

Overview of Centralized Texture-Depth Packing Formats

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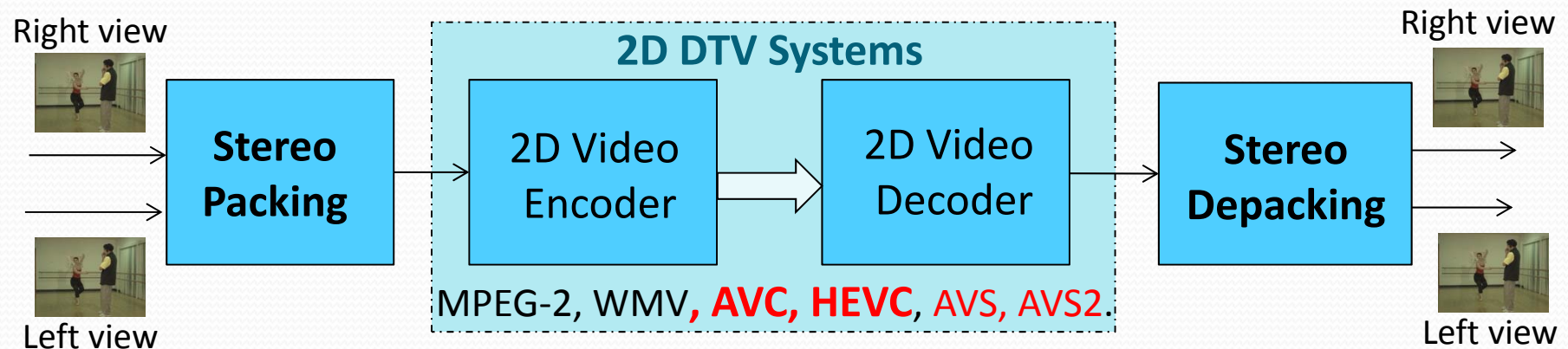
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- Overview
- Centralized Texture-Depth Packing (CTDP)
- Experimental Results
- Conclusions

Pros and Cons of Stereo Packing

Simplest Stereo 3D - Deliverable in 2D DTV Systems:

- To deliver 3D TV services, one simple way is to combine both left and right view frames into single frame by **a stereo packing** such that the traditional TV broadcasting systems can transmit them easily.



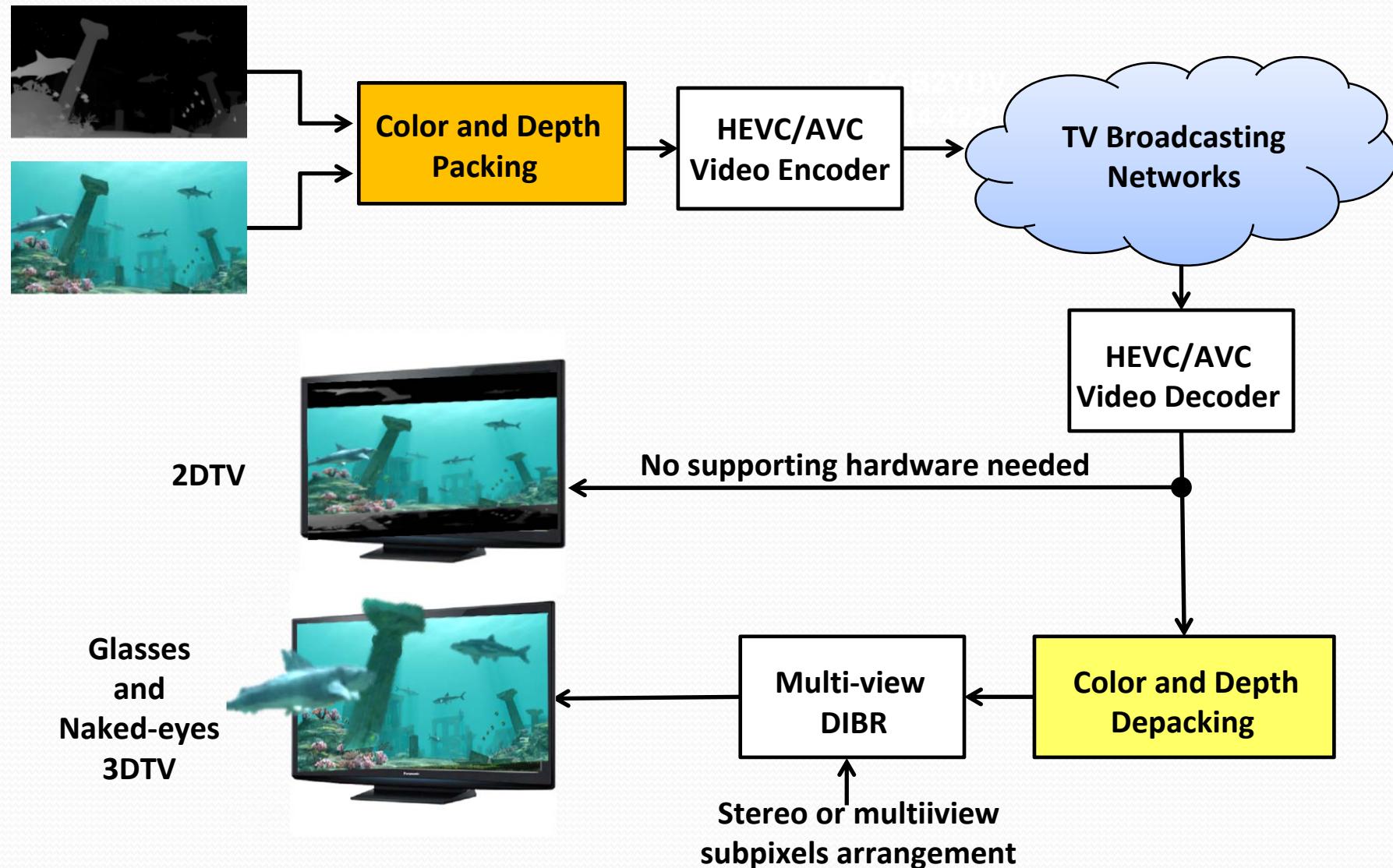
- For 2DTV displays, the users will suffer from very **uncomfortable viewing experiences** for most stereo packing videos.
- For naked-eye 3DTV displays, it also hard to convert stereo videos to multiview videos

