

Thesis topic: Signal processing, feature detection, and data validation of low-cost sensing drifter data.

Description of the work:

Data collection using sensors is a common way to learn about the surrounding environment. In subsurface flow environments, like glacial channels or underground rivers, the data collection is hardened by inaccessibility. A lack of global positioning system (GPS) signals, locally self-similar surroundings, and often extreme nature of the environment, limits the availability of direct measurements and observations.

The problem with inaccessibility can be tackled by using sensing drifters; they are small devices that passively follow the water flow. Over the years, the Center of biorobotics has developed series of different low-cost sensing drifters used in various environments, e.g., glacier meltwater systems, rivers, hydropower plants. These devices are used to collect pressure data but are also equipped with an IMU.

The recorded time-series data is noisy. However, it has been shown to provide valuable information about the characteristics of different systems. The main goal of this project is to create an automated data validation system, that can provide fast preliminary analysis of the data collected during field experiments. The project will investigate different signal processing methods and will produce a solution to assess the data.

What do we expect from you:

- Matlab or Python skills
- Basic mathematics skills

What will you learn:

- Design and implementation of signal processing algorithms.
- Data analysis and validation

Why does it matter?

The submersible drifters can be used to collect data in areas which are normally inaccessible. For example, in glaciology, being able to collect data from the pathways created by the meltwater below the surface of glaciers and ice sheets would help validate the sea-level rise. Therefore, fast validation of the collected data can increase the quantity of good informative data.

Keywords: Signal Processing, Feature Detection, Data Analysis

Contact: laura.piho@taltech.ee