A NEW TECHNIQUE FOR MEASURING THE SOURCE WAVEFORM OF (TRACHEO)ESOPHAGEAL SPEAKERS: TWO-POINT TRANSFER MATRIX METHOD

Objectives: The glottal waveform is an important feature from which relevant information related to the phonation process can be extracted. Non-invasive methods used to obtain the glottal waveform include glottal inverse filtering techniques and the Sondhi tube. Nevertheless, these methods may not be adequate for obtaining the source waveform of subjects with esophageal and tracheoesophageal speech, mainly due to its aperiodic source behavior and low fundamental frequency. The objective is to present a novel technique for assessing the source waveform of subjects with esophageal and tracheoesophageal speech by the measurement and processing of the sound pressure during phonation inside a tube.

Methods: The technique involves determining the subject’s vocal tract geometry using a layer-peeling algorithm. Thereafter, the source waveform is obtained from the subject’s voice signal by resolving a two-port transfer matrix equation originated from the layer-peeling process.

Results: The new technique was validated in an experimental setup using an artificial vocal tract driven by a sound source, whose signal was known. After that, the source waveforms of different patients were assessed and the results were compared with those obtained by glottal inverse filtering and the Sondhi tube, indicating the limitations of the traditional techniques when applied to esophageal and tracheoesophageal voice investigation.

Conclusions: Considering the aperiodicity and the low frequency of source waveforms of laryngectomized patients, this new technique proved to be adequate, aside from being a completely non-invasive method.

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