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几何活动轮廓模型中停止速度场的异性扩散

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Abstract
Geometrical active contours (GAC) are used extensively in computer vision and image analysis, particularly to locate object boundaries. However, GAC-based segmentations have the drawbacks of long evolving time and boundary leaking. Because halting speed fields (HSF) in GAC models are typically not smooth enough in homogenous region, they are not able to make the active contour quickly move towards the desired object boundaries. On the other hand, the HSF don't really vanish along the object boundaries, thus the curve propagating can not stop on the object boundaries and continuously move into the object boundaries (boundary leaking). In this paper, an anisotropic diffusion model is therefore presented and then applied to the HSF in GAC model. This GAC-based segmentation with the diffused HSF can overcome the two drawbacks above. Experimental results on a synthetic image and two real world images show the improvements in terms of reducing both the segmentation time and boundary leaking, in comparison of GAC model with the original HSF.

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摘要
几何活动轮廓(GAC)模型广泛应用于计算机视觉和图像分析领域,特别是用于定位目标边界.然而,基于GAC模型的图像分割有演化时间长和边界泄漏两个缺点.一方面,停止速度场在同质区域一般不够平滑,这导致活动轮廓不能快速演化到希望的目标边界;另一方面,停止速度场在目标边界上不为0,导致活动轮廓不能停止于目标边界,活动轮廓继续演化进入目标边界内(边界泄漏).针对这两个问题,提出了一种对停止速度场进行各向异性扩散的方法.它基于提出的各向异性扩散模型.然后把各向异性扩散后的停止速度场应用于GAC模型进行图像分割.实验结果表明:对1幅合成图像和2幅自然图像,该方法不仅减少了分割时间,在一定程度上也减少了边界泄漏问题.

References:

[1] Kass M, Witkin A, Terzopoulos D. Snakes: Active contour models. International Journal of Computer Vision, 1988,1(4):321-331.

[2] Li PH, Zhang TW. Review on active contour model (snake model). Journal of Software, 2000,11(6):751-757 (in Chinese with English abstract).

[3] Malladi R, Sethian JA, Vemuri BC. Shape modeling with front propagation: A level set approach. IEEE Trans. on Pattern Analysis and Machine intelligence, 1995,17(2):158-175.

[4] Caselles V, Kimmel R, Sapiro G. Geodesic active contours. International Journal of Computer Vision, 1997,22(1):61---.

[5] Li CM, Liu J, Fox MD. Segmentation of external force field for automatic initialization and splitting of snakes. Pattern Recognition, 2005,38:1947-1960.

[6] Deng JW, Tsui HT. A fast level set method for segmentation of low contrast noisy biomedical images. Pattern Recognition Letters, 2002,23(1):162-169.

[7] Sumengen B, Mnajunath BS, Kenney C. Image segmentation using curve evolution. In: Proc. of the Conf. on Record of the 35th Asilomar Conference on Signals, Systems and Computers, Vol 2. 2001. 1141-1145. http://ieeexplore.ieee.org/iel5/7744/21273/00987670.pdf-isnumber=&arnumber=987670

[8] Zhang HM, Bian ZZ, Guo YM, Ye M. An efficient approach to extraction of region of interest. Journal of Software, 2005,16(1): 77-88 (in Chinese with English abstract). http://www.jos.org.cn/1000-9825/16/77.htm

[9] Tsai A, Yezzi A, Willsky AS. Curve evolution implementation of the mumford-shah functional for image segmentation, denoising, interpolation, and magnification. IEEE Trans. on Image Processing, 2001,10(8):1169-1186.

[10] Chan TF, Vese LA. Active contours without edges. IEEE Trans. on Image Processing, 2001,10(2):266-277.

[11] Yezzi A, Kichenassamy S, Kumar A, Olver P, Tannenbaum A. A geometric snake model for segmentation of medical imagery. IEEE Trans. on Medical Imaging, 1997,16(2):199-209.

[12] Siddiqui K, Lauriere YB, Tannenbaum A, Zucker SW. Area and length minimizing flows for shape segmentation. IEEE Trans. on Image Processing, 1998,7(3):433-443.

[13] Alvarez L, lions PL, Morel JM. Image selective smoothing and edge detection by nonlinear diffusion. SIAM Journal on Numerical Analysis, 1992,29(3):845-866.

附中文参考文献:

[2] 李培华,张田文.主动轮廓线模型(蛇模型)综述.软件学报,2000,11(6):751-757.

[8] 张红梅,卞正中,郭佑民,叶敏.感兴趣区域高效提取算法.软件学报,2005,16(1):77-88. http://www.jos.org.cn/1000-9825/16/77.htm