



JCTVC-E050

AhG Parsing Robustness: Constrained Usage of Temporal MV and MVP Candidates

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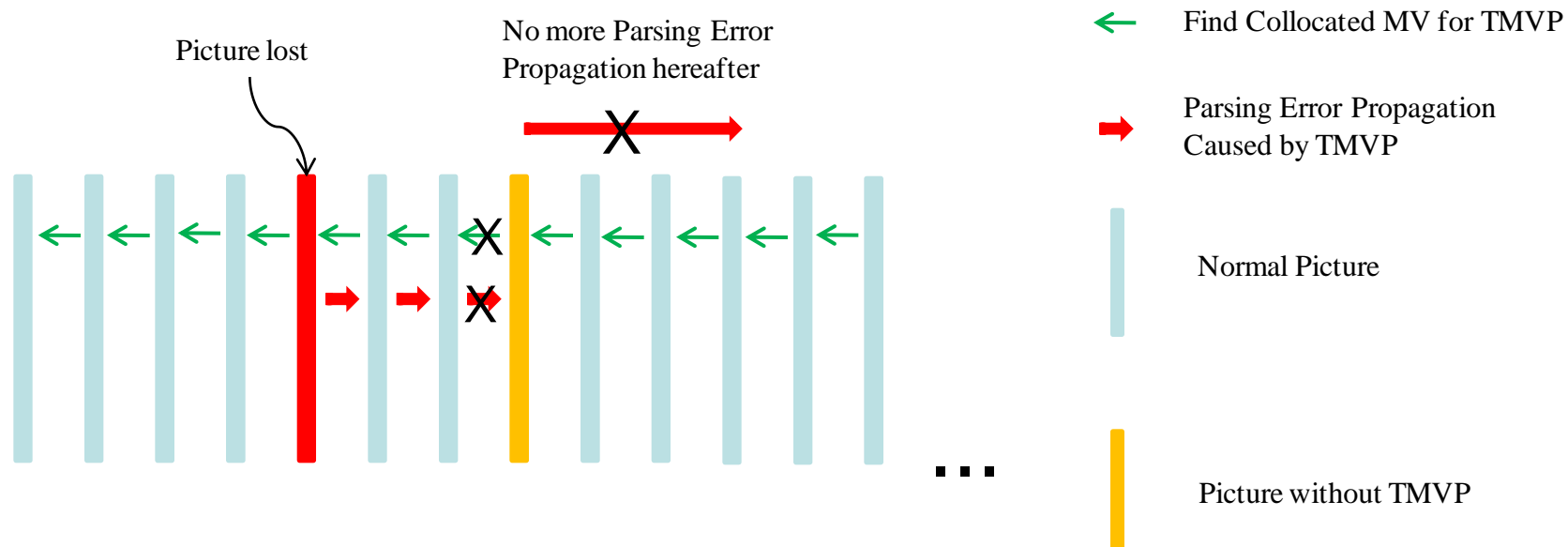


Presented by Shawmin Lei
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Problem

- When a temporal motion vector from a previous picture cannot be decoded correctly
- A **mismatch** between the candidate set on the encoder side and that on the decoder side occurs
- Result in **parsing error** of the index of the best MV or MVP candidate
- The rest of the current picture and following pictures can not be parsed correctly
- One small decoding error of an MV causes **parsing error propagation** of many subsequent pictures

Concept of Parsing Error Control



Overview

- In order to control this parsing error propagation, the use of the **temporal MV or MVP (TMVP)** needs to be constrained
- 3 new syntax elements: 2 in the sequence parameter set (SPS) and 1 in the slice header
- The parsing error can thus be **controlled** within a few pictures instead of uncontrolled propagation to many pictures
- The proposed syntax design provides multiple trade-off points between parsing error resilience and coding efficiency

Tradeoff Points

	Coding Efficiency	Parsing Error Resilience
Temporal not used	Worst	Best
Temporal not used in reference pic.	Medium	Medium
Temporal not used in some slices	Best	Worst

