



THE MARINE ROBOTICS TEAM

Of

K. J. SOMAIYA COLLEGE OF ENGINEERING

April 5, 2018

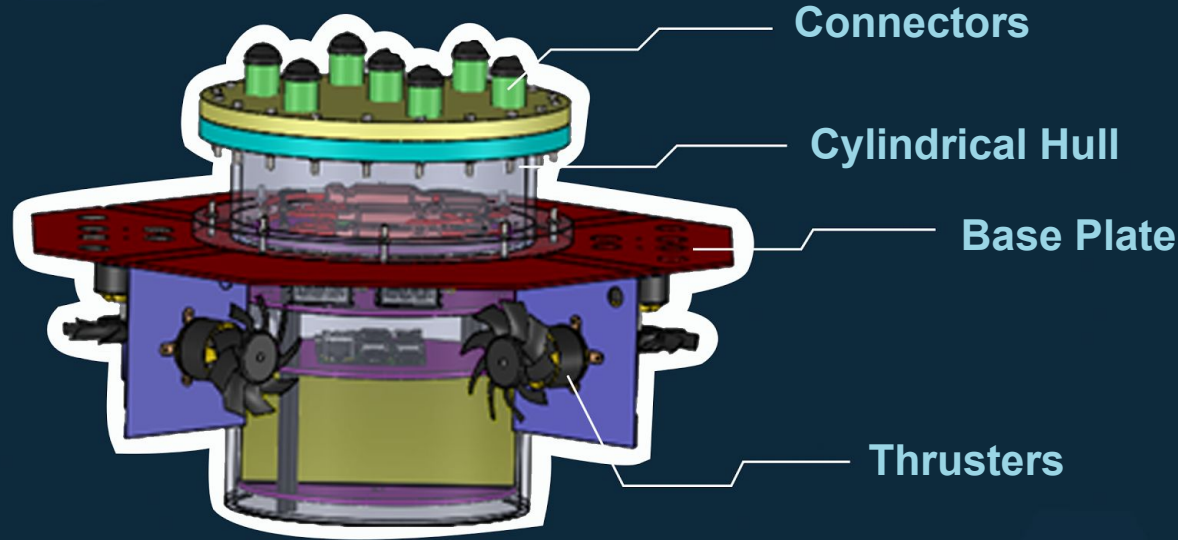
# About TMRT

- **The Marine Robotics Team (TMRT)** is the underwater robotics and offshore engineering team of K. J. Somaiya College of Engineering
- We build underwater technologies from unmanned underwater vehicles to underwater self-stabilizing platforms and buoyancy engines.
- We are the **only Marine Robotics team in India** focusing on solving real world challenges and closing the R&D gap between India and the other European countries and USA.
- Our first project is building an Autonomous Underwater vehicle (AUV) which can explore underwater depths up to 50 m. The AUV will be called TMRT Proton and it will become **the first student built AUV in India** which will be successfully tested in open waters up till 50 m depth.

# TMRT Proton

- **TMRT Proton will be the first student deigned AUV in India which will have machine learning capabilities.**
- **It will be best in performance while being the most affordable because of its thoughtful design.**
- AUVs are untethered, fully automated submersible platforms capable of performing underwater tasks and missions with their onboard sensors, navigation and payload equipment.
- AUVs are not restricted to scientific underwater exploratory applications. They are also used for military purposes, inspection of underwater structures as well as being largely utilized in mining and oil industries.

# Cooper: our first prototype



Cooper is a Remotely Operated Vehicle (ROV), it has four degrees of freedom i.e surge, sway, heave and yaw and has a depth rating of 10 m. We have used image processing algorithms to identify objects underwater. In house connectors and waterproof motors were intelligently developed to bring down the cost of our first prototype. Cooper has been successfully tested.

