Quantitative Optical Coherence Elastography: A novel Intensity-based Inversion Method versus Strain-based Reconstructions

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Abstract

In this work, we consider optical coherence elastography, which is an emerging research field but still lacking high precision and reproducibility. Elastography as an imaging modality aims at mapping of the biomechanical properties of a given sample. Here, we are interested in a quantitative multi-faceted analysis of key factors such as data quality and properties of reconstruction methods required for the successful application of quantitative elastography. We propose, analyse and compare three reconstruction methods for the Young's modulus: uniaxial analysis, strain map based reconstruction facilitating a particle tracking improved optical flow, and a novel image-based inverse reconstruction method. The quality of the proposed reconstruction methods with respect to samples of different mechanical properties is investigated by comparing their performance on twelve silicone elastomer phantoms with inclusions of varying size and stiffness.