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论文

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影象云纹仪及其在航空工程测量中的应用

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SHADOW-MOIRE INSTRUMENT AND ITS APPLICATION IN AVIATION ENGINEERING MEASUREMENT

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摘要

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摘要

本文介绍影象云纹仪的光学原理与设计、结构的特点,结合实例说明了在航空工程测量中的应用。影象云纹仪是一种非相干光光学图像测量仪器,利用光栅与其影象的干涉形成等高云纹,从而测量物体的三维形状和离面位移。文中用付里叶光学推导了影象云纹光场强度分布,得到云纹标高计算公式;创造了一种制作云纹光栅的金属模板直接拷贝法,研制出的光栅节距误差小,对比度高;仪器光栅主方向往复运动提高了图象的信噪比,沿主光轴的微动平移可实现分数级条纹补偿,并可进行凹凸形态的判定。文中还给出了薄壁结构失稳扩展和屈曲形态的云纹图,以及旋翼叶片的等高云纹图。

关键词:

Abstract:

A shadow-moire instrument is investigated, which can be applied to measurement of three-dimensional shape and deformation. The shadow-moire method is quite suitable for pattern measurement in the field where holographic interferometry is not available. First, based on Fourier optics, the luminous intensity formula is inferred to explain shadowmoire in term of theory. Then, the features of shadowmoire instrument are described as follows; 1) large size of its grating, its high precision and ease of its production; 2) ability of grating to reciprocate along its main direction for increasing the signal-to-noise ratio of pattern; 3) a precision serpentine push-type system of the instrument at the main optical axis direction to conduct the fringe interplating technique. Finally, its application in shell structure stability research and measurement of-aerofoils of rotor blades are introduced.

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