ROBOTICS CLUB
IIT Guwahati

Marjanator

Created by
AquaVantage

Our Team

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Problem

- **Describe the problem that you are trying to solve**

The accumulation of these pollutants has become a pressing environmental concern, negatively impacting aquatic ecosystems and human well-being. Floating trash, including plastics and solid waste, poses a significant threat to water bodies globally, endangering marine life and compromising natural beauty. Harmful algal blooms further disrupt ecosystems, causing oxygen depletion and imbalances

- **Describe likely size of market (or indicator of size of market)**

Offshore AUV And ROV Market size was valued at USD 5.27 Billion in 2022 and is projected to reach USD 23.5 Billion by 2030, growing at a CAGR of 18.0% from 2023 to 2030

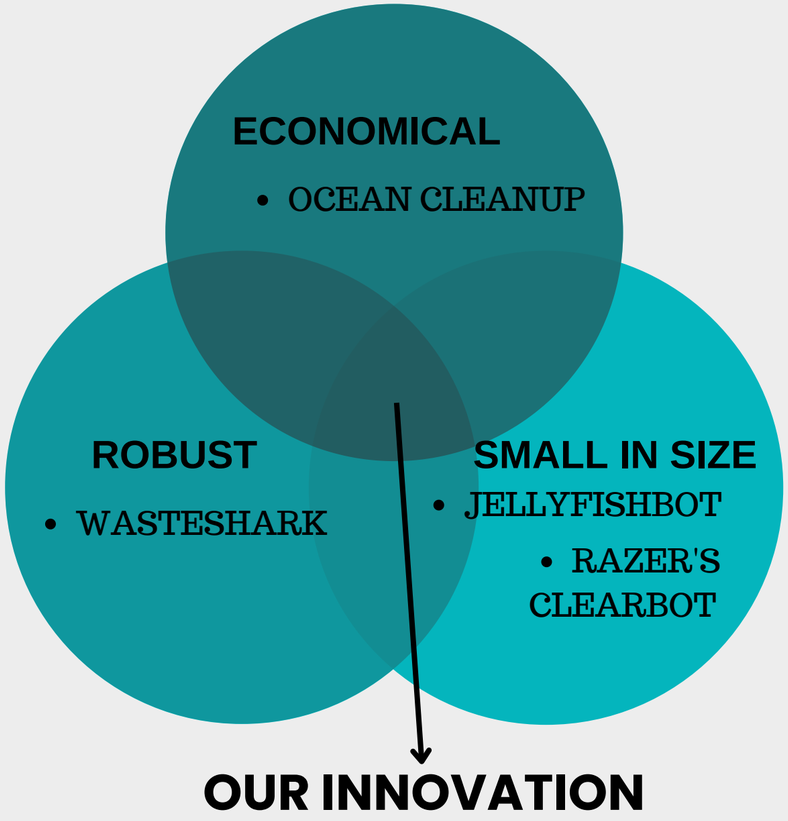
IDEA

INNOVATIONS:

Compared to similar water cleaning bots, our innovation excels in efficient waste removal, adaptability to various pollutants, autonomous operation, advanced sensing capabilities, minimal environmental impact, and scalability at an affordable cost.

OTHER SIMILAR PRODUCTS:

