

A Signal Processing Method to Access Dynamic System Similarity

Description:

This technology features a robust technique to detect dynamic similarity of two systems based on the statistical properties of their signals. The invention assesses the entire autocorrelation structure of a test and a reference signal series. This is achieved in three steps 1) the test and reference signals are subjected to similar pre-processing to guarantee statistical stationarity; 2) the multivariate periodograms or autocovariance functions are calculated for each series; 3) time- and frequency-domain signal discrimination test statistics are computed and assessed. Equality of the test and reference signals is rejected when the multivariate periodograms are too dissimilar and/or sample autocovariance function of the two signals differ greatly.

Applications:

- System fault diagnosis and similarity assessment of two-time series arising in engineering and non-engineering applications as specified below:
 - Engineering: Structural dynamic similarity
 - Geophysics: Seismic pattern similarity
 - Environmental: Eco-systems dynamics
 - Biological: Activity similarity
 - Econometrics: Economic dynamics
 - Astrophysics: Remote dynamic similarity
 - Medical: Diagnostics
 - Military: Remote recognition and identification

Benefits:

- Idea is robust and adaptable to many dynamic systems
- System assessment without the need for mathematical (analytical) models
- A novel methodology in signal processing for multivariate (multi-channel) signals
- Outperforms the conventional multivariate signal processing techniques (e.g. Principle Component Analysis)
- Invention presents the first concept in “dynamic recognition” based on observed signals
- Concept includes extension to the time domain to enhance performance

Inventors: John Wagner, Hany Bassily, Robert Lund

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Licensing Status: This technology is available for licensing

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