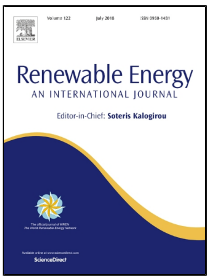
Accepted Manuscript



High Performance of Maximum Power Point Tracking Using Ant Colony Algorithm in Wind Turbine

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PII:	S0960-1481(18)30360-4
DOI:	10.1016/j.renene.2018.03.049
Reference:	RENE 9918
To appear in:	*Renewable Energy*
Received Date:	09 May 2017
Revised Date:	04 March 2018
Accepted Date:	20 March 2018

Please cite this article as: Yacine Mokhtari, Djamila Rekioua, High Performance of Maximum Power Point Tracking Using Ant Colony Algorithm in Wind Turbine, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.03.049

High Performance of Maximum Power Point Tracking Using Ant Colony Algorithm in Wind Turbine

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Abstract: The growing interest in wind power as a source of electric power generation with minimal environmental impact and the advancement of aerodynamic designs, including wind turbines, have been the subject of numerous studies. When wind energy is integrated into the grid, this gives a significant amount of power added to the one produced by other types of plants. Several researchers aim to achieve high efficiency in wind power systems using maximum power point tracking (MPPT) of a variable-speed turbine but this technique is complicated because the different approximations that occur during the online calculations. The main objective of this work is to develop and improve a maximum power tracking control strategy using metaheuristic methods. Ant colony optimization (ACO) algorithm is used to determine the optimal PI controller parameters for speed control. The optimization of the speed gets a better value of power coefficient therefore the extracting power.

Keywords: MPPT, Wind turbine, Ant colony algorithm, Artificial Intelligence, Optimization, Wind Energy

Nomenclature

C_p	Power ratio
f	Viscous friction, N.m.s/rad
G	Gearbox
J	Inertia, Kg.m²
k	Number of ants
L_m	Magnetization inductance, H
L_s	Stator inductance, H
p	Number of pole pairs
P	Pair pole number
P_s, Q_s	Active and reactive stator power, W, VAR
P_N	Nominal power, W
P_t	Turbine power, W
R	Blade length, m
R_s	Stator resistance, Ω
T_{dfig}	Torque of the machine, N.m
T_r	Resistant Torque, N.m
$T_{turbine}$	Turbine torque, N.m