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标度放大和自适应同步识别约瑟夫森结混沌系统中非同阶参数

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摘要：

约瑟夫森结是一个很重要的超导元件，其电路模型关键参数的数值差别很大，传统的自适应同步方法不能准确识别小幅度参数。基于李亚谱诺夫稳定性理论构造带有增益系数的控制器和参数观测器, 结合标度放大方法对约瑟夫森结混沌系统不同阶参数进行识别。以误差函数为统计量，在增益系数和放大因子的相空间给出同步和非同步区域分布，发现对两个小参数同时进行标度放大可以增加同步区域。该方法可以显著提高小参数的识别精度, 数值计算结果验证了该方法的有效性。

关键词： 混沌 标度变换 约瑟夫森结 自适应同步 参数识别

Identification of parameters with different magnitude orders in chaotic Josephson Junction by using scale conversion and adaptive synchronization

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Abstract:

Josephson junction is an important superconducting device, the valuses of the critical parameters within the josephson junction model are mapped with different orders of magnitude. As a result, the unknwon parameters with smller order of magnitude can not be deteced with high precision by using the original scheme of adaptive synchronization. Based on the Lyapunov stability theory, appropriate controller and parameter observers with gain coefficients are approached analytically, a scheme of scale conversion is proposed to estimate the unknown parameters with different orders of magnitude. By defining the statistical error function, the areas of synchronization and non-synchronization are demarcated. It is found that the area of synchronization becomes larger when two smaller unknown parameters are amplified simultaneously. In this way, the precision of the identified results is increased greatly, and the results confirm that the scheme is successful to identify the unknown parameters with small order of magnitude.

Keywords: scale conversion Josephson junction adaptive synchronization identification of parameter

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