

# JCTVC-B074 Rounding Control for Bidirectional Averaging

# Bidirectional Averaging

- Bi-directional prediction averaging in TMuC is performed using bilinear interpolation with upward rounding.
- Proposal: signal rounding offset (0 or 1).
- Encoder:
  - Hierarchical-B coding structure. The encoder decides based on reference or no-reference frame.
  - IPP coding structure with GPB mode enabled (multi-hypothesis coding). Rounding up is used for the even-numbered frames and rounding down for the odd-numbered frames.
- Similar solution included in JMKTA (VCEG-AI20 and VCEG-AI33).

# DCT

- Another problem detected when comparing IBDI on and IBDI off modes.
  - Initial difference between IBDI on and off was much larger in TMuC than in JMKTA.
- The TMuC software uses Chen's fast factorization algorithm to implement transforms up to size  $64 \times 64$ . These transforms use butterfly structures that have divisions by powers of 2.
- Introduce left shift before the transform, depends on the rounding within transform and allowed precision.

IPPP+GPB					
	IBDI off	IBDI on	IBDI off, DCT fix	IBDI off, DCT fix & Adaptive Rounding	
WQVGA	RaceHorses	-1.88	-0.38	-0.50	
	Basketball	-2.29	-0.90	-1.21	
	PartyScene	-2.18	-0.11	-0.88	
	BQSquare	-2.51	-0.18	-1.67	
	<b>WQVGA_AVG</b>	<b>-2.22</b>	<b>-0.39</b>	<b>-1.07</b>	
WVGA	RaceHorses	-2.54	-0.79	-1.01	
	Basketball	-4.51	-1.29	-1.79	
	PartyScene	-2.14	-0.40	-1.11	
	BQSquare	-4.52	-0.96	-1.60	
	<b>WVGA_AVG</b>	<b>-3.43</b>	<b>-0.86</b>	<b>-1.38</b>	
720p	Vidyo1	-11.84	-1.85	-5.16	
	Vidyo3	-12.26	-1.07	-6.56	
	Vidyo4	-12.80	-2.03	-6.15	
	<b>720p_AVG</b>	<b>-12.30</b>	<b>-1.65</b>	<b>-5.96</b>	
1080p	ParkScene	-4.11	-0.94	-1.31	
	Kimono	-4.79	-3.22	-3.29	
	Basketball	-7.01	-3.39	-4.00	
	Cactus	-4.64	-1.75	-2.42	
	BQSquare	-5.91	-0.93	-2.66	
	<b>1080p_AVG</b>	<b>-5.29</b>	<b>-2.05</b>	<b>-2.74</b>	
	<b>AVG</b>	<b>-5.37</b>	<b>-1.26</b>	<b>-2.58</b>	<b>-2.79</b>

HierB					
	IBDI off	IBDI on	IBDI off, DCT fix	IBDI off, DCT fix & Adaptive Rounding	
WQVGA	RaceHorses	-1.04	-0.29	-0.49	
	Basketball	-1.37	-0.50	-0.69	
	PartyScene	-1.65	-0.35	-0.42	
	BQSquare	-2.28	-0.39	-0.73	
	<b>WQVGA_AVG</b>	<b>-1.59</b>	<b>-0.38</b>	<b>-0.58</b>	
WVGA	RaceHorses	-1.55	-0.54	-0.65	
	Basketball	-3.42	-1.10	-1.09	
	PartyScene	-1.72	-0.32	-0.60	
	BQSquare	-2.60	-0.55	-0.73	
	<b>WVGA_AVG</b>	<b>-2.32</b>	<b>-0.63</b>	<b>-0.77</b>	
720p	Vidyo1	-8.38	-1.89	-3.21	
	Vidyo3	-6.89	-1.24	-1.78	
	Vidyo4	-7.76	-1.72	-2.62	
	<b>720p_AVG</b>	<b>-7.68</b>	<b>-1.62</b>	<b>-2.54</b>	
1080p	ParkScene	-3.00	-0.68	-0.87	
	Kimono	-3.82	-2.49	-2.47	
	Basketball	-4.78	-2.54	-2.58	
	Cactus	-3.22	-1.07	-1.20	
	BQSquare	-4.74	-0.86	-1.64	
	<b>1080p_AVG</b>	<b>-3.91</b>	<b>-1.53</b>	<b>-1.75</b>	
	<b>AVG</b>	<b>-3.64</b>	<b>-1.03</b>	<b>-1.36</b>	<b>-2.28</b>