工程与应用

采用极线约束与圆窗口匹配的立体视觉检测

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摘要　　首先建立了一般形式的双目立体视觉的极线约束方程，使其包含两个独立摄像机的所有内部参数和相对参考坐标系的外部结构参数，针对传统矩形窗口匹配存在的问题，提出了采用沿极线滑动的圆形窗口实现左右图像对应点的匹配。以灰度相关系数和Hu矩不变量作为匹配测度，完成了相交圆管（工件）的立体视觉检测，在进行灰度相关计算时采用了主轴旋转校正技术。实验结果表明：圆窗口下计算的灰度相关性和Hu矩不变量的相似测度都好于矩形窗口，对获得的工件表面三维坐标进行拟合重建与实际尺寸相比误差很小，说明文中建议的极线约束下基于圆窗口的匹配技术用于立体视觉检测是有效的。

关键词　　极线约束　立体视觉　圆形窗口　点匹配

分类号

Stereovision-based measurement using epipolar line constraint and point correspondence technique in circular window

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Abstract

A general epipolar line constraint equation for binocular stereo vision is first established，in which the intrinsic parameters and external structural parameters of two cameras with respect to a reference cooridinate system are included.To overcome the drawbacks of rectangular window，a circular window sliding on epipolar line is used to complete the point correspondences between pairs of points from the left and the right images，and the stereo vision measurements for the cross circular pipes（workpieces） are carried out using the Hu moment invariants and the image intensity correlation coefficients which are computed based on the rectification technique of major axis orientation.Experimental results show that the similarity measures of the image intensity correlation and Hu moment invariants in circular windows are better than in rectangular windows，and the workpiece surface is reconstructed using its acquired three-dimensional cooridinates with less errors compared with its actual sizes，which demonstrates that the circular-window-based point correspondence on an epipolar line proposed in the paper is effective to stereovision-based measurement.

Key words　epipolar line constraint　stereo vision　circular window　point correspondence

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