

论文与报告

## 移动最小二乘法在多功能传感器数据重构中的应用

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摘要

针对传统最小二乘法全局拟合的局限性, 将一种新型的数值算法---移动最小二乘法应用于非线性多功能传感器的信号重构. 通过详细研究插值函数的构造方法及性质, 合理地选取基函数和权函数, 求出试函数的系数, 进而得到信号的重构值. 详细分析了基函数维数、影响域节点数及权函数因子对计算结果的影响, 并对最小二乘法以及移动最小二乘法的重构数据进行了对比, 重构的相对误差分别小于 15.3 % 和 1.03 %, 结果表明移动最小二乘法更适合非线性曲面拟合, 且适当地增加基函数维数或影响域节点数可以进一步提高数据重构的精度.

关键词 [最小二乘法](#) [移动最小二乘](#) [非线性曲面拟合](#) [数据重构](#)

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## Application of Moving Least Squares to Multi-sensors Data Reconstruction

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Abstract

In this paper, a novel numerical solution method, moving least squares (MLS), is employed to solve the problem of nonlinear reconstruction of multi-functional sensor with a view that least squares (LS) are restricted in global regression. Through studying the construction method and characters of interpolated function, basis function and weight function are selected reasonably to obtain the coefficients in trial function, and the reconstructed value of input signals is acquired. This paper presents an analysis of the effects of the parameters in MLS, such as the dimensions of basis function, the number of points in the support domain, and the coefficient of weight function. Comparisons are made between LS and MLS reconstruction data, whose relative errors are smaller than 15.3 % and 1.03 %, respectively. The results demonstrate that MLS is suitable for nonlinear regression of curves. Additionally, more points in the support domain or higher dimensions of basis function will greatly increase the reconstructed accuracy.

Key words [Least squares](#) [moving least squares](#) [nonlinear regression of curve](#) [data reconstruction](#)

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