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信息科学

基于轮廓特征多层描述和评价的部分遮挡目标匹配

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摘要： 针对传统目标匹配算法难以实现部分遮挡目标精确匹配的问题,本文基于轮廓特征的描述和评价提出了一种有效的部分遮挡目标匹配算法。首先,利用曲率划分目标轮廓得到描述局部特征的轮廓分段,并根据目标的骨架对轮廓分段进行合并和分类,实现了目标特征的多层次描述。然后,提出了评价轮廓分段的两个参数:重要性和局部性。前者用于评价轮廓分段所描述目标特征的重要性,后者用于评价轮廓分段相对目标整体轮廓的比例。最后,将两个评价参数与轮廓分段之间的相似度联合起来,得到衡量目标相似程度的加权部分相似度,从而获得部分遮挡目标的最佳匹配结果。与现有遮挡目标匹配算法相比,在不同遮挡情况下本文算法的平均识别率提高了1.5%左右。

关键词： 部分遮挡目标 轮廓分段 多层特征描述 特征匹配 加权部分相似度

Partially occluded object matching via multi-level description and evaluation of contour features

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Abstract: As traditional object matching algorithms can not match precisely a partially occluded object, this paper proposes a novel partially occluded object matching algorithm based on the description and evaluation of contour features. Firstly, the contour fragments to describe the local object feature are obtained by splitting the object contour with contour curvature,and those contour fragments are merged and classified according to the object skeleton to describe the object features at multi-levels. Then, two evaluation parameters, importance and partiality, are defined for those contour fragments. The former evaluates the importance of the local feature, and the latter evaluates the proportion of contour fragment to the whole contour. Finally, the two evaluation parameters of contour fragment and the similarity between contour fragments are derived to obtain the weighted partial similarity to measure the matching degree of the partially occluded object reasonably and to obtain the optimal matching result. Compared with some current matching algorithms, the proposed algorithm improves the average recognition rate about 1.5% under various occluded cases.

Keywords: partially occluded object contour fragments hierarchical feature description feature matching weighted partial similarity

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参考文献：

[1] MICHEL D, OIKONOMIDIS I, ARGYROS A. Scale invariant and deformation tolerant partial shape matching[J]. *Image and Vision Computing*, 2011, 29(7): 459-469. [2] KROLUPPER F, FLUSSER J. Polygonal shape description for recognition of partially occluded objects[J]. *Pattern Recognition Letter*, 2007, 28(9):1002-1011. [3] SABER E, XU Y W, TEKALP A M. Partial shape recognition by sub-matrix matching for partial matching guided image labeling[J]. *Pattern Recognition*, 2005, 38(10): 1560-1573. [4] SHOTTON J, BLAKE A, CLIPOLLA R. Multiscale categorical object recognition using contour fragments[J]. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2008, 30(7): 1270-1281. [5] LU C, ADLURU N, LING H,*et al*.. Contour based object detection using part bundles[J]. *Computer Vision and Image Understanding*, 2011, 114: 827-834. [6] 唐永鹤,卢焕章,胡谋法. 基于Laplacian的局部特征描述算法[J]. 光学精密工程, 2011,19(12): 2999-3005. TANG Y H, LU H Z, HU M F. Local feature description algorithm based on Laplacian[J]. *Opt. Precision Eng.*, 2011, 19(12):2999-3005. (in Chinese) [7] HOFFMAN D D, SINGH M. Salience of visual parts[J]. *Cognition*, 1997, 63(1): 29-78. [8] SUN K B, SUPER B J. Classification of contour shapes using class segments sets. *Proceedings of IEEE Conference on Computer Vision and Pattern Recognition, San Diego*, 2005: 727-733. [9] BAI X, WANG X, LATECKI L J. Detection and recognition of contour parts based on shape similarity[J]. *Pattern Recognition*, 2008, 41(7): 2189-2199. [10] LATECKI L J, LAKAEMPER R L, WOLTER D. Optimal partial shape similarity[J]. *Image and Vision Computing*, 2005, 23: 227-236. [11] BRONSTEIN A M, BRONSTEIN M M, BRUCKSTEIN M A, *et al*.. Partial similarity of objects, or how to compare a centaur to a horse[J]. *International Journal of Computer Vision*, 2008, 84(2): 163-183. [12] 史思琦,石光明,陈旭阳,等. 基于特征完整描述的部分遮挡目标识别算法[J]. 系统工程与电子技术, 2011, 33(4): 60-65. SHI S Q, SHI G M, CHEN X Y, *et al*.. Partially occluded object recognition algorithm based on feature description integrity[J]. *Systems Engineering and Electronics*, 2011, 33(4): 60-65. (in Chinese) [13] BAI X, WANG X, LATECKI L J, *et al*.. Active skeleton for non-rigid object detection. *Proceedings of*

International Conference on Computer Vision, Kyoto, 2009: 575-582. [14] BELONGIE S, MALIK J, PUZICHA J. Shape matching and object recognition using shape contexts[J]. *IEEE Transactions on Pattern Analysis and Machine Intelligenc* 2002, 24(24): 509-522.

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