HELWAVE

High Efficiency Low Wake Aquatic Vehicle Exterior

Honors Student Association | Research Committee

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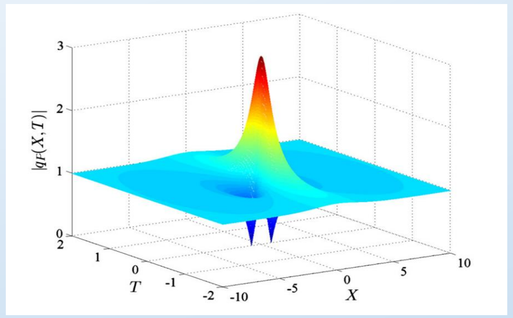
Goal

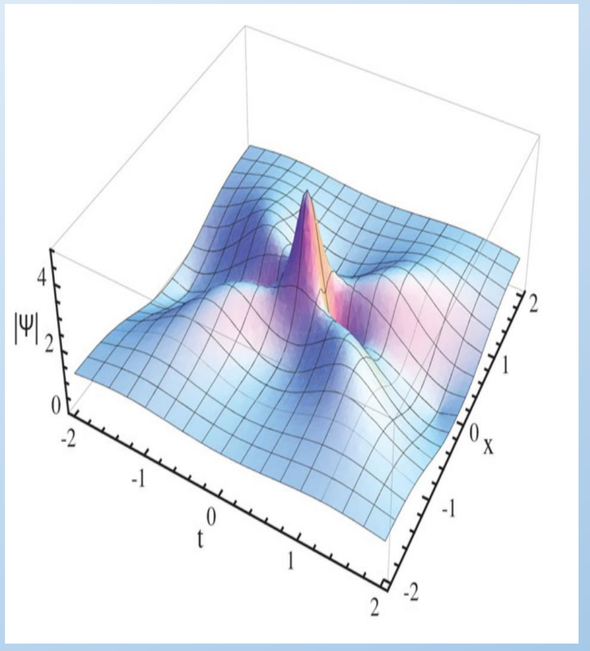
This project would ultimately culminate in the creation of a multitude of highly efficient and low-wake designs suited for a variety of sizes and styles of water-vehicle that would be applicable to both civilian and military interests. Additionally, it is aimed to promote leadership, encourage teamwork, enhance work ethic, and develop or expand hands-on skills.

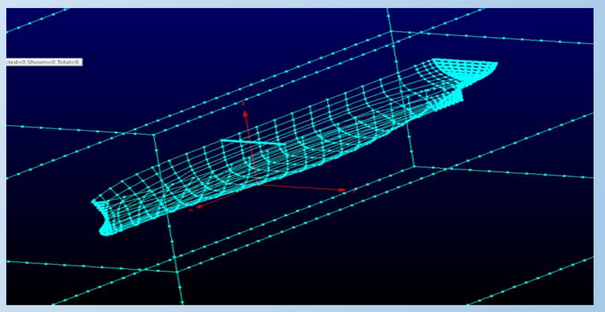
Background

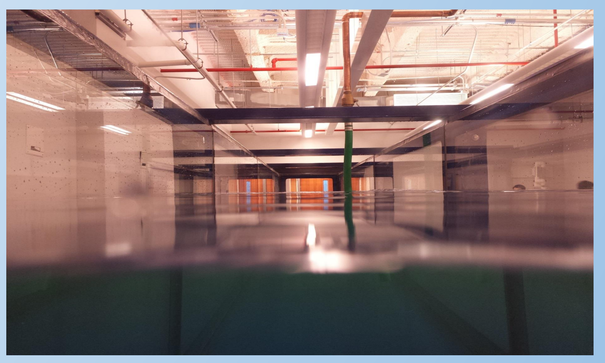
A key element in the dynamics of pattern forming systems is a class of mathematical expressions which are called “solitons.” These are self-localized solutions to certain nonlinear partial differential equations, which describe the evolution of nonlinear dynamical systems with infinite degrees of freedom. Soliton theory was first introduced in 1834 by John Russell Scott and are relevant because they preserve their shape and can be viewed as nonlinear modes of a physical system. Furthermore, a dissipative soliton is localized and exists for an extended period of time. They are self-shaped in saturating nonlinear media due to the compensation of diffraction and dispersion by nonlinearity; however, these particular modes retain close resemblance to a classical soliton.

Solving a mathematical model of these solitons, based on certain initial conditions and parameters, will result in a numerical representation of its shape. By creating a hull that mimics this three dimensional wave, it is hypothesized that the object will retain the properties of a soliton, thus minimizing its interaction with the water.









Project Resources

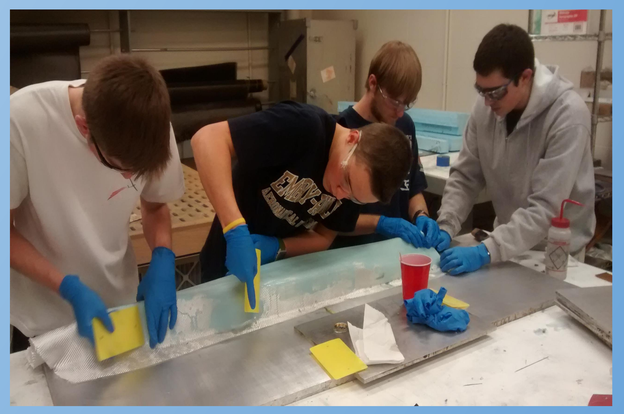
With its depth of resources, HELWAVE is in a prime position to meet and pass its mission.

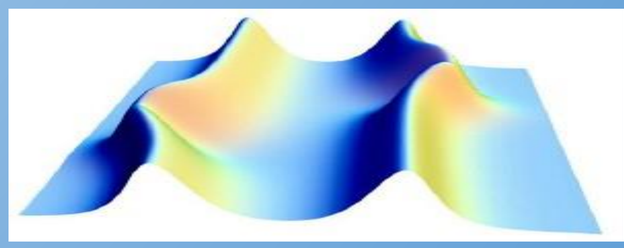
- Members of Embry-Riddle’s teaching staff have offered support and guidance giving HELWAVE members access to both unparalleled knowledge and real-world experience.
- As a division of the Embry-Riddle Honors Student Association, HELWAVE relies heavily on this group for research experience and active membership.
- The Embry-Riddle Ignite Program has become HELWAVE’s main source of funding as their efforts to stimulate undergraduate research have allowed HELWAVE to meet the financial obligations necessary to pursue this project.
- Additionally, HELWAVE is looking into additional outside parties interested in funding this project in order to see it grow to its full potential.
- Embry-Riddle’s state of the art lab space, most notably the Wave Motion Lab and the composites lab, provide environments to build and test.

Impacts

The endeavor has the potential to positively influence individuals from not only the Embry-Riddle campus but also the world.

- Individuals of all disciplines will gain hands-on experience and many will hold a leadership role.
- The majority of intercontinental transportation is done via massive cargo ships and tankers. Due to the colossal size and frequency of use of these vessels, any improvement in their efficiency will be seen in measurable amounts with a reflection in shipping costs.
- The potential for this design ranges across many military vessels due to both stealth and efficiency increases. With interests in reaffirming America's global military strength, new and unique designs would likely be considered for implementation in the replacement of the old vessels.
- A minimal wake design would be useful in numerous other areas, ranging from law enforcement to environmental protection.





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