Proposed Syntax Description in SPS level

- When **temporal_candidate_not_used** = 1
 - no temporal candidate is allowed and no parsing error propagation due to AMVP will occur
 - but the coding efficiency may be significantly decreased.
- When **temporal_candidates_not_used_in_ref_pic** = 1
 - the parsing error may occurs in a non-reference picture
 - parsing error propagation will be terminated by the next reference picture
 - better coding efficiency
 - can not be used in the LD configuration

seq_parameter_set_rbsp() {	C	Descriptor
...		
temporal_candidates_not_used	1	u(1)
if(!temporal_candidates_not_used)		
temporal_candidates_not_used_in_ref_pic	1	u(1)
...		
}		

Proposed Syntax Description in Slice level

- When **temporal_candidate_not_used_in_slice** = 1
 - the **parsing error propagation** caused from any prior slice will be **terminated by the current slice**.
 - most flexible and can be used for the LD configuration
 - Different frequency of setting this flag provides full flexibility of trade-off points between the parsing error resilience and the coding efficiency

slice_header() {	C	Descriptor
...		
if(!temporal_candidate_not_used && (!temporal_candidate_not_used_in_ref_pic !nal_ref_idc))		
temporal_mvp_candidates_not_used_in_slice	2	u(1)
...		
}		

Experiments

- Anchor: HM 2.0
- Test: HM 2.0 with Parsing Error Control Mechanism
- Different levels of trade-off points between performance and parsing error resilience ability
 - Disable TMVP for all pictures (SPS syntax)
 - Disable TMVP for all reference pictures (SPS syntax)
 - Disable TMVP for every 4 pictures (slice syntax)
 - Disable TMVP for every 8 pictures (slice syntax)
 - Disable TMVP for every 16 pictures (slice syntax)
- Results were cross-checked by Qualcomm (E452)

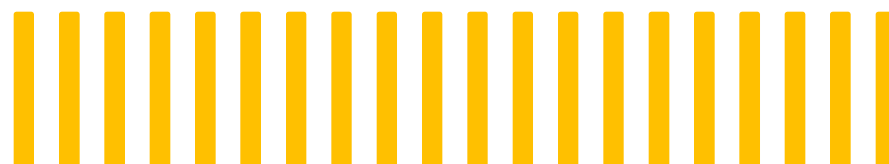
Experiment #1

- TMVP is not allowed in all pictures

	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	2.6	2.3	3.4	2.8	3.0
Class B	2.2	1.3	1.3	1.8	0.7	0.7
Class C	1.9	1.6	1.7	1.9	1.5	1.6
Class D	2.1	1.5	1.6	2.0	1.1	1.3
Class E						
All	2.3	1.7	1.7	2.2	1.5	1.6
Enc Time[%]	96%			97%		
Dec Time[%]	99%			96%		

	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	2.1	1.5	1.4	3.0	1.5	1.7
Class C	1.8	2.0	1.9	2.7	1.9	1.8
Class D	1.4	0.9	0.8	1.9	1.0	0.8
Class E	1.3	1.2	1.8	2.0	0.4	1.5
All	1.7	1.4	1.4	2.4	1.3	1.4
Enc Time[%]	98%			100%		
Dec Time[%]	95%			93%		

