# Numerical challenges connected with the simulation of healthy human phonation

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Human voice production is a complex multi-physical process compromising of the elastic deformation of the vocal folds (VF), the complex airflow and the acoustics together with mutual couplings. Nevertheless, in this talk we will restrict us only on the fluid-structure interaction (FSI) problem. The typical healthy regime of vocal folds vibrations during a voice production is of a flutter type of instability – with a higher flow rate VF vibrations increase amplitudes up to mutual collisions associated with the complete closure of the channel. In this talk we will describe the mathematical model of considered FSI problem with a special focus on the treatment of closing channel.

The numerical simulation of closing channel scenario is quite challenging as besides accurate FSI simulations the contact phenomena and possible topological changes need to be addressed properly in the model. The adopted numerical treatment consists of a suitable modification of the inlet boundary condition, modification of the computational fluid domain and introduction of an artificial porous media subdomain. The presented mathematical model is discretized with the aid of the stabilized finite element method and numerical results are shown.

This a joint work with Petr Sváček from the faculty of Mechanical Engineering, Czech Technical University in Prague.