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Photogrammetry for patient-specific EIT reconstruction

Type	Master thesis
Workingtitle	Videography/photography to determine chest shape and electrode position for patient-specific electrical impedance tomography imaging

In electrical impedance tomography, weak currents are used to measure the changes in resistance changes within a body and then visualized using a reconstruction model.
In this way, pulmonary ventilation can be visualized non-invasively, whereby a three-dimensional model of the chest is required for the analysis, which is as similar as possible to the proportions and dimensions of the patient. For previous work, such models have been generated from CT images of the patient, but the necessary data is not always available and the processing of the CT images is very time-consuming. Standard models that were not specifically designed for the current patient, however, cause reconstruction errors due to the uneven shape and deviating electrode positions. reconstruction errors. Investigation and development work at ICCAS resulted in a method using a mobile camera, such as those available in smartphones, automatically recognize thoracic surfaces and fiducal markers of electrodes based on image data. Calculated shape and position information is now to be further used in order to the shape of the thorax and the exact position and arrangement of the electrodes onto a 3D model and generate an EIT reconstruction model.

The aim of the work is the development and evaluation of a software for the creation and adaptation of EIT reconstruction models using images taken with an additional device (smartphone, tablet).
As part of the work, a process must be developed and tested based on existing software that allows a reconstruction model to be whose circumference and electrode positions correspond to reality.
Finally, verification and process validation are to be used to determine the correct of individual components and the evaluation of the more precise EIT measurements.

Requirements

- Master's degree in a natural science or engineering degree program
- experience with 3D calculations, visualization and calculations of image transformations based on landmarks advantageous
- experience with programming required (Java/C#/Python)

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