iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VI **Month of publication:** June 2020

DOI: http://doi.org/10.22214/ijraset.2020.6024

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VI June 2020- Available at www.ijraset.com

AQUABIN

Prof. Roopa M[1], Kinnari Prakash K[2], Naveen Kumar A[3], Pradyumna B S[4], Varsha Patil[5]
[1, 2, 3, 4, 5]*Electronics and Communication Department, Dayananda Sagar College of Engineering*

Abstract: ***Aquatic waste has to be monitored with great interest to the ecosystems, marine life, human health, and water transport. This paper presents the design and implementation of AQUABIN-a sustainable floating garbage bin that could collect water borne plastics and trash 24 hours a day over time. Our approach is to provide practical solutions to reduce the plastics in our oceans which are one of the world's greatest environmental problems. For this purpose, we utilise a level sensor to identify the level of waste present inside the device. Once the level is detected, the notification is sent to waste disposal unit using IOT for disposal of the waste and reinstall the inner filter component for reuse. Once the notification is received, the waste present inside is cleared and the water present inside the bin is pumped back into the ocean using a water pump. The various sensors and driver circuits are placed in different sections in the device and the information is collected by using IOT.***
Keywords: aquatic waste, AQUABIN, tangible solution, environmental problems, IOT.

I. INTRODUCTION

Lakes and other natural water bodies not only provide a number of environmental benefits but they also tend to influence the quality of life of human population while contributing to the local economy [1]. One of the main issues with natural water body in India and around the world is the dumping of solid waste, especially plastics including plastic bags, bottles, micro plastic beads, etc. These wastes on water surfaces tend to block out the sunlight, depriving the aquatic life under the water surface from receiving any nutrients and minerals. Furthermore, plastics also behave as choking hazards for aquatic life. Plastics Production volumes have soared globally over the past 70 years [2]. Plastic debris is at present recognized as an emerging potential threat for natural environments, wildlife and humans. To overcome environmental problems effective plastic waste management system required [3][4]. Besides being fatal to the existing life in the water body, such as lake or oceans, solid wastes tend to leach out manufacturing chemicals that are toxic for the water and the surrounding environment.

AQUATIC Waste – human-created waste found in water environments – has emerged to be serious environmental issue.

The existing solutions addressing the oceans pollution problems are typically the "Trash-Boats". These Boats drive around harbours and marinas scooping up rubbish with nets built into them. However, this approach is labour-intensive and unreliable.

A better solution is the usage of Bins [5] which automatically collects the rubbish present on the water surface. This approach has the advantages of low installation cost, Reduced water cleaning time, operates 24/7, sustainable and prior detection and conveying of the information through the usage of IoT.

