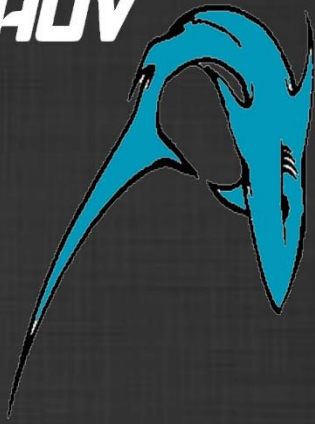


AMOGH

AUTONOMOUS UNDERWATER VEHICLE

AUV



MOGH

iit madras

SPONSORSHIP BROCHURE

FOREWORD

Indian Institute of Technology Madras, is one among the foremost institutes of national importance in higher technological education, basic and applied research. It has established itself as a premier centre for teaching, research and industrial consultancy in the country.

The Institute has fifteen academic departments and a few advanced research centres in various disciplines of engineering and pure sciences, with nearly 100 laboratories organised in a unique pattern of functioning. A faculty of international repute, a brilliant student community, excellent technical & supporting staff and an effective administration have all contributed to the pre-eminent status of IIT Madras.

Centre for Innovation (CFI) is one such 'Student Lab' at IIT Madras. CFI was started in 2008 with an objective to be a forum for creative output of the budding engineers of IIT Madras. It provides students a great workspace, a comprehensive inventory, ample guidance from faculty and the necessary platform for realizing their ideas.

Amogh is the first series of miniature underwater vehicles, pioneered by a group of students at Centre for Innovation, IIT Madras. Starting in July 2012, after successfully testing a ROV, the concept design of the vehicle has been evolved to that of an AUV. A combination of sheer dedication, strong conceptual understanding and intelligent design has enabled the team to qualify for various dynamic events at national and international levels.

The team competes annually in the international RoboSub competition, organized by Association for Unmanned Vehicle Systems International (AUVSI). Expanding upon the success in 2014, the team is planning to build a competent and better equipped AUV, customizable and suitable for different commercial applications.

We invite you to read on to find out more about the team, the vehicle they built, their achievements and goals. We look forward to a great association with you and would be glad to have you on-board on this journey of ours.

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THE TEAM

We are a multi-disciplinary team of 30 dedicated undergraduate and postgraduate individuals exploring the cutting edge of unmanned underwater vehicle technology.

We work under the direct supervision of our faculty advisors Dr. V.G. IdiChandy, Emeritus Professor, Department of Ocean Engineering and Dr. Asokan, Department of Engineering Design. The Co-Curricular Affairs Advisor of the institute, Dr. B. Ravindran extends his invaluable support to the team.

The team is divided into various subsystems based on the interest and expertise of the individuals. At the helm of each subsystem is an experienced member, guiding their team in coordination with the mentors. Under this sustainable leadership model, new members are able to learn at an advanced pace. A high level of coherence and knowledge transfer is maintained to ensure smooth integration of work.



ACOUSTICS

SENSORS

VISION

OUTREACH

PNEUMATICS

PAYLOAD

SKELETAL FRAME

HYDRODYNAMICS

SIMULATIONS

ENCLOSURES

PROPULSION

DESIGN

WEB-OPS

MISSION CONTROLLER

COMPETITIONS

AUVSI RoboSub

The goals of AUVSI RoboSub competition is to provide opportunities for students to experience the challenges of system engineering, to develop skills in accomplishing realistic missions with autonomous vehicles and to foster relationships between young engineers and the organizations developing and producing autonomous vehicle technologies. The competition is co-sponsored by AUVSI and U.S. Office of Naval Research (ONR) and is held annually at SSC Pacific's Transdec Pool in San Diego, CA. Around 40 teams from across the globe participate in the competition.

