Abstract

In optical lenses of conventional cameras, depth of field is restricted to a particular range. Therefore, only those objects that are at a particular distance from the camera captured clearly with proper focus whereas objects at other distances in front of or behind the focus plane remain defocused and blurred. However, for accurately interpreting and analyzing images, it is desired to obtain images with every object in focus. Multi-focus image fusion is an effective technique to solve this problem by combining two or more images of the same scene taken with different focus settings into a single all-in-focus image with extended depth of field, which is very useful for human or machine perception. The main drawbacks of pixel based fusion methods are misalignment of decision map with boundary of focused objects and wrong decision in sub-regions of the focused or defocused regions which produce undesirable artifacts in the final fused image. Therefore frequency domain methods are more preferred than spatial domain methods. In previous years, many kinds of multi-scale transforms have been proposed and adopted for image fusion such as pyramid decomposition, discrete wavelet transform (DWT), dual-tree complex wavelet transform (DTCWT), and discrete cosine harmonic wavelet
transform (DCHWT). These transforms are widely used as wavelets become dominant filters in
most of the techniques but they still have drawbacks. Wavelets are the lack of translation
invariance, especially in two-dimensional (2D) signals and the poor selectivity in orientation.
This can be overcome by steerable pyramid transform as one can choose the orientation before
applying the filters. We have applied this method to achieve multi-focus image fusion of images
which have different focus areas while capturing them. Experimental results shows that the
proposed method affectively carried out fusion process as performance of the technique has
been evaluated by various parameters namely mutual information, QABF factor used for edge
perservance measuring and entropy etc.

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Index Terms

Computer Science           Image Processing
Keywords

Image fusion, gray scale images, multi-focus, pyramid transforms, wavelets