Measurement of vocal fold features in videokymography images

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Videokymography is a novel video recording technique used in laryngology and phoniatrics for examination of vocal folds. A videokymographic camera acquires brightness values only in one row but with a high-speed rate of 7200 lines/s. It can thus capture gradual movements of vocal folds, albeit in one dimension. The resulting videokymogram is a spatio-temporal image of vocal fold vibrations along a line perpendicular to the glottal dorsoventral axis over a short period of time. The advantages of videokymography include low costs and low amount of data to process. Manual analysis of videokymograms is difficult and time-consuming, mainly due to noise, reflections and low contrast in the images as well as high number of vocal fold parameters. The possibility of computer-aided diagnostics is thus of great interest. The objective of this project was to develop (semi)automatic methods for measurement of selected vocal fold features. We focused namely on the variations of rima glottidis, i.e. the space between vocal folds, and the propagation of mucosal waves, i.e. vibrations on the surface of vocal folds. For the segmentation of rima glottidis we proposed a thresholding method based on graph cuts; for the detection of mucosal waves we developed methods based on cross-correlation and Fourier transform. Applicability of the proposed methods was proved by described experiments: the methods were tested on videokymography images of both healthy and vocal folds and folds with various disorders and their results were compared with measurements by medical experts. In the future we plan to develop methods for measurement of further features, e.g. the shape and position of ventricular folds.



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