Progressive Learning for Speech Enhancement Based on Non-negative Matrix Factorization and Deep Neural Network

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Abstract

The combination of the Non-negative matrix factorization (NMF) and deep neural network (DNN) has recently been successfully used in speech enhancement. Nonetheless, in low SNR environments the performance of this method is not good for speech enhancement. So, in this paper, we propose a novel progressive learning speech enhancement method based on NMF and DNN in which the DNN has not only one target, but several progressive targets. In this method, at first, the NMF parameters is input into the DNN as the feature. After that, the intermediate target is used which is not clean speech, but the NMF parameters of noisy speech with different SNR. Finally, a postprocessing operation will be applied to the output of each layer to produce the enhanced speech. Experimental results demonstrate that the proposed method may outperform the other competitive speech enhancement methods in low SNR environments.

Index Terms: Non-negative matrix factorization, deep neural network, speech enhancement