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论文

基于霍夫变换与线性啁啾变换的粒子全息图分析方法研究

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摘要:

基于霍夫变换及线性啁啾变换,提出在空域及频域中分析数字全息图中颗粒粒径大小的方法.在对粒子全息图进行降噪滤波、边缘提取等预处理后,利用弦中点霍夫变换检测粒子的圆心位置,然后以圆心为起点径向扫描出归一化光强分布曲线,求出空域第一个极小值位置.对光强信号做傅里叶变换,结合线性啁啾变换做局部频谱细化,求出频域第一个极小值位置.利用所得极小值位置,代入公式,即可求解颗粒粒径大小.数值计算结果表明,对于粒子间距较大的粒子全息图,该方法误差在2.5%以内.

关键词: 数字全息 粒径测量 霍夫变换 线性啁啾变换

Analysis of Particle Holograms Based on Hough Transform and Linear Chirp Transform

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Abstract:

A method on particles holograms analysis was proposed based on Hough transform and linear chirp transform. Particles sizes were calculated using the position of minimum point in space domain and frequency domain. After pretreatment of noise reduction filtering and edge detection to the holograms, string midpoint Hough transform was used to detect the center position of the particles, and the intensity distribution curve was described according to the cumulative normalized gray value of each circumference. Light intensity signal is applied to Fourier transform, combined with linear chirp transform for local spectral amplification, and then the accurate position of first minimum point in frequency domain can be known. Finally the particle sizes can be resolved by the obtained position in space and frequency domain. In terms of further particle spacing of particle holograms, numerical simulation results show that the method error were 2.5% or less.

Keywords: Digital holography Particles size measurement Hough transform Linear chirp transform

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