

Modified segmentation methods of quasi-stationary time series

Irina Roslyakova

Department of Scale Bridging Thermodynamic and Kinetic Simulation, ICAMS (Interdisciplinary Centre for Advanced Materials Simulation), Ruhr-Universität Bochum, UHW 10/1022, Stiepel Str. 129, 44801 Bochum

Tel.: +49 234 32 22612, E-mail: irina.roslyakova@rub.de

Abstract

The statistical analysis of quasi-stationary processes, like chemical production processes driving this development, requires a division of the measurements into different stationary time segments. Without such segmentation it is not possible to analyze the influence of parameters and setting to the output. This segmentation problem does not only occur in chemical processing. A completely different application is described in [2001GAL] with the segmentation of human heart rate data sets. The segmentation of quasi-stationary time series is a tedious computational problem. One effective method for time series segmentation was proposed by Pedro Bernaola-Galván et al. [2001GAL] and analyzed later by Kensuke Fakuda et al. [2004FAK]. This method can provide exact segmentation in short computational time, but it is applicable only for data sets following normal distributions. Analysis of segmentation algorithm from [2001GAL] with different sets of data indicates that the proposed method is sensitive and not robust to significant outliers near bounds. In this work, segmentation algorithm, presented in [2001GAL] was modified and improved. Both, original and modified algorithms are compared and implemented with R. Additionally a modified segmentation method was compared with functions breakpoints from R-package *strucchange*. The comparison of these two methods shows that the modified segmentation method can provide better segmentation in significant less computational time as function breakpoints from existing R-package *strucchange*.

Literature

- [2001GAL] Bernaola-Galván, Pedro; Ivanov, Plamen Ch.; Amaral, Luís A. Nunes; Stanley, H. Eugene: Scale Invariance in the Nonstationarity of Human Heart Rate. In: Physical review letters (2001), Volume 87, number 16 (abgerufen am 13. August 2009).
<http://polymer.bu.edu/hes/articles/bias01.pdf>
- [2004FAK] Fukuda, Kensuke; Stanley, H. Eugene; Amaral, Luís A. Nunes: Heuristic segmentation of a nonstationary time series. In: Physical review letters 69 (2004).
<http://polymer.bu.edu/hes/articles/fsa04.pdf> (abgerufen am 13. August 2009)