Robotic trash removal system in water bodies.

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ABSTRACT — **Millions of waste and other debris are filling our oceans at an exponential rate. This situation is catastrophic it has now garnered worldwide attention. Despite the catastrophic conditions, little to now robotics research is conducted in the identification, collection, sorting, and removal of waste from oceans and rivers and at the macro- and micro-scale. Only a scarce amount of individual efforts can be found from private sources. This paper presents a cursory view of the current plastic water waste catastrophe, associated robot research, and other efforts currently underway to address the issue. This project solves two of the major problems. This machine is consists of a net like structure which collect & remove the wastage from water bodies. It is also used to remove oil from the upper layer of the river. This is powered by solar powered motors using photovoltaic cells. The use of this project will be made in rivers, ponds, lakes and other water bodies to clean the surface water. This system will be also helpful for Kaveri and "government" projects for cleaning rivers from trashes like dhotis, flower offerings and other wastes.**

KEYWORDS: Floating robot, microcontroller, trash removal, aquatic animals, pollution, solar panel, rechargeable battery.

INTRODUCTION:

One of the most severe threats to nature that the ever growing world is facing today is plastic contamination in river, pond, lake or any surface water. Global plastic production was about 288 million metric tons in 2012 [2]. The solid waste generation has also increased over the past five decades [3]. Human health is threatened tremendously by the plastic toxins that lead to cancers, birth defects and immune system problems. Alongside plastic contamination, presence of water hyacinth h in lakes is a cause of major oxygen level depletion in water bodies killing aquatic animals and harming the ecosystem. Here we are presenting a cost-effective remote controlled robot with advanced control features that can assist the humans in removing the floating water waste safely and quickly making work easier and more sustainable. The robot moves by means of two propellers connected to a gear motor. The robot has been designed in such a way that it can easily float on the water and have the accessibility to move in all four directions, namely- forward, backward, right, left, with neat precision In a very low cost, this machine cleans, plastic pollution from water can be ensured for lives both on land and water

Fig.1 Current plastic status in India.

ENVIRONMENTAL IMPACT:

Many animals that live on or in the sea consume flotsam by mistake, as it often looks similar to their natural prey. Bulky plastic debris may become permanently lodged in the digestive tracts of these animals, blocking the passage of food and causing death through starvation or infection. Tiny floating plastic particles also resemble zooplankton, which can lead filter feeders to consume them and cause them to enter the ocean food chain.
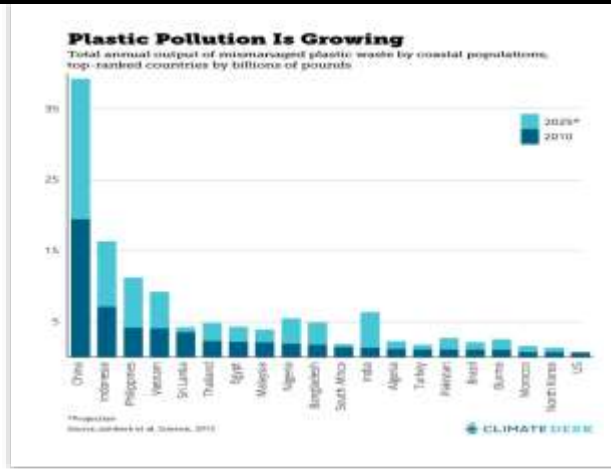
Fig.2 Plastic growth in the past years
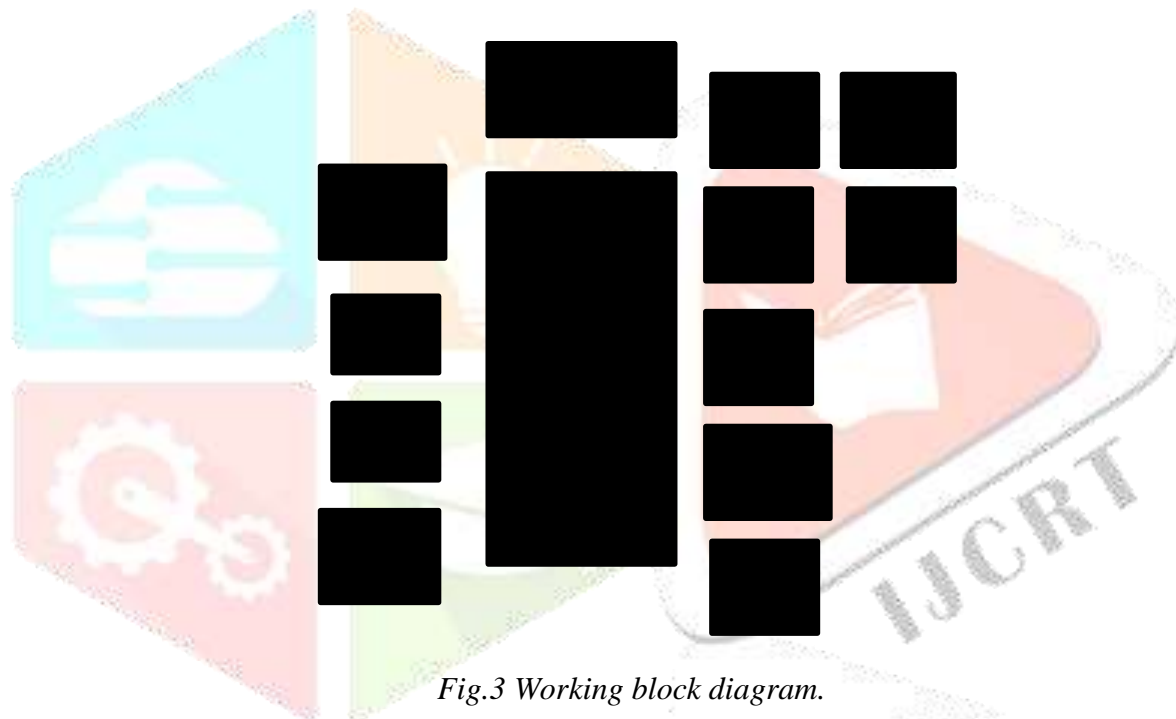
SYSTEM DESCRIPTION:

