

光电信息获取与处理

CCD摄像头圆目标中心定位方法

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摘要:

在大型设备自动对接系统中, 需要CCD摄像头对一设备截面的圆目标进行图像获取,并找出图像的中心点坐标, 用于两设备的中心对准。为了满足实时性测量和高精度定位要求, 提出一种CCD摄像头圆目标中心定位方法。先对图像使用中值滤波方法进行图像增强, 利用广义数字形态学中的多结构抗噪膨胀腐蚀型算子提取单像素宽图像边缘, 用多项式插值法对图像边缘进行亚像素定位, 用半径约束最小二乘圆拟合法对圆中心进行精确定位。实验测量结果表明, 该方法测量时间短、精度高、稳定性好, 亚像素定位精度优于1/20像素, 中心点总标准偏差小于0.01, 可满足设备自动对接系统要求。

关键词: CCD摄像头 多结构抗噪膨胀腐蚀 多项式插值 半径约束最小二乘圆拟合

Center location of circle target captured by CCD camera

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Abstract:

In the automated docking system for large-scale equipments, CCD camera is needed to get the circle target image of one equipment, then find the coordinates of the center of the image using for alignment of the two equipments. In order to meet real-time measurement and high-precision positioning requirements, the paper presents a CCD camera image center positioning method. Firstly, the image uses median filtering method for image enhancement, secondly, single-pixel-wide image edge of the image is fully extracted by generalized morphological structure of anti-noise in the multi operator expansion and corrosion, then a polynomial interpolation method is used for sub-pixel positioning of image edge, and finally use a radius of constrained least squares circle to fit the target image center of the circle for precise positioning. The experimental results show that it is fast, accurate, stable, its sub-pixel positioning accuracy is better than 1/20 pixel, and total standard deviation of center point is smaller than 0.01, which meets the automated docking system requirements.

Keywords: CCD camera multi-operator expansion and corrosion polynomial interpolation radius constrained least squares circle fitting

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