

MULTI-HYPOTHESIS INTER PREDICTION WITH SIMPLIFIED AMVP PROCESS

JVET-L0679



Basic concept

- Superpose multiple (i.e., more than 2) motion-compensated prediction signals
- Allow different weights for the individual prediction signals (“hypotheses”)
- Idea: Use recursive approach
 - $p_3 = (1 - \alpha_3)p_{uni/bi} + \alpha_3 h_3$
 - $p_{uni/bi}$: ordinary uni/bi-prediction signal (as in HEVC/H.265)
 - h_3 : additional 3rd hypothesis
 - p_3 : weighted 3-hypotheses inter prediction signal
 - α_3 : weighting factor with $\alpha_3 \in \{\frac{1}{4}, -\frac{1}{8}\}$
 - Generalize to N hypotheses: $p_{n+1} = (1 - \alpha_{n+1})p_n + \alpha_{n+1}h_{n+1}$

Recap: Experimental results from CE10

#				VTM		
		Y	U	V	EncT	DecT
CE10.1.2.a (8-tap)	RA	-1.08%	-0.99%	-1.03%	114%	102%
	LB	-1.09%	-0.48%	-0.50%	122%	104%
CE10.1.2.b (4-tap)	RA	-1.03%	-1.00%	-1.03%	112%	101%
	LB	-1.00%	-0.49%	-0.41%	119%	103%
CE10.1.2.c (luma FP)	RA	-0.96%	-0.99%	-1.08%	109%	101%
	LB	-1.04%	-0.71%	-0.71%	113%	102%

Worst-case analysis

Test	worst-case computational complexity w.r.t. 4x4 bi	worst-case memory bandwidth w.r.t. 4x4 bi	worst-case computational complexity w.r.t. 8x8 bi	worst-case memory bandwidth w.r.t. 8x8 bi
CE10.1.2.a (8-tap IF for multi-hypothesis prediction)	155%	73%	202%	154%
CE10.1.2.b (4-tap IF for multi-hypothesis prediction)	118%	63%	153%	133%
CE10.1.2.c (only luma full-pel for multi-hypothesis prediction, chroma full-pel or half-pel)	93%	57%	121%	121%

Average number of ref. samples per pred. sample

CE10.1.2.c

VTM-2.0.1

RA				
Class	QP22	QP27	QP32	QP37
A1	2,6	2,1	2,0	1,9
A2	2,4	2,0	1,9	2,0
B	2,9	2,3	2,1	2,0
C	3,1	2,6	2,3	2,1
D	3,5	2,9	2,5	2,4
F	1,9	1,7	1,7	1,7

LB				
Class	QP22	QP27	QP32	QP37
B	2,7	2,0	1,8	1,7
C	2,9	2,3	2,0	1,8
D	3,4	2,6	2,1	1,8
E	1,9	1,5	1,3	1,2
F	1,6	1,4	1,3	1,3

RA				
Class	QP22	QP27	QP32	QP37
A1	2,1	1,9	1,9	1,9
A2	1,9	1,8	1,8	1,9
B	2,3	2,0	1,9	1,9
C	2,8	2,4	2,2	2,0
D	3,3	2,7	2,5	2,3
F	1,8	1,7	1,6	1,6

LB				
Class	QP22	QP27	QP32	QP37
B	2,4	1,8	1,6	1,6
C	2,7	2,2	1,9	1,7
D	3,3	2,5	2,0	1,7
E	1,7	1,4	1,3	1,2
F	1,4	1,3	1,2	1,2

Average % of CTUs using more than 2 diff. ref. frames

CE10.1.2.c

VTM-2.0.1

RA				
Class	QP22	QP27	QP32	QP37
A1	29,1%	13,2%	9,8%	7,0%
A2	36,3%	19,5%	12,4%	7,0%
B	46,9%	26,6%	15,5%	8,1%
C	69,1%	50,7%	34,5%	20,0%
D	76,8%	58,4%	38,2%	20,3%
F	33,4%	22,0%	15,1%	10,0%

LB				
Class	QP22	QP27	QP32	QP37
B	51,3%	34,8%	22,0%	12,7%
C	78,8%	64,4%	47,1%	31,8%
D	89,4%	78,3%	58,7%	37,8%
E	38,3%	16,0%	8,0%	4,4%
F	39,5%	29,3%	20,5%	13,9%

RA				
Class	QP22	QP27	QP32	QP37
A1	20,7%	9,0%	7,2%	5,9%
A2	25,2%	14,5%	10,0%	6,1%
B	37,1%	20,3%	12,2%	6,9%
C	60,8%	46,2%	32,1%	19,0%
D	70,7%	55,0%	37,2%	19,2%
F	30,5%	19,9%	13,8%	9,2%

LB				
Class	QP22	QP27	QP32	QP37
B	44,2%	28,7%	18,3%	11,2%
C	73,1%	59,9%	45,2%	30,7%
D	86,5%	75,9%	57,4%	37,1%
E	29,7%	12,5%	6,9%	3,8%
F	37,2%	27,2%	19,0%	13,3%

Late contribution JVET-L0679

- Concern was raised that in CE10.1.2... up to 4 AVMP processes are required
- Addressed in JVET-L0679:
 - Only two AMVP lists constructed (for the first two inter predictions)
 - For additional hypotheses, take one of the first two AMVP lists (decision based on POC difference, but no scaling necessary)

#						
		Y	U	V	EncT	DecT
Compared to CE10.1.2.c	RA	0,06%	0,09%	0,07%	100%	98%
	LB	0,06%	-0,09%	-0,19%	99%	96%