

CLEANIT

Smart solution for a massive problem

Clogged drain or sewer system is a major issue in Bangladesh, especially in the urban areas. We are working on an AI (Artificial Intelligence) based Autonomous Smart Robot which is capable of analyzing the water surface, detecting wastages and collecting them. Our prototype CLEANIT is smart robot which have a very capable MCU (Micro Controlling Unit) which will work along with some sensors and Deep learning Capable AI interface. We are trying to create a synced CLEANIT robot network in our sewer system, these robots will work autonomously to collect wastes. When the waste bucket gets filled, the technician can manually override the control and bring the robot in his convenient spot, detach the waste bucket, clean it and attach it again.



Major Components:

Shell- To make the shell we will use Polycarbonate materials, which is perfect for wet environment. They are also lightweight and less expensive. The shell can be manufactured by molding or 3D printing.

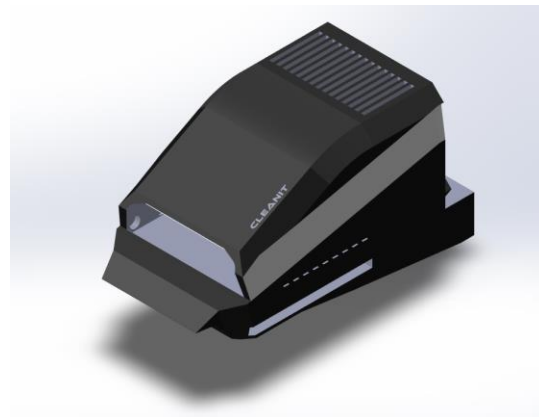


Fig.01. Shell

MCU (Micro-Controlling Unit)- This is the brain of our prototype. We will use Raspberry Pi 4 as our MCU. It is one of the most advanced micro controllers currently.



Fig.02. MCU (Raspberry Pi 4)

Conveyer- This part will guide the wastes towards the shredder after collecting it from the water. A motor will rotate the rollers of the conveyer.

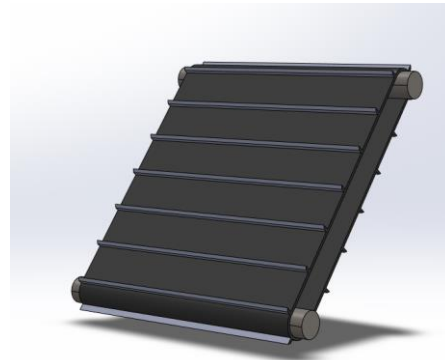


Fig.03. Conveyer

Shredder- This part of the robot will shred the waste into smaller pieces so that more wastes can be stored in the Waste Bucket.

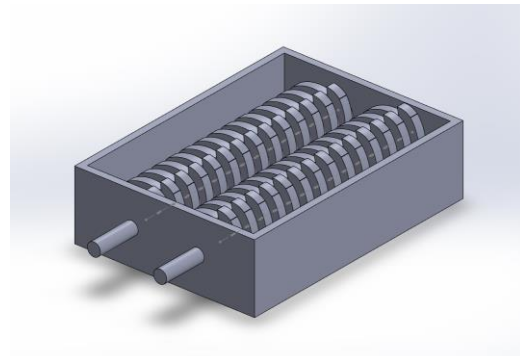


Fig.04. Shredder

Waste Bucket- This is the part where the wastes will be stored after getting shredded. It can be easily ejected and attached with the main robot body. Has a lid so that the user can dump the wastes easily, it's also made of Polycarbonate Materials so that it's lightweight and easily washable.

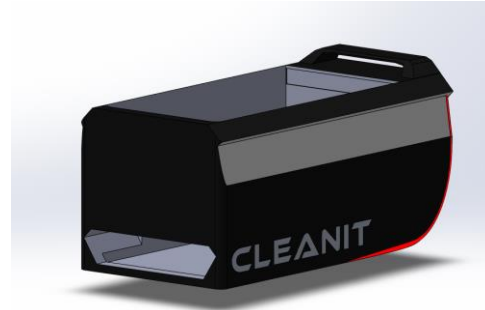


Fig.05. Waste Bucket

D775 DC Motor- We will use D775 DC motor for the propeller's rotation. It is capable of producing high RPM (13000-19000) and work under 12V-36V.

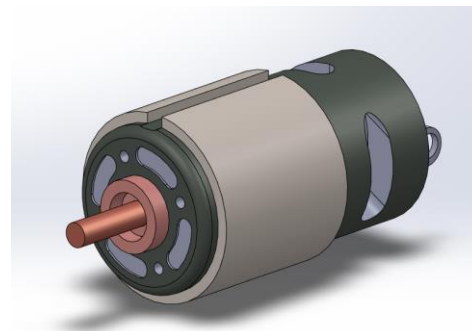


Fig.06. D775 DC motor

Propeller- We will use brushed steel made propeller for the robot's movement which will be connected with the D775 motor.

