Invited Talk-05

Adaptive Mesh Construction Using Equidistribution Principle for a Class of Singularly Perturbed Differential Equations

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ABSTRACT

Singularly perturbed differential equations arise in many practical applications, such as flow in porous media, semiconductor device modeling, ion transport across biological membranes. In general, these types of problems exhibit a layer behavior; and commonly used numerical methods may fail to resolve these layers. To solve such problems numerically in a reliable and efficient way, one has to use locally refined meshes. One of the most efficient ways to generate these meshes is by employing the equidistribution principle. In one dimension, the principle has been successfully applied and analyzed for various test problems. However, it has been reported in the literature that the equidistribution principle is not sufficient for mesh adaptation in higher dimensions. Yet, most of the commonly used mesh adaptation strategies in higher dimension are directly or indirectly based on equidistribution principle. In this talk, we formulate most commonly used mesh adaptation strategies within the framework of equidistribution principle and provide a geometrical insight into the limitations of equidistribution principle for mesh adaptation in higher dimensions, and discuss few possible means to circumvent these limitations.

Keywords: Equidistribution principle, Singular differential equation, Adaptive mesh.

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