University of Victoria | Institute for Integrated Energy Systems

PRIMED

MASc Position: Tidal Current Monitoring using Drones and Drifters

Remote communities that are not connected to the main power grid must generate electricity locally, seizing on available resources. In British Columbia, many such communities (~50) are still reliant on diesel fueled electricity production that comes at high financial, environmental and social cost. Many of these communities are located near the coast in proximity to a strong tidal resource. This apparent synergy between tidal energy and BC remote communities has generated considerable interest from both communities and tidal energy project developers. However, energy systems which use tidal currents to generate predictable electricity are not yet cost competitive with conventional electricity generation and adopting energy system designs based around tidal energy presents risk.

The first step in mitigating this risk is in understanding the resource. Knowledge of the tidal flow characteristics informs technology selection, project siting and economic analysis (can enough diesel be saved to balance the cost of the tidal device?). Conventional approaches to tidal resource assessment use an instrument called an Acoustic Doppler Current Profiler (ADCP) to measure currents across the full water column (seabed to sea surface). While accurate and trusted, the cost of the ADCP sensor and the commercial vessels needed for deployment and recovery are in many cases prohibitive for a local group considering tidal energy.

A lower cost approach to complete early stage resource assessment has been pioneered by Luna Ocean Consulting Ltd of Nova Scotia. With this approach, passive drifters (such are ice blocks) are jettisoned into the flow and their trajectory is then monitored using consumer-grade drone videography. By post-processing the video using image recognition and tracking techniques, the location and velocity of each passive drifter can be monitored, providing a rich description of the surface tidal currents in both space and time. Surface current measurements can be combined with computer models to build a comprehensive descriptions of the resource that in turn informs the deployment of ADCPs.

A graduate position is available under the co-supervision of Dr. Brad Buckham and Dr. Curran Crawford at the Institute for Integrated Energy Systems at the University of Victoria (IESVic). This student will work with Dr. Crawford, Dr. Buckham and Mr. Greg Trowse of Luna Ocean Consulting on a project to apply the drifter based resource assessment techniques to a BC community. The student will further develop the drifter tracking algorithm to improve tracking precision. The bulk of the technical development is expected to be in the development of motion compensation algorithms that use motion sensor data to compensate for drone movements during tracking operations. The goal is to apply the refined drone-drifter method in a field study assisted by Luna Ocean Consulting.

Requirements

- Undergraduate degree in engineering or science.
- Knowledge of the Python programming language.
- Strong writing, conversational and presentation abilities in English.

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- Ability to work effectively in a diverse team

Preferred Experience

- Exposure to drone technology.
- An understanding of image recognition software and algorithms.
- Experience working with GPS and inertial measurement unit sensors.

Timeline

May 2020.

How to Apply

Interested candidates should email Clayton Hiles at cehiles@uvic.ca the subject *Drones and Drifters*, and attach:

- ✓ A detailed curriculum vitae.
- ✓ A one-page cover letter describing your relevant experience and motivation for the position.
- ✓ Names and contact details for two references.

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