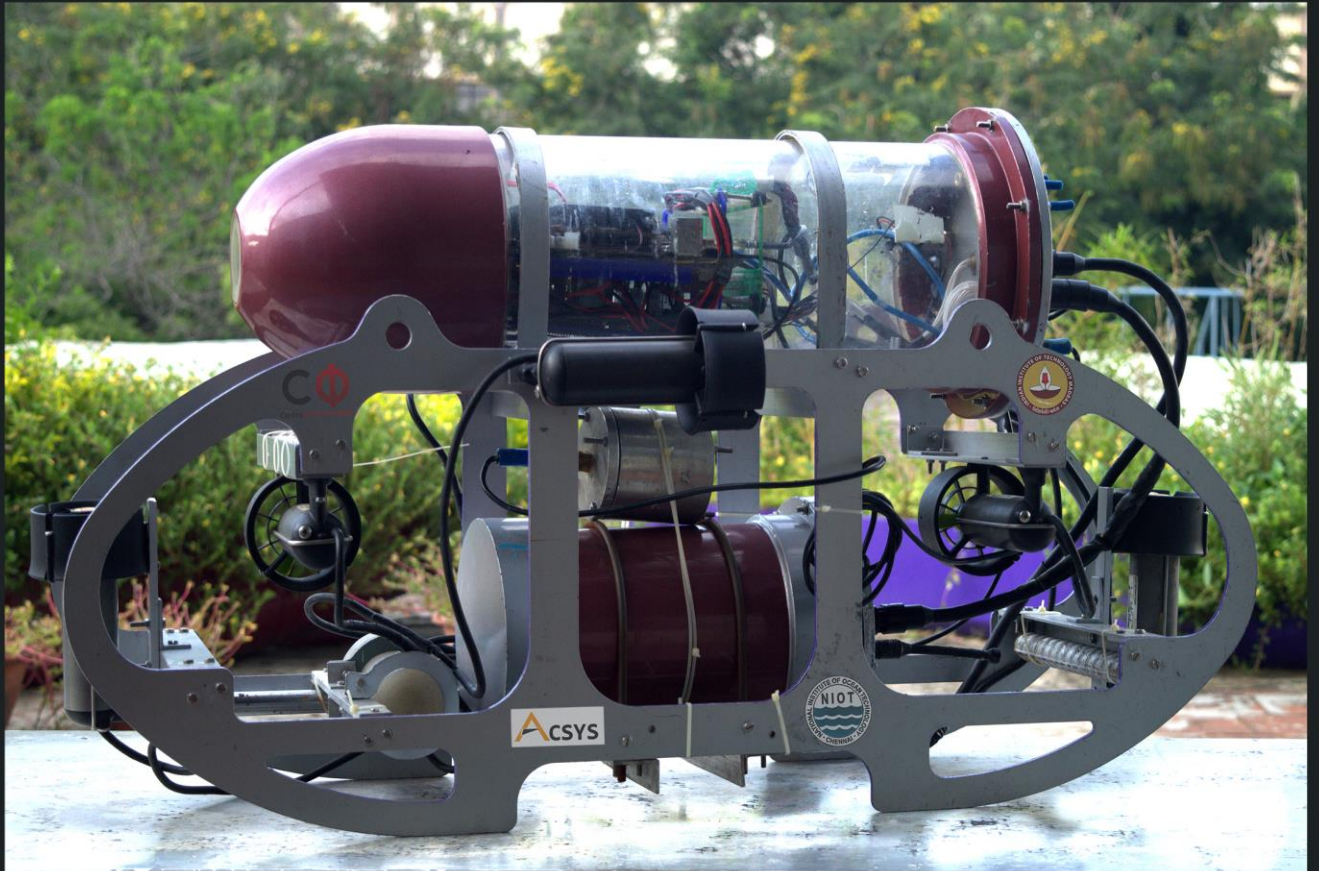
The fundamental objective of an AUV is to demonstrate its autonomy by completing a given set of underwater tasks. The competition mission elements and tasks are designed to simulate real-world challenges such as visual recognition of objects, navigation and acoustic sensing.

NIOT SAVe

National Institute of Technology (NIOT) , under Ministry of Earth Sciences, organizes a Student Autonomous Underwater Vehicle (SAVe) competition for students pursuing engineering degree to visualize and design a fully functional AUV. The main focus of this competition is to involve students on the new frontier areas of ocean technology and kindle their innovative thinking in this unexplored area of ocean environment and observation. It is envisaged to facilitate oceanographic observation using suitable underwater vehicles.