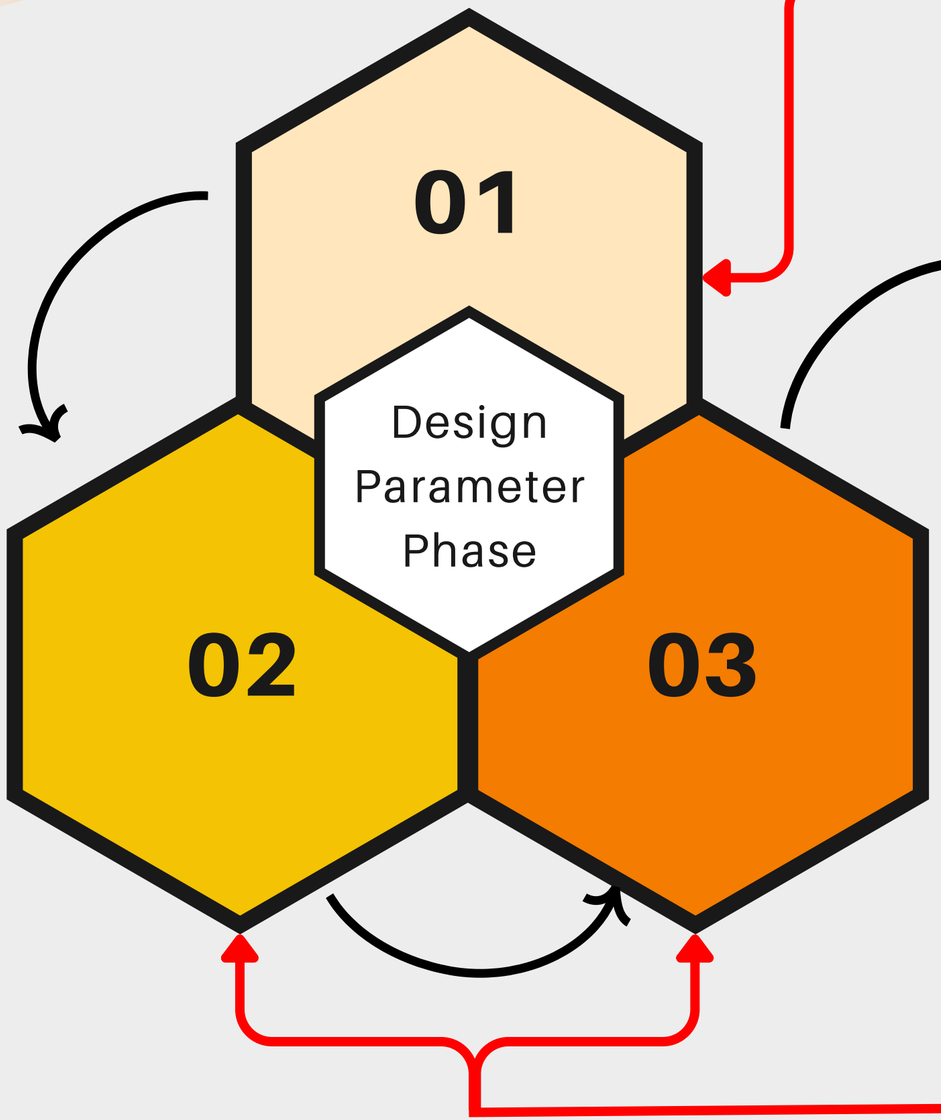
- RanMarine Technology's WASTESHARK : Removes plastic, algae, and biomass from water bodies.
- Jellyfishbot : Collects waste, oil, and performs underwater measurements.
- The Ocean Cleanup : Autonomous river cleaning machine targets plastic pollution.
- Razer's Clearbot : An autonomous trash-collecting robot.

