JCT3V-D0182: CE6.h related: On signaling of DLT for depth coding

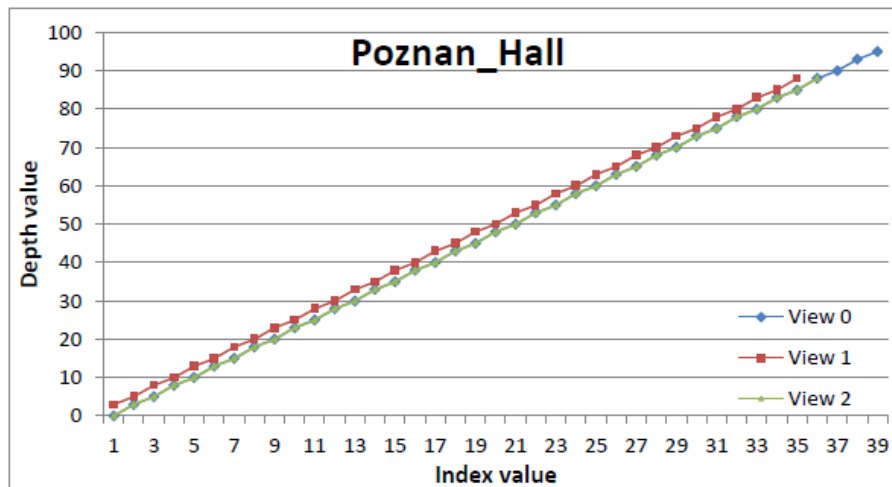Xin Zhao, Li Zhang, Ying Chen and Marta Karczewicz

Introduction

- Depth look-up tables (DLT)

  - Mapping from depth values to index values using look-up tables

  - Available depth values are explicitly signaled in VPS

vps_extension2( ) {	Descriptor
…	
dlt_flag[layerId]	u(1)
if(dlt_flag[layerId]) {	
num_depth_values_in_dlt[layerId]	ue(v)
for (j = 0; j < num_depth_values_in_dlt[layerId] ; j++) {	
dlt_depth_value[layerId][j]	ue(v)
}	
}	
…	

  - Signaling DLT is expensive, i.e., average 577.3 bits under CTC

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Motivation

- Characteristics of depth look-up tables
  - Delta diff between two consecutive depth values is relatively stable

  - High correlation between different views

View 0:	0	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48	50	53	55	58	60	63	65	68	70	73	75	78	80	83	85	88	90	93	95
View 1:		3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48	50	53	55	58	60	63	65	68	70	73	75	78	80	83	85	88			
View 2:	0	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48	50	53	55	58	60	63	65	68	70	73	75	78	80	83	85	88			

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Proposal

- Alignment of HTM and WD
  - All SPS extensions are moved to VPS extension

- For base view, the difference between consecutive depth values is signalled.

...	Descriptor
num_depth_values_in_dlt[i]	u(v)
dlt_depth_start_value[i]	u(v)
dlt_depth_delta_equal_flag[i]	u(1)
if(**dlt_depth_delta_equal_flag[i]**)	
dlt_depth_detla_value[i]	u(v)
else {	
max_diff_minus1[i]	u(v)
for (j = 1; j < num_depth_values_in_dlt[i]; j++) {	
dlt_depth_value_diff_minus1[i][j]	u(v)
}	
}	
...	

Proposal

- For non-base view
  - The overlapped part with base view is identified by 2-bit flag depth_overlap_idc
    - 1: The last N_1 values are copied from base view when $N_i > N_1$
    - 2: The first N_1 values are copied from base view when $N_i > N_1$
    - 3: The N_1 depth values starting from N_{left} are copied from base view when $N_i > N_1$

  - The non-overlapped part is signaled as same as base view

	Descriptor
if (i != 1)	
inter_view_dlt_pred_enable_flag[i]	u(1)
if (i = = 1 || !inter_view_dlt_pred_enable_flag[i]) {	
……	
}	
else {	
num_depth_values_in_dlt[i]	u(v)
depth_overlap_idc[i]	u(2)
if(depth_overlap_idc[i] == 3)	
number_left_nonoverlap_depth_values[i]	u(v)
if(num_depth_values_in_dlt[i] > num_depth_values_in_dlt[1]) {	
max_diff_minus1[i]	u(v)
for (j = 0; j < num_depth_values_in_dlt[i] - num_depth_values_in_dlt[1]; j++)	
dlt_depth_value_diff_minus1[i][j]	u(v)
}	
}	

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Results

- DLT Bits

		DLT Size (bits)		
		Anchor	Proposed	Proposed/Anchor
Balloons	View 0	555	136	24.5%
	View 1	641	59	9.2%
	View 2	617	43	7.0%
Kendo	View 0	485	124	25.6%
	View 1	637	59	9.3%
	View 2	649	65	10.0%
Newspaper	View 0	606	121	20.0%
	View 1	621	21	3.4%
	View 2	696	31	4.5%
PoznanHall	View 0	420	101	24.0%
	View 1	380	14	3.7%
	View 2	381	11	2.9%
Average	View 0	516.5	120.5	23.5%
	View 1	569.8	38.3	6.4%
	View 2	585.8	37.5	6.1%
	All Views	**557.3**	**65.4**	**12.0%**

Results

- Common test condition

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate
Balloons	0.0%	0.0%	0.0%	0.0%	0.0%	-0.03%
Kendo	0.0%	0.0%	0.0%	0.0%	0.0%	-0.03%
Newspapercc	0.0%	0.0%	0.0%	0.0%	0.0%	-0.03%
GhostTownFly	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
PoznanHall2	0.0%	0.0%	0.0%	0.0%	0.0%	-0.04%
PoznanStreet	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
UndoDancer	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
1024x768	0.0%	0.0%	0.0%	0.0%	0.0%	-0.03%
1920x1088	0.0%	0.0%	0.0%	0.0%	0.0%	-0.01%
average	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**-0.02%**

Results

- All intra test condition

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate
Balloons	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
Kendo	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
Newspapercc	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
GhostTownFly	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
PoznanHall2	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
PoznanStreet	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
UndoDancer	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
1024x768	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
1920x1088	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
average	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.00%**

- Thank RWTH Aachen University fro cross-check (JCT3V-D0273)!

Conclusion

- Alignment of HTM and WD
  - All SPS extensions are moved to VPS extension

- Significant reduction of DLT coding bits
  - From average 557.3 bits to average 65.4 bits
  - Average 88% of DLT coding bits are saved

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Thanks!