

Spatial Spectral Estimation for Reactor Modelling and Control

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Two dimensional power spectrum analysis is used to identify spatial structure in measurements taken on a square grid over a circular region. The measurements are of gas temperatures at channel outlets in a nuclear reactor, which are influenced by the age of the fuel in the channels. Multiple Slepian tapers defined over this region are used to optimally minimise bias and spectral leakage. This method is extended to a spatial cross-spectrum analysis between the temperatures and fuel age. The results provide estimates of the effects of fuel age and reactor geometry on the regular and irregular spatial variation in temperature. The results will be used to improve the performance of a reactor physics model for temperature prediction and reactor control.

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