

Abstract

Because the hearing impaired cannot identify warning sounds, they are in danger of meeting with accidents. The purpose of this research is to develop a system that identifies the warning sound for the hearing impaired. There are a few researches on discriminating warning sounds, in which the multivariate analysis and the Hidden Markov Model are used. They have, however, problems: the decrease of the discrimination accuracy under the noisy environment and large computation time.

In this research, we restrict warning sounds to be identified to a horn. We propose two methods for horn identification and evaluate the performance by experiments. One is a method of using the power spectrum. We calculate a short time FFT of the input signal and find spectral peaks existing in the frequency band characteristic of a horn. A fundamental frequency is estimated by the intervals of detected peaks. If the differences among estimated frequencies of three successive frames are less than a threshold (the condition of continuity), the sound is judged a horn. The other is a method of using the auto-correlation function. A fundamental frequency is calculated as the interval between the first and second peaks of the auto-correlation function. If the estimated frequencies satisfy the condition of continuity, the sound is judged a horn.

We conducted experiments by using 14 kinds of horn sounds. As a result, we obtained a high identification rate of more than 90% under the noise environment of about SNR 5dB.