

# Camera-shake Image Deblurring: Modeling and Analysis of the Restoration Performance

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## **Abstract**

Pictures acquired from hand held cameras at reduced lightning conditions are often blurred. In these cases, most of the blur is due to the camera shake and is faithfully described as a linear shift-invariant blur. Several algorithms have been proposed both for estimating the blur PSF and for image restoration. A recent approach relies on the acquisition of an image pair: the first image is taken with a long exposure time, and the second one with a short exposure time. The former image is dominated by the blur produced by the camera shake, while the latter is underexposed and dominated by noise. By combining these two images, the blur estimation problem can be solved and thus the restoration of the long-exposure image is treated as a non-blind deblurring.

In this work we introduce an image formation model that takes into account both the blur due to camera shake and the noise as functions of the exposure time. Further, we study how the deblurring performance is affected by the amount of blur and the shape of the shake PSF, seeking an optimal blur/noise trade-off in the long-exposure image.

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