

## SHORT NOTES

## Estimating One-Dimensional Temperature Field from Insufficient Data During Hyperthermia

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### ABSTRACT

*During hyperthermia therapy, it is desirable to know the entire temperature field in the treatment region. However, accurately inferring this field from the limited number of direct temperature measurements available is very difficult. This difficulty is due to the unknown blood perfusion distribution and the temperature measurements contaminated by random errors. This paper presents a method for attempting to solve this inherently ill-posed problem. From the single value analysis, a comparison of the eigenvalues indicates the model parameters (blood perfusion) that are well-resolved and those that are poorly resolved from a given set of data. The cases studied are not a comprehensive set, but continue to show the feasibility of using least square methods to reconstruct the entire temperature field.*

### NOMENCLATURE

- E: difference between  $T_m$  and  $T_p$  ( $^{\circ}\text{C}$ )*  
*J: Jacobian matrix ( $^{\circ}\text{C}/\text{kg} (\text{m}^3\text{-s})^{-1}$ )*  
*J<sup>T</sup>: Jacobian transposed ( $^{\circ}\text{C}/\text{kg} (\text{m}^3\text{-s})^{-1}$ )*  
*M: number of thermocouples*  
*N: number of perfusion regions*