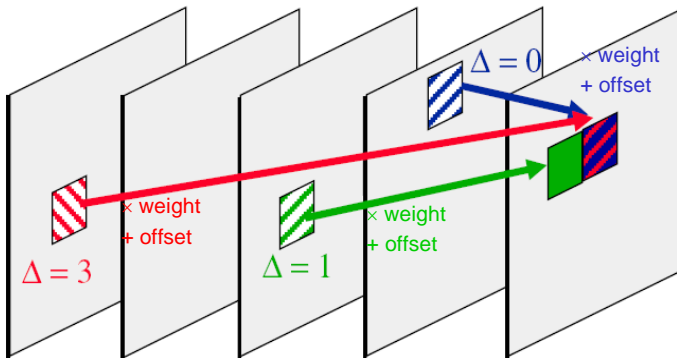


# Local intensity compensation for inter prediction in HEVC

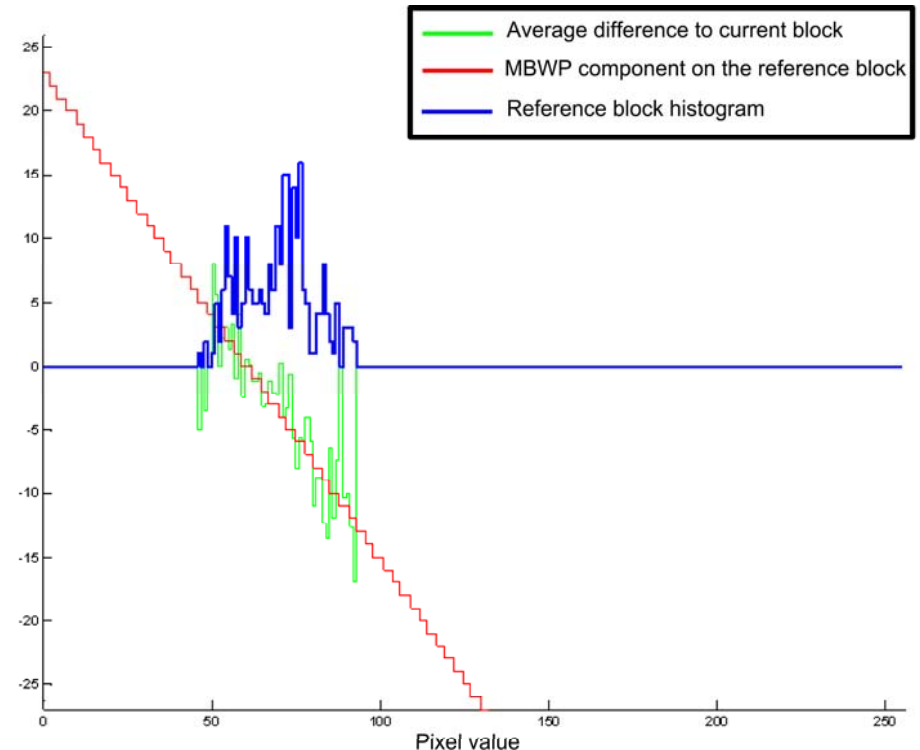
Nikola Sprljan  
Stavros Paschalakis  
Ping Wu

# Local intensity compensation

- Intensity compensation in CfP responses:
  - DC only (A110, A111)
  - DC+scale (A107, A114)



## Example of a pixel intensity change



$$\mathbf{Bp} = o + w_0 \mathbf{Bc}_0 + \dots + w_n \mathbf{Bc}_n + \dots + w_N \mathbf{Bc}_N$$

## DC+scale methods

- MBWP – Macroblock-level Weighted Prediction (A107)
  - Least-squares based minimum distortion point derivation.
  - Starting from this point, fast rate-constrained search for minimum cost point.
  - Blocks of all sizes
  - Quantisation of weights 1/128
  - Prediction from neighbouring blocks
  - Prediction of weights from offset
- IC – Intensity Compensation (A114)
  - Search over the range of weights and several offset candidates, keep lowest rate-constrained cost point.
  - Iterative refinement of the kept candidates.
  - Defined on 8x8 blocks
  - Quantisation of weights 1/64
  - Prediction from neighbouring blocks

