AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electrical Power and Machines Engineering Department

Control of MPPT for Distributed Hybrid Solar/ Wind Generating Systems

A Thesis

Submitted in partial fulfillment of the requirements of the degree of

Philosophy of Doctor in Electrical Engineering

(Electrical Power and Machines Engineering)

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Cairo, 2018

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STATEMENT

This thesis is submitted to Ain Shams University for the degree of Philosophy of Doctor Electrical Engineering (Electrical Power and Machines Engineering).

The work included in this thesis was carried out by the author at the Electrical and Machines Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

No part of this thesis was submitted for a degree or a qualification at any other university or institution.

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ABSTRACT

One of the greatest dependable and advanced alternative energy origins was those coming from wind. Wind energy contribution with deference to the sum of active and reactive powers is growing universally. One of greatest prevalent wind energy industries is Doubly Fed Induction Generators (DFIG's) depending on variable speed variable pitch control systems that could be running through a grid or separate style. Modeling, analysis, control and dynamic details explanation of "DFIG" in all modes of operation are essential to gain optimal wind energy and precisely expect its execution.

The thesis shows an enhanced control approach for grid and rotor side converters (GSC, RSC) of a distributed DFIG depending on wind energy conversion systems (WECS's) utilizing Autonomous Groups Particles Swarm Optimization (AGPSO) and Genetic Algorithm (GA) techniques. The primary objective of this control scheme is reinforcing system constancy during transient operation of the machine considering fault circumstance as compared with the optimization tools to plan PI controllers. Based on GA and AGPSO techniques, definite objective expressions associated to voltages and currents of both stator and rotor are existing to gain the best values for controllers' parameters with the aim of achieving preferable outcomes of power and keeping dynamic system steadiness.

A proposed approach for maximum power by means of Fuzzy Logic Control is advanced. At given wind velocity, the modified system is controlled maximizing output power taken from the wind depending on wind characteristic. The proposed control strategy that achieved via a fuzzy controller (FC) is properly tuned using GA and AGPSO techniques. The success of the supposed control approaches is confirmed through emulation and theoretical analysis executed using Simulink of MATLAB program.

Key words: DFIG; Pitch Control System; Fuzzy Logic; GA Technique;

ACKNOWLEDGEMENT

All gratitude to ALLAH

I would like to express my deep gratitude to Prof. Dr. Mahmoud Abd El Hamid and Dr. Maher El-Dessouki for their precious instructions, constructive advices, helpful and valuable guidance, and strong encouragement and valuable comments during the course of this work. Moreover, Prof. Dr. Mahmoud Abd El Hamid and Dr. Maher El-Dessouki had a great influence on my scientific research life because of their scientific research attitude. Actually, it would have been difficult for me to complete this thesis without their assistance.

Also, I would like to express my gratitude to my family and my friends for their never-ending support, for understanding, patience, and encouragement during the preparation of this thesis.

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