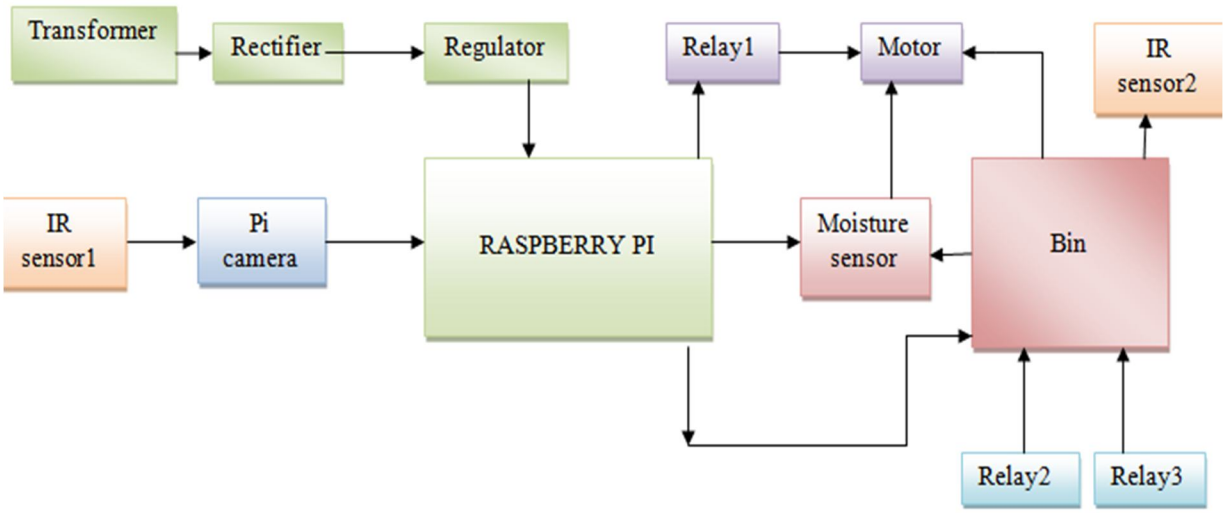


Fig1: Block Diagram of Aquabin

II. OBJECTIVE

The primary goal of this paper is to create a device called "AQUABIN"-a sustainable floating garbage bin that could collect plastics and trash present in the water bodies. Here, we have provided practical and tangible solutions to reduce the trash in water bodies which is one of the world's greatest environmental problems. We are utilizing a level sensor to identify the level of waste present inside the bin. Once the level is detected, the notification is sent to waste disposal unit using IOT for disposal of the waste and reinstalling the inner filter component for reuse.

III.COMPONENTS USED

A. Raspberry Pi 3B

The Raspberry Pi is a powerful, small and lightweight single board ARM-based computer. Apart from the 40 GPIO pins, it provides USB, Ethernet, HDMI and WiFi connectivity as well.

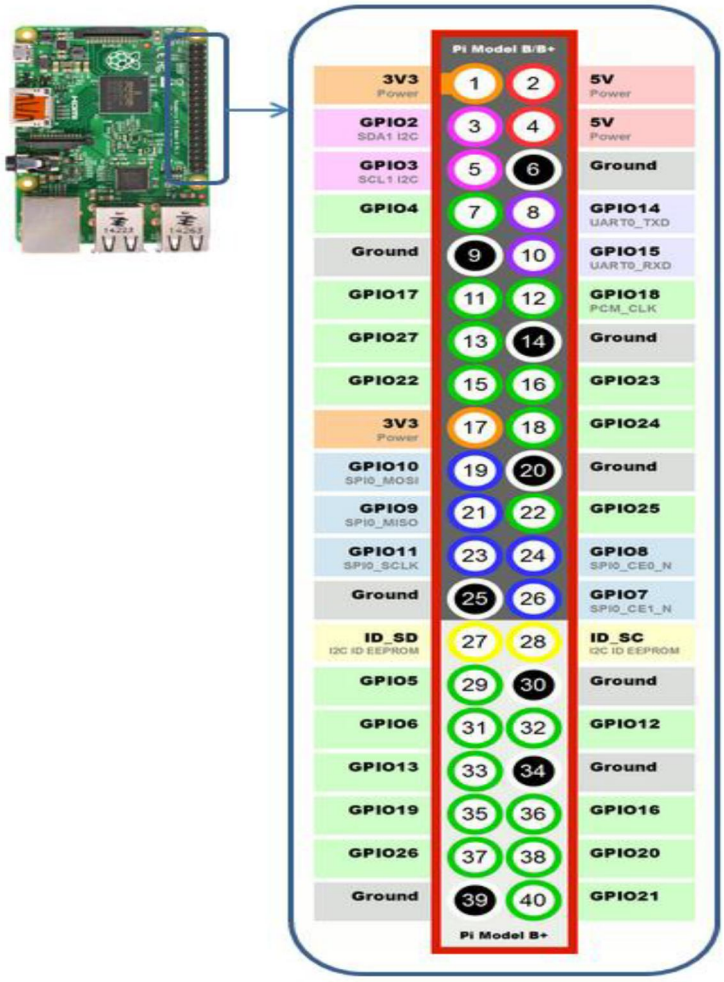


Fig.2. Pin diagram of Raspberry Pi (3B) [6]

