

软件、算法与仿真

结合运动补偿的球体双边滤波视频降噪算法

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摘要:

提出一种结合了运动补偿的球体双边滤波 (motion compensated sphere bilateral filtering, MCSBF) 视频图像降噪算法。在受噪视频图像中, 首先利用视频序列中的当前帧和前后多帧图像, 通过运动补偿得到当前帧的参考帧。在当前帧和参考帧构成的三维空间中, 构建滤波窗为球体的双边滤波器, 对当前帧像素进行三维双边滤波、实现降噪。算法能够充分利用视频图像中的空时相关性, 在保持视频图像细节的同时、有效地去除噪声。实验结果表明, 在提升受噪视频图像主观视觉质量和峰值信噪比 (peak signal noise ratio, PSNR) 等方面, 算法优于空时联合滤波 (spatial temporal joint filtering scheme, JNT)、空时转换滤波 (spatial temporal varying filter, STVF)、多假设运动补偿滤波 (multi-hypothesis motion compensated filter, MHMCF) 等经典视频图像降噪算法。

关键词: 视频处理 降噪 双边滤波 运动补偿

Improved video denoising method based on motion compensated sphere bilateral filtering

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Abstract:

An improved video denoising method based on motion compensated sphere bilateral filtering (MCSBF) is proposed. For video sequence degraded by noise, the reference frames of the current frame are built first by motion compensation between the current frame and the past/future frames. Then in the three-dimensional space which is composed of the current frame and the compensated reference frames, a three-dimensional bilateral filter in which the filtering window is a sphere is used to suppress the noise in the current frame. By fully utilizing temporal and spatial correlations in video content, the proposed method can effectively suppress the noise in the video while keeps textures and details well. Simulation results show that MCSBF outperforms conventional denoising methods like spatial temporal joint filtering scheme (JNT), spatial temporal varying filter (STVF) and multi-hypothesis motion compensated filter (MHMCF) both in peak signal noise ratio (PSNR) and visual quality.

Keywords: video processing denoising bilateral filtering motion compensation

收稿日期 修回日期 网络版发布日期

DOI: 10.3969/j.issn.1001-506X.2010.12.42

基金项目:

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