

## 基于 EMD 谐波检测方法的研究与实现

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## 摘 要

现如今社会高度工业化，各行各业对于电力系统的稳定性有了更高的要求，解决电力系统中的谐波问题已经成为一项紧要的任务，急需采取手段减少其在电力系统中产生的危害。因此研究合适的谐波检测方法对电能质量进行具有实时性和高效性的检测和分析，它为谐波抑制和治理寻找切实可能的措施提供理论依据，具有十分重要的实际意义。

目前谐波检测常用的方法有傅里叶变换、小波变换、神经网络检测法等方法，这些方法或多或少都有它们的一些不足之处。本文介绍的 EMD 分解方法，是近些年来，科研人员为了解决非平稳信号提出的新型谐波检测方法。虽然目前主要用该方法分析非平稳、非线性的电网信号，但是也能对平稳信号进行良好的分析。它检测出的电网中各次谐波分量的瞬时幅度、瞬时相位和瞬时频率都十分准确，摆脱了以傅里叶分析为框架的束缚。本文利用 EMD 方法对仿真电流信号进行了分析，有效的分解出各次谐波电流分量 IMF，并与傅里叶变换方法进行了对比分析。

**关键词：**谐波问题；谐波检测；傅里叶变换；EMD

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## ABSTRACT

Nowadays, the society is highly industrialized, and all walks of life have higher requirements on the stability of the power system, so it has become an urgent task to solve the harmonic problem in the power system, and it is urgent to take measures to reduce the harm caused by it in the power system. Therefore, it is of great practical significance to study appropriate harmonic detection methods to detect and analyze power quality in a real-time and efficient manner, and to provide theoretical basis for finding possible measures for harmonic suppression and governance.

At present, the commonly used methods of harmonic detection include Fourier transform, wavelet transform, neural network detection and so on. The EMD decomposition method introduced in this paper is a new harmonic detection method proposed by researchers in recent years to solve non-stationary signals. Although the method is mainly used to analyze the non-stationary and nonlinear power network signals, it can also analyze the stationary signals well. The instantaneous amplitude, instantaneous phase and instantaneous frequency of each harmonic component in the grid detected by this method are all very accurate and get rid of the constraint of Fourier analysis framework. In this paper, EMD method is used to analyze the simulated current signal, and the IMF of each harmonic current component is effectively decomposed, and compared with the Fourier transform method.

**Keywords:** Harmonic problem; Harmonic detection; Fourier transform; EMD

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