# AUV capability in India

- There are two premiere institutions in India working on Unmanned Underwater Vehicles (UUV) technology namely, National Institute of Oceanography (NIO), Goa and National institute of Ocean Technology (NIOT), Chennai.
- NIOT is equipped with Polar Remotely Operated Vehicle (PROVe), ROSUB6000 and MAYA6000 Samudrayan; NIO is equipped with MAYA AUV (India's first AUV) with depth capabilities of up to 200 m and an Autonomous Vertical Profiler.
- Central Mechanical Engineering Research Institute (CMERI) has also developed AUV-150 in collaboration with Council of Scientific and Industrial Research (CSIR) , Defence Research and Development Organisation (DRDO) and IIT Kharagpur. The AUV has depth capabilities of up to 150 m
- Reliance Naval and Engineering Limited (formerly known as Reliance Defence and Engineering Limited) has set up strategic and technological partnership with Pipavav Defence and Offshore Engineering Company Limited to build AUVs.

# State of AUV technology globally and comparison with India

AUVs are already being used in a multitude of applications around the world. However, India has been lagging behind. Our research and awareness Some of the projects are highlighted below

- **Marine Archeology**

Currently AUVs has are being used for protection of underwater natural and cultural heritage in accordance with UNESCO 2001. Indian Government approved Development of Exhibition-cum-Convention Centre (ECC), Dwarka at an estimated cost of ₹ 25,703 crore by 2025. The Department of Science and Technology is actively considering to entrust the mission to robotic vehicles from NIOT and NIO.

- **Underwater Exploration**

Cooperative Robotics in Marine Monitoring and Exploration (CroMax) involves cooperative control between Unmanned Surface Vehicle (USVs) and AUV. This increases the efficiency of Marine Resource Management. India still hasn't completed a project involving cooperative marine robotics.

- **Curtailling oil spill**

Underwater Robotics for Oil Spill is a fleet of AUVs that provides early detection and tracking of in-water oil plumes to increase the preparedness for reducing the consequences of oil spill on the coast. A fleet of twelve AUVs is used to detect and monitor the oil spill. India has not funded any such project and our total fleet size of the country is smaller than twelve.

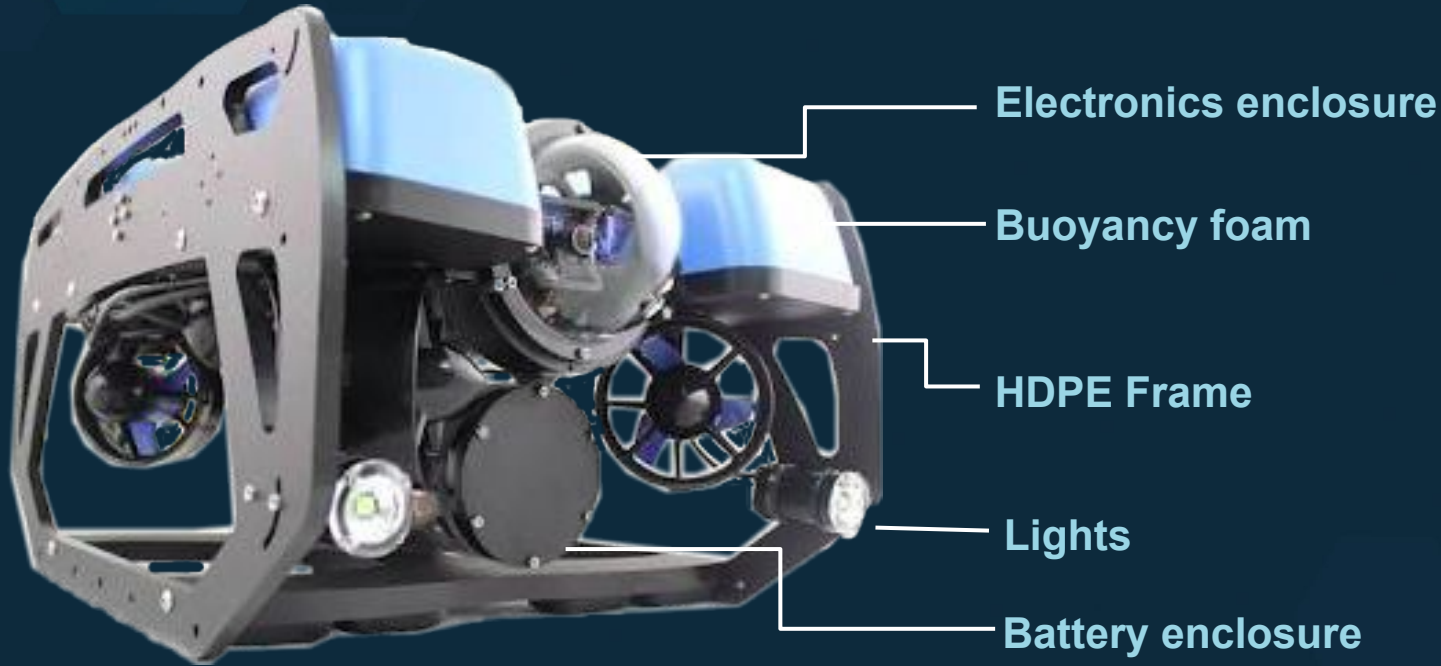
- **Maritime security and Mine Countermeasures**

