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论文

两点边值问题基于三次样条插值的高精度有限体积元方法

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摘要:

针对常微分方程线性和非线性两点边值问题, 提出了基于三次样条插值的高精度有限体积元方法, 给出了具体计算格式, 讨论了格式所具有的优良性质——正型性, 并应用能量方法给出了收敛性分析, 证明了格式按照离散能量模具有四阶精度。最后给出线性、奇异源项和非线性数值算例, 验证了算法的有效性和广泛适用性。

关键词: 两点边值问题; 三次样条插值; 高精度有限体积元方法; 收敛性分析

A high accuracy finite volume element method based on cubic spline interpolation for two point boundary value problems

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Abstract:

A high accuracy finite volume element method was given based on cubic spline interpolation for linear and nonlinear two point boundary value problems of ordinary differential equations. The computational scheme(FVCS) was derived and the property of positive type was discussed. Further we presented the convergence analysis and the scheme was proved having fourth order error estimate in discrete energy norm. Finally, numerical examples including linear and nonlinear problems, and source term with singularity problem were given to illustrate the high efficiency and wide adaptation of the method.

Keywords: two point boundary value problem; cubic spline interpolation; high accuracy finite volume element method; convergence analysis

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