development of a medical waste management and cleaning device for hospital use

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### ABSTRACT

This project emphasizes on design and fabrication of the water body cleaning machine. As we know that water bodies are too polluted, similarly sometimes the aquatic animal tends to eat surface waste debris considering it as food which ultimately causes the death of animals and it also causes skin infections & respiratory diseases to human. The water body cleaning machine is used to places where is waste debris in the body which is to be removed. First the area of garbage or debris is approached and cleaned over by an operator, controlling the machine. Due to its design, it is cost effective and very useful for the society. It also reduces the difficulties which we are facing to keep our water body clean. India is the land of rivers but these days it is being polluted more and more. The water pollution is major problem in water bodies; due to increase in water pollution in the form waste debris, it is hampering the life of human, animal & marine. By Looking the current situation of our country's river we have designed the water body cleaning machine.

**Key words:** Rx-Transmitter, Tx-Receiver, food chain

### INTRODUCTION

The Over two thirds of Earth's surface is covered by water; less than a third is taken up by land. As Earth's population remains to rise, persons are putting ever-increasing pressure on the planet's water resources. In logic, our oceans, rivers, and other inland waters have being "squeezed" by our actions so that its quality is reduced. Minister of Environment, B. Kambuaya, and exposed waste production of 33 cities across India by the Central Bureau of Statistics records in 2007 extended 132,192 cubic meters per day. Not all of the discarded disposed and transported in landfill, for instance a lot of trash that have not been pick up appropriately such as burned and discarded in the river. This phenomenon causes environment problems. Rivers turn into domestic landfill. India's 80 percent of river has been polluted by domestic waste. River ecosystem gets under pressure of high pollution load than other rivers in the Ganga and Godavari River. This river is

located in Allahabad & Nasik which passes through many villages which have poor sanitary conditions in general. All through the raining season this river frequently excesses and causes floods. UP government makes efforts to overcome trash pollution in the rivers. One of them is to launch issue regulation in these states which prohibits dumping into rivers.

In this project the main purpose of this machine is to lift the waste debris from the water surface and dispose them in the storage tank. This machine consists of water wheel driven conveyor mechanism which collect and remove the wastage, garbage & plastic wastages from water bodies. This also reduces the difficulties which we face when collection of debris take place. A machine will lift the waste debris from the surface of the water bodies[1]. This will Ultimately result in reduction of water pollution and lastly the aquatic animal death to these problems will be reduced. It consists of belt drive

mechanism which lifts the debris from the water body. The use of this project will be made for river, ponds, lakes and other water bodies to keep clean. Similarly they are lots of problem of water pollution in Godavari River, Nasik which affects the acoustic, human life & beauty of these rivers.

Some photos show the water contamination near Godavari River Nasik. Waste water is well-defined as the stream of used water from homes, business industries, marketable activities and institutes which are subjected to the dealing plants by a prudently intended and engineered network of pipes. The major influence of cleaning the chemical wastes can be the reason for respiratory diseases and it shows a challenging issue for the municipality officers, Water damage is categorized as three types of contaminated water. They are uncontaminated water, gray water and black water. Uncontaminated water is from a broken water stream 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 [1]. A drainage ditch is a fine channel that is dug at the side of a road or ground to carry away the water. These days, even though automation plays an important role in all industrialized applications in the suitable discarding of sewages from industries and sewage cleaning is still a challenging task. Drainage pipes are used for the discarding of sewage and regrettably occasionally there may be loss of human life while cleaning the blockages in the drainage duct. The municipality workers are only responsible to ensure that the sewage is clean or not. Although they clean the ditches at the side of structures, they can't clean in very extensive sewages. The municipality workers need to get down into the sewage sludge to clean the wide sewage. It affects their health badly and also causes skin allergies.

## **PROBLEM STATEMENT**

1. The statement of the project is "Design & Fabrication of River Cleaning System" to remove the waste debris, plastic waste & garbage from River, This causes harm to acoustic & human life.
2. To achieve clean water body for reduction of river pollution & to achieve the beauty of River by clean water bodies.
3. To reduce the difficulties which we are facing right now and it also remove the chemical wastages from the water body.

## **Effects of Pollution in Water Body**

### **Effects of water pollution**

The effects of water pollution are diverse and rest on what substances are discarded. Many water bodies nearby urban areas (cities and towns) are extremely contaminated. This is the result of both garbage dumped by persons and hazardous chemicals lawfully or unlawfully dumped by industrialized industries, health centers, schools and marketplace.

