Contribution ID: **27** Type: **Sectional reports**

Fractal thermodynamics, big data and its 3D visualization

Tuesday 6 July 2021 16:35 (15 minutes)

The need for big data analysis takes place in many areas of science and technology: economics, medicine, geophysics, astronomy, particle physics and many others.
This task is greatly simplified if big data has structural patterns. In this talk, we will consider the case when big data with a high degree of accuracy are fractals.
We propose to analyze the fractal structure of big data based on the fractal thermodynamics model. In this model, the state parameters fractal entropy Sf and fractal temperature Tf are introduced. These parameters are functions of fractal volume and fractal dimension.
In the fractal thermodynamics model, the parameters Sf and Tf are related by fractal equations of state (FES): S_f=B·T_f^γ,
The value of the exponent γ will be called the FES index. This parameter is the most important characteristic of the fractal structure.
As a specific example of the big data, consider the quantum phase spaces of instantaneous heart rhytm (IHR) Sq, built on the basis of large data on RR-intervals of daily Holter monitoring (HM) of patients from the Tver Regional Clinical Hospital (TRCH).
Our estimates of the parameter δ for Sq for all patients considered in this work gave a value of no more than 1%. Hence, it follows that with a high degree of accuracy the set Sq is a fractal and, therefore, the method of fractal thermodynamics can be applied to the study of its structure.
The fractal diagram of state SfTf allows visualizing the character of the functional dependence of Sf on Tf. All the states of the SfTf diagram occupy a narrow band with a width of 1.3 and a length of 127 dimensionless units.
3D visualization of the big data of HM allows to represent digital information on the array of RR-intervals in three-dimensional space and consequently in an informative form for analysis purposes.
In this report represent, the 3D histograms of the QPS of ICR of patients of Tver Regional Clinical Hospital constructed using the Maple program system according to the data from 24-hour HM.

Summary

Authors: Mrs PARAMONOVA, Ekaterina (GBUZ Tver region "Tver Regional Clinical Hospital"); KUDINOV, Alexei (Tver State University); MIKHEEV, Sergey (Tver State University); TSVETKOV, Victor (Tver State University); TSVETKOV, Ilya (Tver State University)

Presenter: TSVETKOV, Victor (Tver State University)

Session Classification: Distributed computing, HPC and ML for solving applied tasks

Track Classification: 10. Distributed computing, HPC and ML for solving applied tasks