Remote Controlled River Cleaning Machine

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ABSTRACT

River bodies have been polluted indiscriminately by being subjected to waste generated by industries as well as human being and apart from the soluble waste there is a lot of insoluble waste which creates a layer on the river body which not only affects the quality of water but also prevents the sunrays to move down the bed of the river seriously affecting the aquatic life within the river. This huge amount of sewage loaded with pollutants, toxic material and debris has also lead to shortage of potable water to be used by humans and poses health hazard to the flora and fauna as well as humans . The government of India has taken efforts toward cleaning of river bodies by investing huge capital on projects like "Namami Gange", ''Narmada Bachao'' and various other major and medium projects in various cities like Ahmadabad, Varanasi etc. Considering the above factor we have designed and fabricated a machine which is able to flush out the floating waste from the river bodies. The machine is automated with the help of an RF module .This RF module controls the dc motors fabricated on the machine and helps the machine to move ahead and make various movements on the river to collect the floating garbage. The machine is supplemented by a garbage bin which accumulates the garbage collected. The machine is able to collect floating garbage and thus can be supplemented to be used to clean various small water bodies which otherwise may not be cleaned due to want of funds.

Keywords : Water cleaning machine, RF Transmitter, RF Reciever, DC motor.

I. INTRODUCTION

The "River cleanup machine" has been utilized in that places where there's waste   debris within the water body which are to be removed. This machine is consists of waterwheel driven conveyer mechanism which collect & remove the wastage, garbage & plastic wastages from water bodies. This also reduce the difficulties which we face when collection of debris is done . A machine will lift the waste surface debris from the water bodies, this may ultimately end in reduction of pollution and lastly the aquatic animal's death to those problems will be reduced. It consists of Belt drive mechanism which lifts the debris from the water. The use of this project are going to be made in rivers, ponds, lakes and other water bodies for to wash the surface water debris from bodies. Similarly they are lots of problems of water pollution under Godavari River, Nasik which affect the acoustic, human life & beauty of Godavari River. The some photo graphs are shows the pollution near Godavari River Nasik. Waste water is defined because 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 system line or leaking faucet. If not treated quickly, this water can become black water or gray water, counting on length of your time , temperature, and get in touch with with surrounding contaminants. A ditch may be a narrow channel that's dug at the side of a road or field to hold away the water. Nowadays, albeit automation plays important role altogether industrial

applications within the proper disposal of sewages from industries and sewage cleaning remains a challenging task. Drainage pipes are used for the disposal of sewage and unfortunately sometimes there could also be loss of human life while cleaning the blockages within the drainage pipes. 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. It affects their health badly and also causes skin allergy.

II. METHODS AND MATERIAL

An Wherever M. Mohamed Idhris and et.al. in their work "Design and fabrication of remote Controlled sewage cleaning Machine", have fabricated a remote controlled sewage controlled sewage cleaning machine which collects and treats the sewage water.

Abhijeet.M. Ballade and et.al in their work "Design & Fabrication of river cleaning system", have developed a river cleanup machine."River cleanup machine" which involves removing the waste debris from water surface and safely disposing from the water body. The river cleanup machine works on hydropower to extract waste water debris, plastics & garbage from Godavari river at Nashik.

Pankaj Singh Sirohi and et.al. in their work "Review on Advance River Cleaner", have developed a model in which the turbine rotates by flow of river water and these turbine run two conveyor belts. The first conveyer belt is employed to select solid waste from river and therefore the second conveyer belt is employed to draw solid waste out of river for solid waste management.

Ndubuisi c. Daniels in his work "Drainage System Cleaner A Solution to Environmental Hazards", IRJES) ISSN (Online) 2319-183X, Volume3, Issue 3(March 2014) has developed a machine which functions by itself using the force of running water .

Osiany Nurlansa and et.al. in their work "AGATOR (Automatic Garbage Collector) as Automatic Garbage Collector Robot Model" International Journal of Future Computer and Communication, Vol. 3, No. 5, October 2014.have developed AGATOR (Automatic Garbage Collector), a rotor robot model as automatic garbage collector to counter accumulation of garbage in the river which has no flow effectively and efficiently. The machine is microcontroller based and gives a satisfactory operation

Prof. N.G.Jogi,Akash Dambhare, Kundan Golekar, Akshay Giri, Shubham Take, "Efficient Lake Garbage Collector by Using Pedal Operated Boat", IJRTER Volume 02, Issue 04; April 2016 ISSN: 2455-1457 have used pedal operated boat with the conveyor attached thereto for collecting garbage from the lake. The water surface trash collection boat can work in river or lake, it can collect the floating garbage and can be efficiently used for aquatic weed management.

