INDIAN INSTITUTE OF TECHNOLOGY KANPUR, INDIA

# UNDERWATER SEARCH AND SURVEILLANCE VEHICLE

AIM

We aim to build an economically feasible and user-friendly robot in the realm of semi-autonomous underwater robotics which can be utilized for different industrial, surveying, monitoring and scientific purposes.

MISSION

Our mission is to provide indigenous technological solutions for problems our country has been facing for long. We are developing an indigenous Semi-Autonomous Underwater Vehicle which can be mass produced and which may find utility in a wide range of underwater tasks like searching inland water bodies (law enforcement agencies), surveying of canals, analysis of topology and aquatic life, cleaning and quality monitoring of water bodies (small lakes, ponds, swimming pools) sewage and waste managements and solving various environmental issues which are currently accomplished in highly uneconomical and human resource intensive way.
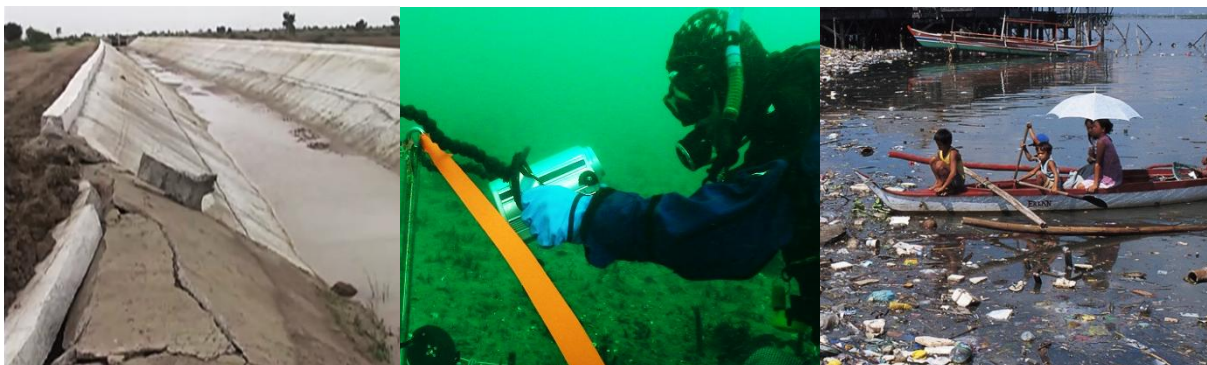
APPLICATIONS

Our primary targets include law enforcement agencies, water body topology survey teams and hydroelectric power projects. A careful observation will lead to the conclusion that technological solutions capable of operating in river systems are largely unaccounted for in our country. State Police personnel have shown great interest in such a product that can supplement and assist their divers in underwater searching of rivers like the Hooghly. This can be used very effectively in searching for structural faults in underwater pipelines, dams and canals or searching in a pond where it might not be always economically feasible to use a SONAR. Some environmental and hydrology researchers have also motivated our concept note. Other secondary targets like cleaning swimming pools can be achieved by attaching small modules to the basic structure. The vehicle will be a cost-effective and portable carrier for heavy technologies like SONAR. This will be a health-hazard-free technological remedy for replacing or reducing dependence on human divers.

ENVIRONMENTAL BENEFITS

The environment can also be benefited from various applications of this vehicle. The designing approach is highly modular so as to ensure that multiple supplementary sensors and equipment can be mounted on this vehicle. It can be used for cleaning water bodies, for monitoring water quality at inaccessible locations, for surveying river beds etc. Tracking and monitoring of aquatic bio-diversity can be done effectively. Water contamination with toxins can be locally monitored to avoid mass death of aquatic life.

