Proceedings of the 10th International Symposium on Radiative Transfer, RAD-23
Thessaloniki, Greece, 12–16 June 2023

RAD-23 SM03

A MONTE CARLO APPROACH FOR BRAIN FUNCTIONAL MAPPING

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ABSTRACT. Spectral optical imaging is a technique used to identify functional areas of the brain during neurosurgery by assessing variations in certain characteristic biomarkers. This technique requires modeling the propagation of radiation in the brain taking into account the presence of heterogeneities such as blood vessels. The present work is devoted to the development and the application of Monte Carlo methods allowing to study the effects of geometrical parameters of blood vessels on the measured signal and consequently on the quantification of biomarkers. The chosen method is based on orthogonal polynomial sequences, allowing, in a single simulation, to evaluate any radiative quantity as a function of these geometric parameters. The results obtained for the case of a brain composed of grey matter and an embedded cylindrical blood vessel with respect to its depth or radius are studied and show good agreement with standard Monte Carlo approaches.

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