Title: Underwater localization using flow and magnetometer data

Level: Bachelor/Master

Keywords: Underwater localization, particle filter, pressure sensor, magnetometer sensor

Supervisor: Naveed Muhammad (Uni of Tartu), **Co-supervisor:** Jeffrey Tuhtan (TalTech)

Skills required: Programming

Description: Underwater robots conventionally used vision and sonar sensors for exteroceptive perception. Flow sensing has also been used as a sensing modality in underwater environments in recent years. In this project you will investigate localization in an underwater environment using flow and magnetometer data. You will employ a structured, grid-like dataset acquired at in a large-laboratory flume (45 m length, 2 m width, 0.5 m height) of an underwater environment including flow turbulence. The main objective of your thesis work will be to explore and further develop the map-based localization developed in our previous research (see literature below), by including the local magnetic field intensity.

Some relevant literature:

[1] Naveed Muhammad, Juan F. Fuentes-Pérez, Jeffrey Tuhtan, Gert Toming, Mark Musall, Maarja Kruusmaa, "Map-based localization and loop-closure detection from a moving underwater platform using flow features", Autonomous Robots, 43(6), 1419-1434.

[2] Naveed Muhammad, Gert Toming, Jeffrey Tuhtan, Mark Musall, Maarja Kruusmaa, "Underwater map-based localization using flow features", Autonomous Robots 41(2):417–436, 2017.

[3] Juan F. Fuentes-Pérez, Jeffrey A. Tuhtan, Gert Toming, Maarja Kruusmaa, Naveed Muhammad, Ruth Carbonell-Baeza, Mark Mussal, "Map-based localization in structured underwater environment using simulated hydrodynamic maps and an artificial lateral line", IEEE International Conference on Robotics and Biomimetics (ROBIO), Macau, 2017.