ARTIFICIAL INTELLIGENCE ENABLED ROBOTIC TRASH BOAT TO DRIVE AND HARVEST FLOATING TRASH FROM URBANDRAIN.

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***Abstract*—A significant amount of floating garbage is entering urban drainage systems, from which it may be able to move through streams, rivers, lakes, and estuaries before reaching the open sea. It is possible to create a robotic garbage boat prototype using artificial intelligence that can collect floating debris from storm drains. The project's primary goal is to clear the urban drain of floating debris in order to lessen sewage obstruction. Numerous lives will be saved if this urban sewer gets cleaned without human assistance. In the suggested approach, floating garbage is cleaned up by an automated robot. As a result, there will be less interaction with insects and hazardous fumes. A little subterranean or roadside waterway is called an urban drain. In order to prevent a blockage over here, the garbage or obstruction from this ditch needs to be removed. This won't clean well enough with manual power. Additionally, manual cleaning tends to cause the cleaners a lot of issues. These factors reduce the significance of the automation. The sewage in the factories will also be cleaned thanks to this robotic technique. Manually cleaning drainage pipes is a challenging task as well. So, in order to gather down the waste in drainage, an automation is needed.**

***Index Terms*—hazardous fumes,little subterranean, obstruction,floating debris**

I. INTRODUCTION

Water is a precious natural resource that is essential for all types of life on Earth. Despite having an abundance of water, water contamination is a serious problem in many nations. 80Floating trash, weeds, plastic litter, sewage, industrial waste, and effluents are all polluting water bodies. In poor nations, water contamination by floating trash is a severe problem that requires rapid response. In the Indian context, the union government is focused on initiatives like "Swachh Bharat" and "Smart City" to fulfil the vision of a Clean and Smart India [1]. Additional initiatives with an emphasis on "Namami-Gange" and "Narmada Bachao". Concentrate on restoring rivers through efficient pollution management and control. One of the major objectives of the initiatives mentioned above is to clean the river's surface in order to remove the solid floating garbage. The river cleaning initiative has received significant funding from the Indian government. According to figures from the Central contamination Control Board (CPCB) [2], water contamination has increased significantly. Throughout the previous few years, bodies. The water quality index further asserts that the river water is unsafe for drinking, bathing, or fishing. Because of this, non-automatic cleaning of water bodies is not at all suitable. Additionally, the health and hygiene of the workers performing manual cleaning suffers greatly. In addition to injuries brought on by work-related accidents, health implications can include musculoskeletal, digestive, and vector-borne infections. This means that approaches that automate the current infrastructure for cleaning the surface of rivers in a cost-efficient manner with minimum technology and that are accessible to the general people will be very effective, which is exactly what our water cleaning bot project will achieve. The objective of this project is to offer automatic oversight to gather Throughout the previous few years, bodies. The water quality index further asserts that the river water is unsafe for drinking, bathing, or fishing. Water bodies that are not automatically cleaned are not at all suitable. The sanitation and health of the workers, as well as the waste that is present

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on the water's surface. For our water collection bot's Arduino model and construction, we used Solid works and Proteus software. For the analysis of our model, we employed the Unity programme. It will scoop up waste from the water's surface and deposit it in the tub set up behind the robot. For the movement of the bot and collector, two motors are added to the circuit. Testing revealed the ability of the bot to Throughout the previous few years, bodies. The water quality index further asserts that the river water is unsafe for drinking, bathing, or fishing.

utilised successfully to gather and eliminate the water's waste. This robot can support up to 7 kg of rubbish at once. The project outlined in this article intends to create a water craft with a collector that can find, gather, and deposit trash from water sources into a tub, cleaning the water sources as a result.