### **Death of aquatic animal**

The foremost problem affected by water pollution is that it destroys organisms that rest on on these water bodies. Dead fish, crabs, birds and sea gulls, dolphins, and several other living being frequently wind up on seashores, destroyed by contaminants in their terrain (living environment).

### **Interruption of food chain**

Pollution interrupts the usual food chain as well. Contaminants such as lead and cadmium are eaten by minute animals. Later, these animals are used up by fish and shellfish, and the food chain endures to be interrupted at all advanced levels.

### **Diseases**

Ultimately, humans are affected by this procedure as well. People can get diseases like hepatitis by consuming seafood that is

contaminated. In many poor nations, there is every time outbreak of cholera and

illnesses as an outcome of poor drinking water treatment from polluted water.



**Fig.1:** Effects of Pollution by Debris and Garbage in Water Body.

### **CONSTRUCTION AND OPERATION OF WATER BODY CLEANING MACHINE**

The Water body cleaning machine Consists of Battery(12V,7.1Ah), motor driver, Bluetooth module , 12V DC Motor(one for conveyor mechanism 160 rpm, 10kg of Torque & two for locomotion waterwheels 160rpm, 10kg of Torque), chain , conveyor belt , propeller & Arduino. The project comprises of a motorized operated water wheel to run the scheme. It comprises of DC Motor. The device which is running the project by chain drive and between the chains is having collecting plate coupled. The project consists of two main shafts balancing and hoisting the sprocket of chain drive [2]. The constituents are rest on frame serve as key body of the project. The PVC pipe with pressurize air generates pressure head to run the project on water surface. The fabricated storing tank is used to store the waste satisfying the purpose of the scheme. The collecting plate and conveyor chain mechanism drivers are rotating continuously by the

motor and motor gets the supply from the battery. The collecting plate is coupled between the two chain drivers for collecting the waste materials from the water body. The collected wastage is thrown on the collecting tank with the help of conveyer. Our project consists of PVC pipe for float the machine over the water body. PVC pipe does not let sink the machine. The propeller is used to drive the machine in the water body[2]. The propeller is run with the help of the DC motor (12 V). The total electrical device is being controlled by Arduino and Bluetooth module which is used to control the machine by mobile. Our machine has been constructed on base frame. Bottom of base frame is fixed PVC pipe for not let the machine to sink into the water body machine. One DC motor is coupled with roller rod when battery supplies the source to the motor, conveyor belt mechanism starts working. And same battery is supplies the source to the locomotive motor to propel the machine. Collecting plate is mounted on conveyor belt to collect the debris from water body.



Fig. 2: 3D Model of Water Body Cleaning Machine.

### OPERATION

In this project the chief aim of this machine is to lift the discarded debris from the water surface and dispose them in the tray. It comprise of arrangement of the conveyer which is sited on the shaft & bearings support; the shaft is attached to the podium bearing and bearing is attached on the M.S angle frame, the frame is linked and be like the form of slope in front of machine part. Due to waterwheels are rotate; this power is transmitted to conveyer system by means of belt drives. As the conveyer is move, it collects the water debris, thrown away garbage & plastics from water bodies. As the machine is situated in the water the undesirable debris in water will get raised up and it moves in upward direction. As the waste debris reaches the upper extreme position it will get dropped in the tray[3]. Therefore this will consequence in cleaning of water surface and harmless collection of waste debris from water, after collection of all wastage debris the second conveyer is convey it out of the river. The River Cleanup Machine uses long floating barricades which is being at an angle capture the plastic, creating mechanical extraction possible.

The machine is being controlled by Bluetooth module. Two Motor drivers are being used and both drivers are getting the supply from Battery. Bluetooth module and propeller's motor driver is connected to the UNO. One Motor driver is connected to the DC Motor and that DC Motor is coupled with Roller where conveyer belt mechanism operates. Another one motor driver is connected to DC Motor for propulsion. When Battery supplies the current to Motor via Motor driver, conveyer belt mechanism starts operating[3]. Propeller's DC Motor also gets the charge from the Battery, and then starts to propel the machine. Our project consists of PVC pipe for float the machine over the water body. PVC pipe does not let sink the machine. The main aim of this project is to lift the debris, plastic & garbage with the help of conveyer belt & chain mechanism and store them in storage tank. The aim of the project is to reduce the man power and bring the semi-automated operation of water bodies cleaning with the help of motor and chain drive arrangement into operation. The biggest advantage is that it can clean chemical wastes with minimized respiratory disease risk & environment.

