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Laser Doppler flowmetry signals: pointwise Hölder exponents of experimental signals from young healthy subjects and numerically simulated data

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Résumé en anglais	We analyze the complexity of laser Doppler flowmetry (LDF) signals which give a peripheral view of the cardiovascular system. For this purpose, experimental and numerically simulated LDF signals are processed. The experimental signals are recorded in young healthy subjects. The numerically simulated LDF data are computed from a model containing six nonlinear coupled oscillators reflecting six almost periodic rhythmic activities present in experimental LDF signals. In the model, the oscillators are coupled with both linear and parametric couplings in order to represent cardiovascular system behaviors. To our knowledge this modeling has never been proposed yet. The complexity of all the experimental and simulated signals is studied by the computation of pointwise Hölder exponents. The latter identify the possible multifractal characteristics of data. The pointwise Hölder exponents are determined with a parametric generalized quadratic variation based estimation method first calibrated from white noise measures. The results of our signal processing analysis show that experimental LDF signals are weakly multifractal for young healthy subjects at rest. Furthermore, our findings together with another recent work of our group show that pointwise Hölder exponents of the simulated data do not describe the ones of the young healthy subjects but are closer to the ones of elderly healthy people. This paper provides useful information to go deeper into the modeling of LDF data, that could bring enlightenment for a better understanding of the peripheral cardiovascular system.
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[1] http://okina.univ-angers.fr/publications?f[author]=1950
[2] http://okina.univ-angers.fr/a.hum/publications
[3] http://okina.univ-angers.fr/publications?f[author]=1901
[4] http://okina.univ-angers.fr/f.chapeau/publications
[5] http://okina.univ-angers.fr/pierre.abraham/publications
[6] http://okina.univ-angers.fr/publications?f[keyword]=1856
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