II. LITERATURE SURVEY

Before presenting our own answer in detail and understanding the need for a more compact, affordable, and adaptable framework, we must first comprehend the prior study and work that has been done in the area. As a result, a wide range of research articles were examined in this part to gather pertinent data on the project. Garbage collecting robots have been created by Sirichai Watanasophon and Sarinee Ouitrakul [1] utilising wireless communication on the beach. An IP Camera that can provide a live feed to the user and a Bluetooth module for wireless connection make up the mobile robot system. The autonomous trash collector bot created by Shobhit Khandare et al [2] will be built on a Raspberry Pi. Obstacles are detected by ultrasonic sensors, and the motors are designed to depending on the Raspberry Pi's pre-programmed instructions, spin. Here, the image processing method just determines whether or not the object is an animal. Garbage collection was proposed by Kamal et al [3]. employing wireless technologies, a robot. With the use of a programme created from a web application, the user may operate a robot. Everything was done on Proteus simulations; the robot was never ever tested on actual terrain. As a result, no real-world scenarios or difficulties were even explored, making it potentially unreliable for testing. Garbage collection was proposed by Kamal et al [3]. employing wireless technologies, a robot. With the use of a programme created from a web application, the user may operate a robot. Everything was done on Proteus simulations; the robot was never ever tested on actual terrain. As a result, no real-world scenarios or difficulties were even explored, making it potentially unreliable for testing. The Autonomous Garbage Collector Robot created by Apoorva et al. [5] employs a shaft with revolving blades to suck up trash, which is a very good and efficient scooping mechanism. Therefore, this device will grab everything it detects within a certain distance and dump it. The Smart Dustbin was created by Twinkle et al. [6] and immediately alerts the user when the dustbin is full of waste to a particular level and has to be cleaned or emptied. The robot for collecting metallic garbage was created by Alshafi and Almaleky [7] with the primary goal of decreasing the environmental degradation brought on by metallic waste. In order to gather trash from the rivers, Nurlansa and the team [8] designed an Automatic Garbage Collector. The garbage collector was created using engineering principles, and its primary propulsion system is a rotor. Sensors are also used for the robot's automated navigation. Anukriti Jha et al. [9] suggested creating an aluminium-built autonomous garbage collection robot.When it detects an impediment, it complies with the rules and continues to lift the trash using the intended mechanism. Presented by Ketan H. Pakhmode et al. A boat with solar electricity for collecting trash on the water's surface is highly useful. By removing the trash that is floating on the water's surface. This idea uses solar energy instead of an external power source, works autonomously, and saves labour costs. The majority of recent work consists mostly of ideas and models. Numerous papers were offered but never even tested under real-world circumstances or challenges, therefore it could not be dependable for someone who wants to test. Proximity-based minimal effort models are unable to discriminate between rubbish and other items. These deals lead to erroneous consequences. Precise robots that use computer vision and video processing employ the most cutting-edge processors for AI computations, which drives up the cost. So, we anticipate to deliver the best by producing accurate results without relying on powerful CPUs and GPUs. Additionally, we want to lower the cost through our suggested structure, creating a more flexible framework for the production of self-governing cleaning robots.The testing findings demonstrated that utilising this strategy, encoding time can be reduced by 30[10]We have discussed some of the potential uses of recent wavelet-based denoising methods for medical ultrasound, magnetic resonance images, and some tomography imaging techniques, such as positron emission tomography and computer tomography imaging, in clinical investigations of the brain[11]

III. EXISTING SYSTEM AND PROPOSED METHODOLOGY

A. Existing System

To find the trash, the current systems use merely standard sensors. And because these systems require full manual operation, they are not automated. These earlier systems will have them stationary. The external inputs will provide all of the controls. This device will offer a simple way to collect garbage utilising a chain and a plate. The most popular methods for removing water from our bodies are using human force or Boats are rarely used when advanced technology is available. It takes a long time because we require a lot of human energy to do this. Now, the level of pollution is 100 times greater in certain areas. than the cap set by Indian authorities. The biggest river in India has the most plastic garbage pollution. The Ganges River is estimated to release 1.2 billion kilogrammes of plastic into the seas annually.

B. Proposed Methodology

A boat is created and designed in this system to be passed via the drainage streams. To find the garbage and pick it up, the boat will include an ultrasonic sensor. The majority of the time, there will be enormous floating rubbish in drainages, such as bottles and plastic waste, which will merely obstruct the flow of the drain water.Therefore, the robotic garbage collection Sheet would gather the trash when it saw some floating rubbish.

