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# A new local thermal bioheat model for predicting the temperature of skin thermoreceptors of individual body tissues

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Abstract

Under non-uniform environments, the human body thermal perception depends on the thermal responses of cutaneous thermoreceptors (TRs) in different body parts. However, skin TRs thermal response includes static and dynamic parts depending on TRs temperature and its change rate, respectively. Thus, it is necessary to evaluate the time-dependent temperatures of cutaneous TRs in different body parts. The Pennes equation is one of the most important bioheat equations for computing the temperature of biological bodies, but, it has been used for evaluating the mean temperature of the whole body, considering average properties for all body parts. In the present study, the Pennes equation was solved for 16 body parts by considering appropriate thermal/physiological properties for each segment. In addition, a controlling system was added to the Pennes equation by applying the thermoregulatory mechanisms of 65-node Tanabe (65MN) model. The time-dependent skin temperatures of the 16 body segments were obtained by solving the localized thermoregulatory bioheat equation. The validation of the present model was carried out using published experimental data and a good agreement was found.

Keywords: Local bioheat model, local temperature of cutaneous thermoreceptors, non-uniform environment

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