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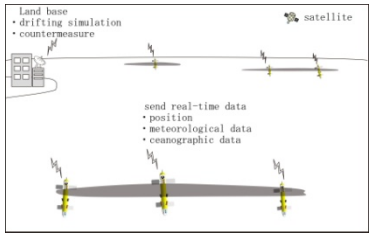
Research on Marine Mechanical System

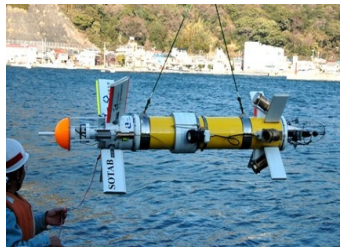
Spilled Oil Tracking Autonomous Buoy System

This study is aimed at development of spilled oil tracking autonomous buoy system to prevent spilled oil from drifting ashore and minimize damages on environments. The system consists of autonomous buoys and the land base. When oil spill accident occurs, several buoys are dropped into the sea from ships or helicopters. They are expected to send their location, the meteorological and oceanographic data around them to the land base in real-time.

Collecting Work of spilled oil drifting ashore



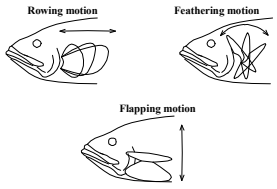
Concept of spilled oil tracking autonomous buoy system



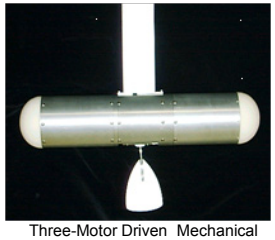
Spilled oil tracking autonomous buoy system

Precision Maneuvering of Biomimetic Underwater Robot under Disturbances

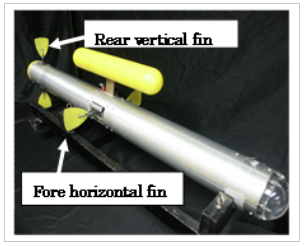
Aquatic animals in coastal area have high performance of maneuvering in severe environmental conditions like waves and currents. This study is aimed at analysis of pectoral fin motion of aquatic animals in waves and currents, development of compact mechanical pectoral fin system, optimization of motion of mechanical pectoral fin, development of an underwater robot equipped with 2 pairs of mechanical pectoral fins and development of guidance and control algorithm in waves and currents



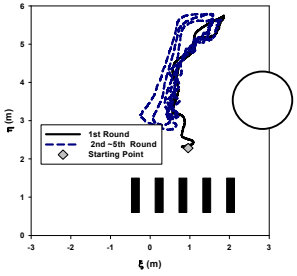
Principal motion of pectoral fin



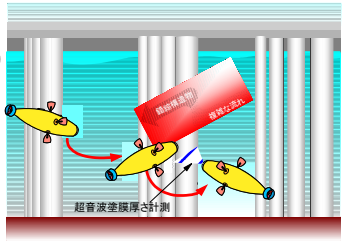
Three-Motor Driven Mechanical Pectoral Fin "Birdfin"



Biomimetic Underwater Robot equipped with 4 mechanical pectoral fins (PLATYPUS)



Guidance and control of PLATYPUS in water currents

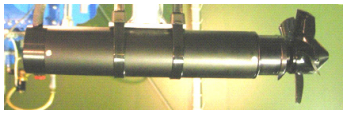


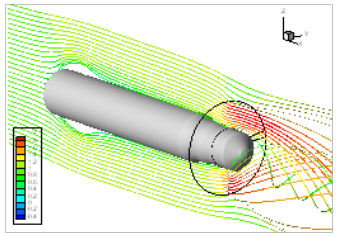
Inspection Task by PLATYPUS around Piles

Flexible Pneumatic Fin Actuator

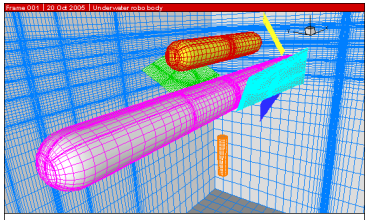
Application of Computational Fluid Dynamics for Ocean Engineering.

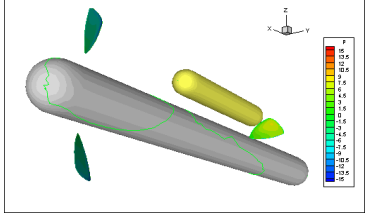
The hydrodynamic performance decides the performance of the underwater equipments and devices itself rep resented by the underwater vehicle. It is necessary to know the flow characteristics around them in order to gr asp the hydrodynamics performance of the underwater equipments and devices. From the viewpoint of above , applications of Computational Fluid Dynamics to the ocean engineering, especially development of underwat er equipments and devices are studied .





Thruster for underwater vehicle (upper) and Computational result of flow field around the thruster (lower)

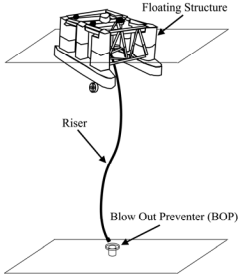




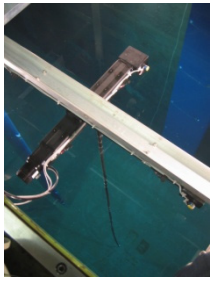
Computation around a underwater vehicle with mechanical pectoral fins " PLATYPUS"

Research on the Vortex Induced Vibration of long flexible pipe

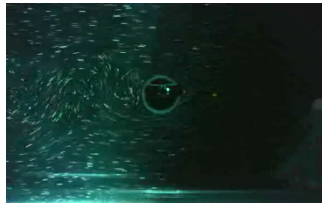
In ocean activities, very long flexible pipes are used for many purposes, such as transporting the natural resources from the sea bed and Cold Water Pipe for Ocean Thermal Energy Conversion. They are always exposed to many external forces, especially the lift force caused by the shedding vortices from them induces the transverse vibration on them. Such vibration is called vortex induced vibration (VIV). VIV is one of the reasons to make the dynamics of long pipes so complex. The dynamics of the long pipes including the VIV phenomenon are studied numerically and experimentally.



Example of long flexible pipe (riser pipe)



Forced oscillation experiment using a flexible pipe model (6.5[m])



Visualization of the flow field around the circular cylinder supported by spring at both end

http://www.naoe.eng.osaka-u.ac.jp/naoe/naoe7/