THE VEHICLE

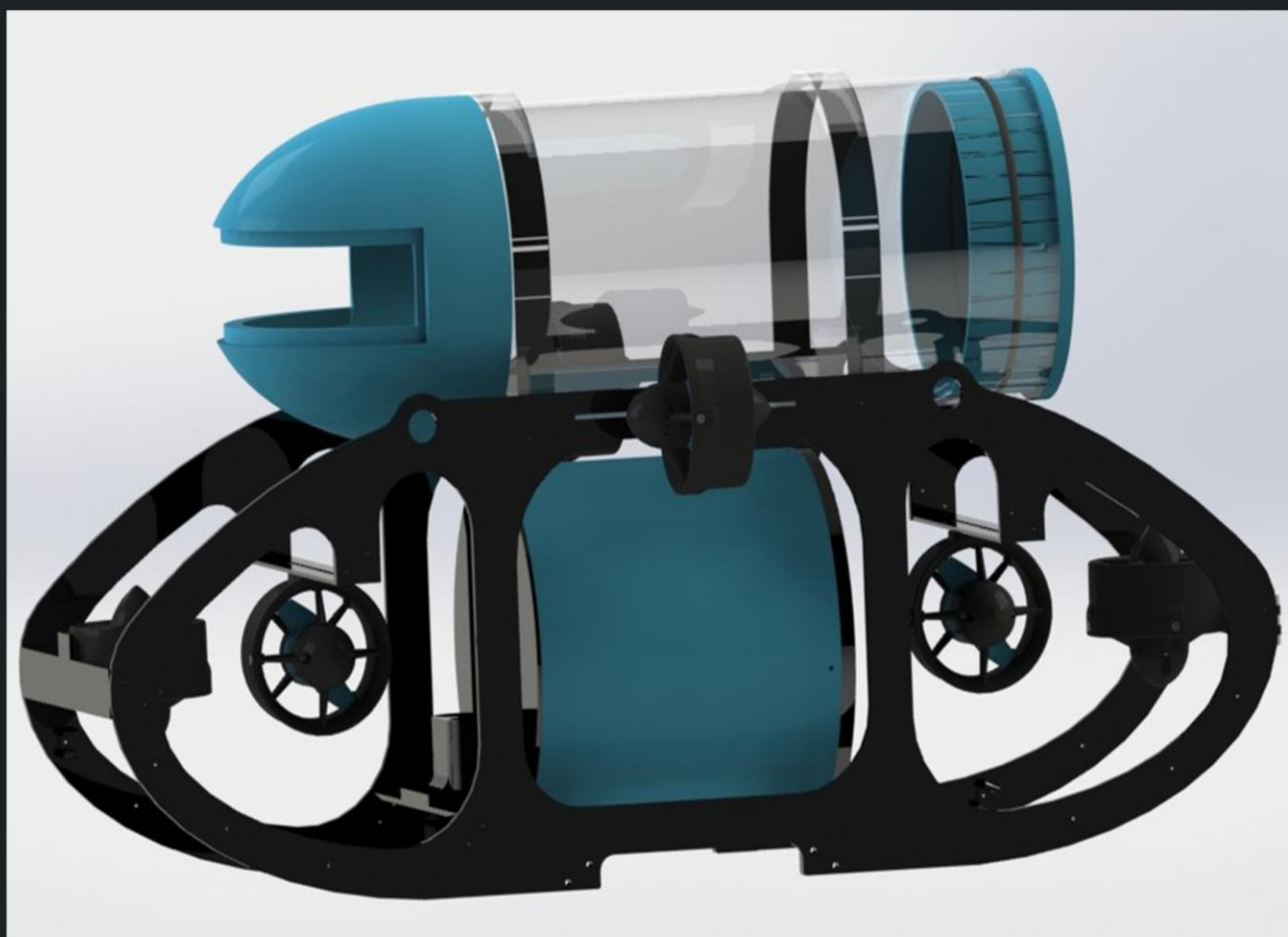
We are proud to present Amogh, our autonomous underwater vehicle with systematic control capabilities to solve specific predefined tasks.



Amogh consists of an array of sensors, advanced computer vision system, artificial intelligence, control system, and integration of all the electrical and mechanical systems to complete the tasks.

