Torsional Vibration Reduction with Augmented Inverse Model-Based Controller in Wind Turbine Drivetrain

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Abstract

Wind energy has shown promising advantages in reducing the greenhouse effect by minimizing carbon dioxide emissions to improve earth climate. Wind turbine which falls under the umbrella of renewable energy family promises cleaner environment while generating electricity from wind energy with no burnt fossil fuel. However, it portrays challenges in terms of high operating cost due to component failure. Thus this paper discusses on mitigating one of the problems related to wind turbine failure, the torsional vibration reduction in drive train. A generator torque control is investigated together with the particle swarm optimization technique in search for accurate parameters of the controller. This control strategy is a solution to low wind speed areas especially around South East Asian region. An augmented inverse model-based controller and band pass filter is proposed to obtain vibration attenuation at the dominant mode. The modelling endeavor is firstly obtained via particle swarm optimization search capability to obtain an accurate transfer function of the inverse model. A band pass filter (BPF) is then augmented with the inverse model as controller for torsional vibration suppression. Results have shown favorable comparison between the proposed and conventional methods in terms of vibration attenuation level.

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