A new “sliding-window” leaf-setting algorithm was developed for generating arbitrary beam intensity profiles using a dynamic multileaf collimators (DMLC) for intensity modulated radiotherapy (IMRT). The algorithm employs the algebraic expression of the composite area under a one-dimensional beam intensity profile. It transforms the coefficients of the expression into the analytical specifications of the leaf-setting sequence for a given intensity profile. In this work, the algorithm was shown to be the optimized solution for generating a prescribed intensity profile with the minimum machine units and total beam delivery time. The algorithm has been demonstrated to be applicable to both a “step-and-shoot” and a “dynamic” style of IMRT beam delivery. Graphical illustrations and numerical implementations of the algorithm were developed and demonstrated for realistic examples. It was found that without further dosimetric optimization, the total beam delivery time was, on average, 15-20% less than that derived from the β-version of a commercial inverse treatment planning system (Corvus, NOMOS Corporation, PA) for the same number of monitor units.

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