Classification of Prolapsed Mitral Valve versus Healthy Heart from Phonocardiograms by Multifractal Analysis

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References:


Abstract:

Phonocardiography has shown a great potential for developing low-cost computer-aided diagnosis systems for cardiovascular monitoring. So far, most of the work reported regarding cardiosignal analysis using multifractals is oriented towards heartbeat dynamics. This paper represents a step towards automatic detection of one of the most common pathological syndromes, so-called mitral valve prolapse (MVP), using phonocardiograms and multifractal analysis. Subtle features characteristic for MVP in phonocardiograms may be difficult to detect. The approach for revealing such features should be locally based rather than globally based. Nevertheless, if their appearances are specific and frequent, they can affect a multifractal spectrum. This has been the case in our experiment with the click syndrome. Totally, 117 pediatric phonocardiographic recordings (PCGs), 8 seconds long each, obtained from 117 patients were used for PMV automatic detection. We propose a two-step algorithm to distinguish PCGs that belong to children with healthy hearts and children with prolapsed mitral valves (PMVs). Obtained results show high accuracy of the method. We achieved 96.91% accuracy on the dataset (97 recordings). Additionally, 90% accuracy is achieved for the evaluation dataset (20 recordings). Content of the datasets is confirmed by the echocardiographic screening.

Keywords:

classification, Phonocardiogram, prolapsed mitral valve, multifractals