



Autonomous Underwater Cave Explorer

Abstract: Underwater robotics have long been utilized for the remote exploration of complex natural environments. However, such systems are yet to achieve the level of autonomy and ability to undertake complex missions that is observed in their flying- or ground counterparts. This is despite the fact that complex underwater environments, such as networks of underwater caves, are particularly important both for scientific exploration and industry applications. Motivated by the above observation, in this project we seek to develop a



mechatronically simple and highly autonomous underwater robot that presents agile control, visual-inertial odometry estimation capabilities, dense mapping, and autonomous exploration path planning skills. To that end we aim to exploit extensive prior experience in subterranean exploration gained through our winning participation in the DARPA Subterranean Challenge.

Tasks:

- Study concepts and propose a design for a simple to build and hard to break water for underwater cave exploration.
- Prototyping of the robot.
- Tailoring of visual-inertial odometry estimation methods for such an underwater robot.
- Tailoring of autonomous exploration path planning methods.
- Experimental evaluation in underwater navigation and mapping tasks.

Literature (indicative):

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