

Novel Underwater Propulsion Mechanism

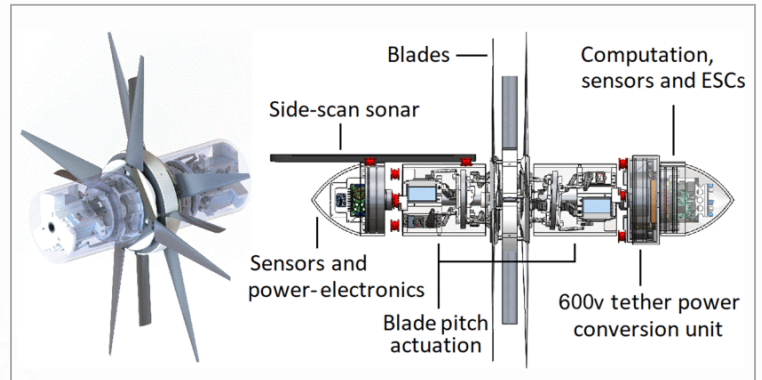
VTIP 20-082 “Highly-agile Omnidirectional Fully-Actuated Novel Underwater Propulsion Mechanism”

THE CHALLENGE

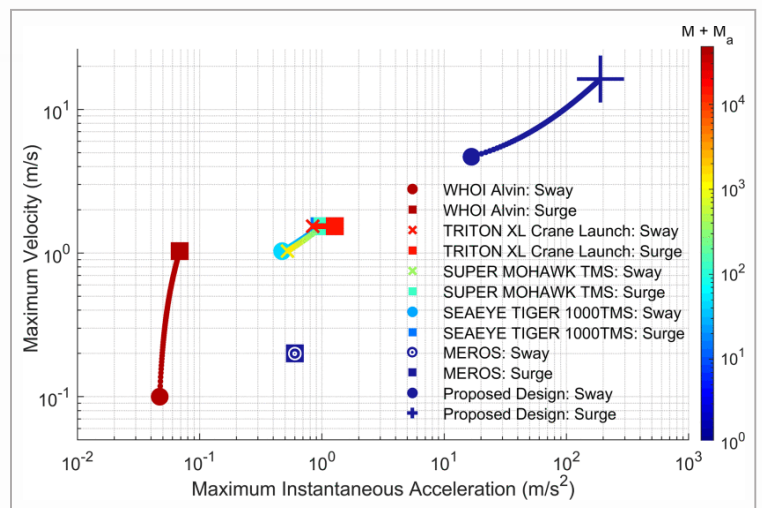
There is a notable divide between the streamlined, torpedo-shaped submersibles and the omnidirectional/semi-omnidirectional crafts that are more round or boxy in shape. As a result, there exists a need for an unmanned underwater vehicle that combines the speed and agility of the former with the full-omnidirectionality and precision of the latter. There is also a growing interest in robots replacing humans in turbulent and dangerous environments that has uncovered a greater need for improved propulsion mechanisms. However, there are multiple design challenges in creating a true omnidirectional craft.

OUR SOLUTION

Researchers at Virginia Tech have constructed a novel propulsion system that would allow small crafts to actively reject heavy turbulence and disturbance using inertial navigation. The design features bi-directional blades that maximize thrust while being long enough to exploit properties emerging from continuous counter-rotation. It also features a basic open-loop controller to link all open-loop control parameters for surge, yaw, and roll movements. This technology will be able to function well in shallow water or other highly dynamic environments that require inspection and also has the speed and agility sufficient to outperform its competitors in any turbulent environments.



Propulsion mechanism (left) and proposed implementation in an un-crewed underwater vehicle (right).



Comparison of mass, top speed, and acceleration of typical remotely operated vehicles. Note the drastically improved maximum velocity and instantaneous acceleration of the new Virginia Tech design.



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