Robust first quantization matrix estimation based on filtering of recompression artifacts for non-aligned double compressed JPEG images

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In this study a novel method for first quantization matrix estimation for non-aligned double JPEG compressed images is investigated. The non-aligned double JPEG scenario poses several challenges in the form of recompression artifacts which needs to be handled effectively in order to arrive at accurate first quantization estimate. One such recompression artifact which is prominent in the non-aligned scenario is the blocking artifacts arising due to the misalignment of the DCT grids in the successive compression cycles. The proposed method investigates the impact of the blocking artifacts induced errors on the DCT histogram and counters these errors via a novel DCT histogram filtering strategy. In addition, the residual noise which is also a recompression artifact is countered utilizing the local rank transform which adaptively filters the residual noise effects. The filtered histograms are compared with a synthetically created ideal second quantization matrix to estimate the degree of similarity between the two cases. Utilizing the maximum degree of similarity, the selection of first quantization value is performed. Experimental analysis utilizing several non-aligned double compressed JPEG images taken from UCID and RAISE datasets with Quality Factor (QF) of second compression being greater than the first compression ($QF_2 > QF_1$) along with the comparative analysis with one of the state-of-the-art method shows accurate estimation of the first quantization values for the proposed method. The proposed method finds its application in image forensics as well as in steganalysis. More in: Signal Processing: Image Communication, Volume 61, February 2018, Pages 9-20,Elsevier, DOI: https://doi.org/10.1016/j.image.2017.10.011.
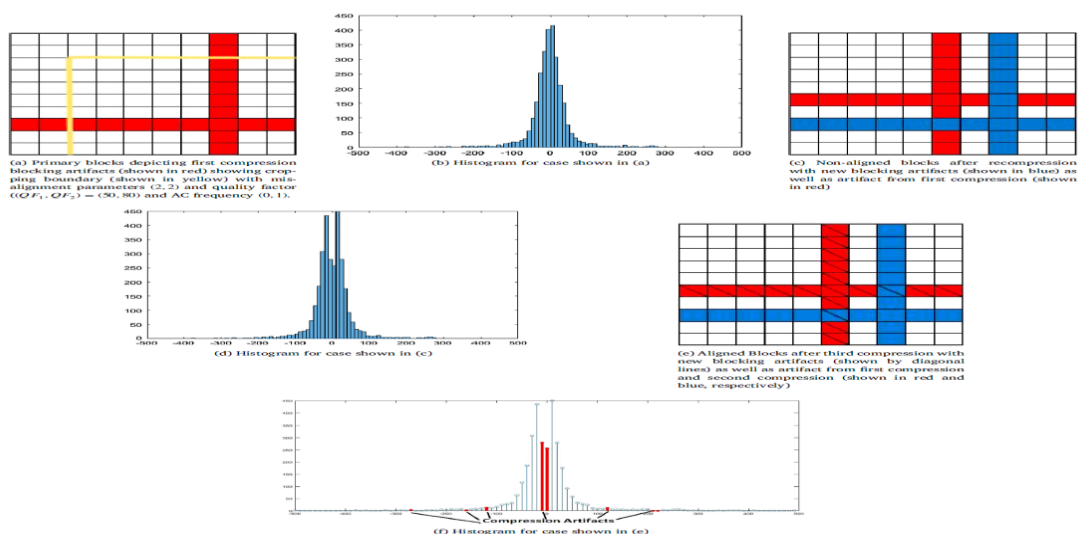
Fig. 2. Visualization and analysis of cropping and recompression operations for NA-DJPEG scenario. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)