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TECHNIQUES TO REDUCE MEMORY REQUIREMENTS FOR COUPLED PHOTON-ELECTRON TRANSPORT.

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ABSTRACT

In this work, we present two methods to decrease memory needs while solving the photon-electron transport equation. The coupled transport of electrons and photons is of importance in radiotherapy because it describes the interactions of X-rays with matter. One of the issues of discretized electron transport is that the electron scattering is highly forward peaked. A common approximation is to represent the peak in the scattering cross section by a Dirac distribution. This is convenient, but the integration over all angles of this distribution requires the use of Galerkin quadratures. By construction these quadratures impose that the number of flux moments be equal to the number of directions (number of angular fluxes), which is very demanding in terms of memory. In this study, we show that even if the number of moments is not as large as the number of directions, an accurate solution can be obtained when using Galerkin quadratures. Another method to decrease the memory needs involves choosing an appropriate reordering of the energy groups. We show in this paper that an appropriate alternation of photons/electrons groups allows us to rewrite one transport problem of n groups as gcd successive transport problems of $\frac{n}{gcd}$ groups where gcd is the greatest common divisor between the number of photon groups and the number of electron groups.

Key Words: Galerkin quadrature, photon-electron transport, radiotherapy