

Thesis topic: Development of control software for a small-scale autonomous mining robot



Figure 1. Two variants of the ROBOMINER concept vehicle (Centre for Biorobotics)

Description of the work:

ROBOMINERS¹ is developing a bio-inspired, modular and reconfigurable robot miner for small and difficult to access deposits. The aim is to create an amphibious robot that is capable of mining underground, underwater, in slurries or on dry land.

Due to the high degree of uncertainty stemming from operating in unstructured, cluttered environments, as well as relying on sparse and unreliable sensor data, a behaviour-based control approach is adopted. The proposed control scheme is a hybrid, and includes characteristics covering the entire spectrum of control of autonomous agents, with low-level reactive control handling tasks relating to the immediate safety of the robot, and high-level deliberative control handling decision-making and planning using a world model. A repertoire of behaviours will determine the sequences of actions the robot can perform, while a behaviour management system will determine hierarchies and behaviour activation. The control software will be developed in a ROS-based simulated environment and evaluated using the small-scale ROBOMINER prototype developed at the Centre for Biorobotics.

What do we expect from you:

- C++ (preferred) or Python 3 skills for development for ROS.
- Familiarity with ROS (ROS 2 will be used but ROS experience would also be valuable).
- Familiarity with control systems.

¹ <https://cordis.europa.eu/project/id/820971>

What will you learn:

- Behaviour-based control for mobile robotics.
- Design and implementation of control for a novel robotic platform.
- Evaluation of control software through simulations and field experiments.

Why does it matter?

The Centre for Biorobotics is developing mid and high level control software for the ROBOMINERS prototype. A robust control scheme is necessary to ensure the safety of the robot, as well as its efficient operation.

Keywords: behaviour-based control, mobile robotics, ROS 2, autonomy

Contact: roza.gkliva@taltech.ee, asko.ristolainen@taltech.ee