IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

Phase-Based Video Motion Processing

Experiments and final results

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Introduction

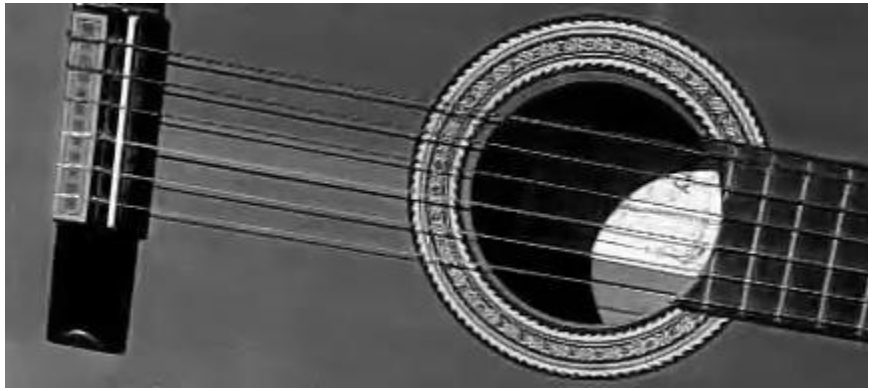
All the tests were done with the same input video.

- Available version: generates a **grayscale** motion magnified video.
- We test the algorithm with three types of **additive noise**: gaussian, uniform, salt and pepper.
- Implementation of the **colored version** of the algorithm: using the RGB and HSV image formats.
- **Visualization** of the coefficients of the steerable pyramid.

Easy-to-test **demo** (see README file).
We can choose the noise to add and the grayscale/colored version of the algorithm by a console application

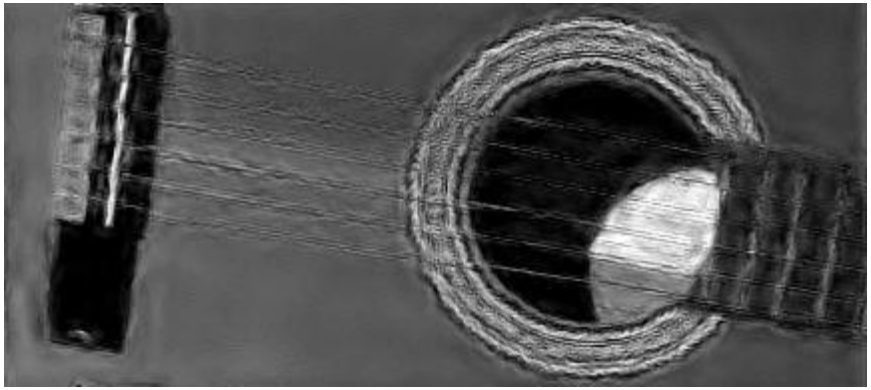
Grayscale video

The algorithm can be directly implemented to grayscale videos



α = 40 (magnification factor)

α = 400
Huge magnification factor generates artifacts, as explained in the paper



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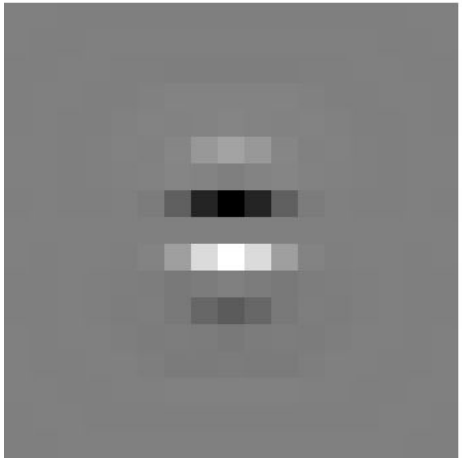
Filters Visualizations

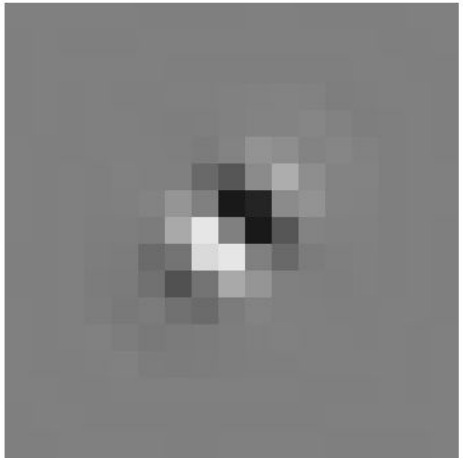
Spatial Filters Visualization

(As shown in the paper)

