SkySails Tethered Kites for Ship Propulsion and Power Generation: Modelling and System Identification

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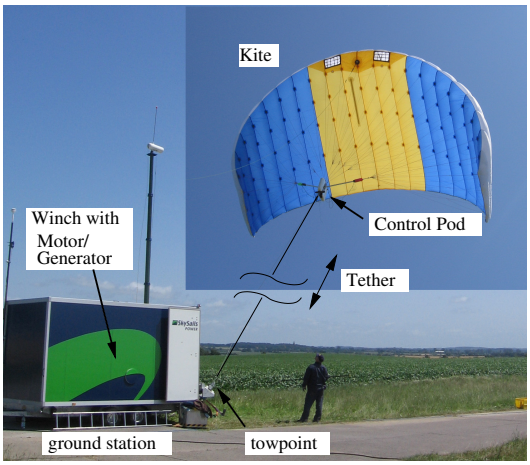
Abstract: Energy harvesting using tethered kites can exploit higher wind speeds at higher altitudes. However, the economic operation of these sophisticated airborne wind energy setups demands for highly reliable and fully automatic control systems mastering the huge uncertainties and disturbances coming along with the natural resource wind. An important key to success in designing suitable control systems is a clear understanding of the system dynamics based on a few system parameters. Particular focus of this lecture will be put on the modeling of the tethered kite system as well as on the validation of the model and identification of basic system parameters by discussing experimental flight data for kites ranging from 20-320 m^2.

Topics:

- Brief introduction to tethered kites for ship propulsion and power generation in pumping cycles
- A simple model for the tethered kite system: setup, physics and derivation of equations of motion
- Short overview on the sensor system
- Experimental validation of the model by special tests and flight data
- Identification of basic system parameters from real flight data
- Challenges and limits of the real-world system
- Brief summary of the control system



Small–Scale Functional Model (50kW peak power)