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Dynamic Systems Analysist Ltd. – Defence Sector Profile

Leaders in high fidelity numerical modeling of naval technologies:

Towed arrays | UUVs/AUVs | Vessel seakeeping and maneuvering | Launch and recovery | Submarines

Introduction

Dynamic Systems Analysis Ltd. (DSA) is an ocean engineering consultancy and software company. DSA provides progressive and accessible dynamic analysis expertise and software to enable those working with vessels, structures, lines, and technologies in harsh marine environments to reduce risk and uncertainty to failure.

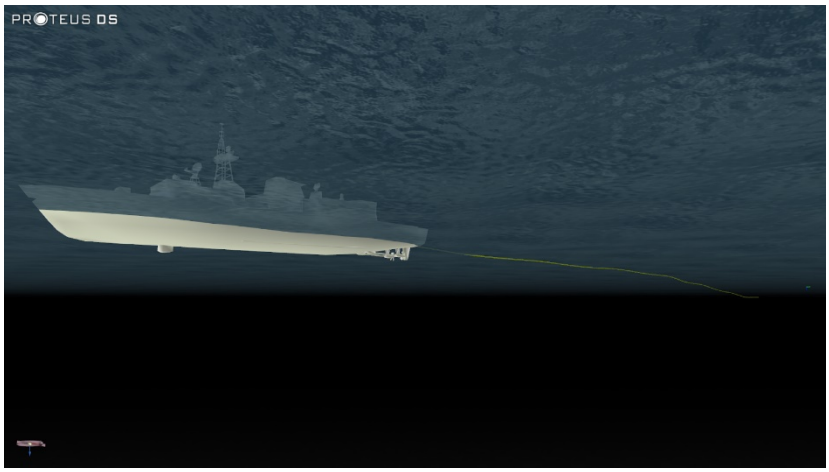

Figure 1 Analysis of a towed array using ProteusDS. Towed array layback, loading, and global performance is assessed using DSA's validated finite-element cable model and vessel seakeeping models. Various sea-states and maneuvers can be simulated.

DSA provides its consulting services and software to defence research scientists, navies, and defence contractors. Our services within defence closely resemble those provided to other marine sectors, with a focus on technologies such as autonomous vehicles, submarines, and towed bodies and arrays.

DSA also licenses two software packages which are used to assess marine technologies: ProteusDS and ShipMo3D. The packages can be used to accomplish a wide range of dynamic analysis projects. Some of these projects and applications are outlined below.

Sample project: Launch and recovery of small craft from a frigate

The launch and recovery of small rescue crafts (e.g. rigid hull inflatable boat) for search and rescue from larger platforms such as a frigate is a high-risk operation for navies. Since 2009, DSA has been developing software tools and expertise for Defence Research & Development Canada (DRDC) Atlantic to de-risk launch and recovery activities [1].

The equipment selected, whether a davit or a multi-purpose boom crane, is tested in a highly accurate and complex virtual marine environment, accounting for the effects of ship motions, wind, waves, and currents. Critical information provided includes loads on the rigging and cranes as well as accelerations

and motions of the equipment and craft. DSA's simulations for DRDC show equipment safety and performance levels in various sea states.

[1] K. McTaggart, A. Roy, D. Steinke, R. Nicoll, D. Perrault, Simulation of Small Boat Launch and Recovery from a Ship with a Crane, ASNE Launch and Recovery Symposium 2012, November 14-15, 2012, Maritime Institute of Technology and Graduate Studies (MITAGS), Linthicum, MD

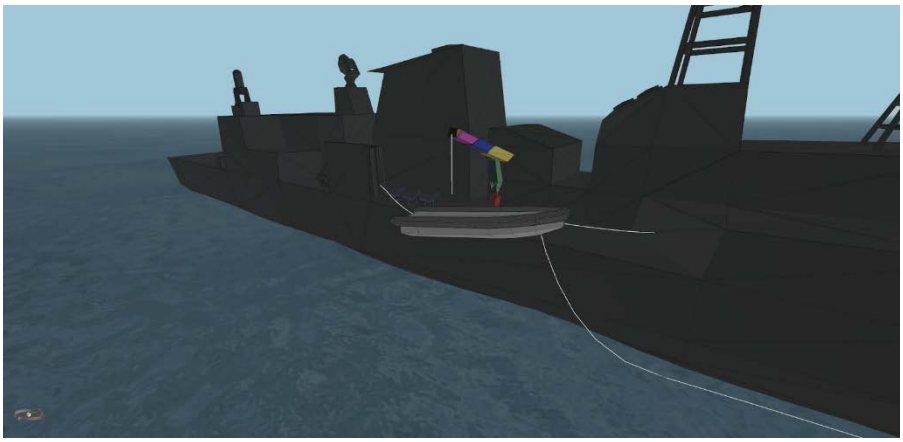

Figure 2 Simulation of the launch and recovery of a small rescue craft with a frigate. A multi-purpose boom crane is simulated. Line, crane, and pedestal loads are determined from the simulation.

Sample project: UUV recovery with a submarine

Submarines operate in littoral waters. Their operational abilities can be expanded significantly by using UUVs. While launching UUVs is relatively straightforward, recovering them to the submerged submarine is far more complex. The problem of recovering a UUV has been investigated by DSA in conjunction with DRDC. The resulting simulations show how hydrodynamics, sensors accuracy, mechanical designs, and control algorithms affect the recovery of the UUV.

Numerical simulation has been shown to greatly reduce physical prototyping and testing costs. The complexity of the UUV recovery methods are ideal for testing using DSA capabiltiies and simulation tools.