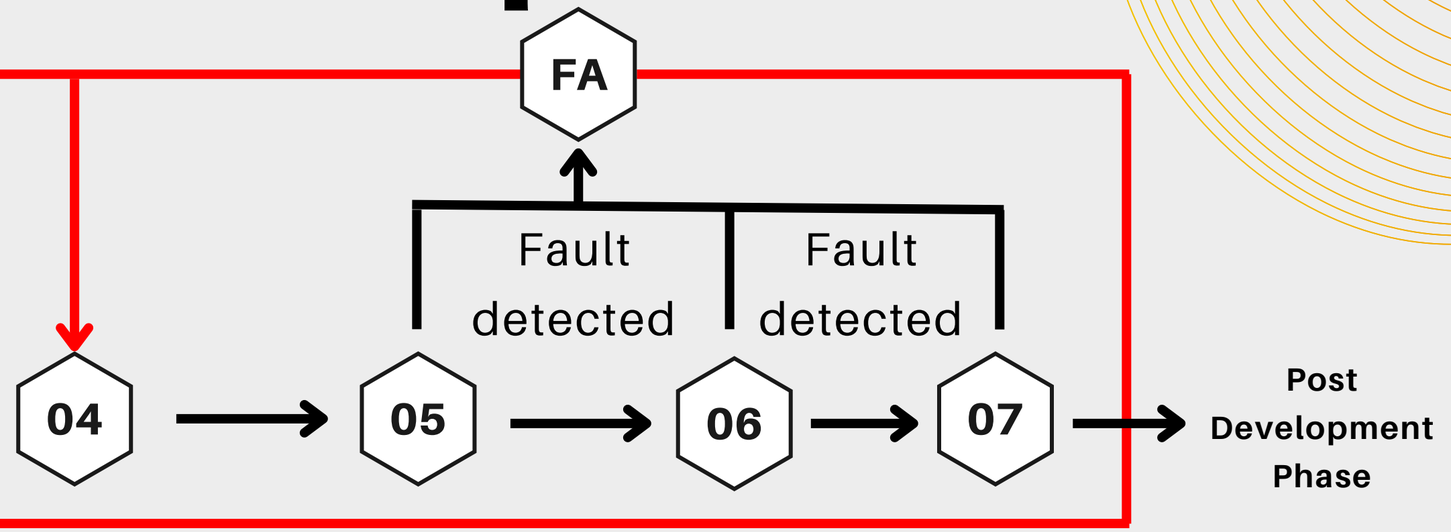


Target Market & Opportunity

- A 2009 study by Keep America Beautiful found that the U.S. spends about $11.5 billion per year to clean up litter.
- Trash pollution poses significant physical hazards to wildlife in aquatic and terrestrial environments. Animals can suffer from ingestion and entanglement, leading to suffocation, drowning, and other injuries. Plastic debris is often mistaken for food, causing damage to the digestive tract and hindering feeding, leading to starvation and negative health effects. Researchers have documented at least 558 species, including turtles, seabirds, and marine mammals, affected by ingestion or entanglement in plastic waste
- AUVs and ROVs are used for positioning and guidance for sub-sea infrastructure construction, monitoring, and survey missions. The applications of underwater vehicles in offshore oil and gas engineering include guide drilling work, undersea observation, fixed-point sampling, auxiliary work involved in jacket installation, laying of oil and gas pipelines, and maintenance of offshore facilities.

