Maximizing power generation in floating offshore wind turbines: nonlinear robust control approaches in low-wind region

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Résumé

This study examines a robust control approach for a floating offshore wind turbine (FOWT) operating in Region II. The aim is to maximize power point tracking (MPPT) while minimizing fatigue loads within wind speed limits. Ensuring the tip speed ratio (TSR) is at its optimal value achieves the MPPT control aim while setting the platform pitch velocity to zero helps in reducing system fatigue. Control design based on the FAST platform model is not trivial due to the nonlinear and complex dynamics provided by the model of a FOWT. A robust nonlinear control approach is proposed to address this issue as it requires minimal knowledge about the model of the system. Such a class of controllers is adapted to parameter variations and perturbation. Finally, simulation results are presented to validate the effectiveness of the implemented control approaches.

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