

Finite Subdomain Radial Basis Collocation Method

***Lihua Wang¹, Fuyun Chu¹, and Zheng Zhong¹**

¹School of Aerospace Engineering and Applied Mechanics, Tongji University, Shanghai, China.

*Corresponding author: lhwang@tongji.edu.cn

Collocation method with global radial basis approximation has easy implementation and exponential convergence. However, in general, the resultant collocation matrix is full and ill-conditioned, and the matrix will be more ill-conditioning with the increase of collocation points. A finite subdomain collocation method using radial basis functions as the approximation is proposed in this paper for boundary value problems. In this method, the approximation in subdomain is established within the subdomain and continuity conditions are imposed on all the interfaces. It can not only well alleviate the ill-condition and improve the solution accuracy but also possess exponential convergence. Furthermore, CPU time can be markedly reduced. Error analysis and proper domain decomposition for the proposed method are investigated. It is shown that this method has good performance for the boundary value problems, especially for problems with high-gradient in local domain and singular problems which are prominent for their local characteristics.

Keywords: Finite subdomain collocation, radial basis functions, ill-condition, exponential convergence