

Dose computation methods based on the convolution/superposition method are often very slow in computational speed. Most of the time is spent in calculating the scatter effects due to the primary dose delivered at a given point. We have developed a novel dose computation algorithm based on the use of spatial data structures derived from oct-trees and quad-trees. Typically, the secondary effects for a given voxel are inversely proportional to its distance from the primary voxel. This allows for approximation of the scatter effect due to a cluster of proximate points which are far away from the point of interest by the scatter effect due to a single point at the center of this cluster, with dose equal to the summation of all the doses on individual voxels in the cluster. The resultant algorithm is two to three orders of magnitude faster than the collapsed cone algorithm and meets the required threshold of 1 percent and 4 percent relative errors in computed dose on the high and low dose regions respectively.