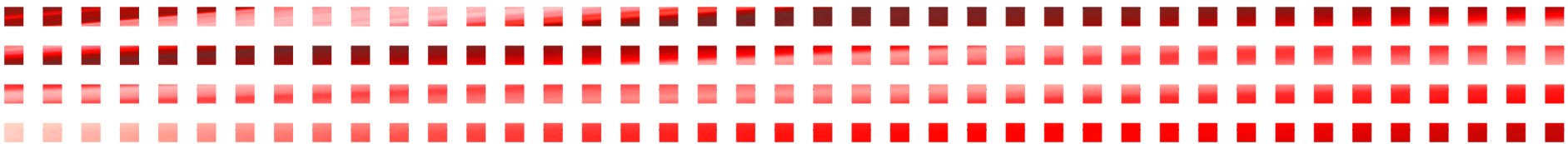




AhG8: Guided Image Filtering for Screen Content Coding

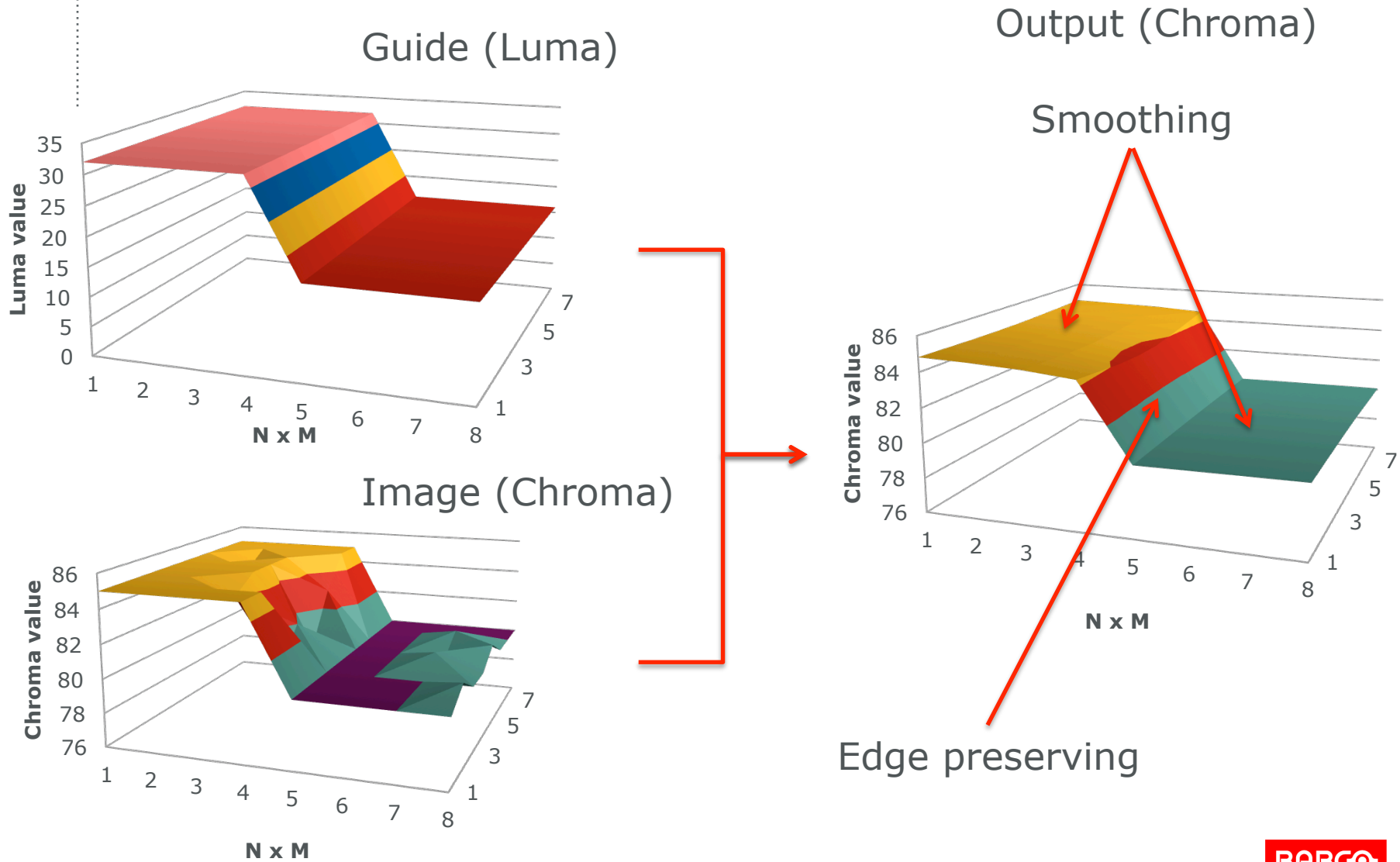
T. Vermeir, J. Slowack (Barco)
J. De Cock, G. Van Wallendael, S. Van Leuven
(UGent – iMinds)



