Meshless generalized finite difference method for inverse bioheat transfer problem of size and location of tumor

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Abstract

The paper aims to non-invasively estimate the sizes and locations of tumors in skin tissue. This recently-developed meshless method, generalized finite difference method (GFDM), is applied to solve heat transfer problem via the spatial discretization. The steady-state temperature distribution on skin surface is simulated by GFDM. Having known the measurement of the skin surface temperature, the estimation is carried on by interleaved computation of Genetic Algorithm (GA) and Levenberg-Marquardt algorithm (LM). The proposed iteration is verified to be accurate by several benchmark test problems, its higher calculation efficiency is proved as well. With the perturbation of noise, the parameters of tumors can still be accurately estimated.

Keywords: Meshless method, generalized finite difference method, interleaved computation, meshless, inverse problems, Pennes bioheat model