Abstract title **Forensics image and video restoration**

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Abstract text

We have addressed image and video restoration in situations when the quality of acquired images or videos in terms of their noise level and sharpness is not sufficient and their improvement is strongly required. Nowadays forensic analysis is often based on the analysis of digital photographs and videos (segmentation, object detection, change analysis, to name a few), but not all the time their quality is sufficient for their efficient processing. Analyzed images and video can be blurred, noisy, with low resolution, or degraded in some other unknown way. The aim is to be able to combine all available information in order to produce restored image/video, which is sharper, with less noise and blur, and possibly with higher resolution, then the original data file. A methodology based on the blind deconvolution methods and the super-resolution forms a basis of proposed image quality enhancement and restoration methods. Efficient denoising method is proposed, which decreases the level of an omnipresent noise while preserving image edges and details. For images compressed by JPEG method the image enhancement is implemented for removal of unwanted JPEG artifacts, which arise after the decompression (blockiness).

Figure: Image (top left) was upscaled and restored. Left image - billinear interpolation only. Right image - an application of the deconvolution and proposed superresolution.

We present a unifying approach to the blind deconvolution for blur removal and to the superresolution for resizing the image, working with multiple degraded low-resolution frames of the original scene. We assume no prior information about the blur source. The approaches are designed to be applicable on both images and video sequences. This will improve the applicability of the video data as forensic evidence. The abilities of the methods will be demonstrated on both synthetic and real data. Software solution PIZZARO (http://pizzaro.utia.cas.cz) implements proposed solutions. Its development was funded by Ministry of the Interior of the Czech Republic and it was introduced to the Police of the Czech Republic. The PIZZARO development was realized in the tight cooperation of the Institute of Information Theory and Automation of the Czech Academy of Sciences and Institute of Criminalistics, Czech Republic.