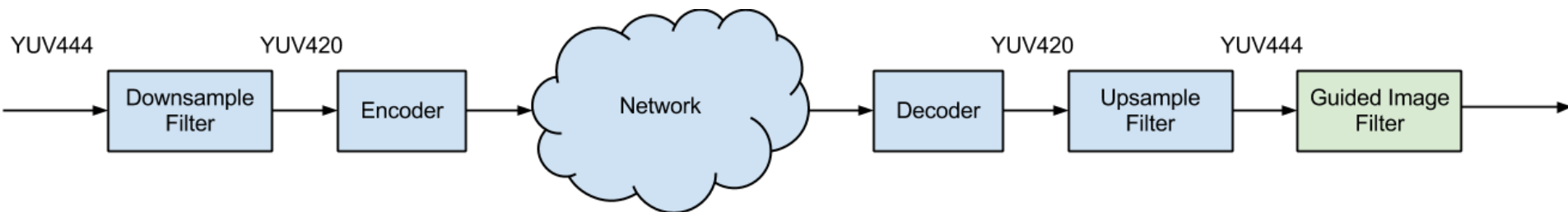
Introduction

- 4:2:0 creates visual artefacts for screen content
 - No visual artefacts in 4:4:4 and RGB
- Consumer electronics (CE) used in profesional systems mostly only (natively) support 4:2:0 compression formats (Main profile)
- Simulcast or transcoding needed to support both CE and profesional equipment
 - Increased cost/complexity on system level

Example of guided image filtering on an 8x8 array of pixels



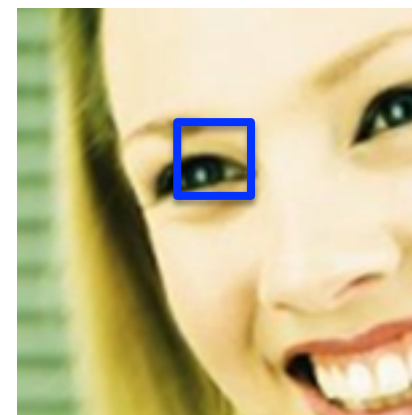
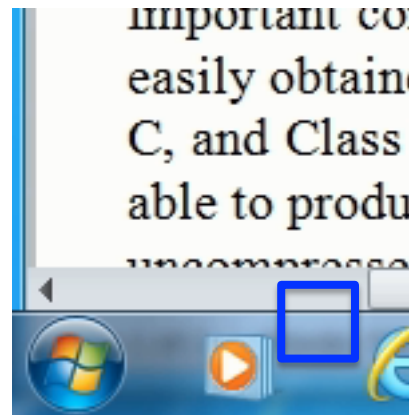
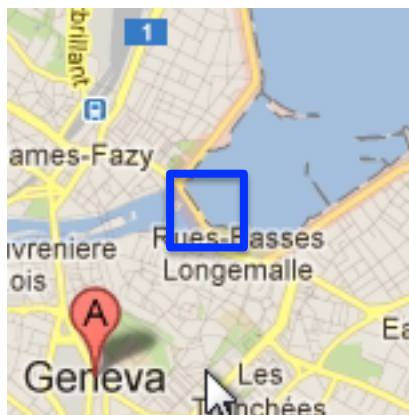
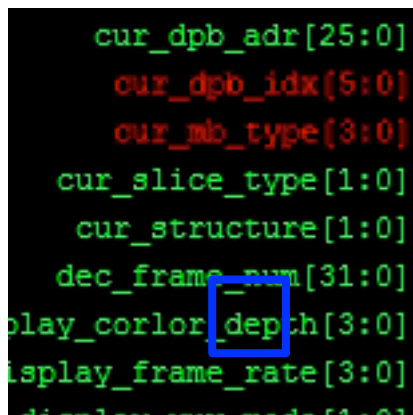
Results of guided image filtering



