Approximate peak time and its application to time-domain fluorescence diffuse optical tomography

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This talk will present an inverse problem for the fluorescence diffuse optical tomography (FDOT) identifying multiple point targets. The targets are the fluorescent agents. The FDOT process is modeled by two diffusion equations coupled with the source term. Our measured data are the time-domain data, measured at some detection points as the temporal response of the fluorescence intensity to an instantaneous injection of the excitation light from a source point. The peak time, clearly observed in the space-time data, has been used as an index to detect the targets. We introduce an approximate peak time based on an asymptotic analysis, which agrees very well with the peak time obtained by the numerical calculation using typical optical parameters. Then, using approximate peak time and combining it with the bisection method, we propose a mathematically rigorous inversion method for the FDOT. The proposed method is efficient and robust and accurate for identifying target locations embedded in deep depth. This is a joint work with Junyong Eom, Gen Nakamura and Goro Nishimura.