

The background is a vibrant blue with a blurred, motion-streaked effect. Faint, light blue binary code (0s and 1s) is scattered across the upper right portion. A large, faint, light blue shape resembling a bird or a winged figure is visible in the center-left. The main text is positioned in the lower half of the image.

***Fast* VDO**
like it's meant to be...



Fast Integer Transforms For HEVC Test Model

JCTVC-C112

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Objective

- ◆ This proposal aims to present simplified transforms of size 16, 32, 64 which, when compared to the TMuC transforms, have
 - virtually identical performance
 - substantial computational savings

Fast Integer Transform Selection

- ◆ 4-pt, 8-pt : AVC transforms
- ◆ 16-pt, 32-pt : fast A124 transforms
- ◆ $T_{64} = T_{32} \times H_2$, where
- ◆ $H_2 = [1, 1; 1, -1]$, the 2D Hadamard.

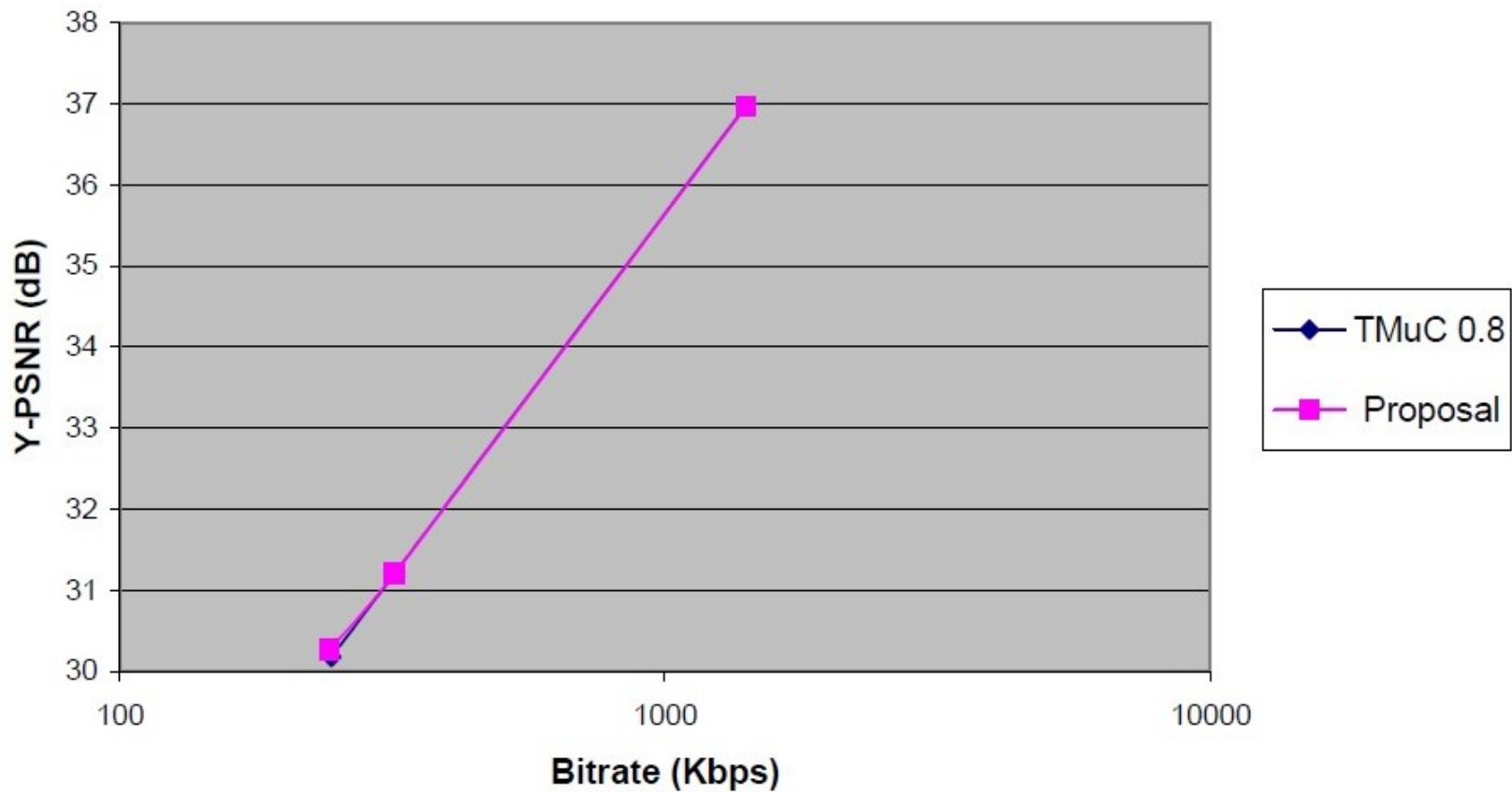


Coding Performance

- ◆ The coding efficiency of the proposed transforms is virtually identical to the existing TMuC transforms
- ◆ Coding results given in C112 package

CS1 Results

BasketballDrill (WVGA)



CS1 Results (2)

GOP Size : 8

GOP structure :IbBbBbBP coding structure

Number of Reference Pictures : 4

Fast Motion Search Range : 64 x 64 (for Class C,E) , 16 x 16(for Class D)

RDOQ enabled

Entropy coder : CABAC

CU size / depth : 128 / 5

Class C Average PSNR Gain : -0.021714188

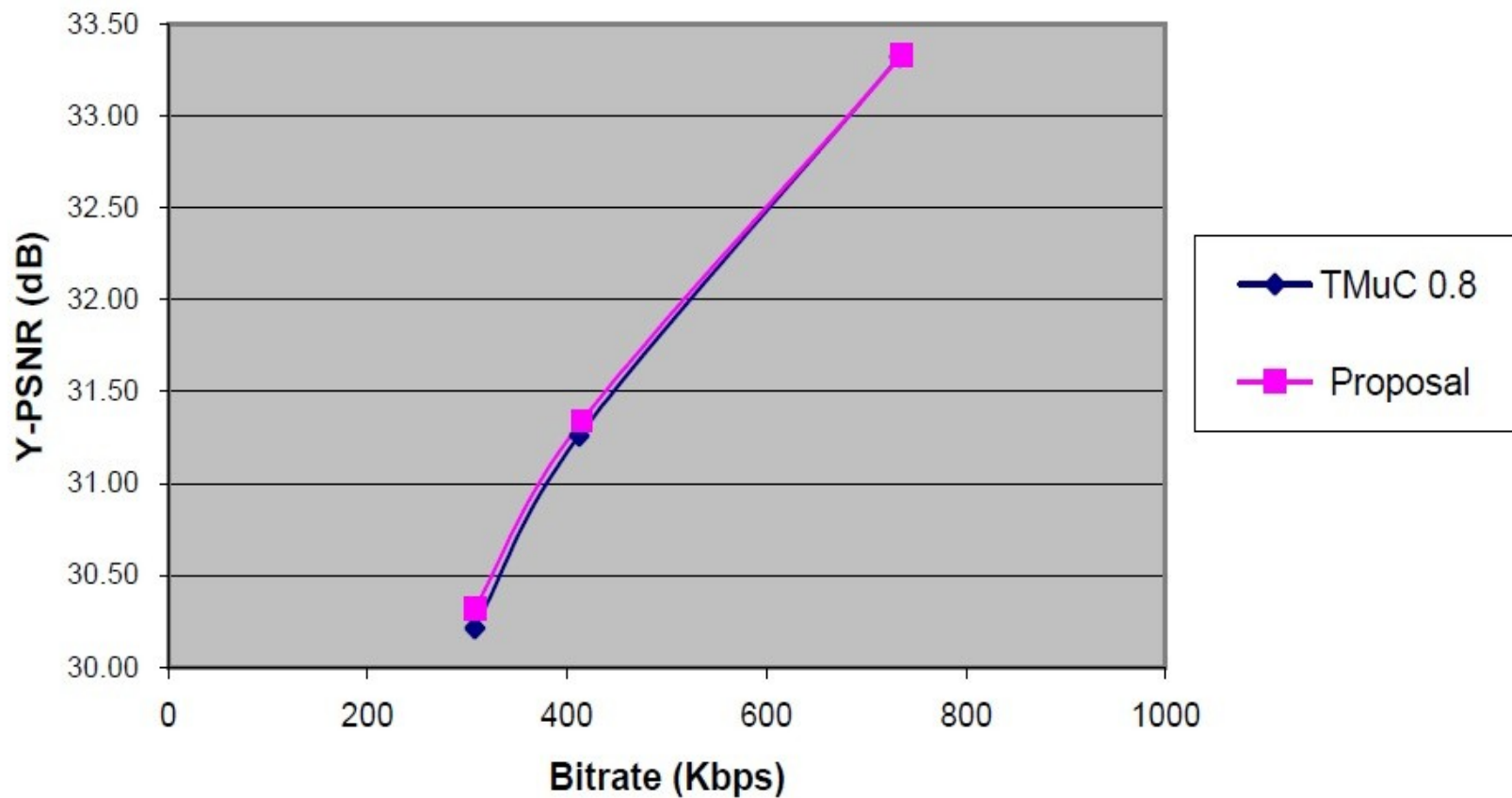
Class D Average PSNR Gain : -0.022035399