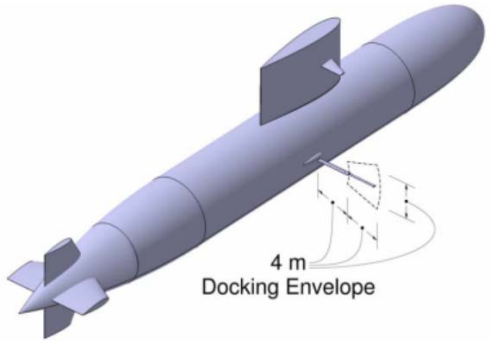

Figure 3 Schematic of a proposed UUV docking arm location on a small diesel submarine. This docking location was tested using DSA's numerical simulations.

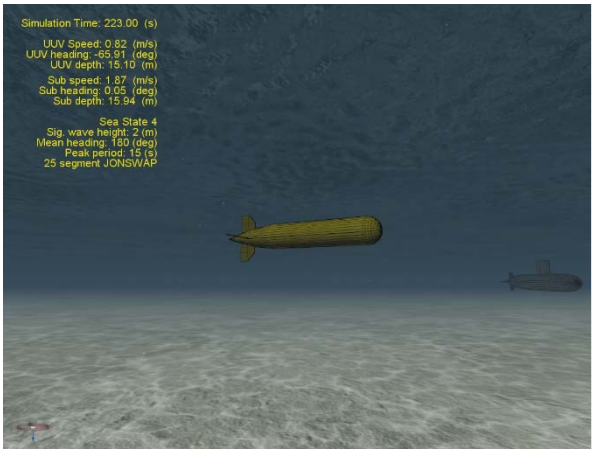

Figure 4 Screenshot from simulation animation of UUV preparing to dock with a submarine

[2] G. Watt, A. Roy, J. Currie, C. Gillis, J. Giesbrecht, G.J. Heard, M. Birsan, M. Seto, J.A. Carretero, R. Dubay, T. Jeans., "A concept for docking a UUV with a slowly moving submarine under waves", IEEE Journal of Oceanic Engineering, Vol 41, No. 2, April 2016

Capabilities: Subsea robotics analysis

DSA has been developing extensive capabilities to assess how subsea robotics platforms such as UUVs, AUVs, and towed systems can be controlled in strong currents and waves. Subsea robotics are playing an increasingly important role in navies and maritime domain awareness and DSA's analysis capabilities can assist in minimizing technology development and deployment risks.

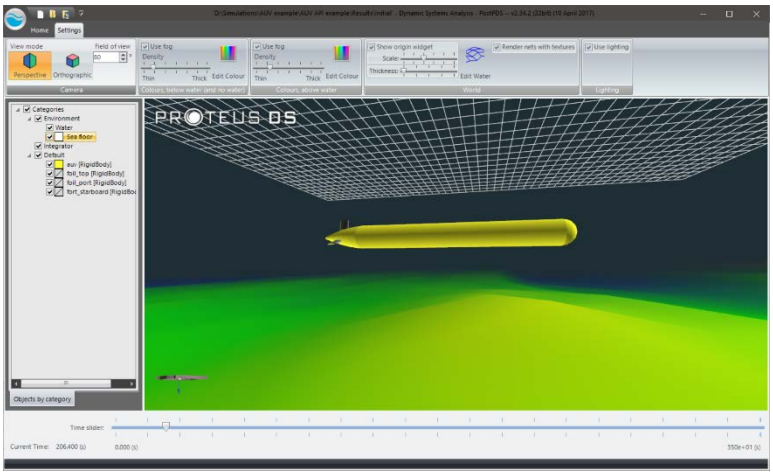

Figure 5 Simulation of an AUV operation in ProteusDS

Capabilities: Vessel seakeeping and maneuvering

Assessing how vessels respond to waves and behave in a variety of seaways is increasingly important. The ability to assess vessel motion in any environment is handled by DSA's team.

Conclusions

DSA has two offices located in Halifax, NS and Victoria, BC. Our talented seven-person technical team is available to assess and support a wide variety of marine simulation projects on topics such as:

- Towed arrays
- Autonomous underwater vehicles
- Submarine hydrodynamics
- Vessel seakeeping and maneuvering
- Launch and recovery

We are registered with Controlled Goods.

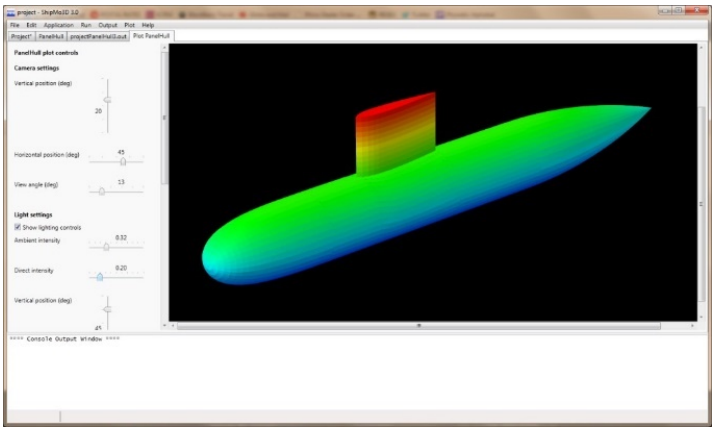

Figure 6 Screenshot of ShipMo3D software being used for analysis of submarine.

Figure 7 Computational fluid dynamics (CFD) simulation carried out by DSA on an AUV

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