# Results

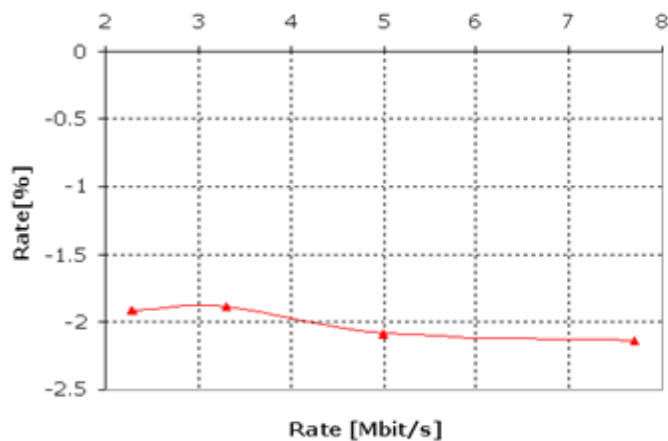
## Settings

Sequence	Total number of frames	QP1	QP2	QP3	QP4
BasketballDrive	96	37	34	31	28
BQTerrace	128	34	32	30	28
Cactus	96	36	33	30	27
Kimono (1st scene)	48	34	31	27	24
Kimono (2nd scene)	48	34	31	27	24
ParkScene	48	36	33	30	27
Train	128	34	31	27	24

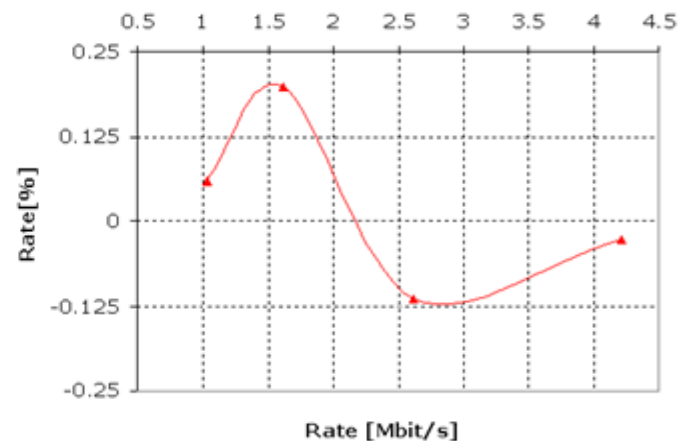
## BD-rate results

Sequence	MBWP (A107)	IC (A114)	IC (A114)
		$QP_{A114}=2.4*QP_{A107}$	$QP_{A114}=2.0*QP_{A107}$
BasketballDrive	-0.53 %	-2.00 %	-1.82 %
BQTerrace	-1.99 %	-1.70 %	-1.45 %
Cactus	-0.45 %	-2.21 %	-2.42 %
Kimono (1st scene)	-0.006 %	+1.01 %	+1.66%
Kimono (2nd scene)	-0.006 %	+0.21 %	+0.14 %
ParkScene	+0.03 %	+0.24 %	+0.40 %
Train	-1.45 %	-1.97 %	-1.22 %
Average	-0.63 %	-0.92 %	-0.67 %

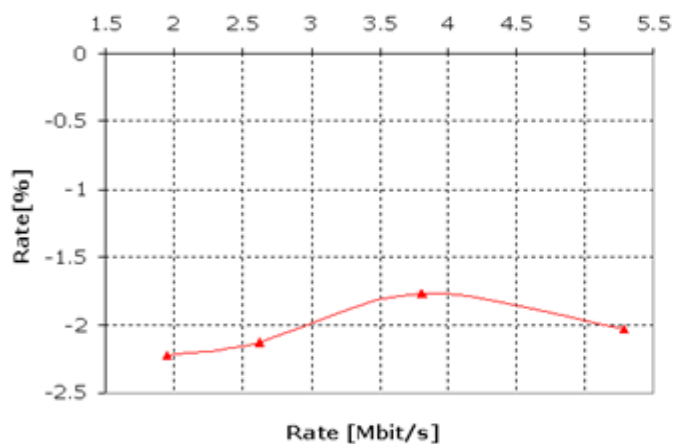
## $\Delta$ rate / rate plots



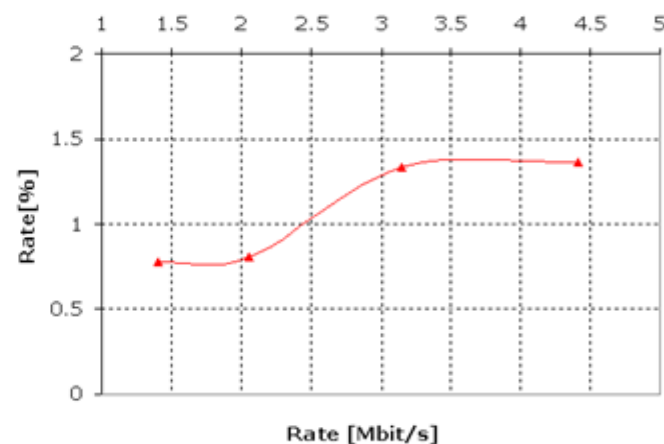
MBWP, BQTerrace



MBWP, ParkScene



IC, BasketballDrive



IC, Kimono

## Conclusions

- Local intensity compensation evaluated on 2 different high-performing codecs from CfP (Wiener in-loop filter, RDOQ, large macroblocks,...)
- Offers gain of up to ~2 %, varies across sequences
- Needs more investigation in TMuC