基于经验模态分解和支持向量机的光伏发电超短期功率预测

摘　要

随着全球面临着能源危机和环境污染危机，传统能量日益减少，全世界都把能源利用的目光投向了可再生能源。而在此之中的太阳能以其得天独厚的优势成为了万众瞩目的焦点，然而光伏发电功率受天气的原因其输出是不平稳的，这对光伏发电系统并网带来了难题。因此对光伏发电功率输出更精准的预测有重要意义。

面对功率输出具有随机性和不平稳性特点的光伏发电系统，以经验模态分解（EMD）和支持向量机（SVM）为基础，提出一种组合式的光伏并网系统输出功率的预测模型。以 15min 为采样间隔进行对历史数据的构建，为了得到不同频率下的固有经验模态分解分量（IMF）和所对应的趋势分量（Res），将此原始输出功率的时间序列进行经验模态分解，进而构建出支持向量机预测模型。然后用所构建出的支持向量机模型进行训练和预测。最后合成重构每一个得到的预测结果，此预测值为得到的关于光伏发电超短期功率的预测值。通过仿真结果表明：基于 EMD 和 SVM 的功率预测模型与单一 SVM 模型以及持续法预测模型相比，有着更高的预测精度和预测质量。

关键词：经验模式分解；支持向量机；超短期功率预测；光伏功率

ABSTRACT

With the global energy crisis and environmental pollution crisis, the traditional energy is decreasing day by day, the whole world has paid attention to the use of energy to renewable energy, and put hope that renewable energy can change the energy structure needed by human beings. In this case, solar energy has become the focus of people's attention with its unique advantages. However, the output signal of photovoltaic power generation due to weather is not stable, which brings difficulties to the grid connection of photovoltaic power generation system. Therefore, it is of great significance to predict photovoltaic power output more accurately.

According to the output power of PV generation system having the characteristics of non-stationary and randomness, a forecasting model for grid-connected photovoltaic generation system output power is proposed based on EMD and SVM optimized by IMF algorithm. Firstly, the time series data of output power in the similar day with the interval of 15 minutes is built on the basis of weather forecast data of the forecast day. Then, the time series data of output power is decomposed into a series of components including some intrinsic mode components and a trend component under different scales by using EMD. Finally, the entire forecasting results are combined into the ultimate forecasting result of grid-connected photovoltaic generation system output power. The forecasting model is tested with the field dada and the results show that the model based on Res has higher accuracy and faster speed compared to single SVM model and EMD-SVM without optimization.

Keywords: Empirical mode decomposition;Support vector machine;Ultra short term power prediction;Photovoltaic (pv) power

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