III. RESEARCH METHODOLOGY

The purposes of this research are

1) To determine the design of C-BOT and

2) To know the performance of C-BOT automatic garbage collector

3.1 Research Design

The Research design is based on a simplified model proposed by Borg & Gall (1983:775) [4] having 10 step which have been modified into four basic steps as given below development of Borg & Gall (1983:775) [4] the authors simplified them into 4 steps. In line with the model, the stages taken in developing C-BOT were:

1) Analyzing the system requirement,
2) Mechanical Design ,
3) Electronic Design
4) Development and Testing

3.1.1 System Requirement

C-BOT developed can be included in the category of rotor mobile robot with navigation system. The System requirement is as given below :

The main driver of C-BOT is rotor, so it takes mechanical wheel and wheel driver.

- Power Supply to develop the required torque to drive the wheel.
- Battery of 12 volts
- Appropriate motion controller.
- Wireless RF remote as robot controller.
- 2 DC Motor used to drive the robot rotor.
- 2 DC Motor which serves to move the lever if the garbage receptacle is full.
- Motor Driver circuit.
- Base Frame
- Collecting Mechanism
- Chain
- Carrying Belt
- Water Wheel

3.1.2 Mechanical Design

The drive source of our project is an electrical motor having 12V and seven .6 ampere current which is employed to drive gear train, water wheel and collecting mechanism. We have used 4 motor. One motor is mounted on garbage collector, One motor each is mounted on left and right water wheel and one motor is mounted on carrying belt with the help of gear train and chain drive mechanism.

Collecting Mechanism is employed in our project to beat real time issue as thanks to water tension garbage is difficult to gather . By using this four bar mechanism, it rotates at a specific angle intended to gather the rubbish for the model. It has two window which can be opened and closed as per the requirement with the help of an RF remote.

Water wheel is bolted on shaft which is placed aboard frame. The purpose of water wheel is to maneuver the machine forward or backward on water. Motor is employed to rotate the water wheel with the assistance of chain drive mechanism.
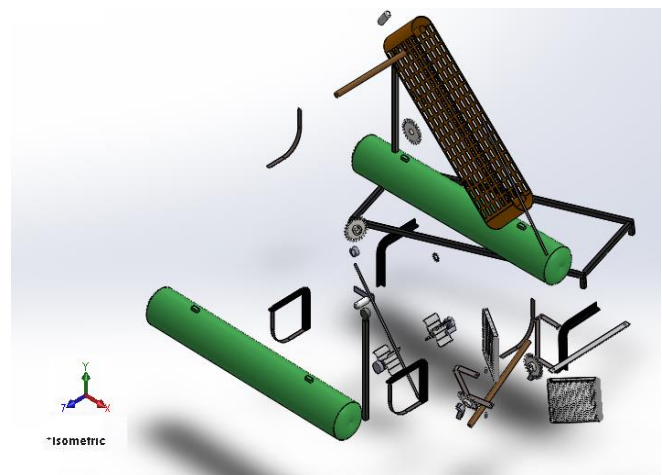

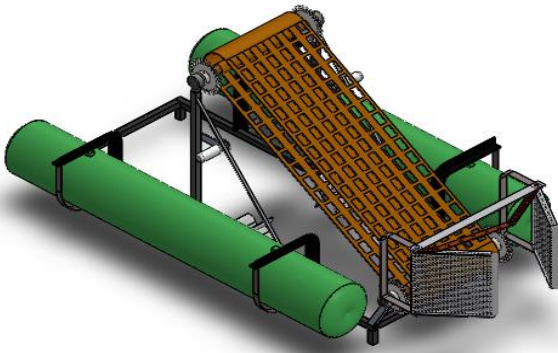**Figure 3.1** Exploded View of River Cleaning Machine

Figure 3.2 Assembled View of River Cleaning Machine
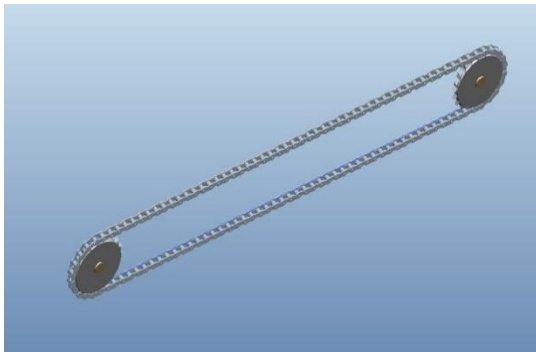
A) Chain Drive

