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Keynote Lecture II

Quantitative Absorption Mapping in Tissue Using Hybrids of Light and Ultrasound

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Abstract - In the last decade, photoacoustic imaging has become one of the hot topics in biomedical optics. In photoacoustic imaging, local absorption of pulsed light leads to ultrasound that propagates through the tissue in a quite undistorted manner. This leads to imaging of optical absorption at ultrasound resolution and penetration depth.

One of the challenges of photoacoustic imaging is quantification. Photoacosutic images provide the product of absorption coefficient and local optical fluence. We pursue to solve this problem in a purely experimental manner by adding acousto-optic imaging. Acousto-optics locally 'tags' the light, hence in theory providing a local sensor for the fluence. In my talk I will show how photoacoustics and acousto-optics must be combined in order to obtain fluence-corrected photoacoustic measurements. I will show results of transmission mode and reflection mode experiments, and, depending on the progress of our work I will show first results from a small animal imager in which both modalities are combined. Finally, I will address the issue of tissue dynamics which until now has inhibited in vivo measurements at sufficiently high speed. We recently have shown that this problem can be overcome using multiple nanosecond laser pulses. I will show our results, but also elaborate on the challenges that we will face in developing this into a practical method.