

LOW COMPLEXITY ADAPTIVE INTERPOLATION FILTER FOR NEW CODING STANDARD

周晋 池永研 修士1年

Background

- ❑ Larger video resolution (SHV 8kx4k)
- ❑ Current coding standard inefficient for bigger picture
- ❑ New standard (NEVC) targeting 50% bitrate reduction to H.264 is emerging
- ❑ In NEVC, adaptive interpolation filter (AIF) provides significant bitrate reduction (up to 32% in SHV sequences)

My target

- ❑ Significantly reduced coding complexity (time)
- ❑ Similar performance with AIF (PSNR & bitrate)

AIF

❑ Concept:

- Predict the information on sub-position of reference frame to reduce the mean-square error.
- Aliasing components, motion blur effect is attenuated



❑ Results (vs. H.264)

- Enhanced coding efficiency (up to +1 db on PSNR & -32% bitrates in SHV)
- Performance get better for larger picture

❑ Problem

- Low speed, high complexity (Motion estimation time doubled at least)

Proposal2 Modified coding pass

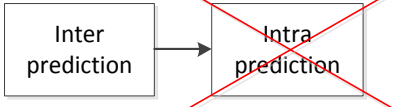
- Intra modes are unnecessary for AIF in first pass



Only inter information is used

- Disable intra prediction in first pass coding when AIF is applied

Mode decision of one MB



Proposal1 Fast early elimination of AIF

❑ Observation:

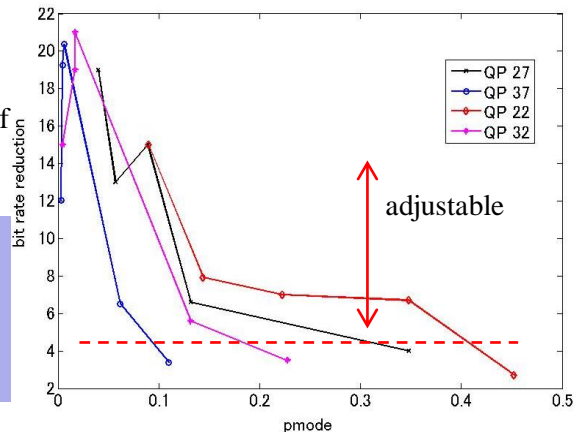
- Performance of AIF has high correlation with occurrence rate of small modes (inter & intra)

❑ Method

- Decide the usage of AIF by define Pmode

• Algorithm:

generate pmode information in first pass coding
 if(Pmode ≤ threshold) disable AIF
 else continue to coefficients finding part



Test and Results

❑ Conclusion

- Proposal 1: Pre-processing part
 - Adjustable

- Proposal 2: Impressive results
 - Can be further designed to achieve similar complexity as H.264

Format	Sequence	AIF vs H.264			Proposal 1 vs H.264			Proposal 2 vs H.264		
		ΔPSNR	ΔBitrates	ΔComplexity	ΔPSNR	ΔBitrates	ΔComplexity	ΔPSNR	ΔBitrates	ΔComplexity
CIF 352x288	Container	0.1	-4.34%	112%	0.1	-4.03%	96%	X		
	Mobile	0.04	-1.49%	113%	0.03	-0.30%	35%			
	Foreman	0.14	-2.39%	112%	0	-1.39%	72%			
	Paris	0.1	-0.56%	112%	0.05	0.00%	30%			
	Tempete	0.1	-1.86%	112%	0.08	-0.50%	12.00%			
	Average	0.096	-2.13%	112%	0.052	-1.24%	49%			
1920x1080	Pedestrian	0.1	-5.13%	96.70%	0	-5.13%	101%	0.11	-5.43%	51.90%
	Riverbed	0.01	-1.14%	97.60%	0.01	0.00%	-1%	0.01	-1.14%	53.60%
	Rush_hour	0.36	-8.43%	95.30%	0.36	-8.43%	96.30%	0.45	-12.43%	51.30%
	Station2	0.49	-16.01%	96.30%	0.49	-16.01%	99.30%	0.5	-15.21%	60.30%
	Sunflower	1.31	-19.18%	90.10%	1.31	-19.18%	89.90%	1.41	-19.18%	50.10%
	Tractor	0.52	-7.95%	96.20%	0	0.00%	26%	0.54	-7.95%	56.20%
	Average	0.465	-9.64%	95.37%	0.36	-8.13%	69%	0.5	-10.22%	53.90%

