A local adaptive multi-grid control volume method for the air bearing problem in hard disk drives

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Abstract:

A new local adaptive grid-generating algorithm is developed and integrated with the multi-grid control volume method to simulate the steady flying state of the air bearing sliders in HDDs (Hard Disk Drives) accurately and efficiently. Local finer meshes (mesh dimension decreases to half) are created on the nodes of the current finest grids that have pressure gradients or geometry gradients larger than a pre-defined tolerance after the pressure distribution has been obtained on the initial uniform mesh. In this way the pressure or geometry sensitive regions have higher resolution, leading to more accurate results without inefficiently larger meshes. Two sliders are used to demonstrate the applicability of this method. It is found that this new local adaptive grid-generating method improves the stability and efficiency of the simulation scheme.