C. Hardware process

Here, the Ultranoic Sensor automatically adjusts its path so that it may only gather the garbage identified by the Ultrasonic Sensor when it detects something abnormal in addition to trash, such as a wall or the bank of a river, lake, or other body of water. This entire procedure will be carried out automatically here without the need for outside guidance.

D. Software process

First The Robotic Boat prefers to gather rubbish that the Ultrasonic Sensor detects when it is positioned in a certain way in the water bodies. The Ultrasonic Sensor will send an update to the motor driver shield and the motor will start so that it can collect trash in water bodies as soon as it detects an obstacle. This code is returned from Arduino as soon as the Ultrasonic Sensor detects an obstacle. The Hylem Sheet, which tends to remove the appropriate floating item, causes the entire procedure to occur.

IV. COMPONENTS USED

A. Arduino Uno

One of Arduino's standard boards is the UNO. The Italian word UNO here is for "one." To identify the initial release of the Arduino Software, it was given the moniker UNO. It was also the first USB board that Arduino has ever released. It is regarded as a strong board that is employed in many projects. The Arduino UNO board was created by Arduino.cc. The ATmega328P microprocessor is the foundation of the Arduino UNO. Compared to other boards, such the Arduino Mega board, etc., it is simple to use. The board is made up of shields, various circuits, and digital and analogue Input/Output (I/O) pins. The Arduino UNO has 14 digital pins, a USB port, a power jack, and an ICSP (In-Circuit Serial Programming) header in addition to 6 analogue pin inputs. It is written using IDE, which Integrated Development Environment, or IDE. It is compatible with offline and internet platforms. All of the Arduino boards that are available share the same IDE.

Microcontroller ATmega328: This member of the ATmel family is a single-chip microcontroller. Its processor code is 8 bits in size. In addition to Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator, it also has oscillator. The In-Circuit Serial Programming (ICSP) pin enables programming with the Arduino board's firmware. Power LED Indicator: An ON LED indicates that power is on. The LED won't light up if the power is turned

Fig. 1. ARDUINO UNO

off. Digital I/O pins: Digital pins can be HIGH or LOW in value. Digital pins have a number from D0 to D1[12]. TX and RX LEDs – The illumination of these signals denotes a successful data transfer LED's. The Arduino UNO board receives a reference voltage from the external power source through the Analog Reference (AREF) pin. Reset button: It is used to give the connection a Reset button. The board may connect to the computer through USB. It is necessary for the Arduino UNO board's programming. Crystal Oscillator: The Arduino UNO is a robust board thanks to the 16MHz crystal oscillator. Using a voltage regulator, the input voltage is changed to 5V. GND: Ground pins. The ground pin functions as a pin that is not powered[13]. The input voltage is known as Vin. The pins with the letters A0 through A5 are known as analogue pins. It is the job of analogue pins to examine the analogue sensor that was connected. GPIO (General Purpose Input Output) pins can also be used with it. The Arduino board's USB connection is used to link the board to a computer through a USB cable. The cable functions as the board's power supply and serial port. Due of its unusual dual functionality, it is simple for beginners to operate. Compared to the Arduino UNO, the Arduino Nano is smaller and comes with a little USB connection.

Technical Information about the Arduino UNO The following is a list of the Arduino UNO's technical specifications: The Arduino UNO board features 20 input/output pins. Six PWM pins, six analogue pins, and eight digital I/O pins are all part of the 20 pins. • The PWM pins can be used for pulse width modulation. The Arduino UNO also contains an inbuilt WiFi module from Arduino and a crystal oscillator with a frequency of 16MHz. This Arduino UNO board is powered by an ATmega328P microprocessor and an integrated WiFi ESP8266 module[14]. • The UNO board's input voltage ranges from 7V to 20V. The external power supply is automatically used to power the Arduino UNO. It can also use the USB to get power.

