

# Generalized synchronization of multidimensional chaotic systems in terms of symbolic CTQ-analysis

Andrey V. Makarenko<sup>12</sup>

<sup>1</sup> Constructive Cybernetics Research Group, P.O.Box 560, Moscow 101000, Russia

<sup>2</sup> Institute of Control Sciences RAS, 65 Profsoyuznaya str., Moscow 117997, Russia  
(E-mail: [avm.science@mail.ru](mailto:avm.science@mail.ru))

**Abstract.** In the report proposed a new approach to analysis of generalized synchronization of multidimensional chaotic systems. The approach is based on the symbolic analysis of discrete sequences in the basis of finite T-alphabet. Each symbol of T-alphabet is defined by three elements of initial discrete sequence. Thus, we can say that T-alphabet symbols encode shape of (structure of geometry) a dynamical system trajectories. Further we have introduced a number of measures for quantitative research of combinatorial and statistical properties of sequences (composed of T-alphabet symbols). These characteristics allow detecting and studying attractors restructuring and intermittency behavior in systems. Investigation of symbol sequences properties allows to diagnose various modes of chaos synchronization, including generalized synchronization (in a certain sense, the topological synchronicity of dynamical systems is studied). Special rule is constructed for detection generalized regime. It is based on indirect relation between symbolic trajectories of synchronizing systems. Key features of the proposed approach (unlike most existing approaches to the study of chaotic systems synchronization): (i) – not only the integral coefficient of synchronization is estimated, but also temporal structure of synchronicity is explored; (ii) – measure of synchronization is generalized to complex ensembles of strongly nonstationary and non-identical large dimensions oscillators with arbitrary configuration and the network (lattice) topology without restrictions. Main features of method are demonstrated by example.

**Keywords:** Chaotic systems, Generalized synchronization, Attractor's structure, Intermittency of synchronicity, Symbolic CTQ-analysis.

