

CHANGE POINT DETECTION IN TIME SERIES

Bachelor's thesis

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SUMMARY

The aim of the present work is to characterize time series. Among other possible ways, during last few decades it has been tried to describe time series using change point method. The change point is defined as a moment where some character of time series changes remarkably.

The change point is described in the first chapter. The second chapter contains introduction to far-spread algorithms of finding the change point. More has been expatiated on frequents likelihood approaches, nonparametric approach and the method of cumulative residuals. Those algorithms are used in the third chapter where a script for statistical computing program *R* is composed. The script provides suitable places for change points and generates models to describe time series and generates graphs of time series and generated models. The script also analyzes the quality of the model. In the fourth chapter the script is used on practical cases.

For this work a special test has been done: heart rate ($b \cdot \text{min}^{-1}$) and concentration of lactate in blood ($\text{mmol} \cdot \text{l}^{-1}$) during physical exercises was measured. The results were analyzed by computer program *Lactate* (created by prof. T. Karu and G. Slavin, 1995-2000) and different statistical tests. According to this, new models were composed to describe time series, but this time with a change point. It also came out that the discovered change points are quite concurrent. This refers to validity of the theory that says that heart rate beating and concentration of lactate in blood are connected. After the common change point heart rates do not speed up so quickly and on the other hand, the concentration of Lactate goes up faster. Since the program gives different results for Lactate concentration depending on the count of measures, according to particular test it was suggested to give for the program at least four measure points, because after that proposed time series were quite similar.