Figure 3.3 Chain Drive

Chain drive may be a way of transmitting mechanical power from one place to a different . It is often wont to convey power to the wheels of a vehicle, particularly bicycles and Motorcycles. It is also utilized in a good sort of machines besides vehicles. The power is conveyed by a roller chain, referred to as the drive chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The gear is turned, and this pulls the chain putting mechanical force.
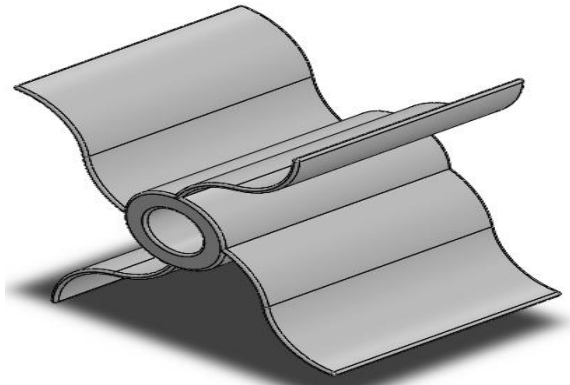
B) Propeller

Figure 3.4 CAD Model of Propeller

Propeller may be a sort of fan that transmits power by converting rotational motion into thrust. A pressure difference is produced between the forward and rear surfaces of the airfoil-shaped blade, and a fluid (such as air or water) is accelerated behind the blade. Propeller dynamics, like those of aircraft wings, are often modelled by either or both Bernoulli's principle and Newton's third law.

3.1.3. Electronic Design

A) D.C. Motor

In any motor , operation is predicated on simple electromagnetism. A current-carrying conductor generates a magnetic flux ; when this is often then placed in an external magnetic field, it'll experience a force proportional to the present within the conductor, and to the strength of the external magnetic flux . The internal configuration of a DC motor is meant to harness the magnetic interaction between a current-carrying conductor and an external magnetic flux to get rotational motion.
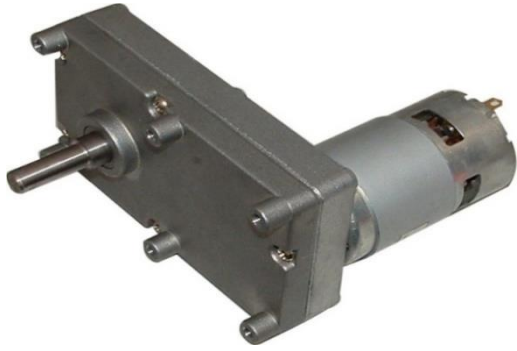
Figure 3.5 Actual DC Motor

Electrical power of the motor is defined by the subsequent formula:

Pin = I * V

Where,

Pin –input power, measured in watts (W)

I – current, measured in amperes (A)

V – applied voltage, measured in volts (V)

Motors alleged to do some work and two important values define how powerful the motor is. It is motor speed and torque – the turning force of the motor. Output mechanical power of the motor could be calculated by using the following formula

Pout = T * ω

Where,

Pout – output power, measured in watts (W)

τ – Torque, measured in Newton meters (Nm)

ω – Angular speed, measured in radians per second (rad/s).

Calculate angular speed if you recognize rotational speed of the motor in rpm:

ω = N * 2π / 60

Where,

ω – Angular speed, measured in radians per second (rad/s);

Rpm – rotational speed in revolutions per minute;

π – Mathematical constant pi (3.14).

60 – Number of seconds in a minute.

