INVERSE PROBLEMS IN OPTICAL TOMOGRAPHY

John C. Schotland
University of Pennsylvania

There is considerable interest in the development of optical methods for biomedical imaging. The mathematical problem consists of recovering the optical properties of a highly-scattering medium probed by diffuse light. The usual approach to this problem makes use of the diffusion approximation (DA) to the radiative transport equation (RTE). Within the accuracy of the DA, it is possible to formulate the linearized inverse problem in terms of the inversion of a suitably defined Fourier-Laplace transform which relates the optical absorption of a random medium to the intensity of light transmitted through the medium. In this talk analogous results which hold beyond the DA will be described. In particular, it is shown that by making use of the plane-wave expansion for the Green's function of the RTE, a generalized Fourier-Laplace structure arises in the inverse medium problem for the RTE. Numerical simulations and experimental data from model systems are used to illustrate the results.