The Architecture includes:

1) *Chip:* Broadcom BCM2835 SoC
2) *CPU:* 700 MHz Low Power ARM1176JZFS Processor
3) *Power:* Micro USB socket 5V, 2A
4) *Operating System:* Linux Version booting done using Micro SD card
5) *Memory:* 512MB SDRAM
6) *USB:* USB 2.0 Connector (x 4)
7) *GPIO Connector:* 40 pins (27 GPIO pins with +3.3 V, +5 V and GND lines)

B. Raspberry Pi Camera Module

The module has a five-megapixel fixed-focus camera that supports 1080p30, 720p60 and VGA90 video modes, as well as stills capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi.
The camera module is very popular in-home security applications, and in wildlife camera traps.

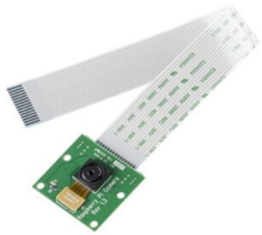


Fig 3. Pi Camera[7]

C. Relays

A relay is an electromagnetic switch. They are used whenever it is necessary to control a high power/high voltage circuit with a low power circuit, or when one signal must control several circuits. The major parts of the relay switch include an electromagnet, a movable armature, switch point contacts and a spring.

D. Infrared Sensors

It consists of two main components-an IR LED (Transmitter) and a photodiode (Receiver). The working principle is based on the reflectivity of the Object. When the receiver receives the reflected rays, it generates a change in the voltage level across its terminals. This voltage level depends upon the intensity of the light reflected back from the object.

Fig 4. IR Sensor[8]

E. Motor

A submersible motor is a device that is used to pump out the water from desired water body. It pumps out the water by converting rotational energy into kinetic energy. It uses less supply voltage (3 ~ 6V power supply) and it's a cost effective device.

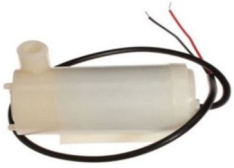


Fig 5. Motor [9]

F. Moisture Sensor

Moisture sensor is a type of sensor used to identify the occupancy of water/moisture in the desired surface. Its output is high when the water content in the desired surface crosses the threshold value, otherwise the output will be low.

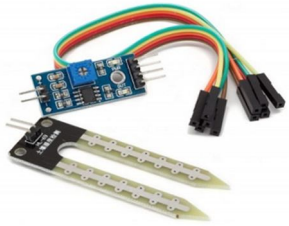


Fig 6. Moisture Sensor [10]

G. OpenCV-Python

OpenCV is an open source computer vision library. It is used by most of the professionals. It is mainly written in C++ and is extended to Python, Java, C# etc.It has many modules for image processing such as histogram, filtering etc.

Python is high-level, general purpose programming language. It is simple and easy to understand. It supports both object oriented programming and procedural programming.

H. Raspbian OS

Raspbian is a free operating system for the Raspberry Pi hardware. Raspbian is the basic desktop version that you can have on raspberry pi running directly from it. Raspbian was built for Raspberry Pi as Linux distribution that works light and fast. Raspbian OS is loaded onto an SDcard.