CURRENT STATUS

An initial prototype has been designed, fabricated and tested in still water up to depths of six meters. Six waterproof motor-propeller assemblies are used instead of thrusters for the prototype and stability is achieved with the help of an IMU (Inertial Measurement Unit) .The tethered vehicle is controlled with the help of an Arduino microcontroller and driven with the help of a joystick module which assures user friendly control of the vehicle.
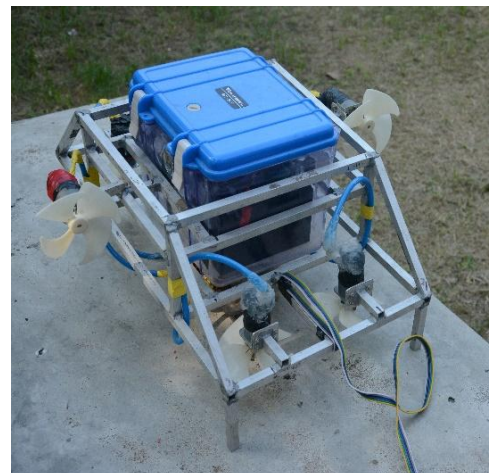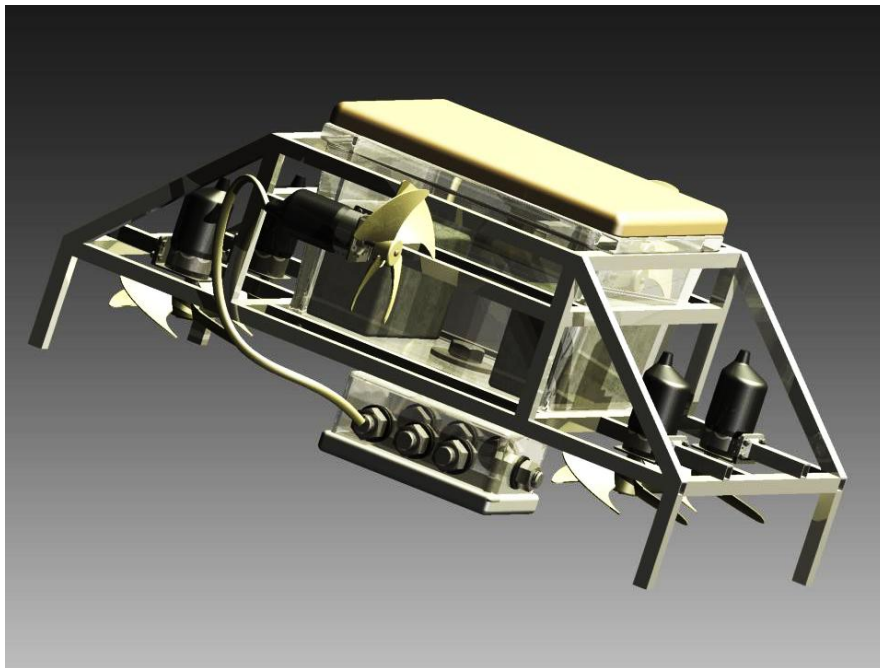
TECHNOLOGICAL SUPPORT REQUIRED

We require technological support in our current research, which includes the following:

- Two-way wireless transmission of information between any vehicles deep inside the water to a platform (buoy) outside water.
- Use of latest simulation, manufacturing and fabrication technologies
- Achieving agile movements under large depths.
- Surviving heavy currents on and near surface.
- Creating a robust control system to ensure desired vehicle responses.
- Underwater tracking of the vehicle for localization.

THE TEAM

The team comprises of eight students along with a faculty mentor. The details of the team members are as follows:

Sr. No	Name	Year	Field of Work
1	Dhrupal R Shah	4th	Control System and Design
2	Abhishek Sharma	4th	Mechanical Design, Team Management
3	Hardik Soni	3rd	Power Systems, Algorithms
4	Aditya Pande	2nd	Mechanical Design
5	Akshat Agarwal	2nd	Power and Control Systems
6	Amartya Sanyal	2nd	Algorithms and Control Systems
7	Pankaj Verma	2nd	Mechanical Design and CFD
8	Yashwanth Kumar	2nd	Algorithms and Coding

Faculty Mentor: Prof. Bhaskar Dasgupta
Head, Centre for Mechatronics
IIT Kanpur, India

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