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基于无网格稳定化方案求解非稳态强对流问题的自适应节点加密技术

The technique to add node adaptively based on meshfree stabilized methodfor unsteady strong convection problems

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中文摘要：

　　无网格Taylor最小二乘(MFLS)稳定化方案可有效地消除无网格Galerkin方法求解对流占优问题时产生的数值伪振荡,但当对流作用很强或纯对流时,它的求解效果不尽人意。因此,本文基于MFLS稳定化方案给出了一种自适应节点加密技术。该技术将无网格方法中背景积分单元作为自适应节点加密时物理量梯度指标的控制单元,并计算该控制单元上的物理量梯度指标;然后将其与给定的物理量梯度指标限进行比较,标识出大梯度区域从而进行自适应节点加密。数值实验表明,当求解对流作用很强的问题或纯对流问题时,这种基于MFLS稳定化方案

英文摘要：

　Meshfree Taylor least squares (MFLS) stabilized method is an effective numerical method to eliminate the spurious oscillations which occur in solving unsteady convection dominated problems by Element Free Galerkin (EFG) method. However, the effects of the stability are dissatisfactory when the convection strongly dominates the diffusion, not to mention pure convection problems. So in this paper, the technique to add node adaptively is introduced to MFLS stabilized method to overcome this deficiency, namely, adaptive MFLS (AMFLS) technique is proposed. In AMFLS, background mesh is considered as the cell to calculate the grads index of physical quantity. The grads index of physical quantity is regarded as the grads indication in these control cells and it decides whether or not to refine the cell by comparing with the grads bound. Several numerical examples are presented and the numerical results show that AMFLS technique can be effective to indicate the region in which there exist spurious oscillations. Meanwhile, it can also eliminate the spurious oscillations completely in unsteady strong convection problems, even pure convection problems.

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