IV. FLOW CHART

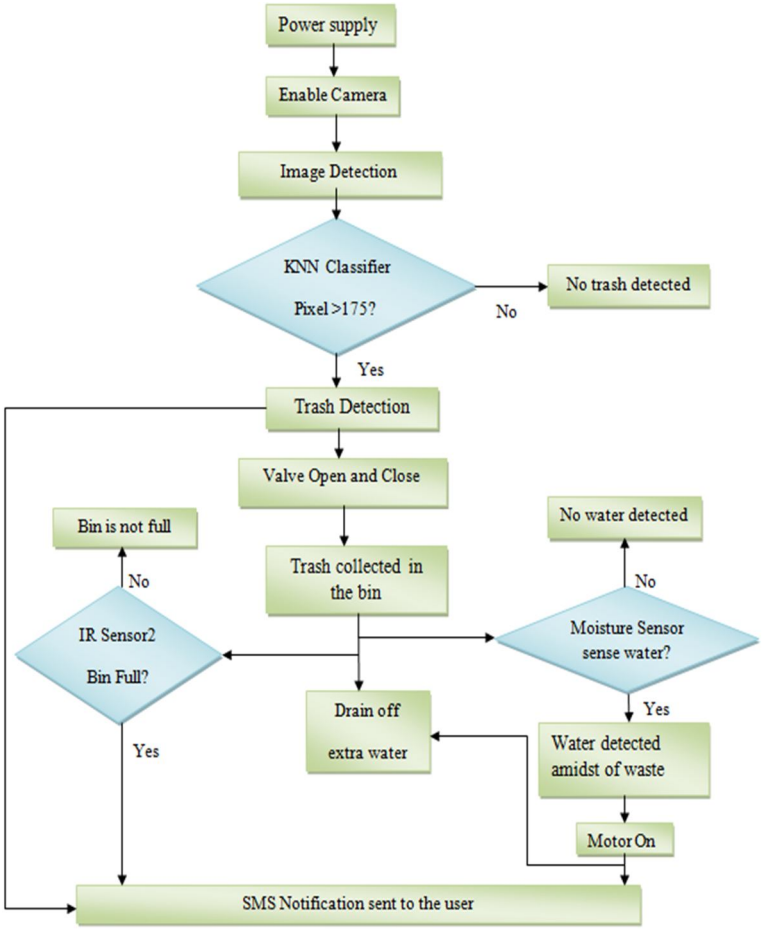


Fig. 7: Flowchart of functioning of Aquabin

Flow chart can be divided into three cases:

1) Case 1

a) When IR sensor1 is enabled by any object then, pi camera starts capturing continuously and sends the images to the raspberry pi for further processing.

b) The raspberry pi trains the images using KNN classifier and finds the value of the image.

c) If the value is less than 175 then the image is not trash. If it is more than 175 then the image is considered as trash.

d) If trash is detected, then relay 2 and relay 3 will get triggered continuously, and open and close the valve of the bin continuously to drain out the water from the bin in order to collect the waste. Also SMS will be transferred to the user if the trash is detected.

2) Case 2

a) When the water gets stuck in the trash, then moisture sensor will turn ON which in-turn turns the motor ON by triggering relay1.

b) Here also SMS will get transferred to user once motor turns ON.

c) Once the water is drained, then moisture sensor will turn off and also turns off the motor.

d) SMS will be transferred in this case too, when motor turns on.

3) Case 3

a) If the bin is full of waste, then the output of the IR sensor2 will become high.

b) Once the output is high, Raspberry pi will send notifications to the user using twilio application.

V. RESULTS

In this paper, the Aquabin is installed as shown in the block diagram. The working of the bin has been conducted and verified for the three test cases. All the results below are shown serially according to the explanation mentioned in the FLOWCHART chapter.

