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Abstract

Aquanaut, an AI-powered underwater transformer that can perform autonomous manipulation tasks for seabed or water column activities.

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Abstract:

Human divers are exposed to health and safety risks every time they perform subsea activities like inspection and manipulation work and are also limited in their practical depth. Consequently, underwater robots have filled that role with varying degrees of success. Directly teleoperated via a tether, Remotely Operated Vehicles (ROVs) possessing no autonomy and have become the norm subsea. Their smarter cousins - Autonomous Underwater vehicles (AUVs) - have no umbilical but until now, have had several drawbacks of their own: preprogrammed missions without the option for operators to intervene while lacking any manipulation capability to accomplish ROV-style tasks. This presentation presents a third option: an autonomous underwater robotic vehicle called Aquanaut. Aquanaut's novel, shape-shifting morphology gives it the ability to conduct long-range, efficient transit while also hovering with full attitude control for stable, in-close manipulation tasks. As a tetherless, subsea, transformable robot, Aquanaut is able to perform subsea services like inspection, maintenance, repair, etc using powerful subsea perception techniques and machine learning strategies that enable autonomous behaviors for manipulation. This new type of subsea vehicle is enabled by a NASA-inspired spaceflight robotics command and control (C2) architecture that offers the latest in autonomous behaviors yet provides operators the flexibility of user-in-the-loop control over low data rates, thereby eliminating the need for costly top side infrastructure and mission-limiting tethers. This presentation will introduce Aquanaut's underwater perception system, learning principals and training techniques also discussing the manipulation and grasping autonomy that allows Aquanaut's high degree of self-sufficiency and self-directedness for subsea environments.

Biography:

Nicolaus Radford. Mr. Radford is co-founder, CEO and CTO of Houston Mechatronics, a growing subsea robotics company. He spent 14 years at NASA in the Dexterous Robotics Laboratory. He was the Principal Investigator for Valkyrie, a bipedal humanoid for the DARPA Robotics Challenge. He was Chief Engineer for Robonaut 2, a spaceflight humanoid. He was the PI in DARPA's electric machine research using Variable Flux. He led efforts in exoskeletons and served as Co-PI on DARPA's Warrior Web. He was the recipient of numerous patents and commendations for his expertise that ultimately culminated in him receiving NASA's Outstanding Leadership Medal.

Publication of speakers:

1. Assessing and mitigating impacts of motorboat noise on nesting damselfish, Environmental Pollution, Volume 266, Part 2, November 2020, 115376
2. Predictors of Adverse Outcomes and Cost after Surgical Management for Idiopathic Normal Pressure Hydrocephalus: Analyses from a National Database, Clinical Neurology and Neurosurgery Available online 22 August 2020, 106178, In Press, Journal Pre-proofWhat are Journal Pre-proof articles?
3. Utility of HAS-BLED and CHA2DS2-VASc Scores Among Patients With Atrial Fibrillation and Imaging Evidence of Cerebral Amyloid Angiopathy, Mayo Clinic Proceedings, Available online 20 August 2020, In Press, Corrected ProofWhat are Corrected Proof articles?
4. High prevalence of cervical myelopathy in patients with idiopathic normal pressure hydrocephalus, Clinical Neurology and Neurosurgery, Volume 197, October 2020, 106099

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