Underwater robotics methods for fish hydrodynamics field measurements

Summary

The candidate will be part of a team developing advanced bioinspired underwater sensors. The devices use pressure and inertial measurement sensors, and are based on the fish's sensory system. They are stealthy, passive and can detect and classify complex underwater environments. The focus of this project will be to address two major research questions: (1) How can we use pressure and inertial sensors to study the information content of turbulent flows? (2) How can we use data from fish-like sensors in different types of flows (e.g. laboratory flume vs. river) to predict real fish behaviour? The results of this 3-year PhD thesis are fundamental, and will be important to a broad range of disciplines including fluid mechanics, fish biology, river ecology, and hydropower.

Research field:	Information and communication technology
Supervisors:	Prof. Dr. Maarja Kruusmaa
	Jeffrey Andrew Tuhtan
Availability:	This position has been occupied.
Offered by:	School of Information Technologies
	Department of Computer Systems
Application deadline:	Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich)

Description

The research carried out by the PhD candidate will create new data processing for assimilation of CFD models with physical model sensor data. The methods should incorporate data collected by sensors located at the source (e.g. mounted onto or inside) as well as data collected by passive sensors (e.g. acoustic Doppler velocimetry, particle image velocimetry). A key component of this research work is to explore, develop and test new algorithms across different temporal scales, and make use of the interactions between these scales to study fluid-body interactions in laboratory and natural flow conditions (e.g. rivers, fish passage structures, plumes).

Responsibilities and tasks:

- Setup and run computational fluid dynamics models in OpenFOAM (RANS, LES), evaluate the data and compare it to sensor data using Python, MATLAB and C++
- Participate in laboratory / field experimentation with underwater sensors.
- The results of the candidates work require that they are able to write high-level journal publications, attend and present their work at leading national and international conferences.
- Supervision of BSc, MSc students as well as assisting in lectures and tutorials is also an important part of the candidate's role in order to prepare themselves for academic and professional advancement after completion of their PhD degree (15% of the candidates workload is teaching and supervision).

Qualifications / requirements:

- This position requires a candidate with a strong educational (MSc or equivalent) and professional background in Software Engineering / Data Science / Computational Fluid Dynamics (available by the date of application).

- Ability to read, write and teach in English at the level of an internationally active junior researcher. Coursework: 60 ECTS; PhD thesis: 180 ECTS; Teaching and student supervision load of 10 – 20%.

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