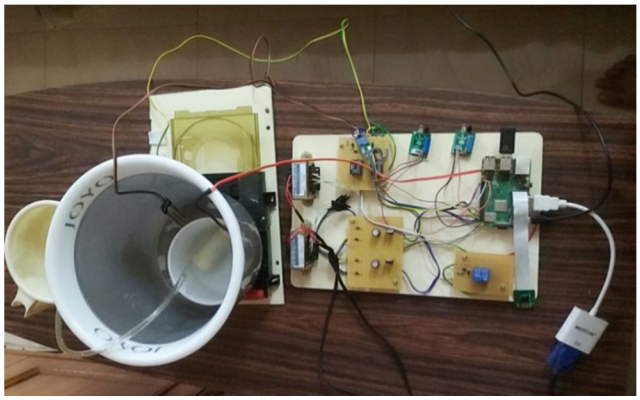


Fig. 8: Apparatus set-up of Aquabin

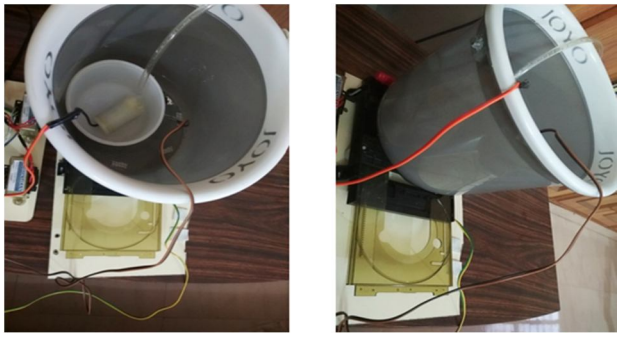


Fig 9. Valve open and close on detection of trash

Fig 10. Water stuck in the trash detected by moisture sensor, motor turns on.

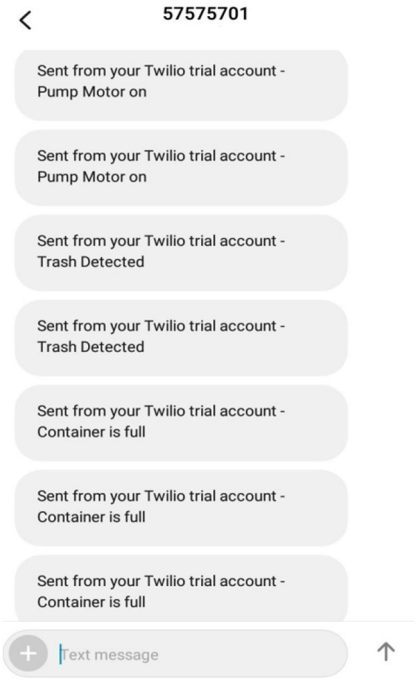


Fig 11. Screenshot of SMS Notification sent to the user.

VI. CONCLUSIONS

The entire purpose of this paper is to design and develop an efficient solution to collect the floating trash or solid waste like plastic polythene bags, plastic bottles container, etc. that are dumped into water bodies every day.

Our approach is to provide practical and tangible solution to reduce the trash in our water bodies which is one of the world's greatest environmental problems.

