Development of Optical/Ultrasound instrumentation and methods for photoacoustic imaging

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Photoacoustic imaging (PAI) simply is the measurement of broadband acoustic pressure induced by short laser pulses in the medium. Local optical absorption contrast thus translated into the ultrasound (US) contrast via thermo-elastic principle. Employing conventional US transducers as a receiver is accompanied with the cost of limited bandwidth and low sensitivity. In this PhD work we are exploring the relatively new transducer technology called “Capacitive Micro-machined Ultrasonic Transducer (CMUT)” for 2D US array to exploit larger bandwidth and higher sensitivity in order to visualizing 3D image of biological tissues. Our strategy is to investigate concurrently on the Light illumination enhancement, architecture of the array, and compatible reconstruction algorithms. Validation will be realized on homemade bimodality phantoms in order to prepare medical applications concerned with biological tissue vascularization. This work is made within the framework of ITN Oiltebia European project regrouping 13 European optical biomedical imaging laboratories.