



二阶和四阶椭圆型偏微分方程的镜像基本解方法及应用

Method of fundamental solution with image technique for elliptical partial differential equations of second and fourth order and applications

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摘要 将基本解方法推广到二阶和四阶椭圆型偏微分方程的对称问题, 在边界上不需要处理奇异积分. 通过坐标变换, 将一般二阶和四阶椭圆型偏微分方程化为目前研究较为成熟的调和或双调和方程. 再根据镜像法构造出适合对称条件的基本解函数, 简化了计算, 且不影响计算的精度. 通过数值计算结果可以看出, 利用镜像技术构造出的基本解, 前期准备数据少, 可保持精度, 是一种有效的数值方法.

关键词: 椭圆型偏微分方程 基本解方法 坐标变换

Abstract: The method of the fundamental solution with image technique is used to study the partial differential equations (PDEs) of the second and fourth order in this paper. This method has the merit that it does not need to deal with singular integrals on the boundaries. The PDEs are converted to the harmonic and biharmonic equations with the help of the coordinate transformation. Then, the fundamental solutions used in the calculations are built for the symmetric problems by the image technique to simplify the computation without loss of accuracy. It is concluded from the numerical example that the relatively higher accuracy can be achieved with less data preparing by this method.

Keywords: elliptical partial differential equation (PDE), method of fundamental solution (MFS), coordinate transformation

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