Human Voice Quality Measurement in Noisy Environments

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Abstract.

BACKGROUND: Computerized acoustic voice measurement is essential for the diagnosis of vocal pathologies. Previous studies showed that ambient noises have significant influences on the accuracy of voice quality assessment.

OBJECTIVE: This paper presents a voice quality assessment system that can accurately measure qualities of voice signals, even though the input voice data are contaminated by low-frequency noises.

METHODS: The ambient noises in our living rooms and laboratories are collected and the frequencies of these noises are analyzed. Based on the analysis, a filter is designed to reduce noise level of the input voice signal. Then, improved numerical algorithms are employed to extract voice parameters from the voice signal to reveal the health of the voice signal.

RESULTS: Compared with MDVP and Praat, the proposed method outperforms these two widely used programs in measuring fundamental frequency and harmonic-to-noise ratio, and its performance is comparable to these two famous programs in computing jitter and shimmer.

CONCLUSIONS: The proposed voice quality assessment method is resistant to low-frequency noises and it can measure human voice quality in environments filled with noises from air-conditioners, ceiling fans and cooling fans of computers.

Keywords. human voice assessment, noise reduction, home-based medical caring system

1. Introduction

Diagnosing speech disorders is an important medical procedure. Currently, there are several commercial software systems dedicated to human voice quality assessment, for examples, the Multi-Dimensional Voice Program (MDVP) [1] and Dr Speech [2]. These systems are designed to be operated in quiet environments to avoid the influences of noises. Thus they are available only in medical centers and laboratories. To offer users more voice examination services, we developed a voice assessment software system which can accurately measure human voice quality under the

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