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信息科学

中心偏移的全景环形图像快速展开

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摘要：采用机器视觉技术检测管道内表面质量时, 获取的原始图像几何中心与其前景区管壁全景环形图像中心存在偏移, 从而会使以图像几何中心展开的图像产生失真的现象。本文针对存在中心偏移的全景环形图像提出了快速展开算法以减小由上述原因造成的图像中几何特征量的测量误差。提出的算法通过最小二乘拟合圆心法找到全景环形图像上代表管壁某一截面的拟合圆, 继而得到全景图像的中心参数, 然后通过四分之一圆扫描方法快速展开全景图像, 并对展开图像的帧纵横比进行修正, 还原全景图像。实验结果表明: 将一幅全景图像环状检测区域展开成分辨率为 $2044\text{ pixel} \times 199\text{ pixel}$ 的矩形图像所需时间为 0.868 s , 展开图像中目标外形尺寸相对误差均在 1.54% 以内, 满足图像处理对实时性和准确性的要求。

关键词：全景图像 图像展开 锥面镜 最小二乘法

Fast unwrapping of panoramic annular image with center deviation

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Abstract: When machine vision technology is used to detect the inner surface quality of a pipeline, the geometric center of an original image will deviate the center of a pipe wall panoramic annular image in the original one's foreground area. However, it will lead to serious deviation in the image unwrapped with the geometric center. In order to reduce the measuring errors of the geometry characters, a fast unwrapping algorithm for the panoramic annular image with center deviation was proposed. Firstly, the least square fitting circle method was used to find a fitting circle representing a cross-section of the wall on the image and to obtain the center parameters of panoramic annular image. Then, by unwrapping the panoramic annular image with a quarter circle scanning method and by correcting the frame aspect ratio of the unwrapping image, the panoramic image was completely restored. Experimental results indicate that it takes 0.868 s to unwrap the annular detection area of a panoramic image into a rectangular one with the resolution of $2044\text{ pixel} \times 199\text{ pixel}$, and the relative errors in outline dimensions of the tested targets are less than 1.54% . It is shown that the method could satisfy the real time and accuracy requirements in the image processing.

Keywords: panoramic image image unwrapping conic mirror least square method

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