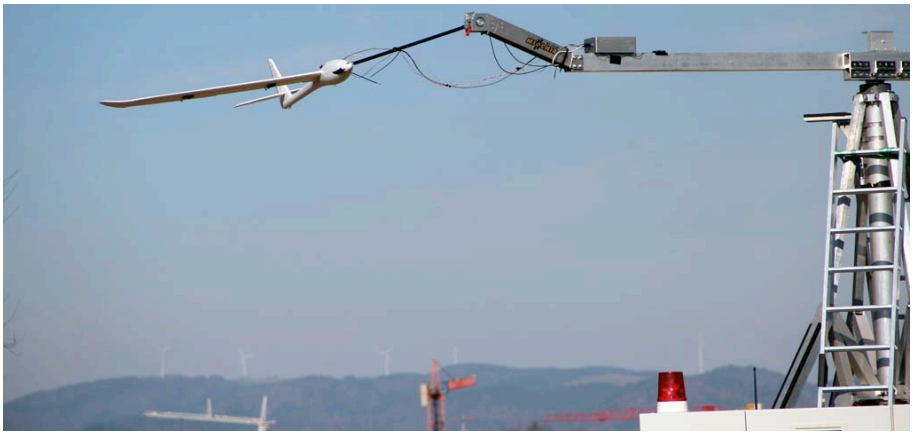
Master Thesis Informatik/ESE/MST/MSE/SSE

Machine Learning for Modelling of Airborne Wind Energy Systems



Airborne Wind Energy (AWE) is a novel way to harvest wind power by flying devices. AWE can harvest winds in higher altitudes than conventional wind turbines and promises to become a major source of renewable energy in the future energy system (more info e.g. on www.awec2017.com). Even though many prototypes have been tested successfully, modeling and controlling these remains a challenge, especially during take-off and landing. The Systems Control and Optimization Laboratory of the University of Freiburg has a carousel flight setup that is used to develop and test modelling and control approaches for airborne wind energy systems (see picture above). In previous work this setup has been modeled with a number of deterministic differential equation models. Evaluations show that the accuracy of these models is limited and leaves room for improvement.

Master topic: The proposed master thesis shall take a new route, and apply state-of-the-art machine learning approaches, e.g., recurrent neural networks, to the task of modelling the dynamic behaviour of the flight carousel. These have to be trained and evaluated in terms of accuracy of the model and their feasibility for control tasks.

Your skills: A background in Machine Learning is requested, prior knowledge in systems, control and optimization is advisable. The implementation will be in Python and using the TensorFlow toolkit. As previous work on the airborne wind energy steup was done in MATLAB and CasADi, knowledge of both tools will be helpful.

Note: This thesis is suited for one or two students. For particularly qualified candidates, related job student contracts with the university or with cooperating airborne wind energy companies can be created to accompany the thesis work.

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