

# JCTVC-B078

## Intra prediction by a linear combination of template matching predictors

L. Guillo (Irisa/CNRS)

T. Poirier (INRIA)

C. Guillemot (INRIA)

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- Objective:

“To improve intra prediction when blocks to be predicted are highly textured or have directional textures”

- Idea:

- To take advantage of textures already in the picture
- predictor = average of weighted template matching predictors

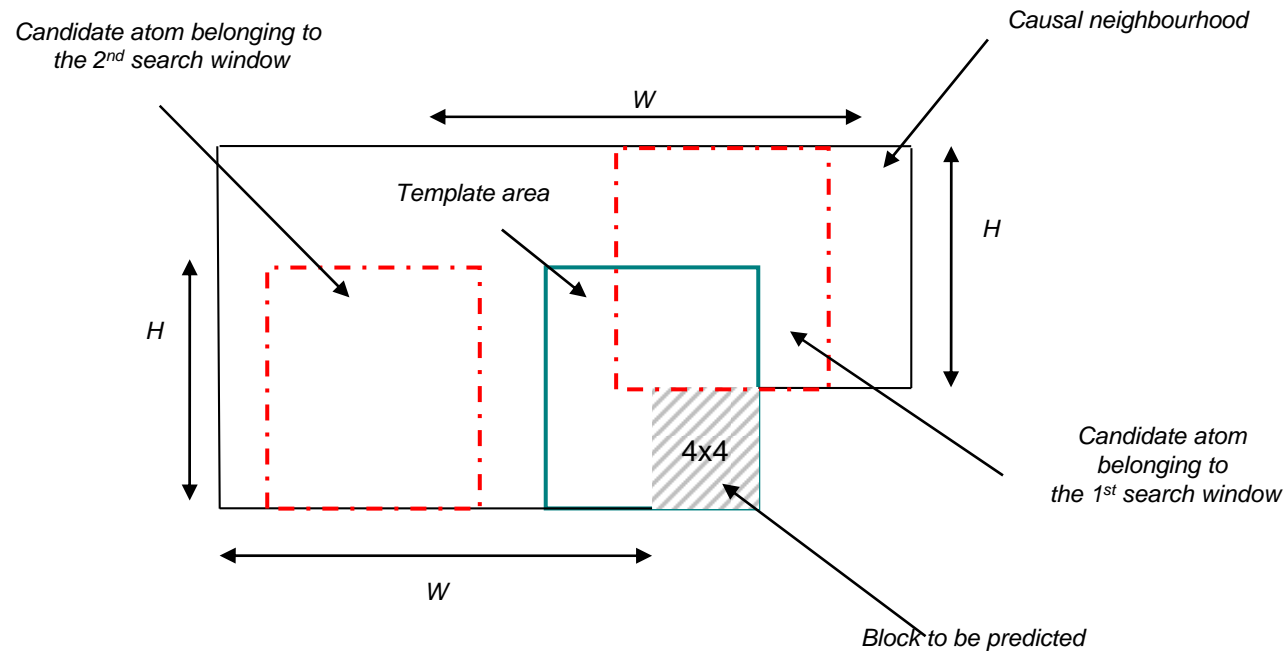


# Outline

- Description of the algorithm
- Test conditions and results
- Ongoing and future works

# Step 1: Selection of atoms

- Atoms are extracted from causal neighbourhood \*:

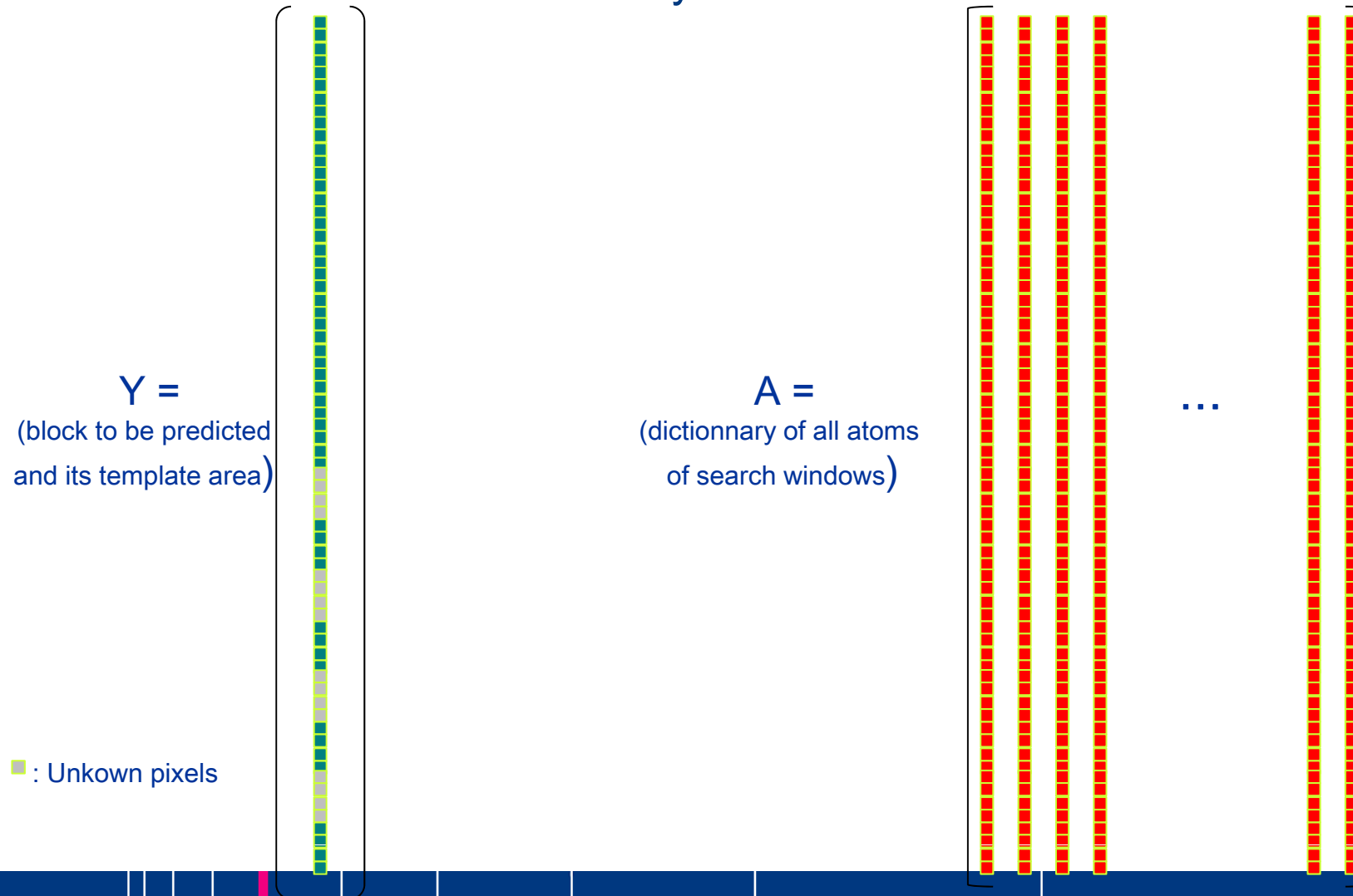


(\*) : 4x4 prediction example.



## Step 2: Linearization

- Blocks are scanned row by row and turned into vectors:



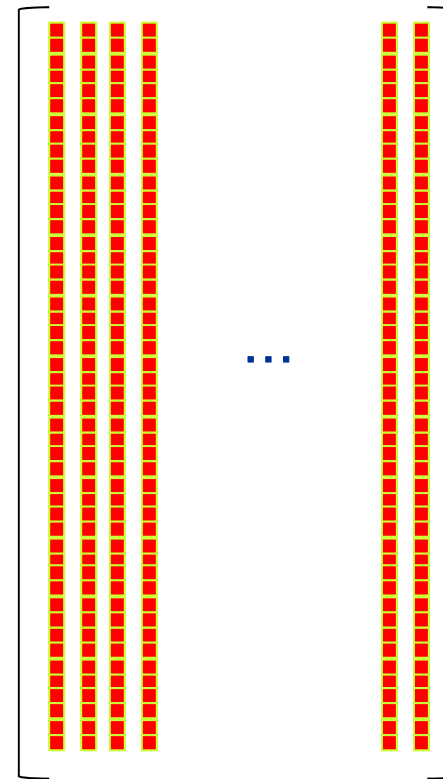
## Step 3: Compacting vectors

- Lines corresponding to unknown pixels are removed

$Y_C =$   
(template area of the  
block to be predicted)



$A_C =$   
(dictionary of all atoms  
without components  
corresponding to unknown  
pixels in Y)



## Step 4: Prediction

- Select the most correlated atom  $a_j$  to  $Y_C$  such that:

$$j = \arg \max_i (a_i^T Y_C)^2 / a_i^T a_i$$

- Compute its weighting factor  $w_j$ :

$$w_j = (a_j^T Y_C) / a_j^T a_j$$

- Multiply the whole atom  $a_j$  to get a value for unknown pixels
- Average the predictions got in this way for the best three correlations



# Test conditions and results (1/3)

- Implemented in KTA2.7
  - For 4x4, 8x8 and 16x16 blocks
  - Source code modified as specified in Intra AhG report
  - MDDT and ALF turned off
- Compared with KTA 2.7 with same configuration as above
- Used with classes, videos and QP specified in Intra AhG report
- Only « all intra » mode tested





# Test conditions and results (2/3)

- Improvements are not significant for classes A, B1 and D ...