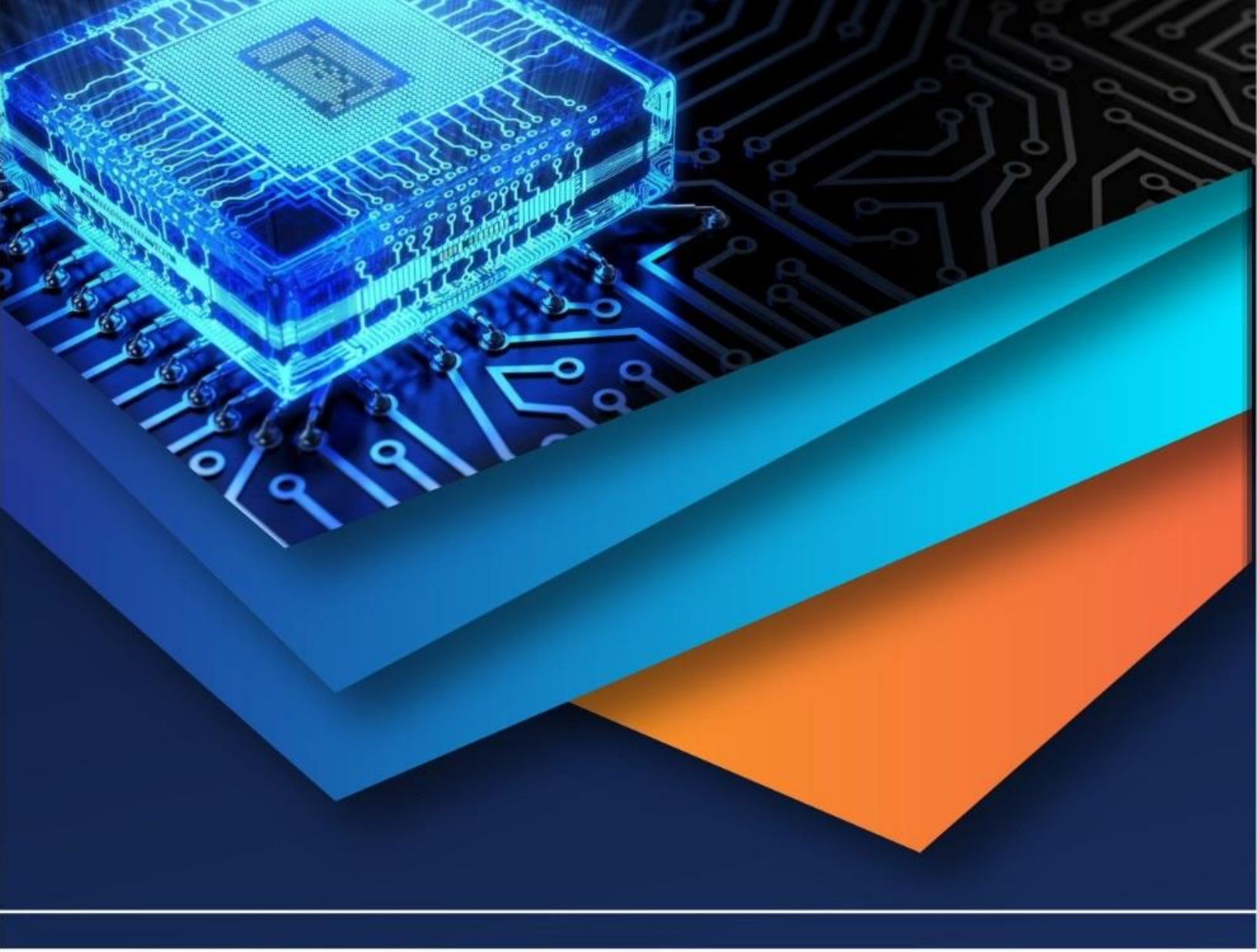
Aquabin will be a revolution in water body cleaning technology which can help us create cleaner water bodies with healthier marine life.

VII. ACKNOWLEDGMENT

The authors would like to thank all the faculty members of the ECE department, DSCE Bengaluru for their continuous support in our research work.

REFERENCES

[1] https://thewatershed.org/how-does-plastic-pollution-harm-water/
[2] Anastasia Bozhko., "Remediation of Marine Plastic Waste," Arcada University of Applied Sciences, May 2019.
[3] Silvia Galafassi., Luca Nizetto., Pietro Volta., " Plastic Sources: A survey across scientific and grey literature for their inventory and relative contribution to micro plastics pollution in natural environments, with an emphasis on surface water," Science of The Total Environment, Volume 693, 133499, 25 November 2019.
[4] Mayuri Chandak., "Plastic waste Management: A Step towards a Smart City," International Journal of Engineering Research in Mechanical and Civil Engineering, Volume 2, March 2017.
[5] https://seabinproject.com/wp-content/uploads/2019/04/seabin_overview_book.pdf
[6] https://www.raspberrypi-spy.co.uk/2014/07/raspberry-pi-b-gpio-header-details-and-pinout.
[7] https://bm-es.com/product/5mp-raspberry-pi-3-camera-module/?gclid=CjwKCAjwiMj2BRBFEiwAYfTbCqFfEvHeFpzCT9zs9peQPPzHVuBH2yDXqcfdDrFJhdGSgN1EEiCbYBoCyYkQAvD_BwE
[8] https://www.mytechnocare.com/product/ir-infrared-obstacle-avoidance-sensor/
[9] https://www.electronicscomp.com/submersible-mini-water-pump-india
[10] https://www.electronicscomp.com/soil-moisture-sensor-module-india



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY