Universitätsklinikum Erlangen

HNO-Klinik Abteilung Phoniatrie und Pädaudiologie

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To students at the Technical Faculty

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Master thesis: Enhancing the vocal fold motion implemented in *simVoice*

The central objective of *simVoice* is the development of a three-dimensional aero-acoustic numerical larynx model for a prospective application in a clinical environment. The model consists of a computational fluid dynamics simulation (CFD) model with externally driven vocal folds motion, based on the Finite Volume (FV) method and a computational aero-acoustic model (CAA), (3D Finite Element (FE) method using the Perturbed Convective Wave Equation (PCWE)). The numeric larynx model considers the incompressible fluid flow through the glottis within a large eddy simulation, the vocal fold motions, and the resulting acoustic signal.

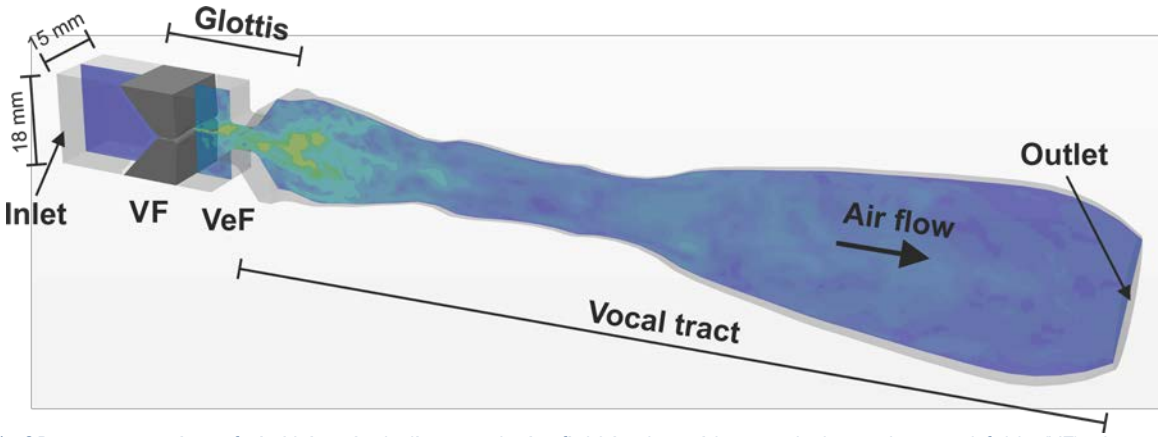

Figure 1: 3D representation of simVoice, including a velocity field in the mid-coronal plane, the vocal folds (VF), the ventricular folds (VeF), and the vowel /a/-vocal tract. The airflow is directed from left to right, from the subglottal trachea (inlet) through the glottis and the vocal tract to the mouth (outlet), representing the vertical fluid flow from inferior to superior.

The existing vocal fold motion is modeled in time-consuming and impractical steps. Furthermore, the actual method is restricted to a few motion properties and should be extended by clinical relevant requirements. The goal of the Bachelor/Project thesis is to develop a program that expands, improves, and accelerates the modeling of the vocal fold motion.

We search for a dedicated and motivated student with

- Coding skills in MATLAB or a similar language
- Interest in HPC, CFD, and numerical methods
- Interest in interdisciplinary research and scientific computing

Tasks:

- Formulation & Implementation of an enhanced, physiologic and pathologic vocal fold motion for *simVoice*
- Performing a *simVoice* simulation with the enhanced vocal fold motion
- Analysis of the effect of the new vocal fold motion on the numeric and aerodynamic properties of *simVoice*

Start: As soon as possible

Contact persons:

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