Class	Video	Lower QP		Upper QP	
		BD-PSNR(dB)	BD-Rate(%)	BD-PSNR(dB)	BD-Rate(%)
Class A	Traffic	+0.07	-1.18	+0.07	-1.25
	People on Street	+0.09	-1.46	+0.10	-1.79
	<b>Average</b>	<b>+0.08</b>	<b>-1.32</b>	<b>+0.09</b>	<b>-1.52</b>
Class B1	Kimono	+0.03	-0.96	+0.04	-1.04
	ParkScene	+0.01	-0.29	+0.01	-0.26
	<b>Average</b>	<b>+0.02</b>	<b>-0.63</b>	<b>+0.03</b>	<b>-0.65</b>
Class D	BasketballPass	<b>+0.19</b>	<b>-3.05</b>	+0.15	-2.80
	BQSquare	+0.05	-0.54	+0.04	-0.47
	BlowingBubbles	+0.05	-0.68	+0.04	-0.69
	RaceHorses	+0.06	-0.74	+0.05	-0.83
	<b>Average</b>	<b>+0.09</b>	<b>-1.25</b>	<b>+0.07</b>	<b>-1.20</b>



# Test conditions and results (3/3)

- ... but are much better for classes B2, C and E:

Class	Video	Lower QP		Upper QP	
		BD-PSNR(dB)	BD-Rate(%)	BD-PSNR(dB)	BD-Rate(%)
Class B2	Cactus	+0.14	-3.35	<b>+0.18</b>	<b>-4.31</b>
	BasketballDrive	+0.07	-2.46	+0.09	-3.04
	BQTerrace	<b>+0.27</b>	<b>-4.25</b>	<b>+0.28</b>	<b>-5.31</b>
	<b>Average</b>	<b>+0.16</b>	<b>-3.35</b>	<b>+0.18</b>	<b>-4.22</b>
Class C	BasketballDrill	<b>+0.24</b>	<b>-4.71</b>	<b>+0.20</b>	<b>-4.43</b>
	BQMall	<b>+0.25</b>	<b>-4.00</b>	<b>+0.26</b>	<b>-4.40</b>
	PartyScene	+0.04	-0.48	+0.03	-0.49
	RaceHorses	+0.07	-0.88	+0.06	-1.06
	<b>Average</b>	<b>+0.15</b>	<b>-2.52</b>	<b>+0.14</b>	<b>-2.60</b>
Class E	Vidyo1	<b>+0.25</b>	<b>-4.61</b>	<b>+0.22</b>	<b>-3.82</b>
	Vidyo3	<b>+0.20</b>	<b>-3.42</b>	<b>+0.23</b>	<b>-3.84</b>
	Vidyo4	+0.11	-2.11	+0.11	-2.18
	<b>Average</b>	<b>+0.19</b>	<b>-3.38</b>	<b>+0.19</b>	<b>-3.28</b>



# Ongoing and future works

- Improve the current signalling
- Extension of the current solution
  - To be able to specify the number of atoms used in the linear combination
  - To take advantage of different shapes for the template area
  - To determine which iteration of matching pursuit is the best
- Integration in the TMuC



Thank you.



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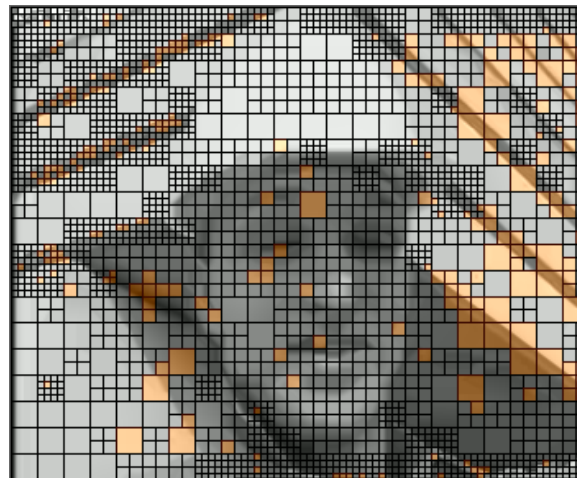
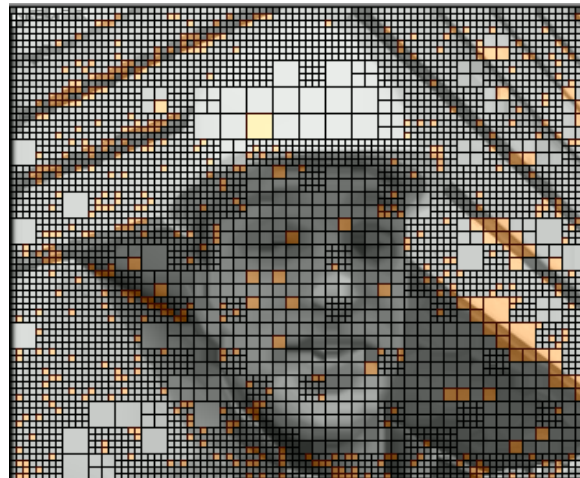


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# First application

- Integrated in KTA2.7, MDDT and ALF turned off
- % of predicted blocks with the new method

	QP = 22	QP = 34
4x4 (%)	11.8	7.4
8x8 (%)	10.6	11.6
16x16 (%)	9.4	25.8



Example of 4x4, 8x8 and 16x16 blocks predicted when QP=22 (left) and QP=34(right)