

Sistemas Multimedia - Study Guide - Milestone 8: Motion Compensation in the DWT Domain?

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1. Description

1.1. Removing the temporal redundancy through Motion Compensation (MC)

The next level in the process of decorrelating the sequence of frames is to remove the temporal redundancy by means of Motion Compensation (MC). Basically, MC consist in substracting to the video data a prediction performed with the information that is available to the decoder. If this prediction is accurate, the result of this operation is a residual video with a lower temporal redundancy, that can be compressed with a higher compression ratio.

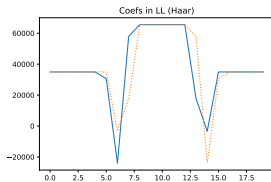
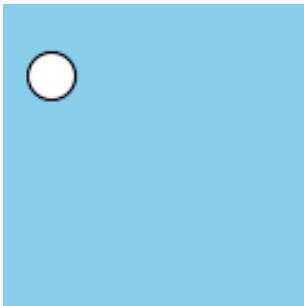
1.2. The lack of shift-invariance in the DWT domain

In our case, the video data is represented in the MDWT domain. Let's suppose that the number of levels of the DWT is 1, and therefore, each frame has been decomposed into two 2D subbands L and H (remember that using the notation introduces in the previous milestone, H has inside the

three high-frequency subbands: LH , HL and HH , and that $L = LL$). So, after using the MDET, MC must be performed using the DWT coefficients.

Unfortunately, as a consequence of the downsamplers used during the DWT to achieve critical sampling and the aliasing between the subbands, all DWT decompositions are shift variant. This can be seen in the Fig. 1 where some DWT coefficients of a test video with two frames (that are “empty” images where a circle has been moved one pixel to the left) has been shown. As it can be seen, the value of the coefficients that correspond to the circumference of the circle are different between different subbands, and different to the original pixels. This makes quite difficult to estimate the motion, and therefore, compensate it.

Shift variance is also generated after the inverse transform when the coefficients are filtered or quantized, because the aliasing between the filters is not completely cancelled in this case [?].



2. What you have to do?

Please, using this [notebook](#), research the possibilities for performing MC of other DWTs available at [PyWavelets](#).

3. Timming

Please, finish this notebook before the next class session.

4. Deliverables

None.

5. Resources