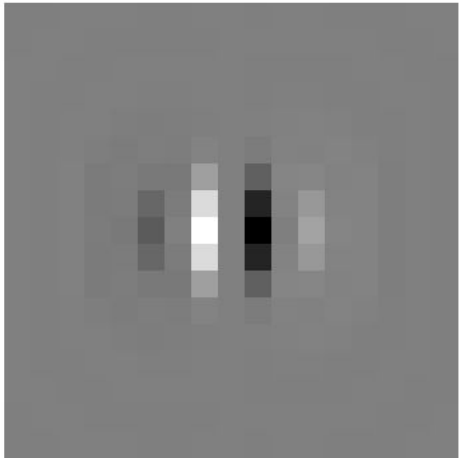
range: [-1.2e-01, 1.2e-01]
dims: [17, 17] * 20



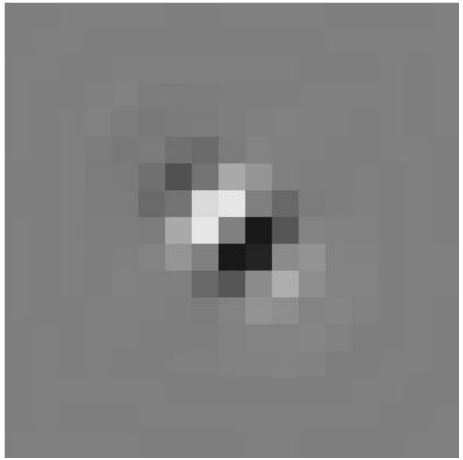
range: [-1.2e-01, 1.2e-01]
dims: [17, 17] * 20



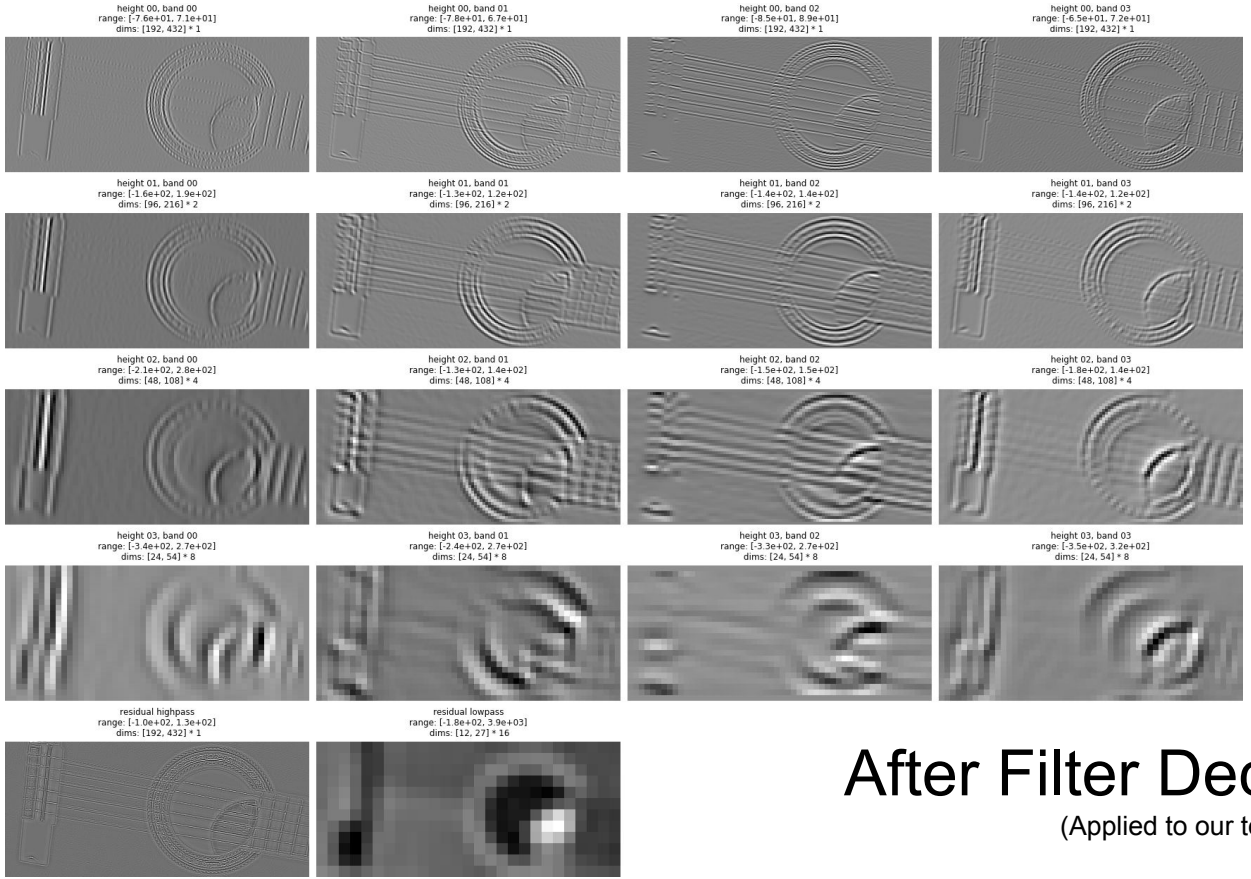
range: [-1.2e-01, 1.2e-01]
dims: [17, 17] * 20



