Adaptive Backstepping Control of Lightweight Tower Wind Turbine - DTU Orbit
(15/01/2016)

Adaptive Backstepping Control of Lightweight Tower Wind Turbine
This paper investigates the feasibility of operating a wind turbine with lightweight tower in the full load region exploiting an adaptive nonlinear controller that allows the turbine to dynamically lean against the wind while maintaining nominal power output. The use of lightweight structures for towers and foundations would greatly reduce the construction cost of the wind turbine, however extra features ought be included in the control system architecture to avoid tower collapse. An adaptive backstepping collective pitch controller is proposed for tower point tracking control, i.e. to modify the angular deflection of the tower with respect to the vertical axis in response to variations in wind speed. The controller is shown to guarantee asymptotic tracking of the reference trajectory. The performance of the control system is evaluated through deterministic and stochastic simulations including an extreme wind gust event, and the feasibility of stabilizing the tower position while maintaining the rated power output is shown.

General information
State: Published
Organisations: Department of Electrical Engineering, Automation and Control, Department of Applied Mathematics and Computer Science, Dynamical Systems, Norwegian University of Science and Technology, VESTAS Wind Systems A/S
Authors: Galeazzi, R. (Intern), Borup, K. T. (Ekstern), Niemann, H. H. (Intern), Poulsen, N. K. (Intern), Caponetti, F. (Ekstern)
Pages: 3058-3065
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the 2015 American Control Conference
Publisher: IEEE
ISBN (Print): 978-1-4799-8685-9
Main Research Area: Technical/natural sciences
Conference: 2015 American Control Conference, Chicago, IL, United States, 01/07/2015 - 01/07/2015
DOIs: 10.1109/ACC.2015.7171802
Source: PublicationPreSubmission
Source-ID: 115502816
Publication: Research - peer-review › Article in proceedings – Annual report year: 2015