An Articulatory and Phonatory Synthesis Model for Production of High Quality Speech and Singing

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Introduction

- Software implementation of a full parametric production model (synthesizer) including control modules for speech and singing
- Control units: articulatory and phonatory gestures (Birkholz et al. 2006)
- Articulatory-acoustic system: lumped element transmission line circuit including correction for acoustic and aerodynamic losses (Birkholz et al. 2007)
- Geometrical part of the glottis model after Titze (1984) and Cranen and Schroeter (1995)
- Direct control of glottal area over time (Birkholz 2005)
- Geometrical model of nasal tract including paranasal sinuses after Dang and Honda (1994 and 1996)

The Synthesizer

Fig. 1. Overview of the synthesizer. Input: gestural score, calculation of articulatory movements and phonatory maneuvers; calculation of area function; calculation of air flow and pressure within each tube section; calculation of radiated sound wave.

Rule-Based Generation of Gestural Scores

Fig. 2. Example of xml formatted gestural control sequences for “dona nobis pacem”

Rule-Based Generation of Gestural Scores

Fig. 3. Low /pitch (left) and high /pitch target shape (right) for the vowel /i:/ and the corresponding spectra for F0=110Hz and F0=440Hz. For the case F0=440Hz the spectrum is given for the low /pitch target shape (false) and for the high /pitch target shape (right).

Vowels at higher pitches are synthesized with a more “open” articulation. The low-pitch vocalic shapes are just adopted from speech articulation.

Generation of F0-Contours

Fig. 4. F0 contour and F0 targets for “…dona…”.

Each F0-gesture for realizing a note comprises a “preparation-phase”, an “overshoot phase” and the “target phase”. During the target phase the F0-contour in addition exhibits vibrato.

References


More information concerning the software and for free download see: http://www.vocaltractlab.de