



JCTVC-D125

Improved Advanced Motion Vector Prediction

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Overall Summary

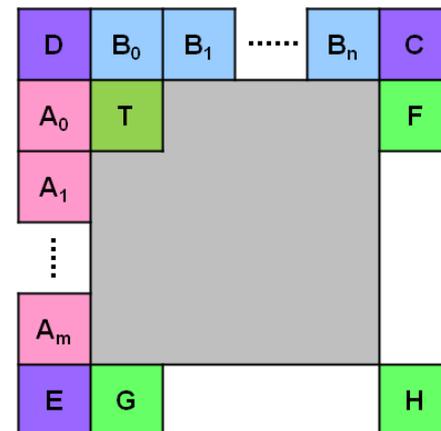
- **Improved Advanced Motion Vector Prediction (IAMVP)**
 - Modified MVP candidate set
 - HE: 6 spatial + 4 temporal MVP candidates
 - LC: 1 spatial + 4 temporal MVP candidates
 - When POC distance is 1
 - Adaptively adjust the order of the co-located temporal MVP candidate
 - Modified spatial MVP candidate
 - Modified temporal MVP candidate
- **BD-rate gains:**
 - For HE-RA and LC-RA: 2.1%, 2.0%
 - For HE-LD and LC-LD: 1.5%, 1.0%
- **The complexities of the encoder and the decoder are roughly the same as that of the TMuC0.9**

Outline

- Introduction
- Algorithm description
- Experimental results
- Conclusion

Modified MVP candidates

- In AMVP, the MVP candidates are all chosen from the above and left blocks.
 - Below and right candidates (F,G,H) not used
- The candidate set and the default order :
 - M (median of A', B', and C' where C' denotes the first available MV from C, E, and D)
 - A' (the first available MV from the left)
 - B' (the first available MV from the above)
 - **C** (C' in the original AMVP)
 - **E**
 - **D**
 - **T**
 - **F (temporal MV from the right)**
 - **G (temporal MV from the below)**
 - **H (temporal MV from the below right)**



Re-order of co-located temporal MVP candidate

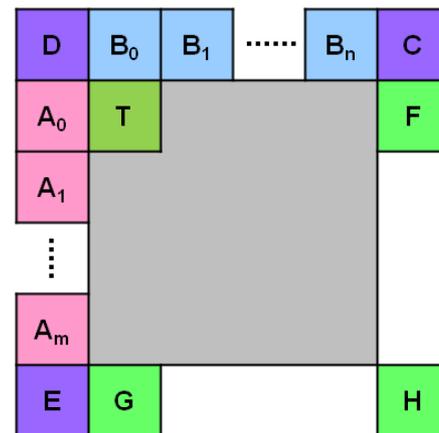
- To better match the probability, T is moved to the first position
 - When T exists and its POC distance is 1
- The remaining MVP candidates follow the relative positions in the default order

Modified MVP candidates for low complexity mode

- Applied on
 - Low complexity
 - When T exists and its POC distance is 1
- The candidate set and the default order:
 - T (co-located temporal MV)
 - **M (the median)**
 - F (right temporal MV)
 - G (bottom temporal MV)
 - H (bottom right temporal MV)

Improved AMVP

- MVP candidate set = $\{\text{median}(A', B', C'), A', B', C, E, D, T, F, G \text{ and } H\}$
- Three spatial MVP candidates (A', B', C')
 - The first available one for each group
 - Groups are the above group $\{A_0, A_1, \dots, A_m\}$, the left group $\{B_0, B_1, \dots, B_n\}$ and the corner $\{C, D, E\}$
- The motion vector of each spatial and temporal candidate can be derived from [difference reference list](#) and [difference reference index with a scaling factor](#).
- Explicit MVP index signaling



Modified spatial MVP candidate

- The spatial MVP candidate is derived based on a pre-defined priority.
 1. The MV from the same reference list and same reference frame - as the current AMVP
 2. Try other good substitutes
 1. The MV from the other reference list and same reference frame
 2. The scaled MV from the same reference list and different reference frame
 3. The scaled MV from the other reference list and different reference frame
- Three more possibilities in the priority list to increase the chance that the spatial MVP exists

Experiment Results

- Compared with JCTVC-C500

	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	-3.1	-2.9	-2.7	-2.9	-2.8	-2.8
Class B	-1.8	-1.6	-1.4	-1.7	-1.5	-1.5
Class C	-2.0	-2.2	-2.3	-1.9	-1.8	-2.0
Class D	-2.1	-1.7	-1.8	-1.8	-1.7	-1.7
Class E						
All	-2.1	-2.0	-1.9	-2.0	-1.8	-1.9
Enc Time[%]	98%			99%		
Dec Time[%]	100%			104%		

	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	-1.5	-1.0	-0.8	-0.9	-1.0	-0.8
Class C	-1.6	-1.6	-1.5	-1.1	-1.2	-1.1
Class D	-1.3	-1.9	-0.7	-1.4	-1.1	-0.9
Class E	-1.6	1.3	-0.4	-0.6	-0.3	-0.5
All	-1.5	-1.0	-0.9	-1.0	-0.9	-0.8
Enc Time[%]	95%			97%		
Dec Time[%]	101%			104%		

Cross Verification

- We thank LG and Samsung for cross-checking our proposed IAMVP
 - [JCTVC-D096](#) : LG Electronics
 - [JCTVC-D333](#) : Samsung Electronics Co., Ltd.
- The BD-rates and run times are confirmed.

Conclusion

- For random access, IAMVP can achieve an average 2.1% and 2.0% BD-rate reduction for HE-RA and LC-RA respectively.
- For low delay, IAMVP can achieve an average 1.5% and 1.0% BD-rate reduction for HE-LD and LC-LD respectively.
- The encoding time and the decoding time of IAMVP are roughly the same as those of TMuC0.9
- Propose to adopt the IAMVP into HM