The goals for our team in 2015 include:

- Upgrading to a robust sealing mechanism.
- Optimizing the vehicle's size and weight as well as number of components.
- Integrating acoustics module with customized hydrophones and hardware.
- Revamping wire-management and electronics maintenance.



Weight : 30 kg

Endurance : 90 min

Bouyancy : +.5 kg

Energy : 960 Whr

Dimension[mm]: 800x250x475

**Power: Lithium Polymer
Batteries**

Max Speed : 1 m/s

**Thruster : 6x Bluerobotics
T100**

Max Depth : 20 m

IMU : 1 MEMS AHRS

**DOF : 4(Surge,Heave,Sway,
yaw)**

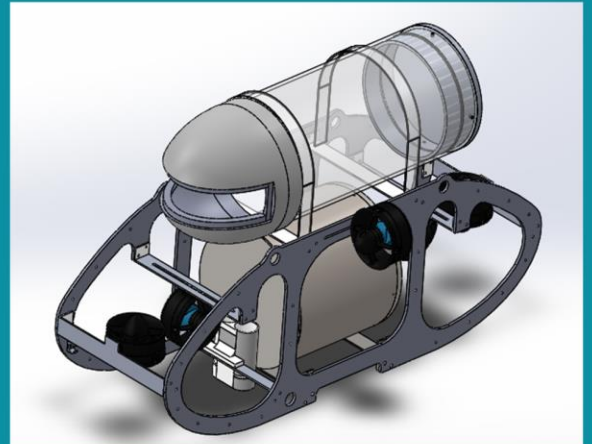
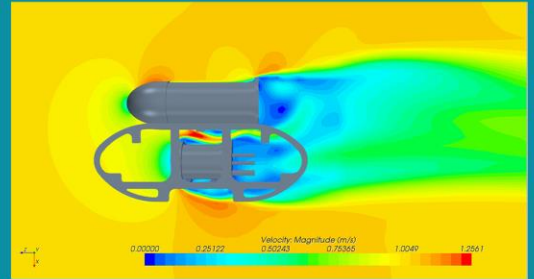
Three Webcams

TECHNICAL DETAILS

MECHANICAL

The AUV's mechanical infrastructure comprises of a vehicle frame, two vacuum-sealed pressure hulls, a unified pneumatic system and a variety of enclosures to house the various sensors. It has a Dual Hull, Multiple Thruster Design with six thrusters providing control in four degrees of freedom. The lower hull contains heavy components like batteries and the upper hull contains relatively light weight electronic components, thus lowering the center of mass and inhibiting the rolling motion.

Amogh basically has a bottom heavy design with the top hull made of acrylic plastic and bottom hull made of mild steel. Lateral sealing mechanism has been used for sealing the hull of AUV.



ELECTRICAL

The electrical sub-system facilitates the control and navigation of the vehicle using mission software and keeps a track of the vehicle's state and health parameters through various sensors. It houses an Intel i7-4770T 3.8GHz processor, mounted on a MSI Z87I AC motherboard and loaded with 4GB of DDR3 RAM. Sensing solutions include an IMU for orientation feedback, a pressure sensor for depth feedback and three HD web cameras for vision.

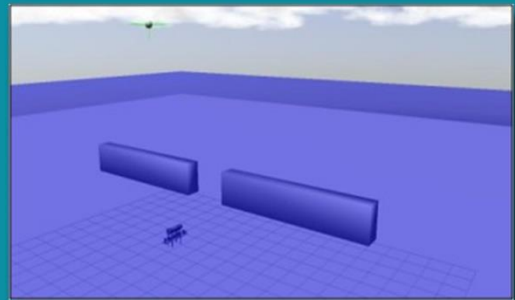
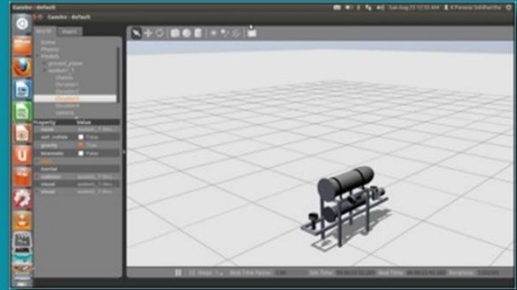
The power management system of Amogh has been designed for an endurance of 1.5 hours and utilizes four Lithium Polymer (Li-Po) batteries.



