Spider

The Research and Development Club

National Institute of Technology,Tiruchirappalli, India

Arboc

A Multi-link Underwater Robot

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INTRODUCTION

Arboc is a multi-link underwater robot which changes its body shape to navigate in underwater environment to carry out underwater exploratory tasks.

OBJECTIVE

To understand the dynamics of underwater robots in general and the effect of lift,drag and hydrodynamic coefficients on them

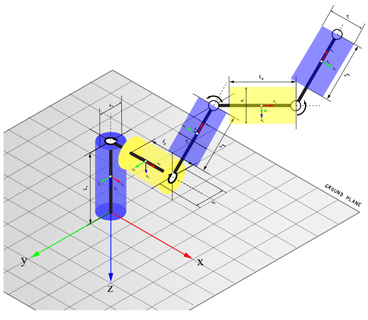
To build a framework to model the general lift, drag, and hydrodynamic coefficients for underwater robots.

To develop a multi-link model which is robust enough to carry out underwater exploratory tasks.

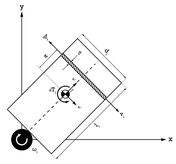
THEORY

Conventional propulsion techniques of using propellers or thrusters in an underwater environment may not be the most effective way for navigation when compared to that of locomotion mechanism in aquatic animals.

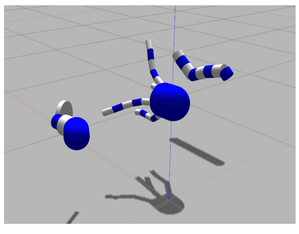
These bio inspired propulsion techniques involve intricate changes in shapes and orientation to the bodies to generate propulsion forces efficiently.

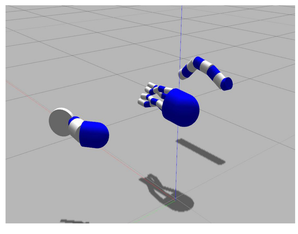


Coordinate system convention



Torque acting on a cylindrical link



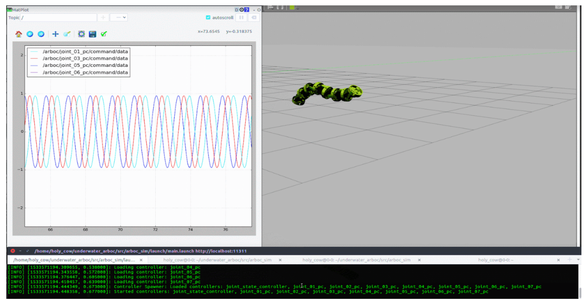


Simulation of underwater creatures in Gazebo using the proposed framework

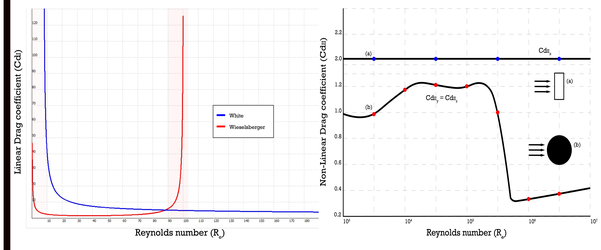
Paper on "**A Scalable Simulation Framework for Underwater Biomimetic Robots**" accepted at International Conference on Control,Automation and Robotics ICCAR, Singapore 2020

RESULT

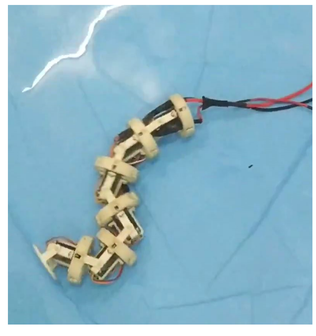
Simulation of a multi-link robot in Gazebo with ROS at the backend :



Relation between Drag coefficients and Reynolds number:



Physical prototype in underwater environment:



CONCLUSION

The effect of lift, drag and hydrodynamic coefficient on the dynamics were found out.

A simulation framework has been developed and open sourced which was developed in Linux using Robot Operating System (ROS) and Gazebo.

A servo actuated physical prototype was developed and tested in underwater environment to validate the simulation results.