B. Ultrasonic Sensor

An ultrasonic sensor is a piece of technology that uses ultrasonic sound waves to detect a target object's distance and then turns the sound that is reflected back into an electrical

signal. The speed of audible sound is greater than the speed of ultrasonic waves. (i.e. the sound that humans can hear). The transmitter (which generates sound using piezoelectric crystals) and the receiver are the two major parts of an ultrasonic sensor. (which encounters the sound after it has travelled to and from the target).

Fig. 2. ULTRASONIC SENSOR

The sensor monitors the amount of time that passes between the transmitter's sound emission and its contact with the receiver in order to determine the distance between the item and the sensor. D = 12 T x C is the formula to use for this computation, where D is the 343 metres per second is the speed of sound, distance, time, and C. The distance between the ultrasonic sensor and the box, for instance, would be D = 0.5 x 0.025 x 343 if a scientist put up an ultrasonic sensor pointing at a box and it took 0.025 seconds for the sound to bounce back.

C. BO Motor (Battery Operated)

DC geared motor that is BO (Battery Operated) and is lightweight and efficient at lower voltages. When powered by a single Li-Ion battery, this motor can rotate at a speed of about 150 RPM. Excellent for battery-powered light robots. Battery Operated (BO) motors are a particular class of DC geared motors that may be powered by batteries. The majority of its uses are light-weight ones. available in various torque and RPM ranges Features: 4.5 to 9 volts in input range;
0.07 amps in current rating (maximum on load) Speed: 100 RPM plus 10The BO Motor by Ansoz is used in engineering projects, science projects, robotics, Arduino programming, project design, internet of things (IoT), science exhibition, do-it-yourself (DIY), embedded systems, training, experiments, and robot building.projects for diplomas, scientific models, Raspberry Pi, apps for augmented reality and virtual reality, and other functional models. The BO Motor may also be utilised for academic, domestic, laboratory, collegiate, or other vocational courses. Lightweight DC geared motor called a "Bo motor" (battery operated) that produces good torque and rpm at lower voltages. You may get bo motors with different rated speeds here. When powered by a single Li-Ion battery, this motor can rotate at a speed of around 200 rpm.

Fig. 3. BO MOTOR

Battery-operated DC motor. Electrical energy is transformed into mechanical energy by a dc motor. Why is a robot's motor control circuit using a DC gear motor. Gear reduction is a DC MOTOR idea in which the vehicle's speed is decreased while its torque is increased. A DC motor is constructed using several a gear arrangement. RPM stands for revolutions per minute, which is how motor speed is measured. RPM is short for revolutions per minute. The set-up assembly aids in boosting torque while lowering motor speed. This sort of DC motor may be utilised with any robot that is microcontroller-based.

D. Dual Full Bridge Driver(L298D)

The 15-lead Multiwatt and PowerSO20 packages contain a massive integrated circuit called the L298. It is a high voltage, high current twin full-bridge driver made to drive inductive loads including relays, solenoids, DC motors, and stepping motors at standard TTL (Transistor-Transistor Logic) levels. To enable or disable the device independently of the input signals, there are two enable inputs available. A circuit known as an H-Bridge may drive current in either direction and is pulse width modulated. (PWM). Using pulse width modulation, one may manage . 1) High working voltage, which

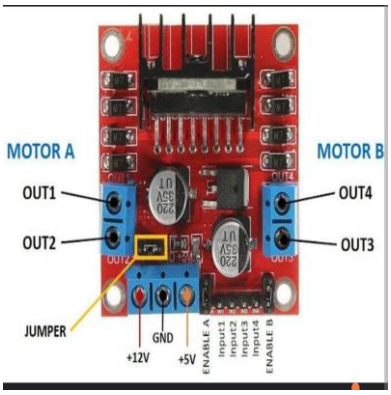

Fig. 4. DUAL FULL BRIDGE DRIVER

may reach 40 volts; 2) Large output current, with a maximum instantaneous current of 3 A; 3) Rated at 25 W; 4) Two built-

in H-bridge, complete bridge drivers with high voltage, huge current, and are able to drive DC motors, stepper motors, relay coils, and other inductive loads. 5) Controlling via a common logic level signal. 6) Capable of driving two-phase DC motors as well as four- or two-phase stepper motors. 7) Use a freewheeling diode and a high-capacity filter capacitor to prevent circuit components from being harmed by an inductive load's reverse current, increasing dependability.