Fig.3 Working block diagram.

A. PIC MICROCONTROLLER: PIC is families of Harvard architecture microcontrollers made by Microchip Technology.PIC16F873A/876A devices are available only in 28-pin packages, while PIC16F874A/877A devices are available in 40-pin and 44-pin packages. The 28-pin devices have five A/D input channels, while the 40/44-pin devices have eight. The Parallel Slave Port is implemented only on the 40/44-pin devices.

B. PUMPING MOTOR: This is a mini submersible type water pump that works on 6V DC'. Just immerse the pump in water, connect a suitable pipe and power the motor to start pumping water. This motor is small, compact and light. It can be controlled from a micro controller using our DC Motor Drivers or one of our Relay Boards. You may use our

5V SMPS Power Supply Adapter to run this pump. You may also use our 6V Solar Panel to run the pump with appropriate a 6V voltage regulator.
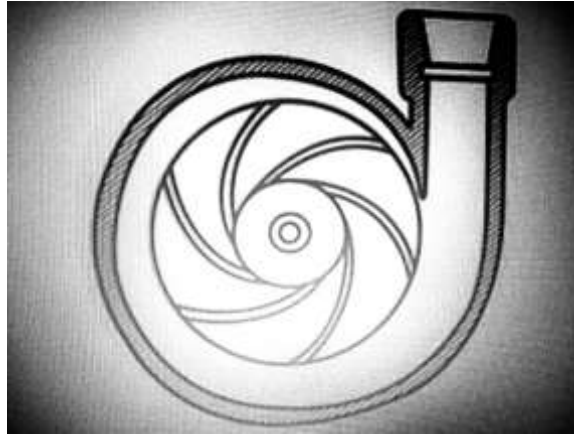

Fig.4 Structure of mini submersible jet pump

C. RELAY: A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically. This module provides the protection to the microcontroller from the higher load current the high power required to directly control an electric motor or other loads is called contactor.

D. RF RECEIVER: This RF Receiver listens on 433 MHz frequency for two types of data transmissions. First it can listen to Active RFID Transmitter tags and output a unique 16 bit ID of the tag in serial data. Second it can detect data from Data Logger Transmitter and output the bytes as serial data. Both types of transmitters are automatically decoded and serial data is output of 9600 bps baud rate. There is no configuration required to use it.

E. RECHARGEABLE BATTERIES: The NCP802 resides in a lithium battery pack where the battery cell continuously powers it. This circuit senses cell voltage, charge current, and discharge current, and correspondingly controls the state of two, N−channel MOSFET switches. These switches reside in series with the negative terminal of the cell and the negative terminal of the battery pack. During a fault condition, the NCP802 open circuits the pack by turning off one of these MOSFET switches, which disconnects the current path. Internal delay circuitry minimizes external component count

F. SOLAR .BATTERY: In our project using one solar panel its consist of 32 cells and producing of about 13.72.Each cell producing of about 0.42v. This energy used to charge the batteries. Solar output is given to the DC Regulators.

