

Author's Accepted Manuscript

A new topological entropy-based approach for measuring similarities among piecewise linear functions

Matteo Rucco, Rocio Gonzalez-Diaz, Maria-Jose Jimenez, Nieves Atienza, Cristina Cristalli, Enrico Concettoni, Andrea Ferrante, Emanuela Merelli



PII: S0165-1684(16)30348-6
DOI: <http://dx.doi.org/10.1016/j.sigpro.2016.12.006>
Reference: SIGPRO6334

To appear in: *Signal Processing*

Received date: 2 January 2016
Revised date: 2 December 2016
Accepted date: 8 December 2016

Cite this article as: Matteo Rucco, Rocio Gonzalez-Diaz, Maria-Jose Jimenez Nieves Atienza, Cristina Cristalli, Enrico Concettoni, Andrea Ferrante and Emanuela Merelli, A new topological entropy-based approach for measuring similarities among piecewise linear functions, *Signal Processing* <http://dx.doi.org/10.1016/j.sigpro.2016.12.006>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

A new topological entropy-based approach for measuring similarities among piecewise linear functions

Matteo Rucco^{a,c,1}, Rocio Gonzalez-Diaz^{b,1}, Maria-Jose Jimenez^b, Nieves Atienza^b, Cristina Cristalli^c, Enrico Concettoni^c, Andrea Ferrante^c, Emanuela Merelli^a

^aUniversity of Camerino, School of Science and Technology, Computer Science Division, Camerino, IT

^bUniversity of Seville, School of Computer Engineering, Applied Math Dept, Seville, Spain

^cResearch for Innovation Group. Loccioni Group, Angeli di Rosora (AN), IT

*Corresponding E-mails: matteo.rucco@unicam.it, rogodi@us.es

Abstract

In this paper we present a novel methodology based on a topological entropy, the so-called persistent entropy, for addressing the comparison between discrete piecewise linear functions. The comparison is certified by the *stability theorem for persistent entropy* that is presented here. The theorem is used in the implementation of a new algorithm. The algorithm transforms a discrete piecewise linear function into a filtered simplicial complex that is analyzed via persistent homology and persistent entropy. Persistent entropy is used as a discriminant feature for solving the supervised classification problem of real long-length noisy signals of DC electrical motors. The quality of classification is stated in terms of the area under receiver operating characteristic curve (AUC=93.87%).

Keywords:

2000 MSC: 55U10, 05E45, 62H30, 28D20

Piecewise linear functions, Noisy signals, Persistent homology, Persistent entropy, Supervised classification

1. Introduction

Piecewise linear function (PL) is a powerful mathematical tool largely used for approximating signals. The task of measuring the similarity among

Download English Version:

<https://daneshyari.com/en/article/4977744>

Download Persian Version:

<https://daneshyari.com/article/4977744>

[Daneshyari.com](https://daneshyari.com)