# Semantic-oriented navigation of an Aerial Robot with Rotatable Camera

Abstract: This project aims to develop an autonomous underwater robot for the task of autonomous exploration and inspection of ballast tanks in vessels (when filled with water). The system will be driven by vision and in this project we seek to develop/deploy visual-inertial SLAM, path planning for inspection/exploration and precise position control. On vision we will build upon recent contributions of our lab on refractive camera modeling and refraction-aware visual-inertial fusion. On path planning we will build on lab contributions originally built for flying and ground systems. On control we aim to rely primarily on open-source autopilots. The project focuses both on methods and their experimental validation.
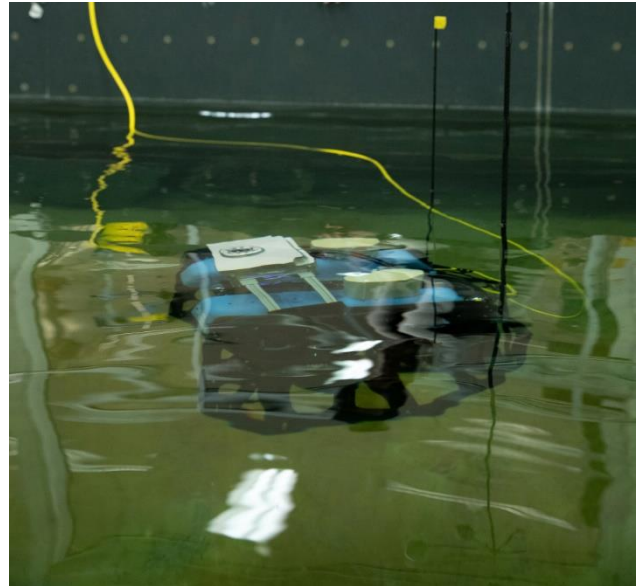
Tasks:

- Study ballast tank inspection requirements.
- Study previous work on autonomous ballast tank exploration and inspection using aerial robots or underwater vehicles.
- Develop the software for autonomous underwater ballast tank exploration and inspection.
- Deploy the methods on one of our lab's underwater systems.

Literature:

[1] Jayatra, K., 2023, October. Mini-ROV Utilization for Banyu Urip FSO Underwater Inspection and Maintenance. In SPE Asia Pacific Oil and Gas Conference and Exhibition (p. D012S002R008). SPE.

[2] Dharmadhikari, M., De Petris, P., Kulkarni, M., Khedekar, N., Nguyen, H., Stene, A.E., Sjøvold, E., Solheim, K., Gussiaas, B. and Alexis, K., 2023, December. Autonomous Exploration and General Visual Inspection of Ship Ballast Water Tanks using Aerial Robots. In 2023 21st International Conference on Advanced Robotics (ICAR) (pp. 409-416). IEEE.

Relevant Funded Project:

- **Title:** AUTOASSESS
- **Funding Agency:** European Commission (Horizon Europe)

Main supervisor: Kostas Alexis, Professor, NTNU | **Co-supervisor:** Mohit Singh, PhD Candidate, NTNU