

采用脉冲耦合神经网络的改进显著性区域提取方法

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Improved salience region extraction algorithm with PCNN

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摘要

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摘要 由于仅考虑颜色等视觉对比信息的视觉显著性提取模型不符合人眼生物学过程,本文提出了一种基于混合模型的改进显著性区域提取(ISRE)方法。该混合模型由显著性滤波算法和改进脉冲耦合神经网络(PCNN)算法构成。首先,利用显著性滤波算法获得原图像的初始显著性图(OSM)和亮度特征图(IFM),用IFM作为PCNN的输入神经元;然后,进一步对PCNN点火脉冲输入进行改进,即对PCNN内部神经元与OSM的二值化显著性图进行点乘,确定最终点火脉冲输入,以获得更加准确的点火范围;最后,通过改进后的PCNN多次迭代,完成显著性二值化区域提取。基于1 000张标准图像数据库进行的实验结果显示:在视觉效果和客观定量数据对比两方面,本算法均优于现有的5种显著性提取方法,平均查准率为0.891,平均召回率为0.808,综合指标F值为0.870。在真实环境实验中,所提算法获得了精确的提取效果,进一步验证了本算法具有较高的准确性和执行效率。

关键词 : 混合模型, 特征提取, 改进显著性区域提取, 脉冲耦合神经网络(PCNN), 点火脉冲, 二值化

Abstract : The visual salience extraction model only considers visual contrasting information and it does not conform to the biology process of human eyes. Therefore, a hybrid model based on Improved Salient Region Extraction (ISRE) algorithm was proposed in this paper. This hybrid model consists of a salience filtering algorithm and an improved Pulse Coupled Neural Network (PCNN) algorithm. Firstly, the salience filtering algorithm was used to get Original Salience Map (OSM) and Intensity Feature Map (IFM) was used as the input neuron of PCNN. Then, the PCNN ignition pulse input was further improved as follows: the point multiplication algorithm was taken between the PCNN internal neuron and the binarization salience image of OSM to determine the final ignition pulse input and to make the ignition range more exact. Finally, the salience binarization region was extracted by the improved PCNN multiply iteration. Based on ASD standard data base, some experiments on 1 000 images were performed. The experimental results show that the proposed algorithm is superior to the five existing salience extraction algorithms uniformly in visual effect and objective quantitative data comparison. The results display that the precision ratio, recall ratio, and the overall F-measure of the proposed extraction algorithm are 0.891, 0.808, and 0.870, respectively. In a real context experiment, the proposed algorithm gets more accurate extraction effect, which verifies that the proposed algorithm has higher accuracy and execution efficiency.

Key words : hybrid model feature extraction Improved Salient Region Extraction(ISRE) Pulse Coupled Neural Network(PCNN) ignition pulse binarization

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