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论文

基于非线性滤波方法的PIV计算

卢宗庆①, 廖庆敏①, 裴继红②

①清华大学深圳研究生院 深圳 518055; ②深圳大学信息工程学院 深圳 518060

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摘要
针对流体运动图像计算(也称为PIV)，为了获得可靠的运动矢量场、散度场和旋度场，该文提出了一种基于非线性滤波思想的PIV计算方法。新方法属于变分PIV方法，其在克服传统PIV方法不足的同时避开了经典变分方法中能量范函凸性和可微性的约束，将能量函数的最小化过程转变为非线性滤波过程。该文针对实际粒子图像序列与经典方法进行了实验和比较，结果证明新方法能够在有效抑制噪声的同时可以较好地保持在多流体运动的情况下运动矢量、散度和旋度场的细节信息。

关键词 PIV 光流 扩散滤波 变分

分类号 TP391

A PIV Approach Based on Nonlinear Filtering

Lu Zong-qing①, Liao Qing-min①, Pei Ji-hong②

①The Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China;
②College of Information and Engineering, Shenzhen University, Shenzhen 518060, China

Abstract
For fluid motion image computation (PIV), a nonlinear filtering based PIV approach was proposed which can obtain reliable motion vector, div and curl fileds. As variational based PIV approaches the new approach is a nonlinear filtering process instead of an energy minimizing process, which can overcome the shortage of correlation based PIV approaches and avoid the restrictions of convexity and differentiability required by classical variational approaches. Experimental results from real particle image sequences demonstrated that the new method can help to suppress the computation noise and increase the reliability of fluid motion characteristic and structural descriptions.

Key words PIV (Particle Image Velocimetry) Optical flow Diffusion filtering Variational

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通讯作者 卢宗庆 luzq@sz.tsinghua.eud.cn

作者个人主页 卢宗庆①; 廖庆敏①; 裴继红②