

Ingmar Wegner

Dr. sc. hum.

Image Guided Navigation for Endoluminal Diagnosis and Therapy - Application on Bronchoscopy

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For exact and fast orientation inside the airways, clinicians are in urgent need of a navigation system. Such an image guided system has the ability to show the current position of a flexible bronchoscope within the tracheobronchial tree. This improves orientation inside the complex tree structure. The developed approach of navigated bronchoscopy specially addresses the problem of using static images of the patient to navigate inside continuously moving soft tissue. The implemented prototype gives direct guidance to a pre-interventionally defined target inside the bronchial tree. This limits intervention time spent searching for the right path and therefore the duration of the patient's anesthesia. A movement compensation approach adapts the tracked position of an instrument to the the patient's breathing cycle, freeing him from further stressful interventions to minimize lung movement. A navigation sensor is introduced, which allows a virtual bronchoscopy to be displayed in real time. To demonstrate the application of the prototype an evaluation of its accuracy within an ex vivo lung phantom is performed. The navigation system has proven its ability to compensate for respiratory lung movement and to guide the instrument to a previously defined target in the periphery of the bronchial tree.