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Higher-Order Sliding Mode Control of a Wind Energy Conversion System

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Abstract: This work presents a control strategy employing the second-order sliding mode for a variable-speed wind energy system based on a double-fed asynchronous machine (DFIG). This technique finds its stronger justification in the problem of using a nonlinear control law robust to inaccuracies in the model. The objective is to apply this command to independently control the active and reactive power generated by the double-fed asynchronous machine decoupled from the flow direction. The use of this method provides very satisfactory performance for the DFIG control. The overall strategy has been validated on a 7.5 kW wind turbine driven by a DFIG using the Matlab/Simulink. The numerical simulation results show the growing importance of this control in the systems of wind energy conversion.

Keywords: *DFIG; PWM converters; MPPT, higher-order sliding mode controller; wind energy.*

Mathematics Subject Classification (2010): 03B52, 93C42, 94D05.

1 Introduction

The consumption of electricity has increased dramatically over the past decade because of the massive industrialization of some countries and the significant population increase. During the first half of the century, fossil fuels remain the main source of energy, which consequently causes environmental problems in terms of global warming and climate change. Nowadays, the renewable energy attracted the interest of several research teams. Thus, the development of wind turbines is a great investment in technological research.

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