G. POWER SUPPLY UNIT: The 230/240VAC line voltage is applied to the transformer primary. Step down transformer is used to convert 230VAC to 12V/1A output voltage in the transformer secondary. This 12VAC supply is applied to the bridge rectifier. The bridge rectifier voltage rating should be double the Vrms of secondary AC and higher forward current rating. The bridge rectifier has four diodes in that, available as singular. This is the most important and it produces full-wave varying DC or pulsating DC. This rectified output is smoothed by using shunt capacitor filter (C1). The larger the filter capacitor lowers the ripple.

H. WIRELESS CAMERA: This machine uses a mobile camera. The range in which about 100 to 150 meters.

I. CONTROLLER UNIT: The controller unit is used to control the movement of the floating material. It consists of the transmitter which sends the signal to the receiver in the floating material. When the signal is sent the floating material moves according to the inputs given.
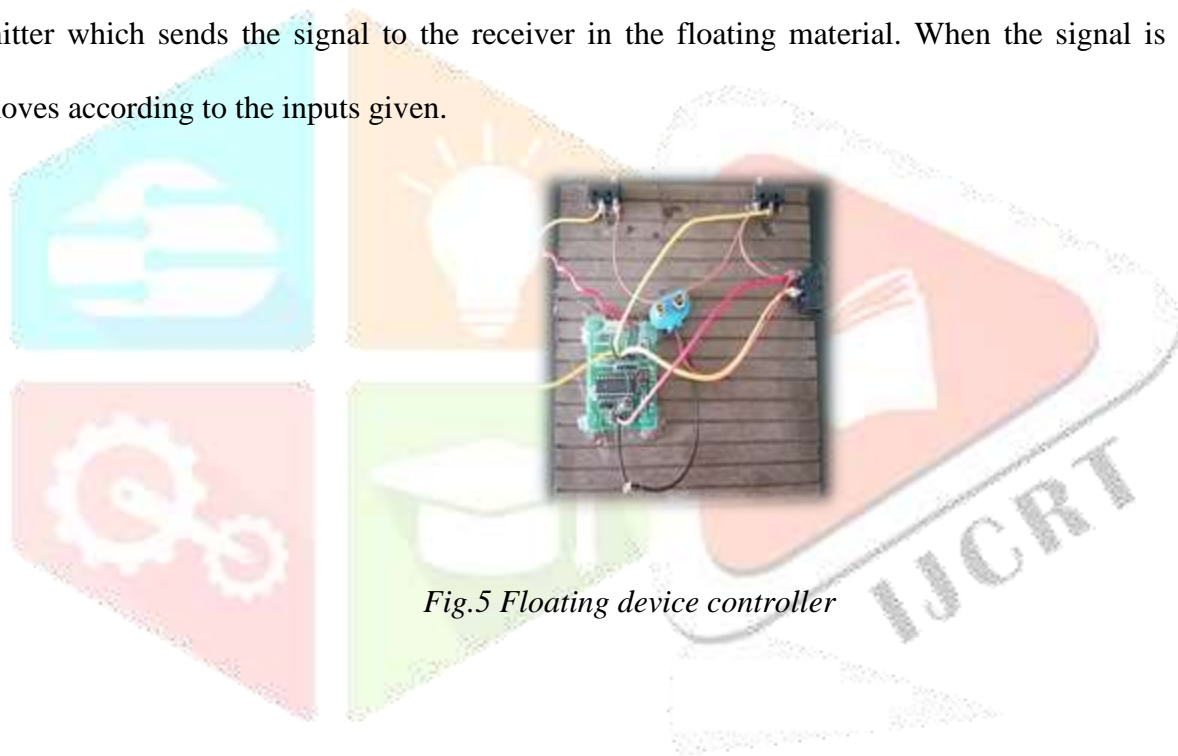
Fig.5 Floating device controller

DESIGN:

The system is an unmanned water boat and thus the design needs to be streamlined, water resistant, light weight and durable. The material chosen for the body of the robot is polyvinyl chloride (PVC) board keeping all the aspects in mind. The   PVC pipe has been designed to keep the body a float and the streamlines structure aids movement through water currents. The projecting teeth structure used to carry the plastics on the water and lift it on the bin. The whole bodies   including the submersible pump are made of water repellent materials that do not add excess weight to the robot this motor is small, compact and light. It can be controlled from a micro controller using our DC Motor Drivers or one of our Relay Boards.

It may use our 5V SMPS Power Supply Adapter to run this pump. It may also use our 6V Solar Panel to run the pump with appropriate a 6V voltage regulator. The operation of the relay the When a current flows through the coil, the resulting magnetic field attracts an armature that is mechanically linked to a moving contact. The movement either makes or breaks a connection with a fixed contact. Rechargeable batteries are used but for the long term implementation we can use solar battery thus reducing the wastage of energy. , in effect, you supply power to the power supplier. The NCP802 resides in a lithium battery pack where the battery cell continuously powers it.

