A Generalized Wavelet Expansion - based Algorithm for Line Scratches Detection in Old colored or grey Videos and Static Images

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Abstract

This article presents a generalization of Jin Xu, Jinghuo Guan, Xingdong Wang, Jun Sun and Guangtao Zhai’s OWE-based line scratch detection[1]. It is based on Over-complete wavelet Expansion(OWE), which allows us to design a more efficacious and precise position, description for scratch than traditional methods. The proposed detector even works well for secondary (slight) scratches resulting in completely automatic detection. The experimental results show that the proposed detector works better in terms of good detection and false alarms rejection with a lower computing time. The method is applicable for both colored and black and white images or videos. Then it presents very simple technique for removal of detected scratch. More sophisticated methods for missing data interpolation are present in literature which can be used for high quality scratch removal. The optimized way of scratch detection makes it easy to remove the scratch without any kind of decrease in image quality. All methods are static as it works independently on each single frame of the sequence, so also applicable on images.

Index Terms - Digital film restoration, line scratches detection, line scratches removal, wavelet transform.

1 Introduction

OVER THE LAST FEW YEARS, computer based image processing has gained great attention from researchers. In the research area of image processing, old film restoration of particular interest mainly due to the increasing computational power of microprocessors together with the low cost of computers. The main defect in old films are dust
spots, line scratches, abrasion, blotch, film unsteadiness and intensity flicker. Line scratches are one of the most annoying artifacts in old films. This is caused by particle caught in film transport mechanism, and when film passes over the particles material being abraded and line scratches are formed. Typically they are vertical lines across the frame. The visual result is random scratches of the frames having white or black values totally unrelated to initial information at those sites. From an image processing point of view a scratch in an image can be defined as a few columns wide (3 to 10 pixel), vertical (angle to the vertical up to 5%) and the loss of color information in the region is complete usually have bright or dark color) portion of the image. The scratch can not be considered as one frame defect as it occupies similar position in many continuous frames. In Figure 1 it is shown a typical example of a frame from an old movie corrupted by scratch lines. In particular a number of methods kokaram [2] have been presented for the detection and removal of line scratches. To Restore the film without causing distortion to areas of the frames that are not affected, the location of scratch must be located precisely. Median filtering based missing data detection is presented in this article, and their action on sequences is compared. Restoration improve the subjective visual quality of archive films and also provide higher quality at identical compression rates for storage on digital media. Moreover a fully automatic restoration system is very hard to develop, because the correction of misalignment of brightness, detection and removal of shot and scratch, noise reduction, etc., represent the main obstacles to solve the problem in the best way. V. Brunis algorithm [4] is the most advanced, which is easy to compute with little false detection. It is almost automatic except for interaction between the algorithm and users for the scratches color (black or white). Scratch detection methods can be classified into two scratch tracking is performed over vertically sub sampled types: spatial and temporal methods. Temporal is mainly tracking of scratch in motion compensated image frames. While nearly all spatial detection methods uses strong vertical scratch property.

In removal step, most algorithms are based on the interpolation of the damaged area from its neighboring part. Restoration using polynomial, Fourier interpolation 3-D Autoregressive algorithm, MRF model and Bayesian restoration but they consume too much computational time. Our method intends to simplify the complexity of the model for the scratch detection and to implement a system able to detect and remove only line scratches in each frame without considering any knowledge on the other frames of the sequence. The scratch detection

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is simply based on statistical information extracted from the whole image. First, we conduct a three scales wavelet decomposition of the image containing line scratches, and we use horizontal wavelet coefficients to represent the edge of line scratches. We then apply the height and width restraint to extract real scratches from potential artifact positions. For the restoration we assume a total loss of information where the scratch is detected, and adopt a median filtering approach to recover missing data from neighborhood pixels. This paper is organized as follows. Section II proposes the OWE based method for line scratches detection. An median filter based algorithm for the removal of defects in Section III and experimental results achieved are presented in Section IV. Finally in section V, we draw the conclusion.

2 References

References


[8] Laurent Joyeux, Samia Boukir, Bernard Besserer, *Film Line Scratch Removal Using Kalman Filtering and Bayesian Restoration*