8) The module may draw 5 volts from the battery using the integrated stabile tube 78M05. power source. However, when the drive voltage is higher than 12 volts, an additional 5 volt logic supply should be utilised to prevent damage to the 78M05 chip. 9) Logic voltage: 5V; drive voltage: 5-35V 10) 4.2 x 4.2 cm PCB size.

E. Motor Driver Shield

One of the finest methods for controlling DC motor, Servo motor, and Stepper motors on a single board is the L293D Motor driver shield. Four DC motors, two Servo motors, and two Stepper motors may all have their rotational direction and speed controlled. Connecting to an Arduino UNO or MEGA is simple. This shield is very useful for Arduino projects like CNC and robots. Two L293d dual-channel H-Bridge motor driver ICs and a 74HC595 shift register IC make up this module.

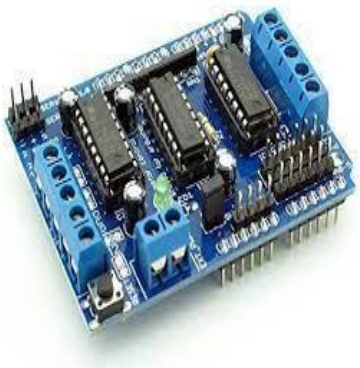

Fig. 5. MOTOR DRIVING SHIELD

This extension shield has servo motor, two DC motor, and stepper motor driving capabilities. All you have to do is connect the shield to the Mega2560 or Uno board. In order to drive a large-current motor, you can connect an external supply for the Motor Driver Shield and the control board. It is powered by two sources: when linked to a control board, it receives power from the output of the board. The shield has an indication LED. You may turn off the shield using the switch when it's not needed, and the control board won't be affected. 6.5V to 12V is the operating voltage.

F. 18650 LI-ION Recharable Battery

This 1200mAh 18650 battery is authentic. A Li-ion rechargeable battery with a 1200 mAh capacity is the 18650 battery. Although it is not a regular AA or AAA battery, this one is highly helpful for devices like cameras, DVD players, iPods, and others that need high current either continuously or briefly. A 18650 cell may undergo up to 1000 charges and discharges without significantly losing battery power. They have extended battery lives, are safe to use, and are environmentally friendly.

Fig. 6. LI - ION BATTERY

It has a high energy density and offers your device great continuous power sources. It should be used in conjunction with a protective circuit board to safeguard the battery from overcharging, overdischarging the pack, and avoiding drawing too much current.

G. Castor Wheel

Designed to be mounted to the base of a larger object and used to move it, casters are non-powered wheels. Shopping carts, office chairs, hospital beds, and material handling equipment all use caster wheels. Caster wheel variants come in a broad variety and vary significantly depending on the needs of the application. With qualities like strength, corrosion resistance, water resistance, and weather resistance, it is an excellent mobility aid. Caster wheel applications require accurate size based on the surface they will be operated on and the weight they are intended to support.

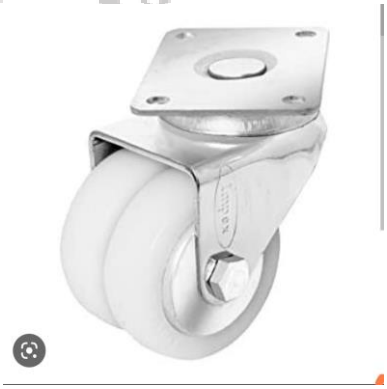

Fig. 7. CASTOR WHEEL

In order to distribute weight uniformly, larger, heavier objects may require additional wheels or casters with thicker wheels.

H. Hylem Sheet

Where mechanical strength, wear resistance, and resilience are more crucial than electrical insulation, hylam sheets are utilised.

