

Non-Invasive Imaging of Tissue Using Near Infrared Radiations

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Abstract : NIR Light is non-ionizing and can pass easily through living tissues such as breast without any harmful effects. Therefore, use of NIR light for imaging the biological tissue and to quantify its optical properties is a good choice over other invasive methods. Optical tomography involves two steps. One is the forward problem and the other is the reconstruction problem. The forward problem consists of finding the measurements of transmitted light through the tissue from source to detector, given the spatial distribution of absorption and scattering properties. The second step is the reconstruction problem. In X-ray tomography, there is standard method for reconstruction called filtered back projection method or the algebraic reconstruction methods. But this method cannot be applied as such, in optical tomography due to highly scattering nature of biological tissue. A hybrid algorithm for reconstruction has been implemented in this work which takes into account the highly scattered path taken by photons while back projecting the forward data obtained during Monte Carlo simulation. The reconstructed image suffers from blurring due to point spread function. This blurred reconstructed image has been enhanced using a digital filter which is optimal in mean square sense.

Keywords : least-squares optimization, filtering, tomography, laser interaction, light scattering

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