### FUNDAMENTAL OF BLOCK DIAGAM

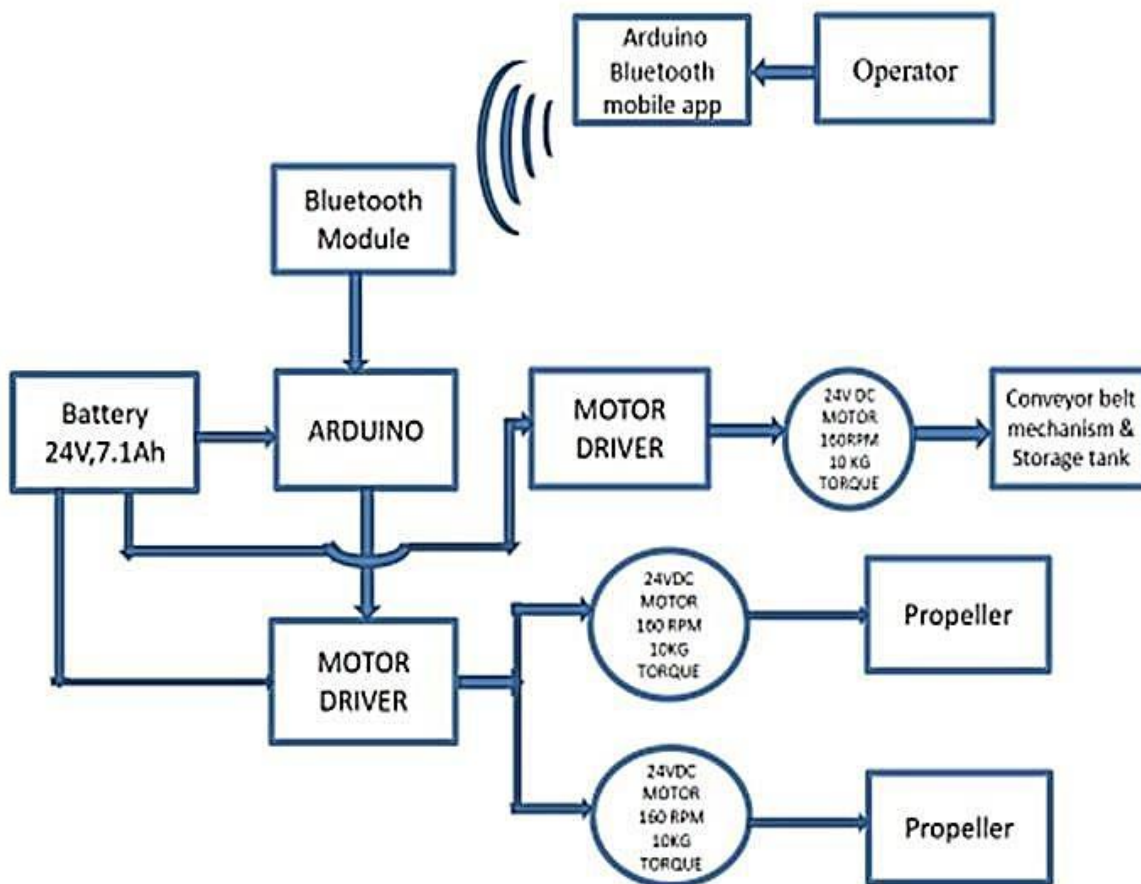


Fig. 3: Block Diagram of Water Body Cleaning.

**Block Diagram Explanation**

The machine is being controlled by Bluetooth module. Two Motor drivers are being used and both drivers are getting the supply from Battery. Bluetooth module and propeller’s motor driver is connected to the UNO. One Motor driver is connected to the DC Motor and that DC Motor is coupled with Roller where conveyor belt mechanism operates. Another one motor driver is connected to DC Motor for propulsion. When Battery supplies the current to Motor via Motor driver, conveyor belt mechanism starts operating. Propeller’s DC Motor also gets the charge from the Battery, and then starts to propel the machine.

