

N维多重非齐次调和方程及其边界积分方程

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摘要 对 n 维多重非齐次调和方程 $\Delta^k u=f(x), x \in \mathbb{R}^n$, 给出了基本解的递推公式以及多重调和函数的积分关系式. 在非齐次项 $f(x)$ 为 m 次调和的情形下将域上的积分转化为沿边界的积分, 进而应用直接法给出了基本边界积分方程. 对 $f(x)$ 为一般光滑函数的情形, 给出了用泰勒多项式逼近时相应的误差估计并证明了含误差项的积分是收敛的.

关键词 [多重调和方程](#), [边界积分方程](#), [基本解](#), [\$k\$ -次调和函数](#), [弱解](#).

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N-Dimensional Multiple Non-Homogeneous Harmonic Equation and Its Boundary Integral Equation

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Abstract In this paper, the n -dimensional multiple non-homogeneous harmonic equation $\Delta^k u=f(x), x \in \mathbb{R}^n$, is considered. Firstly, the fundamental solution and its recurrence formulae are given. Then some fundamental integral relations are presented, specially, for multiple harmonic function. Under the assumption that non-homogeneous term $f(x)$ is m -degree harmonic, the integral term in domain is shifted boundary integral, and hence the boundary integral equation without integral in domain is obtained. Finally, the error and convergence analysis is discussed by Taylor polynomial approximation of non-homogeneous term $f(x)$.

Key words [Multiple harmonic equation](#) [boundary integral equation](#) [fundamental solution](#) [k-degree harmonic function](#) [weak solution](#).

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