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Yaw control for power optimization of an array of turbines: large eddy simulations[1] UMBERTO CIRI, MARIO ROTEA, STEFANO LEONARDI, The University of Texas at Dallas — Nowadays, advanced control systems are highly sought for the efficient operation of large clusters of wind turbines. The main objective is to mitigate wake interactions thus increasing annual energy production and/or limiting fatigue loads. Several control strategies have been proposed: generator torque, blade pitch angle and turbine yaw angle. Specifically, the introduction of a misalignment between the rotor plane and the wind direction (i.e. a non-zero yaw angle) causes the wake to laterally displace. Consequently, this phenomenon can potentially be exploited to avoid or reduce waked operations in aligned turbines configurations. However, the successful use of this strategy requires proper coordination between the individual machines in order to identify the optimal yaw angles. Because of the complex mechanisms which are expected to occur in this kind of flow, modeling inaccuracies may have a major impact on the results. As a consequence, a model-free approach is pursued, namely a Nested Extremum Seeking Control, coupled with Large-Eddy Simulations to assess the impact on performances of this control strategy, devise optimal settings and identify key interactions.

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