Roadmap





01 Parameterisation Phase

02 Research & Conceptualization Phase

03 Proof of Concept

04 Engineering Design Phase

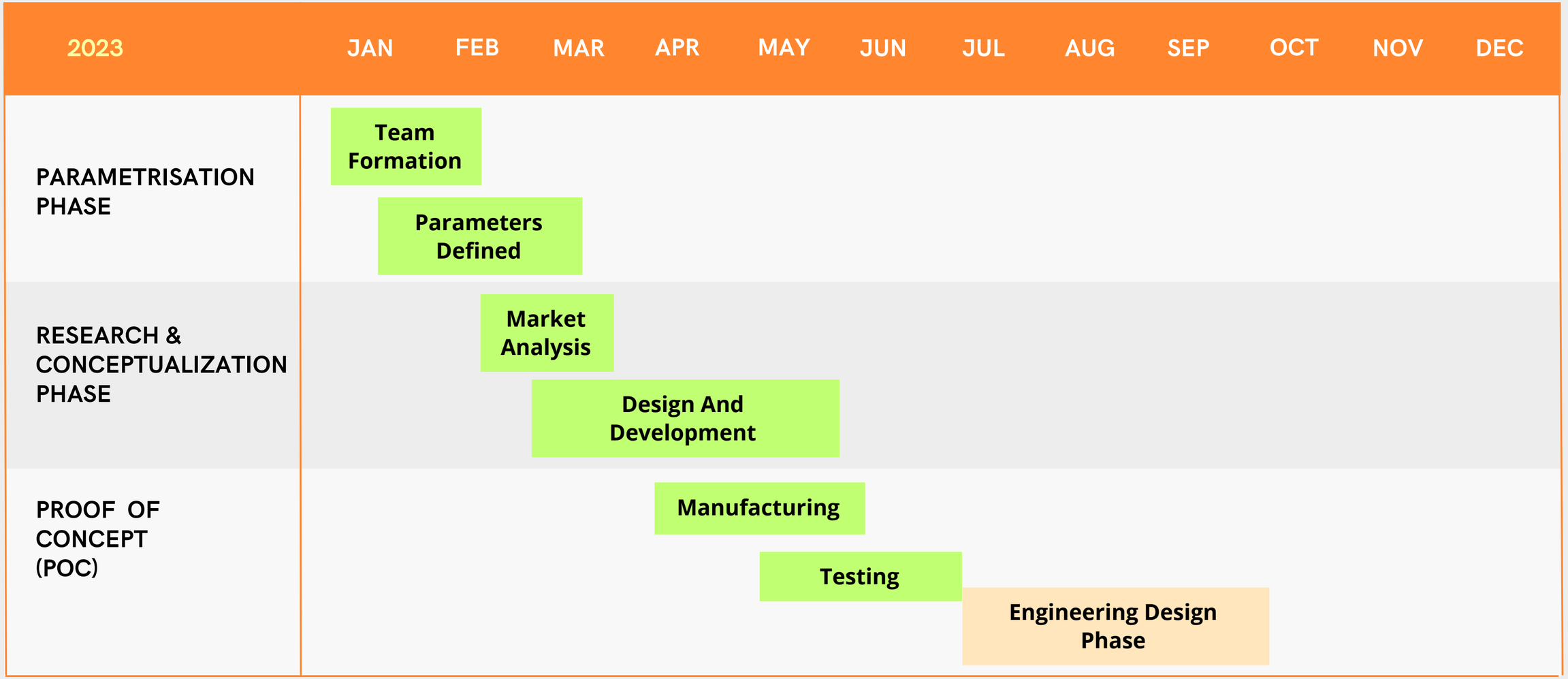
Simulation Phase 05

Fabrication Phase 06

Assembly & Testing Phase 07

Fault Analysis FA

Work Timeline



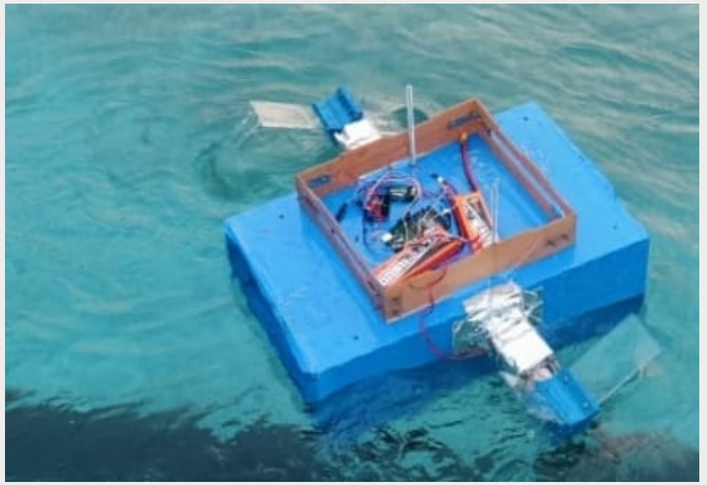
Objectives of Project Defined:

- Water Surface Floating Solid Trash Collection
- Cleanup of biological or chemical buildup (algae, fertilizer buildup, etc.).
- Mapping and Localisation of area.
- Detection of relevant trash/buildup.
- Autonomous traversal capabilities.

The Great Pacific Garbage Patch (GPGP)

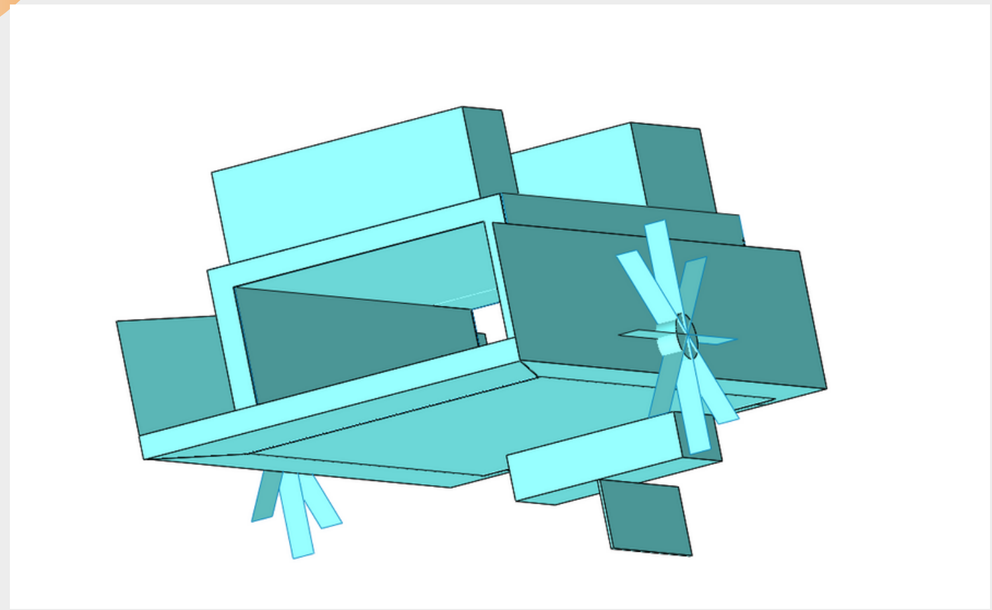
Objectives Of Proof of Concept:

