

JVET-M0354

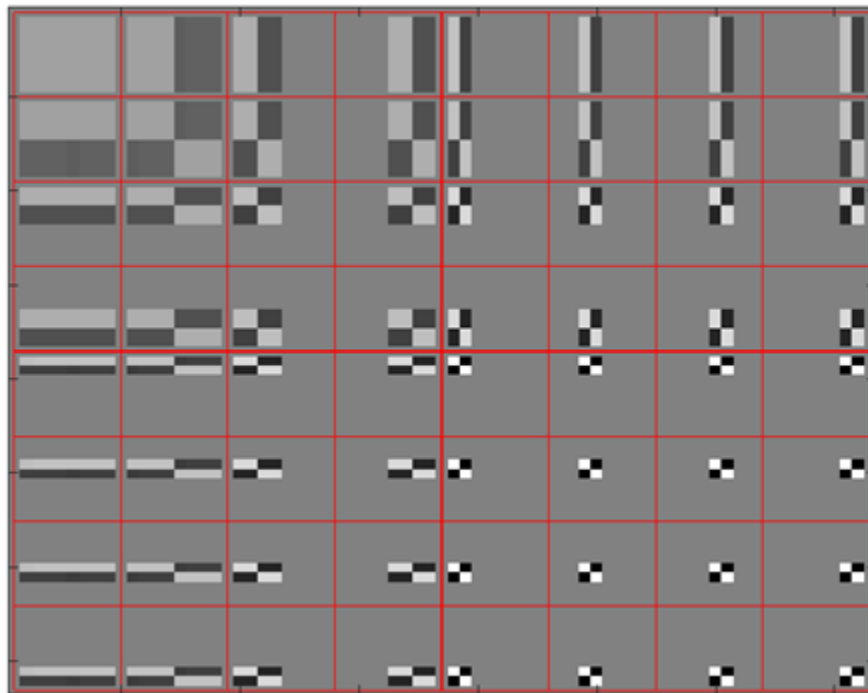
CE6-related: MTS with Haar transform for Screen Contents Coding



Karam NASER, Franck GALPIN and Tangi POIRIER - Technicolor

Motivation

- Haar transform is characterized by:
 - Smooth basis functions with sharp edges
 - Very simple to implement (multiplication free)
 - Proved to be good transform for special signal (SCC, Depth maps)
- Proposal:
 - Utilize Haar transform in VTM



2D basis of Haar transform (8x8)

Idea

■ VTM transform design:

- (DCT2,DCT2) as core transform
- (DST7, DST7), (DST7, DCT8), (DCT8, DST7) (DCT8, DCT8) as MTS

■ Embed Haar in MTS:

- (DCT2,DCT2) as core transform
- (DST7, DST7), (DST7, Haar), (Haar, DST7) (Haar, Haar) as MTS

Simulation Results

■ Results over VTM-3.0 (Class F)

AI →

	Y	U	V	EncT	DecT
BasketballDrillText	-0.03%	-0.02%	-0.15%		
ArenaOfValor	-0.02%	-0.09%	-0.03%		
SlideEditing	-1.30%	-0.62%	-0.64%		
SlideShow	-0.49%	-0.36%	0.19%		
Average	-0.46%	-0.27%	-0.16%	102%	99%

RA →

	Y	U	V	EncT	DecT
BasketballDrillText	0.08%	-0.26%	-0.13%		
ArenaOfValor	0.11%	0.17%	-0.05%		
SlideEditing	-1.23%	-0.66%	-0.57%		
SlideShow	-0.34%	0.08%	0.42%		
Average	-0.35%	-0.17%	-0.08%	101%	100%

LBD →

	Y	U	V	EncT	DecT
BasketballDrillText	0.12%	-0.26%	0.02%		
ArenaOfValor	-0.03%	0.03%	0.01%		
SlideEditing	-0.94%	-0.23%	-0.51%		
SlideShow	-0.44%	1.36%	0.23%		
Average	-0.32%	0.22%	-0.06%	101%	107%

Simulation Results

■ Results over VTM-3.0 (Class TGM)

AI →

	Y	U	V	EncT	DecT
sc_flyingGraphics	-1.00%	-0.40%	-0.35%		
sc_console	-1.61%	-0.63%	-0.63%		
sc_desktop	-1.06%	-0.48%	-0.37%		
ChineseEditing	-1.67%	-0.73%	-0.76%		
Average	-1.34%	-0.56%	-0.53%	102%	103%