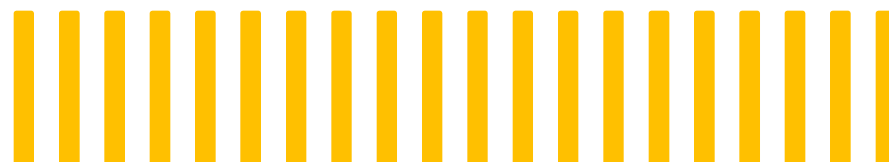
Random Access



Normal Picture

Picture without TMVP

Low Delay

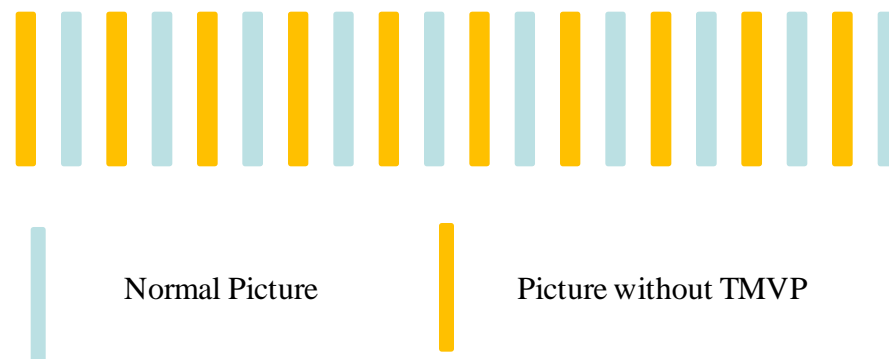


Experiment #2

- TMVP is not allowed in all reference pictures for random access

	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	1.6	1.6	1.3	1.7	1.8	2.0
Class B	1.0	0.6	0.6	0.8	0.4	0.4
Class C	0.8	0.7	0.7	0.7	0.6	0.6
Class D	1.2	0.8	0.8	1.0	0.4	0.5
Class E						
All	1.1	0.9	0.8	1.0	0.8	0.9
Enc Time[%]	97%			98%		
Dec Time[%]	99%			98%		

Random Access



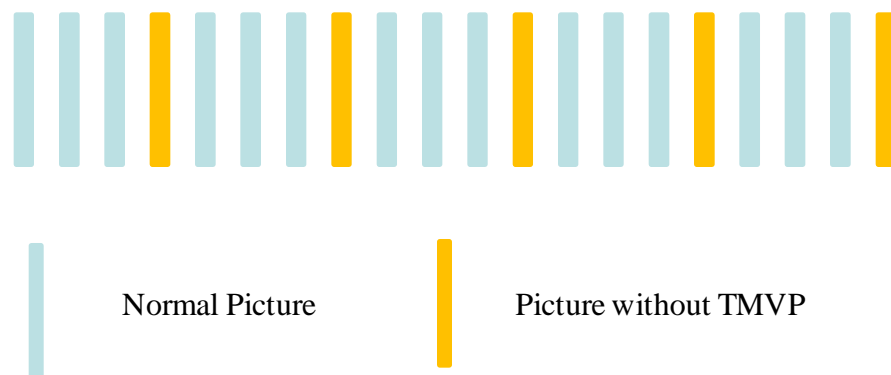
Experiment #3

- TMVP is not allowed in every 4 pictures

	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	0.9	0.6	0.8	1.0	1.1
Class B	0.5	0.3	0.2	0.4	0.3	0.3
Class C	0.4	0.3	0.3	0.3	0.3	0.3
Class D	0.9	0.5	0.5	0.7	0.3	0.3
Class E						
All	0.7	0.5	0.4	0.6	0.4	0.5
Enc Time[%]	99%			99%		
Dec Time[%]	98%			98%		

	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	0.8	0.4	0.2	0.7	0.2	0.5
Class C	0.6	0.5	0.6	0.7	0.3	0.2
Class D	0.7	0.4	0.1	0.7	0.2	0.2
Class E	0.3	-0.1	0.4	0.2	-0.7	0.1
All	0.6	0.3	0.3	0.6	0.1	0.2
Enc Time[%]	99%			100%		
Dec Time[%]	98%			98%		

