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信息科学

机器视觉多视场协同测量方法

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摘要： 提出了机器视觉多视场协同测量方法以实现二维几何特征的现场高精度自动测量。介绍了该方法的基本原理,研究了实现多视场协同测量的关键技术。首先,建立测量空间,在大视场图像上识别被测特征并规划测量路径,建立大视场图像坐标与测量空间坐标之间的映射关系;根据测量路径,在测量空间中完成小视场序列图像的自动采集。然后,建立大视场图像坐标与小视场图像坐标之间以及相邻小视场图像坐标之间的映射关系,据此关系,在小视场图像的相应位置搜索并构建精细的辅助测量特征。最后,根据小视场序列图像在测量空间中的方位,求解各局部被测特征参数并进一步求和得到整体被测特征参数。应用该方法对φ150 mm圆盘上分布的100 mm孔距进行测量实验,结果表明,相对误差的绝对值不超过0.03%。该方法测量精度不受机械坐标精度的影响,适用于在工业现场组建高精度自动测量系统。

关键词： 机器视觉 多视场 协同测量 现场测量 自动测量

Cooperative measurement method of multi-FOV for machine vision

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Abstract: A machine vision cooperative measurement method of multiple field of view (Multi-FOV) was proposed to realize the high-precision automatic measurement of two-dimensional geometric features. The basic principle of the method was introduced and the key technologies to realize the cooperative measurement were studied. Firstly, a measuring space was established, the features to be measured were identified, and an optimized measuring path was planed in a large FOV image. Then, the mapping relation between the image coordinate of the large FOV and the measuring space coordinate was established. Guided by the measuring path in the large FOV image and the control system, the sequential images with small FOVs were collected automatically in the measuring space. Furthermore, the mapping relation between the image coordinates of the large FOV and the small FOVs and that between the adjacent small FOV image coordinates were derived. On the basis of these relationships, exact auxiliary measurement characteristics in the corresponding locations in the small FOV images were researched and constructed. Finally, according to the orientations and positions of sequential small FOV images in the measuring space, the partial parameters were calculated and then further add them to get the whole parameters of the measured features. Experimental results indicate that the absolute value of relative error is less than 0.03% when the method was used to gauge the distance of circular holes with the nominal dimension of 100 mm. The outstanding advantage of the cooperative measurement method of multi-FOV is that the measuring accuracy is not influenced by ambient temperature and the coordinate precision of machine. It is an effective method to automatically measure two-dimensional complex geometric characteristics of mechanical parts in industrial fields.

Keywords: machine vision multiple field of view cooperative measurement in situ measurement automatic measurement

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