**Model of Water Body Cleaning Machine**

The water body cleaning machine is basically constructed upon the ply board. Roller stands are connected with the ply board[3]. Ball bearing has been mounted with the roller rod both sides. Ball bearing is placed upon the roller stand. Chain sprockets are welded along with the roller rod and then chain is coupled between chain sprockets. Conveyor belt is placed between the chain sprockets on the roller rod. Storage tank is placed behind the roller stand so wastages from the water body is stored in the storage tank. Collecting plate is being placed on the conveyor belt. PVC pipe is mounted at the bottom of ply board for floating the machine over the water body. Propellers are being used for propel the machine.

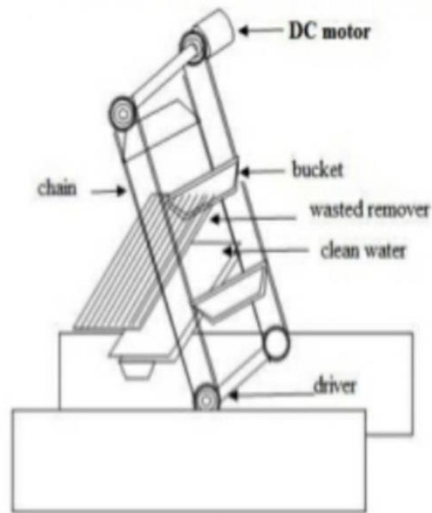


Fig. 4: Model of Water Body Cleaning Machine.

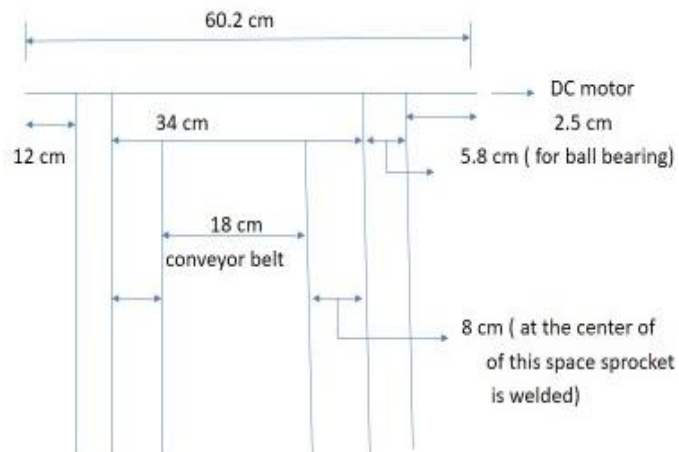


Fig. 5: Roller Rod Arrangement.



Fig. 6: Model Picture of Our Machine.

## **WORKING OF WATER BODY CLEANING MACHINE**

The “Water body cleanup machine” used in that area where there is leftover debris in the water body which is to be clear. This machine is comprised of waterwheel driven conveyor mechanism which gather & eliminate the waste, trash & plastic wastes from water bodies. This also reduces the difficulties which we face when collection of debris takes place [4]. A machine will boost the waste surface debris from the water bodies, this will finally result in decrease of water pollution and to end the marine animal's death these difficulties will be reduced. It comprises of Belt drive mechanism which boosts the debris from the water. The usage of this project will be made in rivers, ponds, lakes and additional water bodies for to clear the surface water debris from bodies. In the same way there are lots of difficulties of water pollution under Godavari River.

Nasik which affects the sound, life & beauty of Godavari River, some pictures show the water contamination near Godavari River Nasik. Waste water is well-defined as the movement of used water from houses, commercial industries, commercial activities and institutes which are lay open to the treatment plants by a cautiously designed and engineered network of pipes. The main influence of cleaning the chemical wastes can ground respiratory problems and it plays an inspiring issue for the municipality officers. Water damage is classified as three types of polluted water. They are clean water, gray water and black water. Clean water is from a damaged water supply line or leaking faucet. If not pickled quickly, this water becomes black water or gray water, dependent on span of time, temperature, and contact with surrounding pollutants. A drainage ditch is a constricted channel that is burrowed at the side of a road or ground to carry away the water. Nowadays, even though automation plays a vital role in all

industrial applications in the proper disposal of sewage from industries and sewage cleaning is still a challenging task [3]. Drainage pipes are used for the removal of sewage and inappropriately from time to time there may be damage of human life while cleaning the obstructions in the drainage pipes. The municipality workers are only responsible to ensure that the sewage is clean or not. However they spotless the ditches at the side of constructions, they can't clean in very wide sewage. The municipality workers need to get down into the sewage sludge to clean the wide sewage. It affects their health badly and also causes skin allergies.

