IMPROVEMENT OF COMPUTATIONAL TIME IN RADIATIVE HEAT TRANSFER OF THREE-DIMENSIONAL PARTICIPATING MEDIA USING THE RADIATION ELEMENT METHOD

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ABSTRACT. The radiation element method by ray emission model (REM^2) has been improved by using the stabilized bi-conjugate gradient (BiCGSTAB) method and reduction of the size of equations in order to reduce computational time. This improved method was applied to analyze radiative heat transfer in arbitrary three-dimensional participating media and enclosures. The accuracy of the improved method was evaluated by comparing its predictions with the Monte Carlo and the YIX solutions. And the method was used to calculate radiative heat transfer in the boiler furnace. Total CPU time to calculate the radiative heat transfer for a model comprised of 3211 elements was reduced to 1/22 of that by the previous numerical method using a decomposition method.