

Image Fusion: a powerful tool for object identification

Jan Flusser, Czech Academy of Sciences

Due to imperfections of imaging devices (optical degradations, limited resolution of CCD sensors) and instability of the observed scene (object motion, media turbulence), acquired images are often blurred, noisy and may exhibit insufficient spatial and/or temporal resolution. Such images are not sufficient for object detection and recognition. Reliable detection requires recovering the original image. If multiple images of the scene are available, this can be achieved by image fusion.

In this talk, we review the respective methods of image fusion. We address all three major steps - image registration, blind deconvolution and resolution enhancement. Image registration brings the acquired images into spatial alignment, multiframe deconvolution estimates and removes the blur, and the spatial resolution of the image is increased by so-called superresolution fusion. We propose a unifying system that simultaneously estimates blurs and recovers the original undistorted image, all in high resolution, without any prior knowledge of the blurs and original image. We accomplish this by formulating the problem as constrained least squares energy minimization with appropriate regularization terms, which guarantee close-to-perfect solution.

We demonstrate the performance of the method on many real examples, namely on car licence plate recognition and face recognition. Both these tasks are of great importance in security and surveillance systems.