Random Access



Low Delay



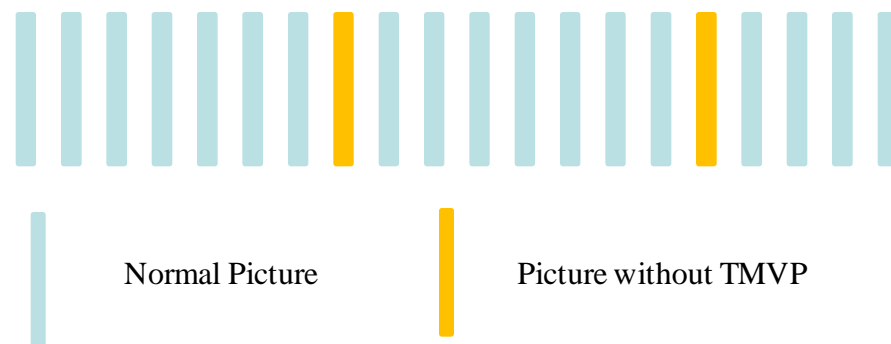
Experiment #4

- TMVP is not allowed in every 8 pictures

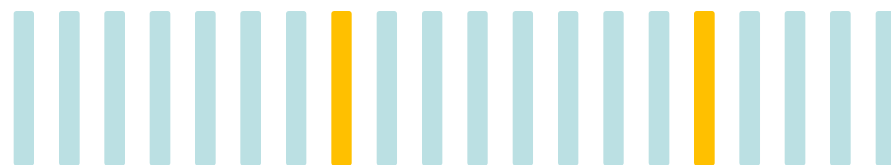
	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.8	0.7	0.6	0.7	0.7	0.8
Class B	0.3	0.1	0.1	0.2	0.1	0.2
Class C	0.3	0.2	0.2	0.2	0.1	0.2
Class D	0.7	0.3	0.4	0.5	0.2	0.1
Class E						
All	0.5	0.3	0.3	0.4	0.3	0.3
Enc Time[%]	100%			100%		
Dec Time[%]	99%			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	0.4	0.2	0.2	0.3	0.0	0.1
Class C	0.4	0.4	0.2	0.3	0.0	-0.1
Class D	0.3	0.0	0.2	0.3	0.1	0.2
Class E	0.1	0.2	0.6	0.0	-0.2	-0.1
All	0.3	0.2	0.3	0.3	0.0	0.1
Enc Time[%]	100%			100%		
Dec Time[%]	99%			98%		

Random Access



Low Delay



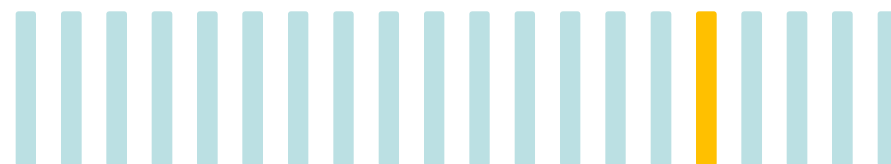
Experiment #5

- TMVP is not allowed in every 16 pictures

	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	0.7	0.3	0.5	0.5	0.5
Class B	0.1	0.1	0.0	0.1	0.1	0.1
Class C	0.1	0.1	0.1	0.1	0.1	0.1
Class D	0.3	0.1	0.1	0.3	0.0	0.1
Class E						
All	0.3	0.2	0.1	0.2	0.1	0.2
Enc Time[%]	100%			100%		
Dec Time[%]	99%			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	0.2	0.0	0.0	0.1	0.0	0.3
Class C	0.2	0.4	0.3	0.2	0.1	-0.2
Class D	0.1	-0.1	0.0	0.2	0.0	0.1
Class E	-0.1	-0.4	0.0	-0.2	-0.2	0.3
All	0.1	0.0	0.1	0.1	0.0	0.2
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

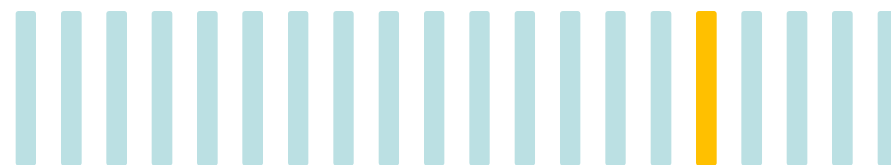
Random Access



Normal Picture

Picture without TMVP

Low Delay



Conclusion

- Propose two flags in SPS and one in slice header
 - Temporal_candidate_not_used
 - Temporal_candidate_not_used_in_ref_pic
 - Temporal_candidate_not_used_in_slic
- Allow flexible trade-off points between parsing error resilience and coding efficiency



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