Real-Time Embedded Video Denoiser Prototype

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Abstract

This demo is related to an accepted paper on DASIP 2019: *A New Real-Time Embedded Video Denoising Algorithm*

Many embedded applications rely on video processing or on video visualization. Noisy video is thus a major issue for such applications. However, video denoising requires a lot of computational effort and most of the state-of-the-art algorithms cannot be run in real-time at camera framerate. This demo introduces a new real-time video denoising algorithm for embedded platforms called RTE-VD.

In the related article, we compare its denoising capabilities with other online and offline algorithms. We show that RTE-VD can achieve real-time performance (25 frames per second) for qHD video (960×540 pixels) on embedded Nvidia AGX CPUs and the output image quality is comparable to state-of-the-art algorithms. In order to reach real-time denoising, we applied several high-level transforms and optimizations (SIMDization, multi-core parallelization, operator fusion and pipelining). We study the relation between computation time and power consumption on several embedded CPUs and show that it is possible to determine different frequency and core configurations in order to minimize either the computation time or the energy.

This demonstration introduces a prototype of a real-time video denoiser called VIRTANS (VIdeo Real-Time Algorithms : Noise Suppression). VIRTANS is based on an Nvidia TX2i architecture and comes in a low profile packaging. Right now, RTE-VD is running on Nvidia TX2i plateform.

During the demonstration, VIRTANS is connected to a high performance camera through SDI protocol. Since we have a complete control of the camera, we can downgrade its performances by changing its parameters: exposure time, numerical gain, Dynamic Range Compression (DRC)... It allows us to vary the noise intensity of the video.

VIRTANS process the video flow with a 480×270 pixels resolution. It then live displays the the noisy and the denoised video side by side.