The scheme comprises of a motor worked water wheel to run the scheme. It has four DC Motor of 12V. The device that is running the project is chain drive coupled containing collecting plate. The project consists of two main shafts balancing and hoisting the sprocket of chain drive [8]. The machineries are rest on frame serve as chief body of the scheme. The steel pipe with pressurize air generates pressure head to run the project on water surface. The fabricated storage tank is used to stock the leftover satisfying the aim of the project. Here we are fabricating the remote operated water body cleaning machine. The collecting plate and chain drives are rotating nonstop by the motor. The collecting plate is coupled among the two chain drives for collect the waste ingredients from river. The collected wastages are thrown on the collecting tank with the help of conveyor. Our project is having propeller that is used to drive the machine on the river. PVC pipe is being used to float the machine over the water body. The propeller is run with the help of two DC motor. The total electrical device is controlled by Bluetooth module and Bluetooth module is connected to the Arduino which use to control the machine remotely.

### **Assembly Procedure of Machine**

The general step is to bring together base frame of the plan via hand cutting machine and electric fusing machine to withstand the model and its procedure. The base frame is made of M.S angle.

Hollow tube is pull together at the base frame with the aid of L- section via nut and bolt. It is made of tin sheet by using rolling and tapping operation [4]. The purpose of this pipe is to drift on water, carrying the project weight as compressed air is located in pipe making a differential pressure head, causing the machine to float on water.

L- Section is joined in base frame which is used to hold the hollow pipe with the aid of nut and bolt. Inclined section is joined on base frame to care the bearing and shaft.

T- Section is assembled on base frame by welding. It is used to support the bigger chain drive with the aid of bearing and shaft.

Shaft is used to convey the torque from motor to chain drive. There is two shaft assembled in machine. Shaft 1 is mounted at the front chain drive of machine and shaft 2 is mounted at the rear chain drive with the help of inclined selection and T-section respectively [5].

The drive source of our project is an electric motor having 12V and 7.6 ampere current which is used to drive gear train, water wheel and collecting mechanism. Here we are used 4 motor. 1 motor is attached on garbage collector, 2 and 3 motor is attached on left and right water wheel and 4 motor is attached on carrying belt with the aid of gear train and chain drive mechanism.

Gear drive is fused on shaft with the aid of connecting link and T- section. Gear drive is power transmission drive used to transmit the power from motor to chain drive as required to carry a load as

desirable to complete the project objective. There is 8 sprocket wheel used in the mission in which 1,2,3,4 are of same measurement is attached on shaft of carrying belt with the aid of chain and Left over 5,6,7,8 are used to drive the water wheel which is used to float the appliance in water.

Chain drive is a process of conveying mechanical power from one area to another. It is sometime used to carry power to the wheels of a means of transportation, mainly bicycles and Motorcycles [5]. It is as well used in a varied variety of machines besides vehicles. The power is carried by a roller chain, identified as the drive chain, transient over a sprocket gear, via teeth of the gear meshing with the holes in the links of the chain. The gear is twisted, and this pulls the chain placing mechanical force.

Gathering Mechanism is used in our project to overwhelmed real time problem as due to water tension waste is hard to collect. By means of this four bar mechanism, it rotates at a specific angle planned to collect the garbage for the model. It has two window open and close as handler wishes using remote to ON and OFF the mechanism.

Water wheel is locked on shaft which is located on base frame. The main purpose of water wheel is to move the machine forward or backward on water. Motor is used to rotate the water wheel with the aid of chain drive mechanism [6].

## **SOFTWARE EXPLANATION AND PROGRAMMING**

The machine is being operated by Bluetooth module which is connected with Arduino. These all are wireless connected with Arduino Bluetooth RC car. A Bluetooth module is used to receive command from android phone and Arduino UNO is used for controlling the

whole system [9]. Bluetooth controlled car moves via button touched in the android Bluetooth mobile app. We can use any Bluetooth app that supportive or can send data. A Bluetooth module is used to accept command from android phone and Arduino UNO is used for regulating the whole system. Bluetooth controlled car

moves according to button touched in the android Bluetooth mobile app. To run this project first need to download Bluetooth app form Google play store. We can use any Bluetooth app that supportive or can conduct data. Here is some apps' name that may work suitably.

