

Modeling the pre-phonatory vocal fold posture in the larynx model SynthVOICE

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ABSTRACT

This work presents a synthetic larynx model that includes the adduction motion and the elongation of the vocal folds. Beside the description of the model, validation measurements and their results will be presented.

Keywords: Phonation, synthetic larynx model, fluid-structure interaction

1. INTRODUCTION

The basic aim of synthetic larynx models is to reproduce the phonation process. Thus, we develop the synthetic larynx model SynthVOICE that incorporates the control of the pre-phonatory posture (ad-/abduction) and the elongation of the vocal folds (VFs). The aim is to reproduce the physiological and pathological phonation process especially dysfunctions of the muscular and neural control such as muscle tension dysphonia.

2. LARYNX MODEL

The model is manufactured in a multistage pouring process using liquid silicone mixtures with a different stiffness. It is composed of a cylinder mimicking the thyroid cartilage, the VFs and five manipulator devices to control the pre-phonatory VF posture and tension. Both, single- and three-layer VF models can be inserted that are based on the M5 shape (1, 2). The pre-phonatory settings are controlled by a mechanical setup that exhibits seven linear and two rotational traverse tables. A Matlab script determines the appropriate displacements and angles of the traverse tables to move the VFs in a specific posture.

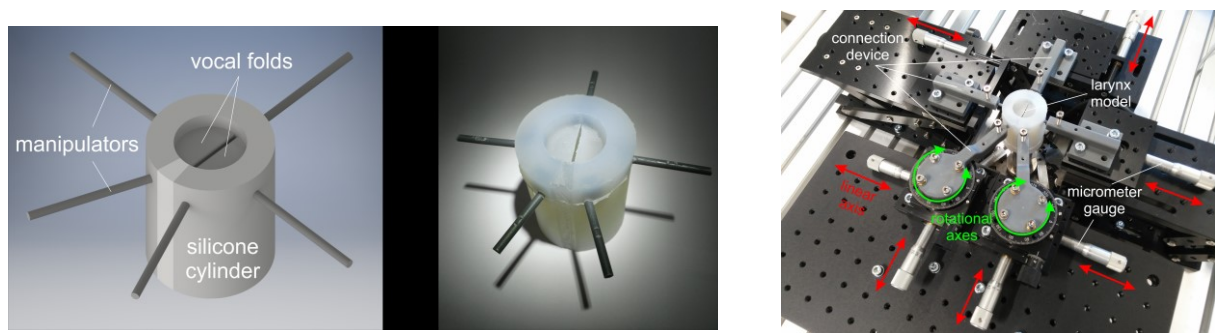


Figure 1: Synthetic larynx model (left and middle) and control setup for prephonatory vocal fold positioning (right).

3. VALIDATION EXPERIMENTS

To validate the SynthVOICE model, we present measurements of the oscillation threshold pressure, the oscillation frequency and the produced acoustic signal for different settings of pre-phonatory VFs posture.

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