

## **Analysis of Vocal Fold Vibrations from High-Speed Digital Images Based on Dynamic Time Warping**

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**Abstract :** Analysis of vocal fold vibration is essential for understanding the mechanism of voice production and for improving clinical assessment of voice disorders. This paper presents a Dynamic Time Warping (DTW) based approach to analyze and objectively classify vocal fold vibration patterns. The proposed technique was designed and implemented on a Glottal Area Waveform (GAW) extracted from high-speed laryngeal images by delineating the glottal edges for each image frame. Feature extraction from the GAW was performed using Linear Predictive Coding (LPC). Several types of voice reference templates from simulations of clear, breathy, fry, pressed and hyperfunctional voice productions were used. The patterns of the reference templates were first verified using the analytical signal generated through Hilbert transformation of the GAW. Samples from normal speakers' voice recordings were then used to evaluate and test the effectiveness of this approach. The classification of the voice patterns using the technique of LPC and DTW gave the accuracy of 81%.

**Keywords :** dynamic time warping, glottal area waveform, linear predictive coding, high-speed laryngeal images, Hilbert transform

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