Fig.6 Prototype model of the floating device.

WORKING:

The floating waste removal robot was developed for cleaning on calm water surface such as on city canal, lake, pond, pool, etc .In this project we are using PIC microcontroller which is the heart of this machine. As this controller is used to connect many peripheral devices we are connecting submersible jet pump along with sprinkler. The main aim of this machine is to lift waste debris from the water surface and dispose them in the tray. It consist arrangement of conveyor which is place on shaft of motor. Due rotation of motor conveyor rotated. As the projecting teeth collects water debris, waste garbage and plastics from water bodies. As the machine is placed in the water the waste debris in water will get lifted and it moves in upward direction. As the waste debris reaches the upper extreme position it will get dropped in

the tray. Hence this will result in cleaning of water surfaces and safe collection of waste debris from water. Here we also don't have energy wastage because we use solar power as our battery.

CONCLUSION:

Plastic pollution in water bodies is a very alarming issue in both local and global arena. Presented prototype offers an extremely low cost, safe and effective means of floating trash removal with low maintenance cost, easy controlling and monitoring system giving feasible solution to the problem of plastic pollution in water bodies. There are several prototypes for cleaning floating waste from water bodies. Some of them have been employed commercially as well. Most of the available devices are manned and require a greater man power and involve a risk element for the operator. Again most of the proposed designs use oil based fuels which have the risk of leakage into water and polluting it further. This project is emphasis to provide flexibility in operation. This is easy in operation and cost of maintenance is low. Hence this project "Robotic trash removal in water bodies" is mostly designed to make system very much economical and helpful to remove water impurities like plastics, trashes, water debris which is floating on river and pond surface. This is mainly very useful maintaining human health and for increasing the life of aquatic animals.

FUTURE SCOPE:

Now as the days go the world facing biggest problem of floating garbage. And it is increasing in tremendous amount so it is very difficult to clean all this floating garbage because of more requirement of manpower. So, in future this remote operated floating river cleaning machine has more scope to remove large capacity of garbage automatically as fast as possible. And by making modifications in this machine, this is used for automatically removing garbage from beaches also. The plastics collected from here can be recycled in the near future.

Fig.7 Future of plastics

REFERENCES:

[1] M. Eriksen, "Plastic pollution in the world's oceans: more than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea," PLoS ONE, vol. 9, no. e111913, 2014.

[2] L. C. Lebreton, J. Van der Zwet, J.-W. Damsteeg, B. Slat, A. Andrady, and J. Reisser, "River plastic emissions to the world's oceans," Nature communications, vol. 8, p. 15611, 2017.

[3] U. Nations, "The united nation's cleaseas programme," 2018. [Online].

Available: http://www.cleanseas.org/get-informed

[4] U. Nations, "The united nation's wold environment day," 2018.

[Online].Available: http://www.worldenvironmentday.global

[5] P. Kershaw, "Biodegradable plastics and marine litter: Misconceptions, concerns and impacts on our marine environments," 2015. [Online]. Available: http://unep.org/gpa/documents/publications/ BiodegradablePlastics.pdf

[6] UNEP and GRID-Arendal., "Marine litter vital graphics," United Nations Environment Programme and GRID-Arendal, 2016.

[7] A. Andrady, "Micro plastics in the marine environment," Marine Pollution Bulletin, vol. 62, no. 8, pp. 1596–1605, 2011.

[8] L. Lebreton, B. Slat, F. Ferrari, B. Sainte-Rose, J. Aitken, R. Marthouse,

S. Hajbane, S. Cunsolo, A. Schwarz, A. Levivier et al., "Evidence that the great pacific garbage patch is rapidly accumulating plastic," Scientific reports, vol. 8, no. 1, p. 4666, 2018.

[9]. Marie Y. Azzarello and Edward S. Van Vleet: "Marine birds and plastic pollution"; Marine ecology - progress series, Vol. 37: 295303. 2006.

[10]. Syeda Azeem Unnisa and Bhupatthi Rao, "Plastic Waste Management Strategies for Indian Cities"; Journal of Chemical, Biological and Physical Sciences, Nov.2011-Jan.2012. Vol.2.No.1, 514-518.

[11]. YashMenaria, RupalSankhla "Use of Waste Plastic in Flexible Pavements-Green Roads";; Open Journal of Civil Engineering, 2015, 5, 299-311.

[12]. JunzhouHuo, Shiqiang Yu, Jing Yang and Tao Li "Static and Dynamic Characteristics of the Chain Drive System of a Heavy Duty Apron Feeder";, The Open Mechanical Engineering Journal, 2013, 7, 121-128.

[13]."www.elastec.com/workboats/marine-trash-debris-collection -boat "for detailed working of skimmer debris removal boats used in seas.