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Dual-tree complex wavelet packet transform for voice pathology analysis

Abstract

Voice pathology analysis has been one of the useful tools in the diagnosis of the pathological voice, as the method is non-invasive, inexpensive, and can reduce the time required for the analysis. This paper investigates feature extraction based on the Dual-Tree Complex Wavelet Packet Transform (DT-CWPT) using energy and entropy measures tested with two classifiers, k-Nearest Neighbors (k-NN) and Support Vector Machine (SVM). Massachusetts Eye and Ear Infirmary (MEEI) voice disorders database and Saarbruecken Voice Database (SVD) were used. Five datasets of voice samples were used from these databases, including normal and abnormal samples, Cysts, Vocal Nodules, Polyp, and Paralysis vocal fold. To the best of the authors' knowledge, very few studies were done on multiclass classifications using specific pathology database. File-based and frame-based investigation for two-class and multiclass were considered. In the two-class analysis using the DT-CWPT with entropies, the classification accuracy of 100% and 99.94% was achieved for MEEI and SVD database respectively. Meanwhile, the classification accuracy for multiclass analysis comprised of 99.48% for the MEEI database and 99.65% for SVD database. The experimental results using the proposed features provided promising accuracy to detect the presence of diseases in vocal fold.

Keywords

Dual-tree complex wavelet packet transform; File-based; Frame-based; Two-class and multiclass; Voice pathology analysis