- Learn about Design of Autonomous Aquatic Vehicles.
- Learn about water-proofing techniques
- Test our Computer Vision Algorithm to detect green algae.
- Learn about Controls and communication protocol.
- Validate our ideas for the project.

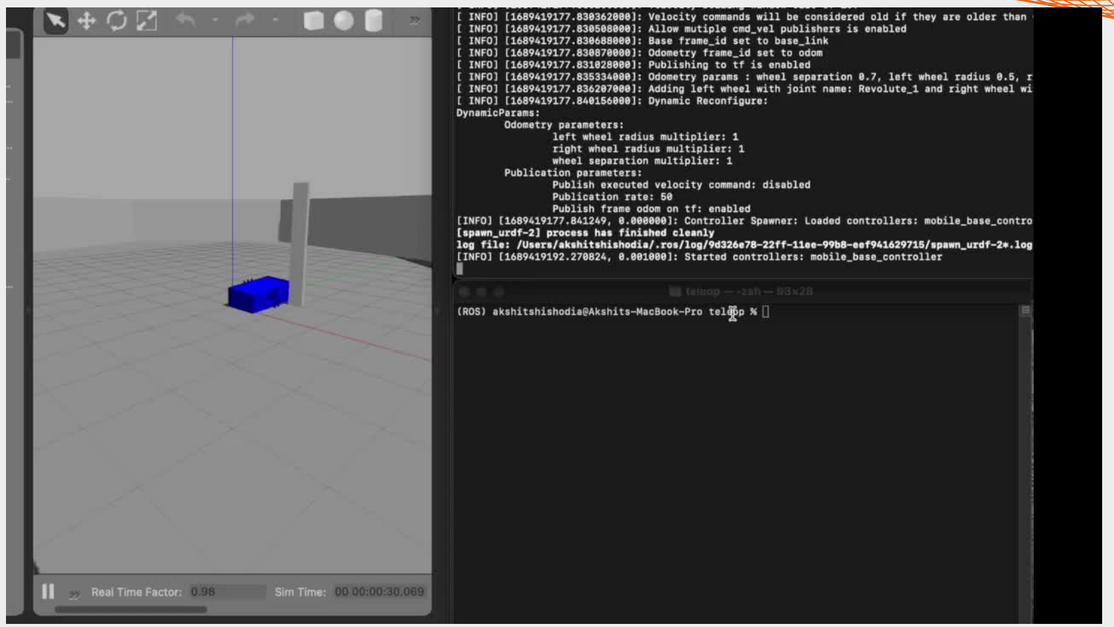


First Prototype of Marjanator tested in swimming pool of our institute

Proof of Concept



CAD Design



Gazebo Simulation of Software

Green Detection by our Computer Vision Algorithm

Additional Work to be Undertaken

The following work is planned to be undertaken in next 3 months:

Engineering Design Phase

- To design an Industry Standard Autonomous Vehicle.
- To be completed by end of August

Simulation Phase

- Simulate the design to validate our concepts
- To be completed by end of September

Additional Work to be Undertaken

Product Sourcing and Finances

- Buy manufactured products and raw materials required for Fabrication phase.
- Source finances for smooth operation of other following phases
- To be started parallely with engineering design phase.

Fabrication Phase

- Manufacturing of the product
- To be completed by October-November

Challenges Faced

- Waterproofing was tough to achieve.
- Tough to translate efficiency of algorithm in real life.
- Tough to create a stable and efficient design.
- Low FPS encountered during algae detection

Challenges Expected

- Difficulties expected in translating efficiency of algorithms into real life scenarios.
- Difficulties expected to create a stable platform that can perform efficiently in various environmental conditions.
- Difficulties expected in predicting probable failures and implementing fail-safe measures for the same.

References

- Underwater Image Processing: State of the Art of Restoration and Image Enhancement Methods
- Floating garbage detection
- A water surface cleaning robot

Thank You