

NTIRE 2019 Challenge on Video Deblurring: Methods and Results

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Abstract

This paper reviews the first NTIRE challenge on video deblurring (restoration of rich details and high frequency components from blurred video frames) with focus on the proposed solutions and results. A new REalistic and Di-verse Scenes dataset (REDS) was employed. The challenge was divided into 2 tracks. Track 1 employed dynamic motion blurs while Track 2 had additional MPEG video compression artifacts. Each competition had 109 and 93 registered participants. Total 13 teams competed in the final testing phase. They gauge the state-of-the-art in video deblurring problem.

1. Introduction

Example-based video deblurring aims to recover the rich details and the sharp edges from blurry video frames based on a set of prior examples with blurry and sharp videos. The loss of sharpness can be caused by various sources, typically by the motions during the exposure. Hand-held cameras are prone to shake while the multiple objects in the scene can act with translation, rotation, deformation, etc. The presence of blur in the videos makes it hard to recognize textures in the scene rendering the videos visually unpleasing. Deblurring is generally an ill-posed problem since infinitely many latent sharp frames are in the large solution

space for a single blurry frame.

In the field of image/video restoration, deblurring has received much attention and many approaches have been proposed. However, evaluating the accuracy of a deblurring algorithm is a tricky issue as it is hard to acquire a pixel-level aligned pair of blurry and sharp image simultaneously. Köhler et al. [10] used a robot to record camera motions and replayed it to capture the same scenes with different exposures. They successfully modeled camera shake blurs for 4 different scenes and 12 different kernels. More recently, new techniques were proposed to synthesize realistic blurry images from high-speed cameras [13, 18] and high-resolution videos [27]. By averaging high-frame-rate (240 fps) video frames to generate a blurry frame, realistic blurs of dynamic scenes could be generated.

The proposed datasets enabled quantitative evaluation of the proposed deblurring methods and inspired the training of various deep neural networks [13, 18, 27, 8, 20, 9]. However, the problem of modeling blurs with realism is not solved yet. 240 fps is still too slow to capture the fast motion of objects [27] and simple averaging of frames does not accurately model the nonlinear property of the camera imaging pipeline [13]. Also, the typical lossy compression of video which makes deblurring difficult, is not considered. Furthermore, the high-frame-rate video recordings usually have less number of effective pixels than the frame resolution. This is because the camera sensors cannot be fully accessed by the processors during the short readout time in a duty cycle. It makes the video reference frame quality to be lower than typical frame-rate videos or static photographs.

The NTIRE 2019 video deblurring challenge is a step forward in benchmarking and training of video deblurring algorithms. It uses REalistic and Dynamic Scenes (REDS)

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Appendix A contains the authors' teams and affiliations.

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