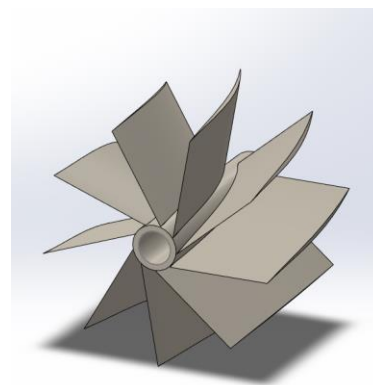


Fig.07. Propeller

Battery Unit- We'll use a Li-Polymer based Battery unit for powering the robot. The battery can get recharged easily from a 220/240V household power socket.

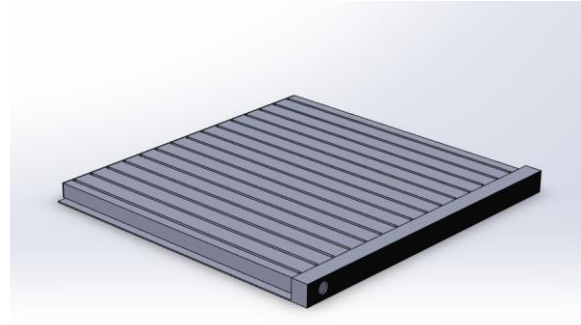


Fig.08. Battery Unit

Fins- Fins are for controlling the robot's movement. They will be connected with a servo motor.

Dimensions:

Total Length: 7 Feet (213.36 cm)

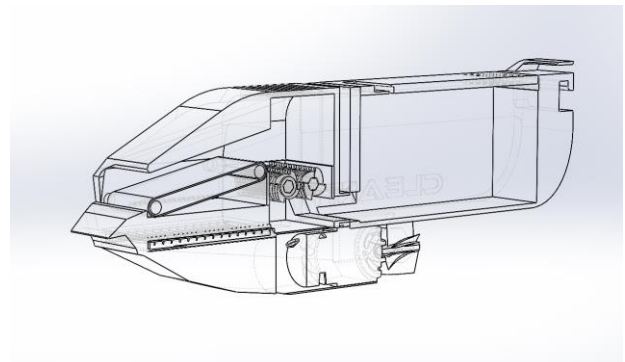
Width: 2 Feet (60.96 cm)

Height: 2.5 Feet (76.2 cm)

Working Method:

At first, wastes from the water surface will be guided to the conveyer via the slope on the front. The belt will lead the wastes to the shredder. The shredder will shred the wastes and guide it to the waste bucket. When the waste bucket gets filled, an infrared sensor will detect it and will send a Warning signal to the client software installed on the user's computer or smartphone. The user can then manually control the robot using the software and drive it to his nearest manhole from where he can grab the robot, detach the waste bucket, empty it and attach it back

again. After leaving the robot again on the water it will start working on the same manner.



Cross section of CLEANIT

The robot will use its AI interface installed on its MCU and use the sensors and camera attached to its fronts to identify its path as well as detecting objects. User can see the robot's location on

the go in his Client software. Also, he can see the waters condition using the software as the robot will feed its camera footage live. It will use satellite-based connection with client software.

User or the technician can watch data from all the robots working at the same time from his computer.

Advantages:

- Fully autonomous, no hassle of controlling
- Have manual override feature for using in critical situation
- Can perform in a narrow or chemical hazardous space where human can't go
- Client software from which user can observe the data
- Completely water resistant and easily washable
- Can be used on any water surface (e.g. Drains, sewers, ponds, canals, river etc.)
- Can be easily manufactured
- Replaceable battery unit

Disadvantage:

- Requires a person to clean the waste bucket
- High level programming language required to develop the AI interface
- Client software required
- Wireless connection required to observe the data
- Limited to cleaning only surface wastes, can't submerged wastes.

According to a recent survey, the 70% of the waste on waters are Plastic based which floats on the water surface. These floating wastes results in clogged drain, canals or sewer system. We have tried to create a prototype which is capable of cleaning the water surface autonomously. Which task is usually done in our country by sensing a person in our sewer systems, which is extremely risky for the person. Also, the amount of hazardous gas and acids lurks in those sewers are out of bounds. Our robot is the perfect replacement for this job. Also, plastic based wastes found on the surface of ponds, canals and other water reservoirs. These wastes create a layer between water and the air. As a result, biological environment of the water gets ruined gradually. Our robot is also capable of cleaning wastes on these types of waters resources. The collected plastic wastes than can be recycled and contribute to a eco-friendly movement.

Project idea by-

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Software Skills-

- Solidworks
- AutoCAD
- Blender
- Simscale
- Keyshot
- Matlab

Projects-

- Gesture Controlled Robotic Arm
- EV prototype- Proto E1
- Soccer Bot
- LFR

Extra-Curricular Activities-

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- General Member at AUST IDC

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ACHIEVEMENT -

- 2nd Runners up HULT Prize at AUST 2021
- Finalist at HULT Prize Kuala Lumpur Impact Summit 2021

PROJECT-

- 1) Active Noise cancellation Headphone
- 2) Line Follower robot
- 3) Home Automation Project

EXTRA CURRICULAR ACTIVITIES-

- Sub-Executive Member of AUST Robotics Club

Computer Skills-

- Solidworks
- MATLAB
- Ansys
- Blender

- Python
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PROJECT-

- 1) Attachable wheelchair automator
- 2) soccer bot

Computer Skills-

- Solidworks
- MATLAB
- Ansys
- C Programming