range: [-1.2e-01, 1.2e-01]
dims: [17, 17] * 20



Filters Visualizations

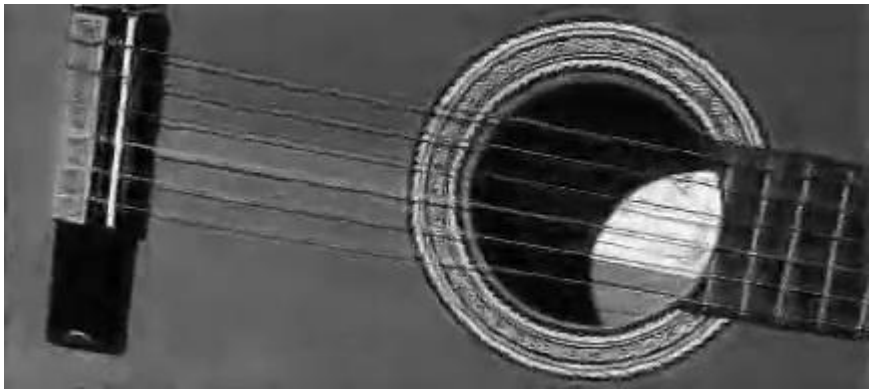


After Filter Decomposition

(Applied to our test video)

Tests with noise (α = 40) - Grayscale video

White Gaussian Noise
(mean 0 and STD 20)



Input video

Ouput video

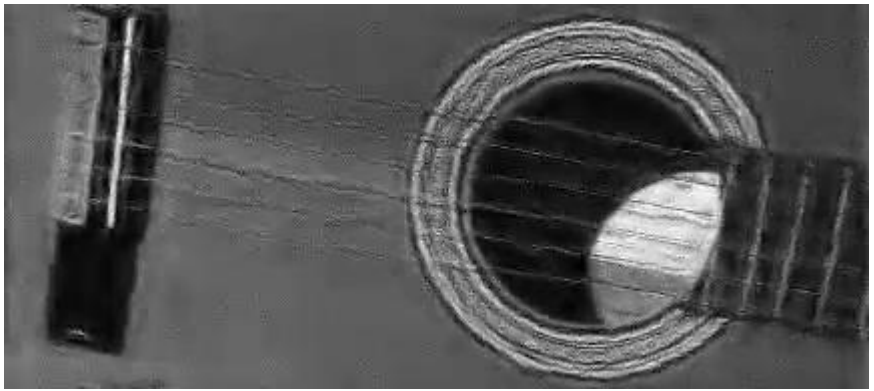
Tests with noise (α = 40) - Grayscale video

Equivalent to WGN with STD=20

Uniformly distributed noise (between -60 and 60)

