Abstract of Doctoral Thesis

Title：Estimation of Speech Recognition Performance in Noisy-and-Reverberant Environments

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Hands-free speech interfaces are recently expected for the ideal environment that it is easy for all users to operate information devices. The automatic speech recognition performance of hands-free speech interfaces is, however, degraded due to noise and reverberation. Estimation of speech recognition performance is an important method to address this problem because it is possible to always achieve higher speech recognition performance by utilizing a suitable improvement method on the basis of the estimation result. In addition, this method can contribute to reduce much cost for speech recognition and large-scale recording. In this thesis, the author develops a method to accurately and easily estimate the speech recognition performance which is degraded due to noise and reverberation.

Firstly, the author designs the reverberant criterion to estimate the speech recognition performance in reverberant environments. In this thesis, the author first investigates early and late reflections on distant-talking speech recognition to help define suitable reverberation criteria. After that, the author tries to design new reverberant criterion based on the relationship between speech recognition performance and ISO3382 acoustic parameters that expresses the early and late reflections. Finally, the speech recognition performance is obtained by using the designed criteria. Evaluation experiments confirmed that the recognition performance can be accurately and robustly estimated with the proposed reverberant criterion.

Secondly, the author designs the noisy-and-reverberant criteria to estimate the speech recognition performance in both noisy and reverberant environments. In this thesis, the author proposes new noisy and reverberant criteria. The author first designs the criteria using the relationships among the acoustic parameters, the PESQ score, and the speech recognition performance. After that, the author estimates the speech recognition performance with the designed criteria in evaluation experiments. Experimental evaluations demonstrated that the proposed criteria make the well suited for robustly estimating the speech recognition performance in noisy and reverberant environments.