

论文

基于鲁棒性神经模糊网络的脉冲噪声滤波算法

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摘要:

在一个简单有效的脉冲噪声检测器和一个鲁棒性神经模糊(robust neuro-fuzzy, RNF)网络的基础上,对于被脉冲噪声污染的彩色图像,提出了一种新的脉冲噪声滤波算法。该算法可分两步进行,首先对RNF网络进行优化训练,然后用优化后的网络对被噪声污染的彩色图像进行噪声滤波。在该算法中,采用一个简单有效的脉冲噪声检测器,它能快速有效的检测出彩色图像中的噪声像素。经过优化的RNF网络仅对噪声像素进行滤波,而对非噪声像素则保持不变。在RNF网络的构造中,采用一个新的隶属函数,使该算法对于脉冲噪声具有鲁棒性。实验结果证明,与一些传统的非线性、多通道滤波器相比,该滤波器具有较好的滤除噪声能力,并且能较好的保留图像的边缘和细节,具有很好的鲁棒性。

关键词: 彩色图像处理 脉冲噪声 多通道滤波器 神经模糊网络 鲁棒性

An impulse noise filtering algorithm based on a robust neuro-fuzzy network

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Abstract:

Based on an integration of a simple impulse detector and a robust neuro fuzzy (RNF) network, an effective impulse noise filtering algorithm for color images is presented. It consists of two modes of operation, namely, training and testing (filtering). During training, the impulse detector is used to locate the noisy pixels in the color images for optimizing the RNF network. During testing, if a pixel is detected as a corrupted one according to the impulse detector, the trained RNF network will be triggered to output a new pixel to replace it. The proposed impulse noise filtering algorithm is distinguished by two properties. The first is the use of a simple impulse noise detector, which is efficient and yet effective in detecting the noise pixels in color images. The other is the use of a novel membership function in the design of the adaptive RNF network, making the network robust to impulse noise. As demonstrated by the experimental results, the proposed filter not only has the abilities of noise attenuation and details preservation but also possesses desirable robustness and adaptive capabilities. It outperforms other conventional multichannel filters.

Keywords: color image processing impulse noise multichannel filter neruo-fuzzy network robust

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