Efficiency of the motor is calculated as mechanical output power divided by electrical input power:

E = Pout / Pin

Therefore

Pout = Pin * E

After substitution we get

T * ω = I * V * E

T * N * 2π / 60 = I * V * E

B) RF Transmitter And Receiver
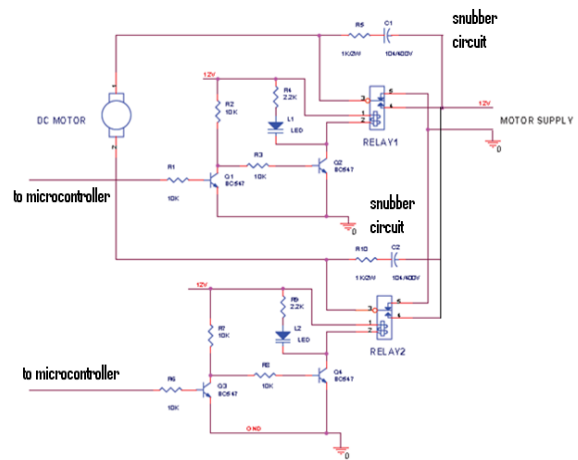
DC Motor Forward - Reverse Control

Figure 3.6 Dc Motor Forward - Reverse Control

Schematic explanation:

This circuit is designed to control the DC motor in the forward and reverse direction. It consists of two relays named as relay1, relay2. The relay ON and OFF is controlled by the pair of switching transistors. A Relay is nothing but electromagnetic switching device which consists of three pins. They are Common, Normally close (NC) and normally open (NO). The common pin of two relay is connected to positive and negative terminal of DC motor through snubber circuit respectively. The relays are connected in the collector terminal of the transistors Q2 and Q4.When high(5 Volt) pulse signal is given to either base of the Q1 or Q3 transistors, the transistor is conducting and

shorts the collector and emitter terminal and zero (Zero volt)signals given to base of the Q2 or Q4 transistor. So the relay is turned OFF state. When low pulse is given to either base of transistor Q1 or Q3 transistor, the transistor is turned OFF. Now 12v is given to base of Q2 or Q4 transistor so the transistor is conducting and relay is turn ON. The NO and NC pins of two relays are interconnected so just one relay are often operated at a time. The series combination of resistor and capacitor is named as snubber circuit. When the relay is activate and switch OFF continuously, the rear EMF may fault the circuit. So the back EMF is grounded through the snubber circuit.

When relay 1 is in the ON state and relay 2 is in the OFF state, the motor is running in the forward direction.

When relay 2 is in the ON state and relay 1 is in the OFF state, the motor is running in the reverse direction.

C) Relay

Relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic flux which attracts a lever and changes the switch contacts. The coil current are often on or off so relays have two switch positions and that they are double throw (changeover) switches. Relays allow one circuit to modify a second circuit which may be completely break away the primary . For example a coffee voltage battery circuit can use a relay to modify a 230V AC mains circuit. There is no electrical connection inside the relay between the 2 circuits; the link is magnetic and mechanical. The coil of a relay passes a comparatively large current, typically 30mA for a 12V relay, but it are often the maximum amount as 100mA for relays designed to work from lower voltages. Most ICs (chips) cannot provide this current and a transistor is typically wont to amplify

the tiny IC current to the larger value required for the relay coil.

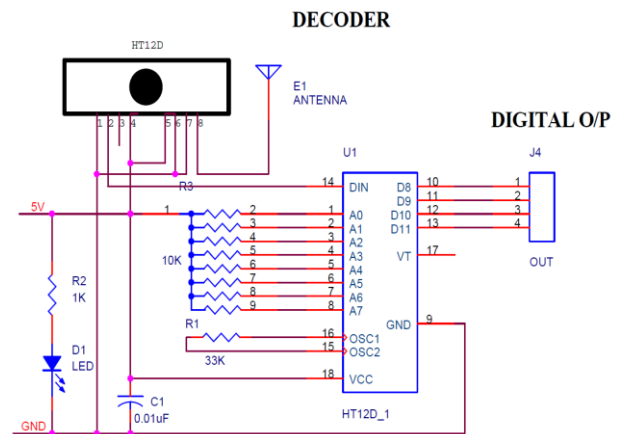**Figure 3.7.** Relay

D) Decoder with RF Receiver

Figure 3.8. Decoder with RF Receiver

This circuit utilizes the RF module (Tx/Rx) for creating a wireless remote, which might be wont to drive an output from a foreign place. RF module, because the name suggests, uses frequency to send signals. These signals are transmitted at a specific frequency and a baud . A receiver can receive these signals as long as it's configured for that frequency. A four channel encoder/decoder pair has also been utilized in this technique . The input signals, at the transmitter side, are taken through four switches while the outputs are monitored on a group of 4 LEDs like each input switch. The circuit are often used for designing Remote Appliance system . The outputs

from the receiver can drive corresponding relays connected to any home appliance.

