

加窗灰度差直方图描述子及其对SURF算法的改进

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Windowed Intensity Difference Histogram Descriptor and Its Application to Improving SURF Algorithm

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摘要

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摘要 如何构造紧凑而有效的特征描述子是机器视觉和模式识别领域重要的研究课题之一。针对SURF (Speeded Up Robust Features)算法的Haar描述子不能充分利用特征点周围信息的缺陷, 该文提出了一种新的局部不变描述子——加窗灰度差直方图(Windowed Intensity Difference Histogram, WIDH), 该描述子基于特征点周围邻域一个较小的核心区域, 通过窗口模板的移动充分利用外围作用区域的灰度差信息, 构造了一个维度低且辨识力很强, 运算简单高效的描述矢量。实验表明, 将WIDH用于改进SURF算法的Haar描述子时, 可以用更低维的矢量获取与SURF相近或更好的辨识能力。在抗模糊性和抗噪性方面, WIDH明显优于SURF的Haar描述子, 相同的错误率下查全率分别提高了大约35%和50%。

关键词: 机器视觉 局部描述子 描述矢量 SURF

Abstract: How to construct compact and powerful feature descriptors is an important research subject in the fields of machine vision and pattern recognition. To tackle the issue that the Haar descriptor of Speeded Up Robust Features (SURF) algorithm can not make full use of the information around the neighborhood of the feature points, this paper proposes a novel local invariant descriptor, called Windowed Intensity Difference Histogram (WIDH). Based on the small core region centered at a feature point, WIDH exploits the intensity difference information within the operating region by sliding the window template, and constructs a simple but discriminative description vector with high computational performance. The experimental results show that the improved SURF with WIDH can obtain comparable or better discriminative power with lower dimensionality, contrast to its original version embedded with Haar wavelets descriptor. In particular, WIDH outperforms its counterpart obviously in the presence of image blurring and noise disturbance, and the recalls of WIDH are upgraded as much as 35% and 50% respectively, with respect to the same false rates.

Keywords: Machine vision Local descriptor Description vector Speeded Up Robust Features (SURF)

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