

## **Two-dimensional words entropy calculation method**

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Entropy is one of the key metrics in measuring how chaotic the considered system is. In this presentation, a new developed method for entropy calculation is being presented. Because of the original problem statement and imposed constraints, the method's application is limited to the cases where the system states are being represented as square matrices consisting of elements in an alphabet of fixed size. Both the original problem and a step-by-step method evolution will be presented and discussed, informing the listeners on encountered pitfalls and used bypassings.

The method was developed by the authors of [1] for the rod like particles' self-organization process analysis and was successfully implemented and used. Method's main idea is based on counting the appearance frequency of the unique configurations in each considered system state during the whole self-organization process. Configuration is defined as a multiset of two-dimensional words, calculated by shifting the square window of fixed size through the original matrix.

Some of the pitfalls mentioned above included the organization of effective calculations and reusing previous ones in order to minimize the computational costs and memory consumption. Effective ways of storing intermediate data mentioned here [2] are also going to be briefly discussed and explained.

### **References**

[1] Mikhail V. Ulyanov, Yuri G. Smetanin, Mikhail M. Shulga, Andrei V. Eserkepov, Yuri Yu. Tarasevich Characterisation of diffusion-driven self-organisation of rodlike particles by means of entropy of generalised two-dimensional words // arXiv:1809.00447 [cond-mat.stat-mech]

[2] Smetanin, Yuri, Mikhail Uljanov, and Mikhail Shulga. "On Calculating the Entropy of 2D Words Over a Finite Alphabet." *2018 International Conference on Engineering Technologies and Computer Science (EnT)*. IEEE, 2018.