Input video

Ouput video



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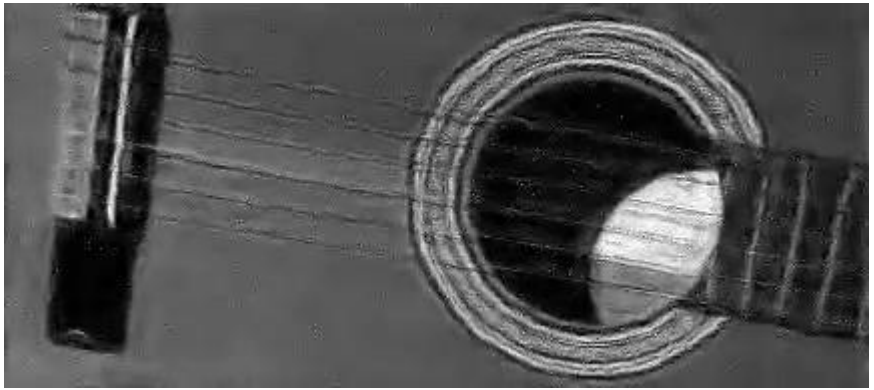
Tests with noise (α = 40) - Grayscale video

Ouput video

Salt and Pepper noise (with total noise probability 0.02)



Input video

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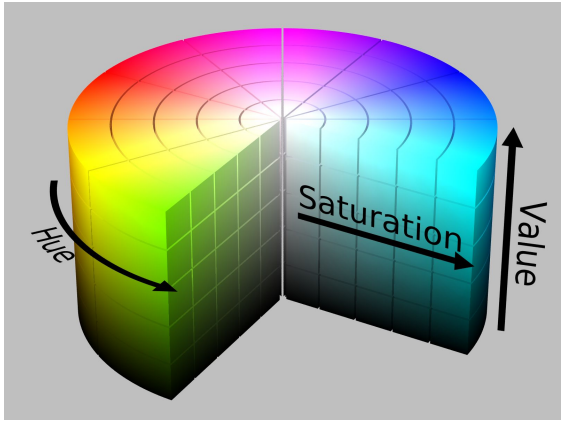
Generating output color video

For obtaining an output color video, two alternatives were explored

1) Running the MoMag algorithm for **all three RGB** components independently.
Drawback: high computational cost (three times that of the gray scale image).

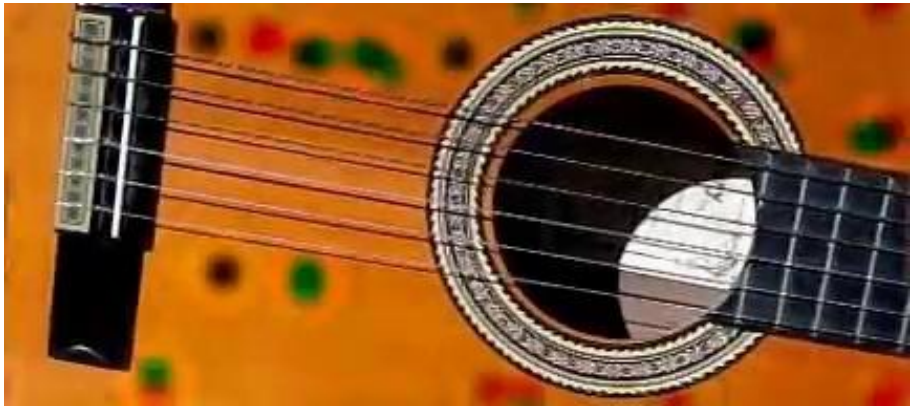
2) Change the video frames to the **HSV** format, and apply the MoMag algorithm only to the “Value” field.
Advantage: no additional computational cost with relation to the gray scale image.



HSV format
Hue: dominant color as perceived by an observer.
Saturation: amount of white light mixed with a hue.
Value: chromatic notion of intensity.

image:https://en.wikipedia.org/wiki/HSL_and_HSV#/media/File:HSV_color_solid_cylinder_saturation_gray.png

Generating output color video (α = 40)



Using **RGB format**: the real colors are maintained, but **artifacts** are produced. The maximum **magnification factor** without is **reduced**.

Using **HSV format**, colors are not fully maintained. However, artifacts are not added with respect to the original method and we can have **higher magnification factors**.

Tests with noise (α = 40) - HSV generated video

Gaussian (μ = 0, σ = 20)

Uniform (-60,60)

Salt and Pepper
(p = 0.01)