

Public Abstract

First Name:Rong

Middle Name:

Last Name:Hu

Adviser's First Name:Yunxin

Adviser's Last Name:Zhao

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:WS 2007

Department:Computer Science

Degree:PhD

Title:ENHANCEMENT OF ADAPTIVE DE-CORRELATION FILTERING SEPARATION MODEL FOR ROBUST SPEECH RECOGNITION

The development of automatic speech recognition (ASR) technology has enabled an increasing number of applications, such as dictation, call routing, broadcast news and medical transcriptions, and voice control, etc. However, the robustness of ASR under real acoustic environments still remains to be a challenge for practical applications. Interfering speech and background noise have severe degrading effects on ASR. Speech source separation separates target speech from interfering speech but its performance is affected by adverse environmental conditions of acoustical reverberation and background noise. This dissertation works on the enhancement of a speech source separation technique, namely adaptive de-correlation filtering (ADF), for robust ASR applications.

To overcome these difficulties and develop practical ADF speech separation algorithms for robust ASR, enhancement and improvement are introduced in several aspects. From the perspectives of speech spectral characteristics, the procedures of pre-whitening are applied to flatten the long-term spectral tilt for the improvement of adaptation robustness and decrease of convergence ADF estimation error. To speedup convergence rate, block-iterative implementation and variable step-size (VSS) methods are proposed. To exploit scenarios where multiple pairs of sensors are available, multi-ADF post-processing is developed. To overcome the limitations of ADF separation model under background noise, procedures of noise compensation (NC) and adaptive speech enhancement are proposed for the achievement of improved robustness in diffuse noise.

Speech separation simulations and speech recognition experiments are carried out based on TIMIT database and ATR acoustic measurement database. Evaluations of the methods presented in this thesis demonstrate significant improvement of performances over baseline ADF algorithm in speech separation and recognition.