材料科学与工程

基于特征点检测的复合材料序列图像的配准

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摘要　　在复合材料图像三维重构技术中，序列图像的配准是一个关键步骤。本文在通过小波边缘检测和Level set方法得到增强相颗粒轮廓的基础上，计算出平面曲线上的高曲率点作为候选点，利用自适应弯曲度来确定曲线上每个点的支撑区间，计算评价曲率。根据评价曲率和一定的规则选择出特征点。利用最大熵原理和Lagrange乘子将点集之间的匹配转化为一个能量函数，再利用最小二乘法计算出使该能量函数值最小的空间变换，即得到了配准的最优解。从而实现了序列图像的配准。

关键词　　复合材料　配准　特征点　轮廓

分类号

Feature points based registration for composite serial sections

Abstract

The registration of serial images is a crucial step in the three-dimension reconstruction of composite materials to obtain the information concerning three-dimension microstructural geometry. Based on the obtainment of grain contours by using wavelet edge detector and the level set method，high curvature points of the plane curve were calculated as the prospective points. An adaptive method was adopted for the polygonal approximation of the digitized raw contours. Instead of setting a fixed length of the support region in advance，the new method computed a suitable length of the support region for each point to find the best approximated curvature. The dominant points were identified as the points with local maximum curvatures.In the second stage，a novel robust point registration algorithm was adopted by maximization of entropy and mutual information. A new energy function，including the joint probability matrix and spatial mapping matrix，was derived. By minimizing the energy function，the estimation of spatial mapping parameters and joint probability matrix were estimated.

Key words　composite　registration　feature point　contour

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