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CE9: Results of Experiments M-Series

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Overall Summary

- M01 - replacing the temporal candidate by T_{BR} reportedly achieved 0.8%, 1.0%, 0.9%, and 1.3% bit rate reductions for HE-RA, LC-RA, HE-LD, and LD-LD, respectively.

- M07 - the modified derivation of spatial candidates reportedly achieved 0.6%, 0.8%, 0.2%, and 0.3% bit rate reductions

- M12 - the modified derivation of temporal candidates reportedly achieved 0%, 0%, 0.3% and 0.6% bit rate reductions.

- M27 - the combination of M01, M07, and M12 reportedly achieved 1.3%, 1.7%, 1.2% and 2.0% bit rate reductions.

- M31- the combination of M01, M07, D125(2.4'), and D274(3) reportedly achieved 1.3%, 1.8%, 1.5%, and 2.6% bit rate reductions.

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Temporal candidate T_{BR}

- The AMVP candidate set becomes :
  - Left predictor (HM2.0)
  - Top predictor (HM2.0)
  - T_{BR} (the above left position of the below right PU as the temporal predictor H in D125 Section 2.1)

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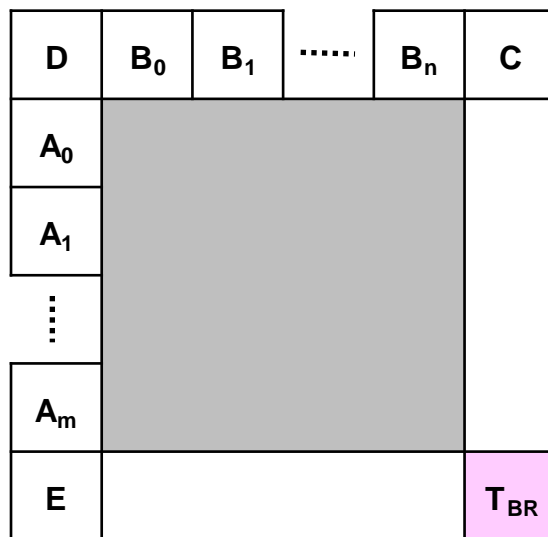
Experiment Results – M01

- Anchor : JCTVC-D600

- AMVP : apply T_{BR}

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.9	-0.7	-1.0	-1.0	-1.0	-1.0
Class B	-0.5	-0.5	-0.5	-1.0	-0.9	-0.9
Class C	-0.9	-0.9	-0.9	-1.0	-0.9	-1.0
Class D	-0.9	-0.9	-0.9	-1.1	-1.1	-1.1
Class E						
All	-0.8	-0.7	-0.8	-1.0	-1.0	-1.0
Enc Time[%]	101%			101%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.7	-0.5	-0.9	-1.4	-1.1	-0.6
Class C	-1.0	-1.0	-1.1	-1.4	-1.2	-1.3
Class D	-1.0	-0.9	-1.3	-1.2	-0.9	-0.9
Class E	-0.6	-1.2	-0.8	-1.4	-1.2	-0.9
All	-0.9	-0.9	-1.0	-1.3	-1.1	-0.9
Enc Time[%]	100%			101%		
Dec Time[%]	100%			100%		

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JCTVC-D125 Section 2.3 : Modified Derivation of Spatial Candidates

- Spatial candidates derived with a pre-defined priority.
  1. The MV from the same reference list and same reference picture - as the current AMVP
  2. Try other good substitutes
     1. The MV from the other reference list and same reference picture
     2. The scaled MV from the same reference list and different reference picture
     3. The scaled MV from the other reference list and different reference picture

- Three more possibilities in the priority list to increase the chance for spatial candidates to be available

- Experiment N, O and JCTVC-E062 are very similar
  – LG, Qualcomm, Fujitsu

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Experiment Results – M07

- Anchor : JCTVC-D600

- AMVP – apply JCTVC-D125 Section 2.3 (the modified derivation of spatial candidates)

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.6	-0.9	-1.3	-1.1	-1.3	-1.3
Class B	-0.4	-0.3	-0.3	-0.6	-0.5	-0.4
Class C	-0.6	-0.8	-0.7	-0.8	-0.7	-0.9
Class D	-0.6	-0.7	-0.7	-0.7	-0.7	-0.7
Class E						
All	-0.6	-0.6	-0.7	-0.8	-0.8	-0.8
Enc Time[%]	102%			103%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.1	0.2	0.1	-0.2	0.0	0.3
Class C	-0.2	-0.1	-0.2	-0.4	-0.3	-0.3
Class D	-0.2	-0.3	-0.3	-0.2	0.2	0.3
Class E	-0.3	0.2	0.2	-0.3	-0.1	0.0
All	-0.2	0.0	-0.1	-0.3	0.0	0.1
Enc Time[%]	104%			105%		
Dec Time[%]	99%			100%		

