الآية

((وَهُوَ الَّذِي أَرْسَلَ الرِّيَاحَ بُشْرًا بَيْنَ يَدَيْ رَحْمَتِهِ وَأَنْزَلْنَا مِنَ السَّمَاءِ مَاءً طَهُورًا)) الفرقان 48

DEDICATION

This study is wholeheartedly dedicated to my beloved family, who have been my source of inspiration, strength, continually encourage and support

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ABSTRACT

The renewable energy sources such as wind and solar energy have taken their place in exchange for the conventional sources, which have greater impact on the environment. This thesis presents the design and analysis of Wind Turbine Control System (WTCS). It gives mathematical models for its various components, such as wind turbine, drive train, generator shaft, and the controller system. This simulations based on the system model has been implemented using MATLAB version R2014a. For the improvement of the system stability a Proportional Integrity (PI) controller has been designed and implemented with the model. The results show enhanced output power and better overall performance in a wide range of wind speeds.

المستخلص

إن مصادر الطاقة المتجددة مثل الرياح والطاقة الشمسية قد أخذت مكانتها بدلاً من المصادر التقليدية للطاقة والتي كان لها أثر بالغ على البيئة. هذا البحث يقدم تصميم وتحليل لنظام تحكم لتوربينة الرياح، مزودة بنماذج رياضية تمثل عناصر النظام المختلفة مثل: توربينة الرياح، صندوق التروس، عمود المولد، وأخيرا المتحكم. هذا النظام قد مُثل عن طريق برنامج الماتلاب لتحسين إستقرارية النظام تم تصميم وإدراج المتحكم التناسبي التكاملي مع النموذج. النتائج أظهرتحسناً في قدرة الخرج وأداءِ أفضل بصورة عامة لمدى واسع لسرعات الرياح.

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LIST OF ABBREVIATION

WTCS	Wind Turbine Control System
MATLAB	Matrix Laboratory
PT	Proportional Integrity
REN	Renewable Energy Network
GHG	Green House Gas
SHS	Solar Home System
REMP	Renewable Energy Medium Term Plan
AD	Anno Domini
HAWT	Horizontal Axis Wind Turbine
VAWT	Vertical Axis Wind Turbine
RPM	Revolutions Per minute
ASG	Adjustable Speed Generator
FSG	Fixed Speed Generator
PMA	Permanent Magnet Alternator
DC	Direct current
PID	Proportional Integrity Derivative
SP	Set Point
PV	Process Variable
WTG	Wind Turbine Generator
PSO	Particle Swarm Optimization
PS	Pattern search
PMSG	Permanent Magnet Synchronous Generator
DEIG	Doubly Fed Induction Generator
WG	Wind Generator
MPPT	Maximum Power Point Tracking
PSS/E	Power System Simulator for Engineering

SCIGWT	Squirrel-cage Induction Generator wind turbine
LQG	Linear Quadratic Gaussian
IG	Induction Generator