This frequency (RF) transmission employs Amplitude Shift Keying (ASK) with transmitter/receiver (Tx/Rx) pair operating at 434 MHz. The transmitter module takes serial input and transmits these signals through RF. The transmitted signals are received by the receiver module placed faraway from the source of transmission. The system allows a method communication between two nodes, namely, transmission and reception. The RF module has been utilized in conjunction with a group of 4 channel encoder/decoder ICs.
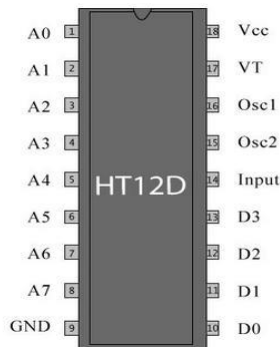

Figure 3.9. HT12D Decoder

Here HT12E & HT12D have been used as encoder and decoder respectively. The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs. These outputs can be observed on corresponding LEDs. Encoder IC (HT12E) receives parallel data in the form of address bits and control bits. The control signals from remote switches along with 8 address bits constitute a set of 12 parallel signals. The encoder HT12E encodes these parallel signals into serial bits. Transmission is enabled by providing ground to pin14 which is active low.

The control signals are given at pins 10-13 of HT12 the serial data is fed to the RF transmitter through pin17 of HT12E. Transmitter, upon receiving serial data from encoder IC (HT12E), transmits it wirelessly to the RF receiver. The receiver, upon receiving these signals, sends them to the decoder IC (HT12D) through pin2. The serial data is received at the data pin (DIN, pin14) of HT12D.
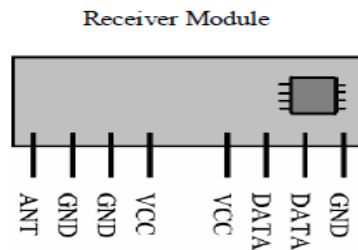

Figure 3.10. Receiver Module
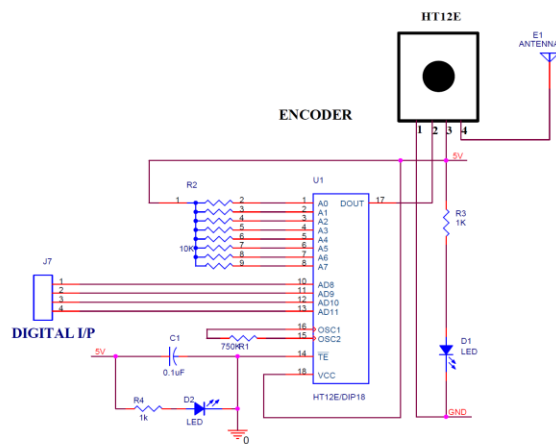
E) Encoder with RF Transmitter

Figure 3.11. Encoder with RF Transmitter

This circuit utilizes the RF module (Tx/Rx) for creating a wireless remote, which might be wont to drive an output from a foreign place. RF module, because the name suggests, uses frequency to send signals. These signals are transmitted at a specific frequency and a baud . A receiver can receive these signals as long as it's configured for that frequency. A four channel encoder/decoder pair has also been utilized in this technique . The input signals, at the transmitter side, are taken through four switches

while the outputs are monitored on a group of 4 LEDs like each input switch.

The RF module, because the name suggests, operates at frequency . The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations within the amplitude of carrier . This kind of modulation is known as Amplitude Shift Keying (ASK). Transmission through RF is best than IR (infrared) due to many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications.
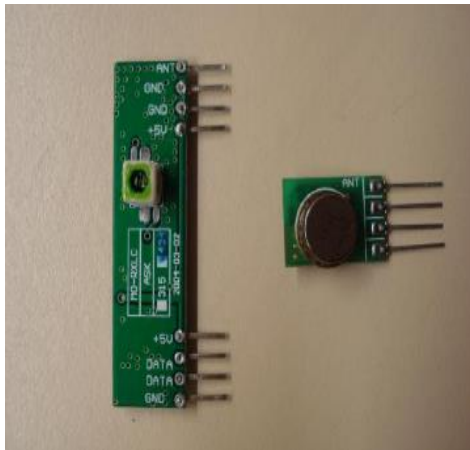

Figure 3.12. RF Module

Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there's an obstruction between transmitter & receiver.Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a selected frequency unlike IR signals which are suffering from other IR emitting sources. This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the speed of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at an equivalent frequency as that of the transmitter.

