主 論 文 要 旨

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論文題名

Distant-talking Speech Acquisition Using Acoustic Distance Measurement and Microphone-array in Noisy Environments

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主論文要旨

A hands-free speech interface has become essential as a stress-free, efficient controller of information equipment by general users. And it requires distant-talking speech acquisition. However, distant-talking speech is distorted and degraded by environmental noises and reverberations. Microphone-array technology is an ideal candidate for overcoming this problem. In high-quality distant-talking speech acquisition using a microphone-array, two technologies are required: 1) direction (or position) estimation of the talker and 2) beamforming by steering high-sensitive directivity for the estimated direction (or position) of the talker. Accordingly, in the present thesis, the author discusses a noise-robust distant-talking speech acquisition method consisting of three components: (I) robust acoustic distance measurement based on interference in noisy environments, (II) talker localization based on interference between transmitted and reflected audible sounds, (III) noise-robust distant-talking speech acquisition using an adaptive microphone-array based on vowel/consonant features. As component (I), the acoustic distance measurement method based on the interference between the transmitted wave and the reflected waves is expanded to a noise-robust method in a noisy environment, which is necessary for a distance sensor. Distance sensors are very important in numerous engineering fields. As component (II), a talker localization method is proposed by expanding the acoustic distance measurement method to a microphone-array because the acoustic distance measurement method can measure distance with component (I) in a noisy environment. Finally, as component (III), using a talker position estimated by the talker localization described above, the author proposes an adaptive microphone-array based on vowel/consonant features designed under the condition of a constraint that tolerates distortion of the desired signal. As a result of evaluation experiments in a real environment, the effectiveness of three components was confirmed, respectively.