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Experiment Results – M12

- Anchor : JCTVC-D600

- AMVP and Merge – apply JCTVC-D125 Section 2.4 (the modified derivation of temporal candidates)

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.0	0.1	-0.1	0.0	0.0	0.0
Class B	0.1	0.1	0.1	0.1	0.1	0.1
Class C	0.0	0.0	0.0	0.0	0.1	0.0
Class D	0.0	0.1	0.0	0.0	-0.1	0.0
Class E						
All	0.0	0.1	0.0	0.0	0.0	0.0
Enc Time[%]	101%			101%		
Dec Time[%]	100%			99%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.3	-0.2	-0.2	-0.9	-0.4	0.0
Class C	-0.3	-0.1	-0.1	-0.5	-0.1	-0.3
Class D	-0.4	-0.1	-0.6	-0.4	0.5	0.7
Class E	-0.5	-1.0	-0.8	-0.6	-0.6	-0.3
All	-0.3	-0.3	-0.4	-0.6	-0.2	0.1
Enc Time[%]	100%			100%		
Dec Time[%]	100%			99%		

Experiment Results – M27

- AMVP and Merge – apply JCTVC-D125 Section 2.4 (the modified derivation of temporal candidates)

- AMVP – apply HCTVC-D125 Section 2.3 (the modified derivation of spatial candidates)

- AMVP – apply T_{BR}'

- Anchor : JCTVC-D600

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-1.5	-1.7	-1.8	-2.2	-2.4	-2.4
Class B	-0.8	-0.7	-0.7	-1.3	-1.1	-1.0
Class C	-1.4	-1.5	-1.5	-1.7	-1.5	-1.7
Class D	-1.5	-1.5	-1.6	-1.7	-1.5	-1.6
Class E						
All	-1.3	-1.3	-1.4	-1.7	-1.6	-1.6
Enc Time[%]	103%			104%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-1.0	-0.9	-0.6	-2.4	-1.2	-0.7
Class C	-1.4	-1.3	-1.3	-2.2	-1.5	-1.7
Class D	-1.3	-1.1	-1.2	-1.7	-0.4	-0.3
Class E	-0.9	-0.9	-1.3	-1.6	-0.3	-0.8
All	-1.2	-1.1	-1.1	-2.0	-0.9	-0.9
Enc Time[%]	105%			107%		
Dec Time[%]	99%			102%		

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JCTVC-D125 Section 2.4'

- A simplified derivation of temporal candidates in current HM 2.0

- Remove the process of checking shortest reference picture distance

- If both motion vectors cross the current picture or both do not cross, the co-located motion vector in the same list will be chosen

- JCTVC-D274 (3') [Panasonic] is exactly the same

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Experiment Results – M31

- AMVP and Merge – apply JCTVC-D125 Section 2.4 ' (a simplified derivation of temporal candidates)

- AMVP – apply JCTVC-D125 Section 2.3 (the modified derivation of spatial candidates)

- AMVP – apply T_{BR}'

- Anchor : JCTVC-D600

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-1.5	-2.0	-1.9	-2.3	-2.5	-2.3
Class B	-0.9	-0.8	-0.9	-1.5	-1.1	-1.1
Class C	-1.4	-1.5	-1.4	-1.7	-1.6	-1.7
Class D	-1.4	-1.5	-1.5	-1.7	-1.5	-1.5
Class E						
All	-1.3	-1.4	-1.4	-1.8	-1.6	-1.6
Enc Time[%]	103%			104%		
Dec Time[%]	100%			101%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-1.2	-1.2	-1.1	-2.7	-1.9	-1.4
Class C	-1.6	-1.5	-1.5	-2.6	-2.1	-2.1
Class D	-1.8	-1.6	-2.0	-2.3	-0.9	-0.9
Class E	-1.3	-1.1	-0.6	-1.9	-1.4	-1.3
All	-1.5	-1.3	-1.3	-2.5	-1.6	-1.5
Enc Time[%]	105%			107%		
Dec Time[%]	100%			102%		

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M31 and T

- HHI claimed T has less complexity than M31, but this was challenged by other experts

	HE-RA	LC-RA	HE-LD	LC-LD
M31	-1.3%	-1.8%	-1.5%	-2.5%
T	-1.4%	-2.0%	-1.9%	-1.1%

Conclusions

- Combing T_{BR}, modified derivation of spatial candidates, simplified derivation of temporal candidates, and JCTVC-D274(3) as M31 can achieve 1.3%, 1.8%, 1.5%, and 2.5% bit rate reductions for HE-RA, LC-RA, HE-LD, and LC-LD, respectively.

- Since M31 has the best coding efficiency in CE9, we suggest to adopt M31 into HM
  - Other enhancement or simplification can be considered on top of M31 in the BoG

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Thank you