TECHNICAL DETAILS

SIMULATOR

Simulator uses software to test out code to be used for control and Image Processing(IP) in a virtual environment before live testing the machine. It uses the open source softwares Gazebo, ROS and SolidWorks to achieve this task. It includes the graphical rendering of the AUV model, inclusion of sensors and lighting conditions. It helps gain a visual understanding of the situation and facilitates optimization of algorithm.

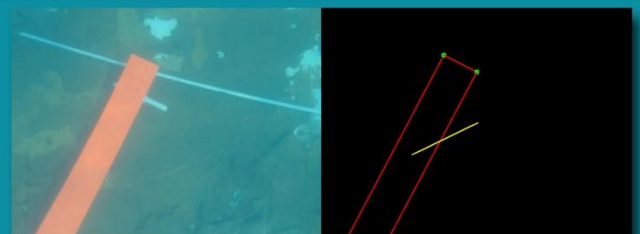


COMPUTER VISION

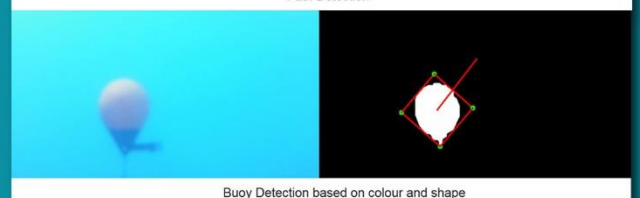
Computer vision involves the use of techniques for acquiring, processing, analyzing and understanding images. OpenCV- an open source cross-platform computer vision library developed by Intel - is used for implementing the Image processing techniques.

Pre-processing: Images are preprocessed to enhance color and brightness. This is required to compensate for the effect of the photo being captured underwater.

Object/pattern detection: It involves detecting patterns as well as distinguishing them from other patterns of similar nature based on their appearance characteristics.



Path Detection



Buoy Detection based on colour and shape

ACHIEVEMENTS



AUVSI Robosub 2014

Participated for the first time in 2014. Qualified for the semifinals and placed 15th amongst top 43 teams of the world.



NIOT-SAVe 2014

Winner of the national competition organized by NIOT.



ACHIEVEMENTS



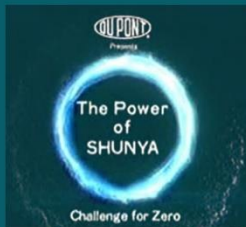
India Innovation Initiative 2013

Shortlisted amongst the top 44 projects across the nation and was presented at the National Fair of India Innovation Initiative, jointly conducted by CII and DST.



Student Design Competition 2013

Won Gold Medal and Silver Medal respectively for reports on Control Systems of AUV and Mechanical Design of AUV in Student Design Competition conducted by NDRF.



Power of Shunya 2013

Selected amongst the top 24 innovations across the country to appear on the show Power of Shunya - Challenge for Zero, hosted by ET NOW TV news channel.



SPONSORSHIP

- ➡ By sponsoring AMOGH, you will be helping a group of ambitious and dedicated students to pursue their passion for engineering.
- ➡ Year long branding and visibility at both International and National Team Events such as Robosub AUVSI, SAVE (conducted by NIOT), Shaastra 2015.
- ➡ Branding on team apparels and merchandise.
- ➡ LOGO of your company will feature on the 2016 version of Amogh.
- ➡ Promotion for your company will be featured prominently on our website as well Press coverage in leading national newspapers like The HINDU, The Economic Times, Deccan Herald as well as The Fifth Estate (Institute Newsletter) and other Technology magazines.
- ➡ Access to members (current and alumni) of Amogh for surveys, studies, interaction session, seminars etc.
- ➡ Building strong public relations with our student team and faculty network.
- ➡ Access to the Amogh AUV (by mutual consent of the team and partners) for showcase events or exhibitions.
- ➡ The team requires the sponsorship of INR 15 Lakhs for a contingent of 8 members to participate in AUVSI Robosub 2016 competition.



OUR PARTNERS IN 2015



CONTACT US



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