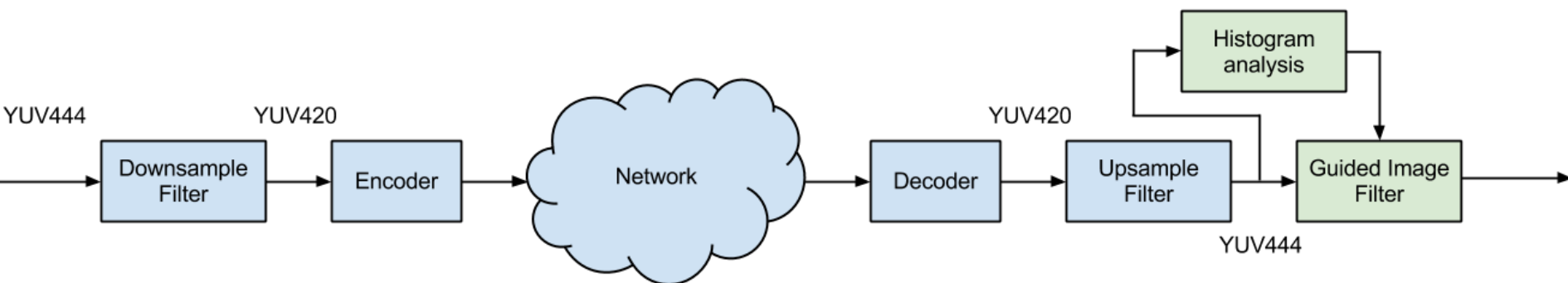
	Unfiltered		Guided Image filtering with fixed radius									
			3		5		7		9		11	
	Cb	Cr	Cb	Cr	Cb	Cr	Cb	Cr	Cb	Cr	Cb	Cr
Office_Scada_1	36,67	38,58	37,28	40,33	35,07	40,35	33,63	40,08	32,68	39,74	32,01	39,42
sc_cad_waveform	24,97	23,06	26,05	24,35	26,44	24,45	26,45	24,27	26,36	24,09	26,26	23,91
Video_Maps_1	37,95	42,95	38,98	43,97	38,00	42,96	36,95	41,77	36,02	40,75	35,22	39,89
sc_programming	36,14	35,96	36,99	36,96	36,00	36,10	34,90	35,03	34,30	34,43	33,84	33,95
sc_video_conferencing_doc_sharing	32,70	31,12	32,91	31,26	32,64	31,01	32,40	30,81	32,24	30,64	32,09	30,48
sc_wordEditing	37,95	36,28	37,24	36,48	36,03	35,81	35,51	35,50	35,13	35,30	34,74	35,14

Histogram-based analysis

- Reconfigure guided image filter:
 - Parameters: radius (smoothing window)
 - properties in local luma histogram: amount of colors, pixels with equal colors, difference between colors



Results: guided image filtering with histogram-based analysis



Sequence	Unfiltered		Histogram based guided image filtering		Gain	
	Cb	Cr	Cb	Cr	Cb	Cr
Office_Scada_1	36,67	38,58	37,29	40,52	0,62	1,94
sc_cad_waveform	24,97	23,06	26,75	25,01	1,78	1,95
Video_Maps_1	37,95	42,95	38,91	43,86	0,96	0,91
sc_programming	36,14	35,96	36,57	36,6	0,43	0,64
sc_video_conferencing_doc_sharing	32,7	31,12	33,11	31,25	0,41	0,13
sc_wordEditing	37,95	36,28	37,54	36,63	-0,41	0,35
Average					0,63	0,99

Results: guided image filtering with histogram-based analysis

```
cur_dpb_adr[25:0]  
  cur_dpb_idx[5:0]  
  cur_mb_type[3:0]  
cur_slice_type[1:0]
```

Original

```
cur_dpb_adr[25:0]  
  cur_dpb_idx[5:0]  
  cur_mb_type[3:0]  
cur_slice_type[1:0]
```

Filtered output

Future work

- Integrate upsample filter
- Improve radius prediction
 - Re-use information from encoding process as predictor
- Adaptive LUT in SEI

Conclusion

- Guided image filtering improves chroma components with +0.63 dB and +0.99 dB on average for sequences under test
- Subjective visual improvements in filter output
- ...
- Work in progress