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成像技术与图像处理

面向低纹理图像的快速立体匹配

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摘要：　立体匹配中,低纹理区域容易产生匹配多义性,导致失配,为了解决低纹理匹配问题,通常采用增大聚合窗口或全局优化算法(如:动态规划算法),但是此类算法会导致边缘处的视差模糊不清,因此,文章提出了一种基于边缘图像的快速立体匹配算法。首先,对立体图像对进行边缘检测和Sobel滤波;然后,基于Sobel滤波后的图像,先后计算水平聚合代价和垂直聚合代价;最后,利用WTA(Winter-Take-All)优化算法得到最终视差图。实验中,对视差稠密度和准确度进行了定量分析,左右一致性检验平均达标率超过了88%,结果表明,本算法使用边缘提取取代图像分割作为代价聚合向导,很好地解决了低纹理区域立体匹配问题,同时大大提高了匹配效率,获得了准确可靠的视差图,达到了自主导航系统的要求。

关键词：　三维重建　立体匹配　代价聚合　左右一致性检验　Winter-Take-All

New Stereo Matching Method Based Edge Extraction

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Abstract: Computing disparity images for stereo pairs of low texture images is a challenging task because matching costs inside low texture areas of the stereo pairs are almost similar. This problem can not be solved straightforwardly by increasing the size of aggregation windows or by using global optimization methods, e.g. dynamic programming, because those approaches will smooth depth discontinued boundaries as well. This paper proposes a new method that is able to robustly perform stereo matching for low texture stereo images. First, edge detection and Sobel filtering are performed for the images; second, edge maps is used to guide the aggregation of pixel matching costs; Finally, disparity computation and left-right validation(≥88%) are used to get the disparity maps. Experimental results demonstrate that the proposed method utilizes the edge maps computed from the stereo pairs to guide the cost aggregation process in stereo matching, and can produce a larger number of and a better accuracy of reliable disparities for low texture stereo images than the moving average method.

Keywords: 3D reconstruction　stereo matching　cost aggregation　left-right validation　winter-take-all

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