The Fifth Conference on Information Theory and Complex Systems
TINKOS 2017

BOOK OF ABSTRACTS

Editors: Velimir Ilić and Miomir Stanković

Belgrade, Serbia, November 9-10, 2017
Mathematical Institute of the Serbian Academy of Sciences and Arts

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МИНИСТАРСТВО ПРОСВЕТЕ
НАУКЕ И ТЕХНОЛОШКОГ
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THEMATIC FIELDS

Information theory

Information transmission

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Decision making in complex systems

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Bioinformatics

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Complexity research in the humanities – recent examples

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Summary

Over the years, complexity research has become increasingly interdisciplinary [1]. In addition to natural sciences such as physics and biology and social sciences such as economy, the possibilities of complexity are being recognized in some unexpected fields [2].

The impression is that nowadays there are no more scientific disciplines in which numerical computation is not applied. Complexity has been used in humanities as well. The use of complexity in humanities can be shown by reviewing the volume No. 21 of *Complexity* journal for 2016. We have chosen to present here four articles from fields which have highly humanistic character such as music, history, culture and art.

Humanities are based on critical thought and understanding of human creativity in all its complexity, but using the numerical computation isn't their characteristic. On a line which represents the frequency of using data processing methods, humanities would be placed on the opposite side of natural, as well as social sciences.

The first example that we present is an article in the field of music. By measuring composer style's comprehensiveness it is concluded that Mozart's works have the highest complexity score [3]. The complexity score was determinated for 321 composers from the set of almost 10,000 classical themes.

The second article is in the field of history. It is about investigating a transmission of violence and instability in Imperial Rome throughout the time by using a time series of reign length of 82 Roman emperors, half of whom died unnaturally [4]. The author used two tests. The first one involved autocorrelation (the tendency of nearby points to correlate), which was performed using the Breusch-Watson test. The second one involved the Hurst exponent (presence of "memory" over time) which was obtained by using the Rescaled Range Analysis algorithm. The results indicate that reign length stability did not arise randomly, which could mean that succession-related violence in Roman Empire also came in time clusters.

The third example is an article about a model which considers cultural evolution to be a nonstationary stochastic process [5]. It is a modified Tangled Nature Model of biological evolution which uses interacting agents with a stochastic dynamics based on partial knowledge of their environment. This model could be used for cultural activity effected by a disruptive innovation (from the use of fire, The Stone Age, The Metal Age to the modern technologies such as personal computers and cell phones). To demonstrate the possibility of the model authors used data for automobile industry such as number of manufacturers from 1886 to 1981.

In the fourth article complexity has been applied in the analysis of Orthodox icons. It is an example of delicate problem in human creativity which has been studied, until now, only in the theory of art and theology of the icon. Processing the data of Orthodox iconography is equivalent to processing the top cultural achievements of The Middle Ages. The authors have recognized the existence of fractality and self-organization in the icons and the role of the observer in both [6].

By the mere fact that complexity has found its use within nearly all branches of science including humanities and by the increasing interdisciplinarity of complexity research, it actually becomes a framework for the science of the 21st century.

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