Fig. 8. HYLEM SHEET

Gears, textile shuttles, bearings, pickers, bushes, and maritime application are some common uses for fabric laminates. Various grades are available to suit various uses.

Phenolic Resin Bonded Cotton Fabric Laminates (SRBP) or cotton fabric reinforced phenolic are made of a continuous cotton woven fabric that has been impregnated with phenolic resin binder. They are natural in colour (light tan to brown). In addition to these names, BAKELITE sheet is sometimes referred to as Hylam sheet, Tufnol sheet, Norplex sheet, Micarta sheet, Phenolic sheet, Fabric sheet, Laminated sheet, and Synthetic Resin Bonded Fabric foundation sheet. (SRBF).

I. L293d motor driver IC

A dual-channel H-Bridge motor driver is the L293D. One IC may manage either one stepper motor or two DC motors. The L293D is made to deliver peak output currents of 1.2 A per channel and bidirectional driving currents of up to 600 mA at voltages ranging from 4.5 V to 36 V.

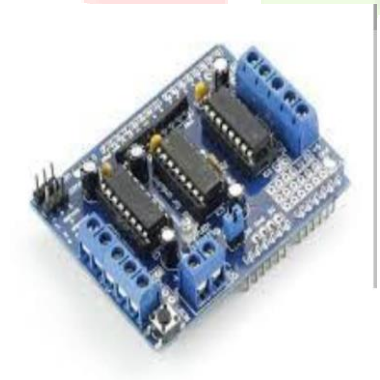

Fig. 9. L293d motor driver IC

Two enable inputs on this IC are available for independently enabling and disabling the device regardless of input signals.

Two L293D motor driver ICs are included on the motor driver shield. The L293d shield may therefore control either one stepper motor or four DC motors.

V. WORKING PROCESS

We have developed a prototype of an Artificial Intelligence Enabled Robotic Trash Boat that is capable of harvesting and harvesting floating trash from urban to drain areas. Ultrasonic Sensor, Bo Motor, L298D, Motor Driver Shield, Hylem Sheet, Arduino UNO In addition to this, the fundamental parts that are employed throughout robot operation are also utilised here. Batteries, castor wheels, and PVC bodies are a few of these essential parts. It gathers rubbish using a Hylem sheet that is put at the front of the robotic boat, as indicated in the above image, and it also collects trash that is retrieved from the river. This river cleaning equipment operates utilising artificial intelligence.

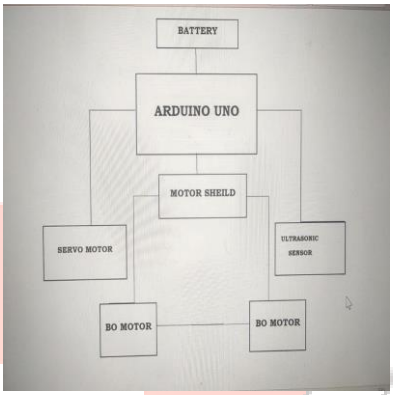

Fig. 10. BLOCK DIAGRAM

Then river is sent immediately by that hylem sheet to the bin attached to the Robotic Boat. The process which happens in this construction of AI enabled Robotic Boat is when the robot is kept in the water with the help of ultrasonic sensor it sense the obstacle, whenever there is any obstacle in front of ultrasonic sensor it sends message to Arduino whether the obstacle is of the size which we set in the Arduino code which is dumped in that Arduino UNO, If the Obstacle size meets the criteria (in terms of size) set by user in the code , then Arduino UNO immediately sends command to Motor Driver Shield then it turns on the motor which will help the Hylem sheet movement which will immediately catch up the trash ,our project can detect trash upto 40 cm. If there is any obstacle which is greater than the size criteria set by the user in Arduino code detected by the ultrasonic sensor then it again sends message to Arduino UNO ,then it sends command to motor (298)whether to send in left side or right side based on the obstacle i.e. river banks then it automatically takes left or right based on the obstacles sensed by the Ultrasonic Sensor.

