

Aerodynamic wind-turbine rotor design using surrogate modeling and three-dimensional viscous-inviscid interaction technique - DTU Orbit (08/11/2017)

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In this paper a surrogate optimization methodology using a three-dimensional viscous-inviscid interaction code for the aerodynamic design of wind-turbine rotors is presented. The framework presents a unique approach because it does not require the commonly-used blade element momentum (BEM) method. The three-dimensional viscous-inviscid interaction code used here is the accurate and fast MIRAS code developed at the Technical University of Denmark. In comparison with BEM, MIRAS is a higher-fidelity aerodynamic tool and thus more computationally expensive as well. Designing a rotor using MIRAS instead of an inexpensive BEM code represents a challenge, which is resolved by using the proposed surrogate-based approach. As a verification case, the methodology is applied to design a model wind-turbine rotor and is compared in detail with the one designed with BEM. Results demonstrate that nearly identical aerodynamic performance can be achieved using the new design method and that the methodology is effective for the aerodynamic design of wind-turbine rotors.

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