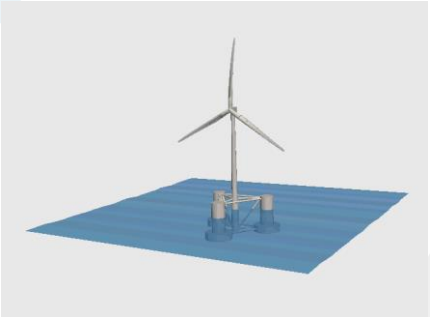
Internship or BSc/MSc thesis: Advanced Controller Design for Floating Wind Turbines

Floating foundations for offshore wind turbines are a novel technology, which makes harvesting of offshore wind energy possible at sites of large water depth, where fixed-bottom foundations are not feasible. In various international research projects, the University of Stuttgart (SWE) was able to build up knowledge and infrastructure for design, simulation and controller development of these multidisciplinary systems. Simulations involve structural and aerodynamic models for the aero-elastic interaction and potential flow hydrodynamic models to simulate the ocean waves and the forcing on the floating system.

sowento is a successful spin-off of the University of Stuttgart with the aim of realizing commercial construction of floating wind projects in the future through advanced technology: We use advanced modeling and control in order to save material, approaching minimum safety factors for a most efficient use of steel and concrete. Our vision is to advance Floating Offshore Wind Turbine (FOWT) technology for sustainability and cost-efficiency through an optimization of the dynamic characteristics. (Read more: Floating Wind)



Floating Wind Turbine simulated in FAST (NREL).

Research challenge

The present work will be detailed further, depending on the applicant and requirements (thesis or internship). The goal of the present work is to take advanced control solutions from theory to practice: While numerous advanced controllers like Model Predictive Control (MPC), H_∞, LQR, etc. have been proposed, their realization into usable full-range controllers is still not solved. sowento is currently working on a project on MPC for onshore and floating offshore wind turbines with the clear goal of making this controller work on a real wind turbine for the first time. The research questions are as follows:

- Which advanced control strategy is most suitable for advanced & robust FOWT control?
- Can NMPC guarantee feasible and reliable performance for FOWTs?
- Can we automate the development of MPC for FOWTs?

In the present work, you will learn how to use sowento's and SWE's in-house reduced-order wind turbine model SLOW and the open-source tool OpenFAST. You will gain knowledge in industry-standard wind turbine control, control of floating wind turbines, as well as the challenges of MPC in its theory and implementation. You will be part of a very motivated team, working in a creative and enthusiastic environment.

Candidate Profile

For a successful completion of the internship/thesis project, applicants should have an understanding of control engineering, wind turbine control, dynamic systems simulation and programming.

Contact

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