Class B Average PSNR Gain : 0.006844406

Overall PSNR Gain : -0.016130954

CS2 Results

BasketballDrill (WVGA)



CS2 Results (2)

GOP structure : IPPPP coding structure

Number of Reference Pictures : 1

Fast Motion Search Range : 64 x 64 (for Class C,E) , 16 x 16 (for Class D)

RDOQ enabled

Entropy coder : CABAC

CU size / depth : 128 / 5

Class C Average PSNR Gain : 0.02311

Class E Average PSNR Gain : 0.0259

Class D Average PSNR Gain : - 0.00635

Class B Average PSNR Gain : 0.000556

Overall PSNR Gain : 0.01081

Comp. Complexity

Table 3 Number of operations of 16 point one dimensional transforms

Transform	Operations	Number	Total operations	Total Ops/sample
TMuC 8.0	+	150	268	16.75
	>>	118		
Proposed	+	106	167	10.43
	>>	55		

Table 4 Number of operations of 32 point one dimensional transforms

Transform	Operations	Number	Total operations	Total Ops/sample
TMuC 8.0	+	484	871	27.22
	>>	387		
Proposed	+	353	507	15.84
	>>	154		

Comp. Complexity (2)

Table 5 Number of operations of 64 point one dimensional transforms

Transform	Operations	Number	Total operations	Total Ops/sample
TMuC 8.0	+	1416	2600	40.63
	>>	1184		
Proposed	+	770	1078	16.84
	>>	308		

- ◆ 64-pt is just 32-pt plus 2D Hadamard
 - Just one add more in 1D (2 adds in 2D)
 - Can compute as 2 level transform

Partial Freq Transform

Compute Low Freq Coeffs

Ignore High Freq Coeffs

- ◆ Compute only low-freq components
 - Saves computation, data mgmt..
 - Equiv to computing full transform and nulling high freq components
 - Also advocated by C209, C237



Conclusions

- ◆ Introduced fast, efficient transforms
 - Perf equiv to TMuC transforms
 - Complexity substantially less
- ◆ Transforms familiar from A124
 - Cross check of our results in process (Samsung)
- ◆ Can reduce complexity further
 - Partial freq



Recommendations

- ◆ Transforms mature, virtually ideal
 - Can't reduce complexity
 - Can't improve performance
- ◆ Suggest inclusion in TMuC (or TM)
 - Set up core exp, validate next meeting
 - If acceptable, include in TM
 - Study 64-pt further for retention decision



Thank You