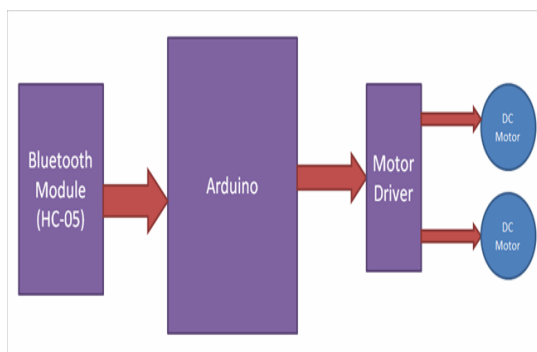


Fig. 7: Connection of Electronics Media.

Afterward installing app you requisite to open it and then search Bluetooth device and select preferred Bluetooth device. And then form keys [8]. Here in this plan we have used Bluetooth controller app.

1. Download and install Bluetooth Controller.
2. Turned ON mobile Bluetooth.
3. Now open Bluetooth controller app
4. Press scan
5. Select desired Bluetooth device
6. Now set keys by pressing set buttons on screen after setting keys press ok.

When we switch forward button in Bluetooth controller app at that time machine start moving in forward direction and moving endures forward till following command comes.

When we switch backward button in Bluetooth controller app at that time machine start moving in reverse direction and moving endures reverse till following command comes.

When we touch left button in Bluetooth regulator app then instrument start moving in left direction and moving endures left till next command come from. In this situation front side motor turns front side

wheels in left direction and rear motor runs in forward direction.

When we touch right button in Bluetooth regulator app then machine start moving in right direction and moving endures right till next command come from. In this situation front side motor turns front side wheels in right direction and rear motor runs in forward direction. There by touching stop button we can stop the machine.

### RESULTS AND DISCUSSION

A Motor driver is associated to Arduino to run the car. Motor driver's input pins 2, 7, 10 and 15 are connected to Arduino digital pin number 12, 11, 10 and 9 respectively [7]. Here we have taken two DC motors to driver car in which one motor is associated at output pin of motor driver 3 and 6 and additional motor is connected at 11 and 14. A 6 volt Battery is too used to power the motor driver for driving motors. Bluetooth module's RX and TX pins are directly connected at RX and TX of Arduino. And vcc and ground pin of Bluetooth module is associated at +5 volt and gnd of Arduino. And a 9 volt battery is used for power the circuit at Arduino Vin pin.

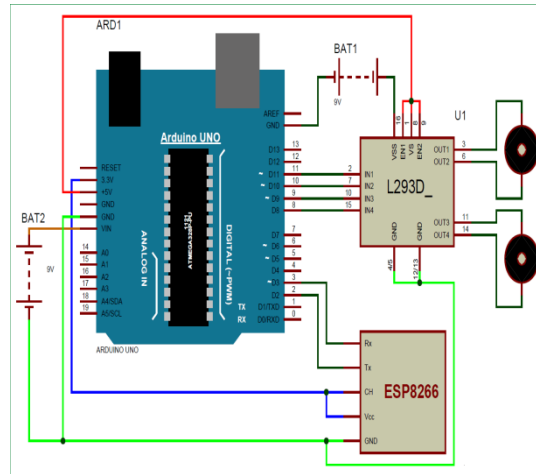


Fig. 8: Circuit Diagram of Electronics Media.

Then it has created functions for different directions of machine. There are five conditions for this Bluetooth controlled

machine which are used to give the directions:

Touched button in Bluetooth controller app.	Output for front side motor to give direction		Output for rear side motor to move forward or reverse direction		Direction
	M11	M12	M21	M22	
Stop	0	0	0	0	Stop
Forward	0	0	0	1	Forward
Backward	0	0	1	0	Backward
Right	1	0	0	1	Right
Left	0	1	0	1	Left

**CONCLUSION**

This project is fabricated on the basis of literature and research on different journals and papers relevantly available and fabricated accordingly. It can provide flexibility in operation. This innovation is easy & cost effective and has lots of room to grow more economical. The Water body cleaning machine is designed with the hope that it can serve the purpose of water body cleaning with minimum disease risk and optimum effectiveness. Due to its design, it is cost effective and very useful for the society. It also reduces the difficulties which we are facing to keep our water bodies clean. By using this machine, water body can be kept pollutant free. We were able to gain valuable insights while designing and constructing the water body cleaning machine. These precious learning and critical thinking skills will help us throughout our careers.

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