De-Blurring Motion Blurred Images

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Improving Photographic Imaging:
Images acquired with cameras become blurred when objects are distant, moving, or poorly illuminated. Similar blurring effects occur if the camera itself is moving due to, for example, pressing a shutter release button on the camera. Capture of a still, non-blurred image requires that, during the time at which the camera is receiving photons, i.e., the exposure time, the camera remains stationary. This is particularly troublesome for zoomed images where a small movement by the camera will result in the blurring of distant objects. When light is sparse, a longer exposure time is required to capture enough light to create an image with sufficient contrast, thus increasing the likelihood of blurring due to camera or object motion. Current solutions to blurring artifacts are available, but they are limited, bulky, or very costly. Thus, there is a need for a small and inexpensive device that improves image quality by removing blurring artifacts.

Blurring Corrected with Photographed Moving Images:
This invention provides for systems and methods that correct blurring introduced into an image due to camera motion or moving objects. The first technique requires three components:
1. A primary detector that generates primary image information at lower (better) spatial resolution.
2. A secondary detector that generates secondary image information at higher (worse) spatial resolution, but at several instances during which only one primary image is generated.
3. A processor that de-blurs the primary image based on a point spread function modeled using the secondary image information.

The second technique is an interactive method of de-blurring an image based on select features. For instance, by selecting a blurred point, line, ramp, or corner of an image, the user can modify certain image parameters to extract the point spread function necessary to de-blur the image. This invention thus describes methods that provide an effective de-blurring method that is low-cost and easy to implement.

Applications:
• Dual-sensor camera that allows for an automatic de-blurring feature.
• Dual-sensor camera that allows for motion information in addition to regular low resolution images. The motion information can be used in post-processing techniques to de-blur the image.
• Interactive de-blurring software. A blurred image can be modified using different software tools to de-blur the image.

Advantages:
• Dual-sensor camera. The necessary additional apparatuses are small, light-weight, inexpensive, and simple to manufacture. The de-blurred images may be reconstructed automatically.
• Interactive de-blurring software. May be used on old blurred images to extract additional information. Simple and easy to use. May be easily incorporated into existing image editing software.

Licensing Status: Available for Licensing and Sponsored Research Support

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