RA →

	Y	U	V	EncT	DecT
sc_flyingGraphics	-0.32%	-0.23%	-0.34%		
sc_console	-0.86%	-0.38%	-0.35%		
sc_desktop	-0.75%	-0.31%	-0.30%		
ChineseEditing	-1.40%	-0.69%	-0.69%		
Average	-0.83%	-0.40%	-0.42%	103%	101%

LBD →

	Y	U	V	EncT	DecT
sc_flyingGraphics	-0.16%	0.01%	-0.11%		
sc_console	-0.40%	-0.22%	-0.18%		
sc_desktop	-0.32%	-0.34%	-0.07%		
ChineseEditing	-0.18%	-0.39%	-0.38%		
Average	-0.26%	-0.23%	-0.19%	118%	112%

Simulation Results

■ Results over VTM-3.0 (Class F)

■ CPR=1

AI →

	Y	U	V	EncT	DecT
BasketballDrillText	-0.05%	-0.13%	-0.17%		
ArenaOfValor	-0.03%	-0.09%	-0.05%		
SlideEditing	-0.59%	-0.19%	-0.23%		
SlideShow	-0.35%	-0.46%	0.13%		
Average	-0.25%	-0.22%	-0.08%	103%	109%

RA →

	Y	U	V	EncT	DecT
BasketballDrillText	0.01%	-0.52%	-0.25%		
ArenaOfValor	0.12%	0.00%	0.00%		
SlideEditing	-0.55%	-0.18%	-0.23%		
SlideShow	0.02%	-0.09%	0.03%		
Average	-0.10%	-0.20%	-0.11%	102%	106%

LBD →

	Y	U	V	EncT	DecT
BasketballDrillText	0.08%	-0.43%	0.00%		
ArenaOfValor	0.00%	0.13%	0.15%		
SlideEditing	-0.86%	-0.44%	-0.36%		
SlideShow	-0.16%	0.26%	0.81%		
Average	-0.23%	-0.12%	0.15%	117%	112%

Simulation Results

■ Results over VTM-3.0 (Class TGM)

■ CRP=1

AI →

	Y	U	V	EncT	DecT
sc_flyingGraphics	-0.48%	-0.12%	-0.07%		
sc_console	-1.08%	-0.38%	-0.45%		
sc_desktop	-0.54%	-0.13%	-0.22%		
ChineseEditing	-0.66%	-0.14%	-0.20%		
Average	-0.69%	-0.19%	-0.24%	108%	101%

RA →

	Y	U	V	EncT	DecT
sc_flyingGraphics	-0.22%	-0.05%	-0.16%		
sc_console	-0.54%	-0.30%	-0.16%		
sc_desktop	-0.46%	-0.19%	-0.19%		
ChineseEditing	-0.46%	-0.19%	-0.19%		
Average	-0.45%	-0.19%	-0.16%	104%	105%

LBD →

	Y	U	V	EncT	DecT
sc_flyingGraphics	-0.03%	0.08%	0.02%		
sc_console	-0.11%	-0.18%	-0.04%		
sc_desktop	-0.04%	0.30%	0.03%		
ChineseEditing	0.08%	-0.24%	-0.11%		
Average	-0.02%	-0.01%	-0.02%	118%	111%

Additional Results

■ Testing the impact on natural sequences

■ RA CTC

Random Access Main 10					
Over VTM 3.0					
	Y	U	V	EncT	DecT
Class A1	0.11%	0.24%	0.13%	115%	107%
Class A2	0.13%	0.02%	0.11%	116%	108%
Class B	0.14%	0.17%	-0.08%	116%	107%
Class C	0.08%	-0.26%	0.05%	119%	108%
Class E					
Overall	0.12%	0.04%	0.04%	117%	107%
Class D	0.01%	-0.20%	-0.11%	120%	108%

Summary

■ Haar transform:

- Simple + efficient for SCC
- Significant coding gain (especially for TGM and AI cfg: 1.34%)
- little loss for natural sequences (0.12% on RA CTC)

■ Conclusion

- Can be either restricted to screen contents or for all sequences with small loss