3.2. Working Principle

In this project the most aim of this machine is to lift the waste debris from the water surface and dispose them within the tray. Here we are fabricating the remote operated river cleaning machine. The collecting plate and chain drives are rotating continuously by the motor. The collecting plate is coupled between the 2 chain drives for collect the waste materials from river. The collected wastages are thrown on the collecting tray with the assistance of conveyer. Our project has propeller which is employed to drive the machine on the river. The propeller is run with the help of two PMDC motor. The total device is controlled by RF transmitter and receiver which use to regulate the machine remotely.

IV. CONCLUSION

Although

Figure 4.1 The Remote operated river cleaning bot

Thus we have been able to develop a bot which is able to move on the surface of the water. The bot are often controlled using an RF remote . The remote is used to control the dc motors which are able to provide forward , reverse , left and right movement. Apart form this the bot is able to collect the garbage with the help of the wings which continually flap over the water. Once the wings grab the garbage, the garbage is pushed on to the belt which carries the garbage and drops it into the waste bin attached with the bot. Thus this bot is able to pick the floating garbage and is able to clear the surface of the water from such floating objects.

This project has been developed after a through literature revive so as to maximize the flexibility in operation. The project has been developed with basic material and is cost effective and had been successful in removing the floating garbage on the water surface .The basic challenge has been to design a black box which houses the RF receiver. Further work can be done on integrating the system to an IoT and Android Application along with cloud. The machine can be operated from anywhere in the world using a customized android application and the system can be integrated with cloud to store data related to the amount of garbage collected and the data can be used by the government authorities to have a tab on level of pollution in the water bodies and can help them to focus on revising policies related to water pollution. The battery is one of the issue which need to be dealt out. Switching the system on to the solar power can do the trick thus further work can be carried in the direction of integrating the system with solar power.

V. REFERENCES

[1]. M. Mohamed Idhris, M.Elamparthi,C. Manoj Kumar, Dr.N.Nithyavathy, Mr. K. Suganeswaran, Mr. S. Arunkumar, "Design and fabrication of remote controlled sewage cleaning Machine", IJETT – Volume-45 Number2 -March 2017

[2]. Mr.Abhijeet.M. Ballade, Mr. Vishal.S. Garde, Mr.Akash.S. Lahane and Mr.Pranav.V.Boob, "Design & fabrication of river cleaning system", IJMTER Volume 04, Issue 2, [February– 2017] ISSN (Online):2349–9745.

[3]. Mr. P. M. Sirsat, Dr. I. A. Khan, Mr. P. V. Jadhav, Mr. P. T. Date, "Design and fabrication of River Waste Cleaning Machine", IJCMES 2017   Special Issue-1 ISSN: 2455-5304

[4]. Pankaj Singh Sirohi, Rahul Dev, Shubham Gautam, Vinay Kumar Singh, Saroj Kumar,"Review on Advance River Cleaner", IJIR Vol-3, Issue-4, 2017 ISSN: 2454-1362.

[5]. Ndubuisi c. Daniels, "Drainage System Cleaner A Solution to Environmental Hazards", IRJES) ISSN (Online) 2319-183X, Volume3, Issue 3(March 2014)

[6]. Osiany Nurlansa, Dewi Anisa Istiqomah, and Mahendra Astu Sanggha Pawitra, "AGATOR (Automatic Garbage Collector) as Automatic Garbage Collector Robot Model" International Journal of Future Computer and Communication, Vol. 3, No. 5, October 2014.

[7]. Basant Rai, "Polltution and Conservation of ganga river in modern India", International Journal of Scientific and Research Publications, Volume 3, Issue 4, April 2013 1 ISSN 2250-315

[8]. Huang Cheng, Zhang Zhi*,"Identification of the Most Efficient Methods For Improving Water Quality in Rapid Urbanized Area Using the MIKE 11 Modelling System", 2015 Seventh International Conference on Measuring Technology and Mechatronics Automation.

[9]. Emaad Mohamed H. Zahugi, Mohamed M. Shanta and T. V. Prasad,"Design Of Multi-Robot System For Cleaning Up Marine Oil Spill", IJAIT Vol. 2, No.4, August 2012.

[10]. Prof. N.G. Jogi, Akash Dambhare, Kundan Golekar, Akshay Giri, Shubham Take, "Efficient Lake Garbage Collector By Using Pedal Operated Boat", IJRTER Volume 02, Issue 04; April 2016 ISSN: 2455-1457.

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