



Intellectual Property Office

Methods Using Recurrence Quantification Analysis to Analyze and Generate Images

Technology Reference

R204/213 - Medical Imaging, Diagnostic Tool

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Dr. Zbilut's (now deceased) focus was physiologic research related to nonlinear dynamics. Working with colleagues in physiology, biophysics, and medicine, he has performed considerable research into the identification of rhythms and patterns in a variety of systems. Recognition of such "patterns" in complex systems provides unique challenges.

Field

Physiology

Patent Status

US Patent **7,430,313**

AREAS OF APPLICATION

- Quantification of laboratory or clinical images
- Software tool for the analysis of functional MR images

ADVANTAGES

- The method is model free
- No assumptions are made in either analysis or image creation
- No specific requirements regarding linearity or stationarity of the MR signals
- Signals can be of relatively short duration
- Minimize supervisory intervention of human operators
- RQA descriptors are made available and subject to straightforward interpretation

THE TECHNOLOGY

An input image or data representing a spatially resolved time varying process is segmented or windowed into a series of overlapping elements; one or more distance metrics appropriate to the specific application is/are computed between each possible pair of such elements; these distances are arranged as a square or cube matrix; and local and global recurrence values are computed. Parameters computed from these recurrence matrixes are used to compare, correlate and/or evaluate images or, alternatively, plotted or displayed to create a 2-D or 3-D image representative of the time varying data.

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