

Optimum Relaxation Factor for the SOR Method Applied to 9-point Laplacian

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This paper presents two different approaches for evaluating the successive overrelaxation (SOR) factor for the 9-point Laplacian obtained after discretizing the classical model problem consisting of two-dimensional Poisson's equation and the Dirichlet boundary conditions. The first approach is numerical and uses the golden section search method. The second approach gives an explicit formula for the optimum relaxation factor. For the sake of deriving this formula a spectrum analysis is conducted. A theorem which gives the formulae for the eigenvalues of the Jacobi iteration matrix of the 9-point Laplacian is formulated and proven. Formula for the maximum by an absolute value eigenvalue of the Jacobi matrix is given. The results from the two approaches are compared between themselves and with the known results from the literature.

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