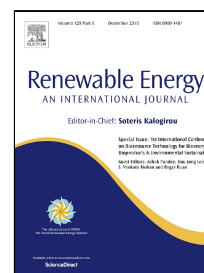


Accepted Manuscript

Linear and Nonlinear Features and Machine Learning for Wind Turbine Blade Ice Detection and Diagnosis

Alfredo Arcos Jiménez, Fausto Pedro García Márquez, Victoria Borja Moraleda, Carlos Quiterio Gómez Muñoz



PII: S0960-1481(18)31000-0
DOI: 10.1016/j.renene.2018.08.050
Reference: RENE 10477
To appear in: *Renewable Energy*
Received Date: 28 November 2017
Accepted Date: 14 August 2018

Please cite this article as: Alfredo Arcos Jiménez, Fausto Pedro García Márquez, Victoria Borja Moraleda, Carlos Quiterio Gómez Muñoz, Linear and Nonlinear Features and Machine Learning for Wind Turbine Blade Ice Detection and Diagnosis, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.08.050

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Linear and Nonlinear Features and Machine Learning for Wind Turbine Blade Ice Detection and Diagnosis

Alfredo Arcos Jiménez¹, Fausto Pedro García Márquez¹, Victoria Borja Moraleda¹,
Carlos Quiterio Gómez Muñoz²

¹ Ingenium Research Group, Castilla-La Mancha University, Spain.

alfredo.arcos@alu.uclm.es, faustopedro.garcia@uclm.es, victoria.borja@uclm.es

² Universidad Europea, Spain.

carlosquiterio.gomez@universidadeuropea.es

Abstract

The mass of ice on wind turbines blades is one of the main problems that energy companies have in cold climates. This paper presents a novel approach to detect and classify ice thickness based on pattern recognition through guided ultrasonic waves and Machine Learning. To successfully achieve a supervised classification, it is necessary to employ a method that allows the correct extraction and selection of features of the ultrasonic signal. The main novelty in this work is that the approach considers four feature extraction methods to validate the results, grouped by linear (AutoRegressive (AR) and Principal Component Analysis) and nonlinear (nonlinear-AR eXogenous and Hierarchical Non-Linear Principal Component Analysis), and feature selection is done by Neighbourhood Component Analysis. A supervised classification was performed through Machine Learning with twenty classifiers such as Decision tree, Discriminant Analysis, Support Vector Machines, K-Nearest Neighbours, and Ensemble Classifiers. Finally, an evaluation of the classifiers was done in single frequency and multi-frequency modes, obtaining accurate results.

Key Words: Feature Extraction, NARX, NLPCA, NCA, Machine Learning, Guided Waves, Ice, Wind Turbine Blade, Classifiers.

Download English Version:

<https://daneshyari.com/en/article/11001204>

Download Persian Version:

<https://daneshyari.com/article/11001204>

[Daneshyari.com](https://daneshyari.com)