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On the fast impulsive noise removal in color digital images

Bogdan Smolka

Silesian University of Technology, Poland

Noise reduction in color images is still an important research field of image processing and computer vision. Recent advances in imaging technology have been accompanied by the miniaturization of optical systems and shrinkage of pixel sensors area to accommodate increasing spatial resolution. As a result, many imaging devices provide shots of poor quality in low light situations. Therefore, fast and effective image denoising techniques are still of vital importance for the performance of the imaging pipeline and the successive steps of image analysis. The novel filter is based on the concept of exploration of the local pixel neighborhood by digital paths which start from the boundary of a filtering window and reach its central element. The minimal value of the paths ending at a given pixel serves as a measure of its impulsiveness. To decrease the computational complexity, the proposed approach is utilizing only shortest paths joining the border of a window with its center. In the 5x5 filtering window only 8 paths consisting of 2 nodes have to be examined, which leads to the computation of only 16 Euclidean distances between the pixels in a given color space. To determine the filter output, a soft-switching scheme is applied, which is a compromise between the identity filter and the weighted average of uncorrupted pixels in the processing window. The comparison with the state-of-the-art algorithms revealed excellent properties of the proposed denoising framework. The filtering operations can be easily parallelized and thus can be utilized for real time image and video enhancement.

Biography

Bogdan Smolka received the Diploma in Physics degree from the Silesian University, Katowice, Poland, in 1986 and the PhD degree in Computer Science from the Department of Automatic Control, Silesian University of Technology, Gliwice, Poland, in 1998. Since 1994, he has been with the Silesian University of Technology. In 2007, he was promoted to Professor at the Silesian University of Technology. He has published over 250 papers on digital signal and image processing in refereed journals and conference proceedings. His current research interests include low-level color image processing, human-computer interaction and visual aspects of image quality.

bogdan.smolka@polsl.pl

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