The US Navy has a fleet of one hundred and twenty AUVs as compared to a handful of AUVs under our fleet.

- **Polar expedition**

India is lagging behind from other developed nations because it still doesn't have a single AUV which can successfully operate for our research stations.

# TMRT ROV Shell for testing codes





# MENTOR

1. Dr. N R Gilke, Vice Principal, TMRT Faculty Head at K. J. Somaiya College of Engineering
2. Dr. Sanjay Panwar, G-Level Scientist at BARC, Mumbai
3. Rajat Mishra , PHD candidate at National University of Singapore

# Competitions

- **Singapore Autonomous Underwater Challenge (SAUVC)** is organised by IEEE Ocean Engineering Society Singapore Chapter and is currently in its sixth edition. The International competition boasts participation from over 20 teams from across 13 countries held from March 9-12, 2018.
- **RoboSub RoboNation**: RoboSub RoboNation is organized by the Association for Unmanned Vehicle Systems International (AUVSI) foundation. The aim is to provide opportunities for the participation of young technologists in scientific meetings and to aid in the formal training and education in unmanned vehicle systems technology. The competition will be held in July 2019. It is an international competition held at SSC Pacific TRANSDEC, San Diego, California, USA.
- **SAVe**: Student Autonomous Underwater Vehicle Competition organized by National Institute of Technology (NIOT) under Ministry of Earth Sciences, focuses on involving students in areas of ocean technology. It is held in the month of October/November. It is a national competition held at Chennai.

# Exhibitions

- **INMEX SMM India** is South Asia's largest Maritime Exhibition and conference for shipbuilding, Shipyards, Marine Technology and Ports.
- **Maritime Nation India** is an international trade show organised to demonstrate expertise and opportunities in Indian Maritime and Logistics sector.
- **Abhiyantriki** the annual technical festival of the K. J. Somaiya College of Engineering. Over 35 events are organized, ranging from workshops to exhibitions and witness a footfall of around 15,000.
- **Maker Mela** is the biggest maker festival in India with over 50,000 footfalls and an eminent audience of government officials and techpreneurs from across the world.



# Budget

Sr. No.	Item	Expense
1.	Mechanical Team	₹77,205
2.	Electronics and Software Team	₹3,12,559
3.	Pool Frame (For testing)	₹1,40,000
	Filtration Accessories for Pool	₹32,000
4.	Logistics:	₹2,75,000
	• Mumbai to Singapore (Air)	₹2,00,000
	• Singapore to Mumbai (Ship)	₹75,000
5.	Marketing and Publicity	₹30,000
Total		₹8,66,764

Deliverables	Gold Sponsor >₹1,00,000	Silver Sponsor >₹50,000	Bronze Sponsor >₹25,000
Logo on team T-shirt(Back)	Yes	Yes	Yes
Social Media Post	Yes	Yes	Yes
Company's name,logo & link on Website	Yes	Yes	Yes
Company’s name on marketing Prospectus	Yes	Yes	Yes
Company pamphlet distribution at exhibitions	Yes	Yes	Yes
Branding through Augmented Reality	Yes	Yes	--
Mentioning your Product in Technical Reports	Yes	Yes	--
Logo presence on flags, banners etc.	Yes	--	--
Speaker Session/ Seminar announcements	Yes	--	--
Logo on team T-shirt(Sleeve)	Yes	--	--
Logo presence on AUV at Competitions	Yes	--	--

# THANK YOU

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