VI. RESULT

Any form of drainage system may be sent by this robot. (small, medium, large).This floating rubbish may be readily gathered. This robot can keep the drain clear and unblocked.

Mosquito population growth can be slowed. Plastic waste pollution may also be eliminated.

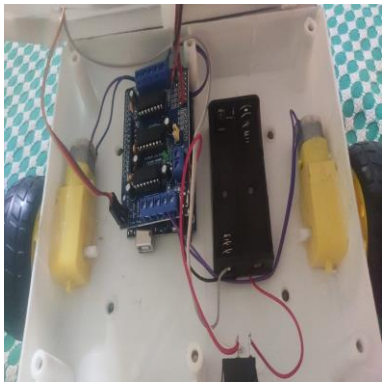

Fig. 11. OUTPUT 1

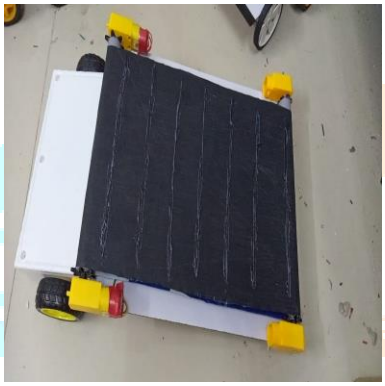

Fig. 12. OUTPUT 2

The problem of floating rubbish is especially prevalent in metropolitan areas. Due to the rubbish clogging up the region, there would likely be an overflow of drainage water in that location. Furthermore, the stagnant water will breed more mosquito larvae. These drainage waters will have a significant negative impact on people's health. These trash must thus be eliminated from the area for these crucial reasons.

A. Context:

This has a boat-like mechanical mechanism with a bin to collect the rubbish. The garbage from the river is collected using hylem sheets.

B. Electrical system

Here, the complete system is powered by a single DC battery. A solar panel is also included. is employed as a backup battery.

C. The system has the following benefits: It is simple to use. This system is affordable, and it's simple to rectify any issues and replace it. There is less labour involved in this, and many lives of labourers would be saved. This machine will be portable and light, and it will use less electricity. Large amounts of trash will be gathered and supplied to recycling here.

D. Usefulness: Any form of drainage system may be sent by this robot. (small, medium, large).This floating rubbish may be readily gathered. This robot can keep the drain clear and unblocked. Mosquito population growth can be slowed. Plastic waste pollution may also be eliminated.

VII. CONCLUSION

This will enable the spread of the illnesses to be slowed down. Many employees have perished as a result of poisonous fumes in the drain, but if you use this, no such issues will develop. The proper placement of the floating items will be determined since this approach makes use of sophisticated programming. The portability of this robotic technology allows for time savings. This would be simple to afford and uses less energy. This system can be more efficiently developed here, which makes it possible for it to be extensively used. It is simple to clean drainage from both industrial and urban drains with these automated equipment that use cutting-edge technology. For our nation, such In India, this technology will be more helpful in cleaning the drains because it is more efficient. By using this approach to handle drainage waste water, plants may be watered and toilets can be cleaned. The wet seasons will make this robotic system more helpful because drainage will be more likely to become clogged then.The suggested framework was successfully implemented. By using our suggested architecture[15], we also want to dramatically lower prices and open up the market for a variety of self-sufficient cleaning robot designs. Our robot can eventually be enhanced such that it can distinguish between static and moving things. We may design our undertaking so that the robot should possess the capacity to distinguish between metallic and non-metallic items. We may also create a "Automatic Waste Segregator" that separates garbage into three categories: dry, moist, and metal. Additionally, it is effective since the greatest features from previous progress have been adopted and improved into a single integrated framework.

VIII. FUTURE SCOPE

Sewage drains are open in India. Many individuals discard their non-biodegradable garbage, including plastic bottles, covers, and other plastic items. Cleaning up these Ares will be more beneficial for this project. This technique would be used in the future to clean the entire lake as well. This initiative promotes national cleanliness and health.

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