

An Automatic Tool for Pediatric Heart Sound Segmentation

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A large number of children referred for echocardiography have normal hearts; this number could be noticeably decreased by using a computer-assisted screening system. A big obstacle for development of such an auto-matic screening system comes from the fact that childrens heart murmurs are typically more intensive than those of adults, which decreases the robustness of the heart sound segmentation step. In this paper, we present an original segmentation tool, based on our pre-vius work [Amir Sepehri et al, A Novel Method for Pediatric Heart Sound Segmentation without Using the ECG, Computer Method and Programs in Biomedicine, Elsevier, volume 99, July 2010]. The method works in two steps. We first extract cardiac cycles using wavelet transform. Then we segment first and second heart sounds within the cycle by taking their spectral properties into account. We enhance the robustness of our original algorithm by coupling ECGs and PCGs. In order to assess the method, we prepared 120 heart sound signals, each containing 10 seconds of phonocardiogram and electrocardiogram with various abnormalities, recorded under the supervision of pediatric cardiologists using echocardiography and complementary tests in the Children Heart Center of Tehran. The abnormalities include mild to severe systolic murmurs, ejection clicks and third heart sounds. Results showed that in more than 97% of the data-bank, the system correctly identifies first and second heart sounds while in 100% of them, cardiac cycles are correctly extracted. The algorithm, as well as a subset of the data, are incorporated into a tutorial software (with a user-friendly GUI), which could be demonstrated at the conference.