AN AUTOMATED SURFACE AND UNDERWATER INSPECTION ROBOT WITH SPLIT HULL

IITM Technology Available for Licensing

Problem Statement

- Use of boats for survey of water bodies **is labor intensive and cumbersome** for large areas while **risking lives of people**. Autonomous Underwater Vehicles (AUVs) and Remotely Operated Vehicles (ROVs) help overcome these challenges
- However, **conventional single hull torpedo shaped robots require a longer single body** design to accommodate several components this **impacts maneuverability** in constrained spaces.
- There is **a need for a split hull** under water inspection robot that that can operate as an **ROV as well as AUV** with easy maneuverability.

Intellectual Property

- IITM IDF Ref. **1711**
- **IN 474777- Patent Granted**

TRL (Technology Readiness Level)

TRL 4 Technology Validated in Lab

Technology Category/ Market

Category- Automation & Robotics
Industry Classification:

- **NIC (2008)- 72-** Scientific research and development**; 2829-** Manufacture of other special-purpose machinery; **26515**- Manufacture of radar equipment, GPS devices, search, detection, navigation,aeronautical and nautical equipment; **30112**- Building of warships and scientific investigation ships

Applications- offshore oil and gas industry, the defense sector, maritime search and rescue, oceanographic research, underwater archaeology and environmental monitoring.

Market report: Revenue from worldwide sales of autonomous underwater vehicles is estimated at US$ 3.42 billion in 2024 and is forecasted to increase at a CAGR of 15.6% to reach US$ 14.58 billion by 2034

Research Lab

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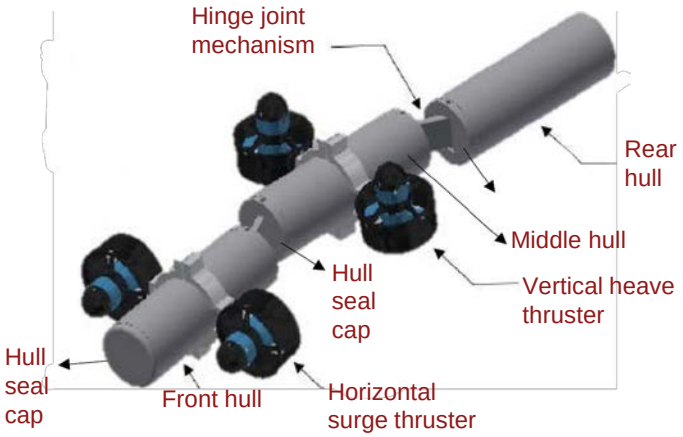

Figure: Schematic representation of M-HULL with 3 hulls

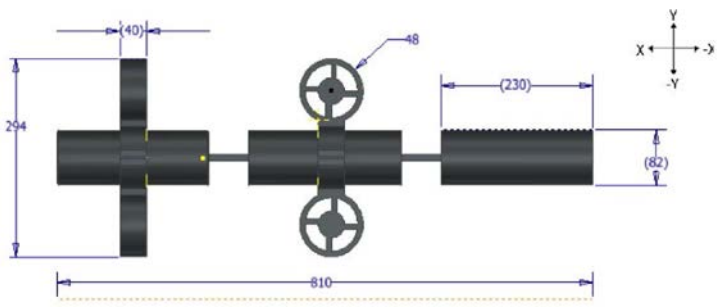

Figure: Schematic diagram showing the experimental dimensions (in mm) in the top view of MHULL

Figure: The image of M-HULL with 3 hulls after fabrication

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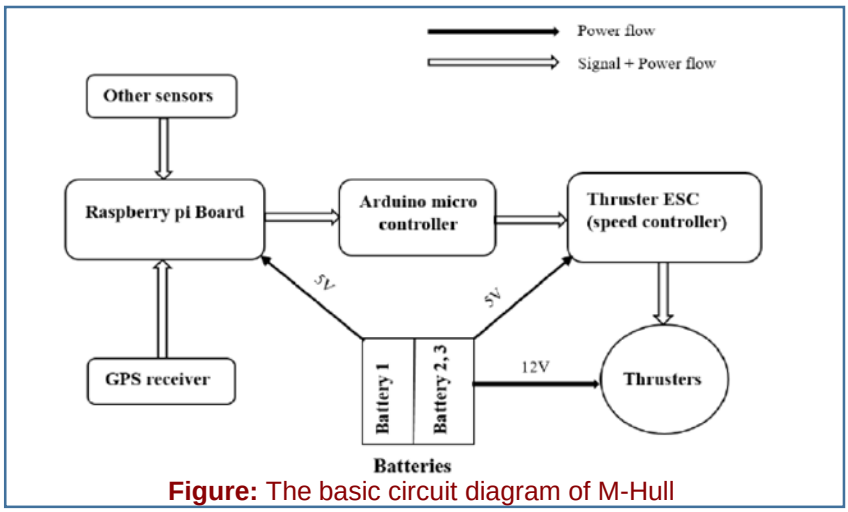

Figure: The basic circuit diagram of M-Hull

Technology

- The automated surface and underwater inspection robot comproses multiple hulls, multiple thrusters attached using thruster clamps, a tether, and a communication device
- The front hull carries sensor components, the middle hull acts as a command and control module and the rear hull carries batteries
- The hulls connected by a hinge joint mechanism which facilitates in-plane rotation of 5 hulls about z-axis. Balancing blocks (Buoyancy balancers) are attached to the bottom of each hull to obtain lower center of gravity and hence the rolling stability of the robot
- The tether is attached to the rear hull and powered and controlled from an external station, and the communication device is attached to the top most portion of the hulls to communicate to a control base.
- Designed to operate both as an ROV (using onboard camera) and an AUV (Bathymetry mode) near the water surface level fully immersed..

Key Features / Value Proposition

- Splitting the long hull into multiple bodies reduces the turning diameter considerably when compared to single hull robots. This will improve the maneuverability in constrained spaces such as oil tanks, water bodies etc.
- In AUV bathymetry mode the robot can record parameters such as pH level, Conductivity, Radiation level, Water depth, temperature etc., at equally spaced points throughout the surface of water body.
- Compared to conventional single hull robots the the multiple hull concept allows modularity where an additional component can be added to the robot in an extra hull without disturbing the current systems.
- Effect of water forces on the navigation (especially while taking a turn) of robot will be lesser on M-HULL as each hull has different orientation such that forces due to the water flow in a particular direction will not act with the same intensity on every hull as in the case of a single hull robot.

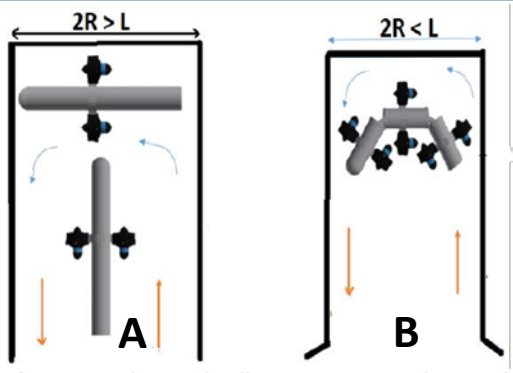

Figure: Schematic diagram comparing and showing the reduction in the turning diameter of the available conventional model **(A)** with split hull **(B)**

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