

Integer Technologies Completes At-Sea Testing on UUV Digital Twin Architecture Prototype as Part of a DARPA SBIR Phase 2 Award



Release from Integer Technologies

COLUMBIA, S.C.—August 23, 2023—Integer Technologies announced today that it has successfully completed at-sea testing as part of its SBIR Phase 2 Award—Defining and Leveraging Digital Twins in Autonomous Undersea Operations (DELTA)—with the Defense Advanced Research Projects Agency (DARPA).

Integer, along with its subcontractors at the Woods Hole Oceanographic Institution (WHOI) and Rite-Solutions, Inc., have been investigating the implementation of digital twins for unmanned underwater vehicle (UUV) missions. The team integrated the digital twin architecture, software, and communication systems on a REMUS 100 vehicle, which were validated during at-sea tests.

“Observing and communicating with undersea assets is challenging and thus forecasting what might happen on missions is very important, but also very difficult to do with any accuracy,” said Integer Technologies’ Chief Operating Officer, Dr. Josh Knight. “We are developing digital twins of all size classes of UUVs to overcome the sparsity of data, simulate missions, and adapt the mission plan before something goes

wrong. We want to turn 'What ifs' into 'What wills.'"

The SBIR Phase 2 program aims to define and demonstrate digital twin use cases for individual UUVs as well as multi-UUV missions with the goal of helping operators overcome undersea communication challenges and UUV mission interruptions. The developed "operational" digital twins are digital models of a physical thing, a process, or a system that also use historical mission data logs, sensor data, and faster-than-real-time simulations "at the edge" to inform operational decisions, leading to better mission outcomes.

Integer has a track record of success with prime contracts in the maritime space and is leveraging its expertise to test the feasibility of translating digital twins to the undersea environment, which has not yet been deeply explored.

The research program included developing and performing in-water testing on a split onboard/offboard digital twin prototype architecture. This architecture enables the prediction of mission success likelihood and provides alternative achievable missions in real time to the operational commander based on environmental and UUV subsystem past, present, and forecasted states.

Although providing a mission commander with real time mission performance data from undersea assets remains challenging, Integer's digital twin architecture holds the potential to drastically reduce communications bandwidth requirements and increase the accuracy of system health and mission performance data displayed to the operator. Further demonstration events are planned in 2023.