Background The human lung is the essential organ for respiration. The airway tree is a complex system including gas transport and gas exchange in the alveoli. Its functionality can be impaired by acute injury or lung diseases as i.e. cystic fibrosis.

One major test to diagnose lung diseases is the gas washout test. Analysis of tracer gas concentration during expiration provides information about the lung morphology and its functionality.

However the sensors used to measure the tracer gas concentration in the expired air are very sensitive to the air temperature. A numerical simulation of the upper airways and the sensor system to receive the temperature of the expired air could provide helpful information for sensor calibration.

Aim In this project the gas flow and its temperature distribution in the upper airways, mouth and the sensor device should be simulated using the simulation software Comsol.

Tasks
- Implementation of geometric model of trachea – oral cavity – sensor device
- Simulation of fluid flow and temperature distribution using Comsol
- Evaluation of different models and assumptions

Nature of the Thesis:
Geometrical modelling: 20%
Simulation with Comsol: 50%
Evaluation: 20%
Documentation: 10%

Requirements:
Biomedical engineer with experience in computational fluid dynamics.

Supervisors: Carl-Friedrich Benner
Examiner: Prof. Dr. Dominik Obrist

Institutes/Collaborators:
The student is given the opportunity to work on an interdisciplinary project involving the following institutes:
- ARTORG Center, Cardiovascular Engineering, University of Bern
- Dept. Pneumology, Inselspital Bern

References:

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