On Lempel-Ziv complexity for multidimensional data analysis

S. Zozor\textsuperscript{a}, P. Ravier\textsuperscript{b} and O. Buttelli\textsuperscript{c}

\textsuperscript{a}Laboratoire des Images et des Signaux
Rue de la Houille Blanche
B.P. 46
38420 Saint Martin d’Hères Cedex
France
Phone # +33 4 76 82 64 23
Fax # +33 4 76 82 63 84
E-mail: Steeve.Zozor@lis.inpg.fr

\textsuperscript{b}Laboratoire d’Électronique, Signaux, Images, 12 rue de Blois, B.P. 6744, 45067
Orléans Cedex 2, France

\textsuperscript{c}Laboratoire Activité Motrice et Conception Ergonomique, Rue de Vendôme, B.P. 6237, 45062 Orléans Cedex 2, France

Abstract

In this paper, a natural extension of the Lempel-Ziv complexity for several finite-time sequences, defined on finite size alphabets is proposed. Some results on the defined joint Lempel-Ziv complexity are given, as well as properties in connection with the Lempel-Ziv complexity of the individual sequences. Also, some links with Shannon entropies are exhibited and, by analogy, some derived quantities are proposed. Lastly, the potential use of the extended complexities for data analysis is illustrated on random boolean networks and on a proposed multidimensional extension of the minority game.

Key words: Complexity measures, Lempel-Ziv complexity, Shannon Entropy, nonlinear deterministic multidimensional systems, random boolean network, minority game.

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