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Image Re-Sampling Detection through a Novel Interpolation Kernel

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Highlights

- Novel kernel that imitates famous kernels used in signal and image processing
- Interpolation kernel response is controlled by five independent parameters
- Proposed model expose images that have undergone complex re-sampling modifications
- Image re-sampling traces are detected by identifying kernel parameters

Abstract – Image re-sampling involved in re-size and rotation transformations is an essential element block in a typical digital image alteration. Fortunately, traces left from such processes are detectable, proving that the image has gone a re-sampling transformation. Within this context, we present in this paper two original contributions. First, we propose a new re-sampling interpolation kernel. It depends on five independent parameters that controls its amplitude, angular frequency, standard deviation, and duration. Then, we demonstrate its capacity to imitate the same behavior of the most frequent interpolation kernels used in digital image re-sampling applications. Secondly, the proposed model is used to characterize and detect the correlation coefficients involved in re-sampling transformations. The involved process includes a minimization of an error function using the gradient method. The proposed method is assessed over a large database of 11000 re-sampled images. Additionally, it is implemented within an algorithm in order to assess images that had undergone complex transformations. Obtained results demonstrate better performance and reduced processing time when compared to a reference method validating the suitability of the proposed approaches.

Keywords – Re-sampling Detection; Digital Forensics; Image Interpolation; Signal Processing.

1. Introduction

Photography digitization has led to countless consequences; the digital image can be easily stored, instantaneously shared and straightforwardly printed. Moreover, the availability and the high potential of graphical editor programs made the processing of the digital image an easy and accessible procedure. Such processing includes (i) minor modifications, like color or contrast intensification that can be classified as enhancement maneuvers, as well as (ii), major adjustments such as removing or concealing an object from an image, duplicating items or