Abstract

In non-invasive thermal diagnostics, accurate correlations between the thermal image on skin surface and interior human pathophysiology are often desired, which require general solutions for the bioheat equation. In this paper, a difference scheme for the Pennes with a space-dependent thermal physiological parameters and convective boundary condition on the top surface, was used to approximate the solution. Details computations indicated that the thermal states of biological bodies, reflecting physiology conditions, could be correlated to the temperature mapping recorded at the skin surface. The effect of the skin emissity, the convective heat transfer coefficient and the temperature of the surrounding air, the metabolic rate and the blood perfusion rate in the tumor, and the tumor size and number on the sensitivity of the thermography are comprehensively investigated. Moreover the inverse problems consisting in the simultaneous estimation of unknown geometrical parameters (location size) of the tumor are solved. On the stage of numerical solution the pattern search algorithm coupled with the difference scheme has been applied.