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Appropriate control of wind generator's blade angle via application of singular perturbation method

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In the recent years, benefiting from renewable energy resources such as wind is drawn so much attention. Therefore many countries worldwide are planning to use this energy in case of developing the variety of energy sources and improving their environment. In associate with this movement, the wind generator producers are creating bigger and more high-tech generators. Due to the fact that wind is not predictable in associate with its non-linear behavior and changing through time, controlling of wind generator will be difficult. This situation needs a modern technology to meet needed efficiency, reliability and availability. The focus of this research is on application of a method for order reduction of wind generator system without loss of issue generality that this causes easier controlling actions. The target of this research is using of singular perturbation method for modeling and order reduction of wind generator equations in case of performing suitable control for blade angle. Appropriate change of blade angle leads constancy of rotor speed and will control it. In order to control of rotor speed and its adjustment in definite speed range of wind, the LQG controller is applied. Also FAST simulator is applied for modeling and assessment of controller. This simulator is allocated to the American national laboratory of renewable energies. In the mentioned simulator, the model of a 5 MW wind generator is applied. For accuracy checking of controller's operation, the modelling results are compared with a Proportional-Integrator controller and the achieved result of designed controller was significant better.

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