

## 论文

### 基于希尔伯特-黄变换方法的同轴粒子全息图 中粒子轴向位置提取方法

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#### 摘要:

在颗粒的数字全息中,传统方法应用数值再现反演计算得到颗粒的相关信息,其中再现的判焦过程中存在繁琐费时的缺点.本文提出了一种基于希尔伯特-黄变换方法的同轴粒子全息图分析方法.将粒子同轴全息图沿中心往外得到的单个粒子径向强度分布作为初始信号,根据希尔伯特-黄变换方法中的经验模态分解首先将信号分解成几个本征模态函数,通过分析第一本征模态函数的希尔伯特谱,由拉依达法则剔除部分奇异点后做最小二乘线性回归分析,得到粒子的空间位置.该方法不需要对全息图进行重建,由信号自身构建基函数,有很强的适应性.理论模拟和实验证明,该方法计算速度快,准确度高,有望应用于全息图的实时在线分析.

关键词: 同轴全息 希尔伯特-黄变换 粒子位置 线性回归

### Extraction of Particle Axial Position From In-line Digital Holograms Based on Hilbert-Huang Transform

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#### Abstract:

In particle digital holography, the process of determining focal distance is cumbersome and complex using traditional numerical reconstruction methods. Based on Hilbert-Huang transform, a method for detecting axial position of particle from in-line digital hologram is presented. The radial intensity distribution of single particle hologram is transformed by empirical mode decomposition which results in several intrinsic mode functions. The particle position can be determined by using liner regression of the first intrinsic mode function's Hilbert spectrum. The validity and reliability are demonstrated by the theoretical simulation and experiments. Since it does not need to reconstruct the hologram, this method is expected to be used in real time digital particle hologram analysis.

Keywords: In-line hologram Hilbert-Huang Transform(HHT) Particle position Linear regression

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