Current Side-by-Side Stereo Packing

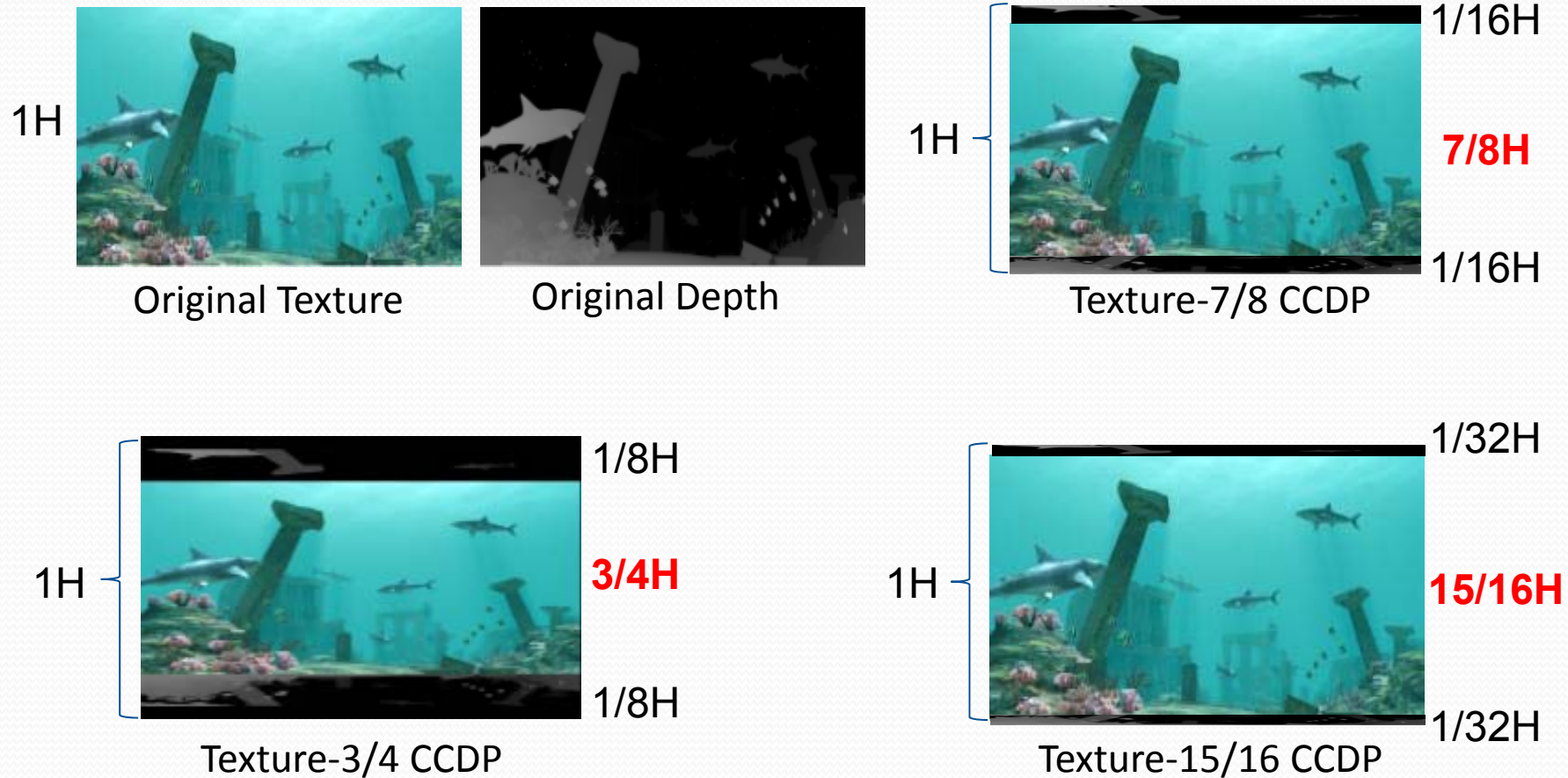


Frame Compatible Centralized Texture-Depth Packing (CTDP)

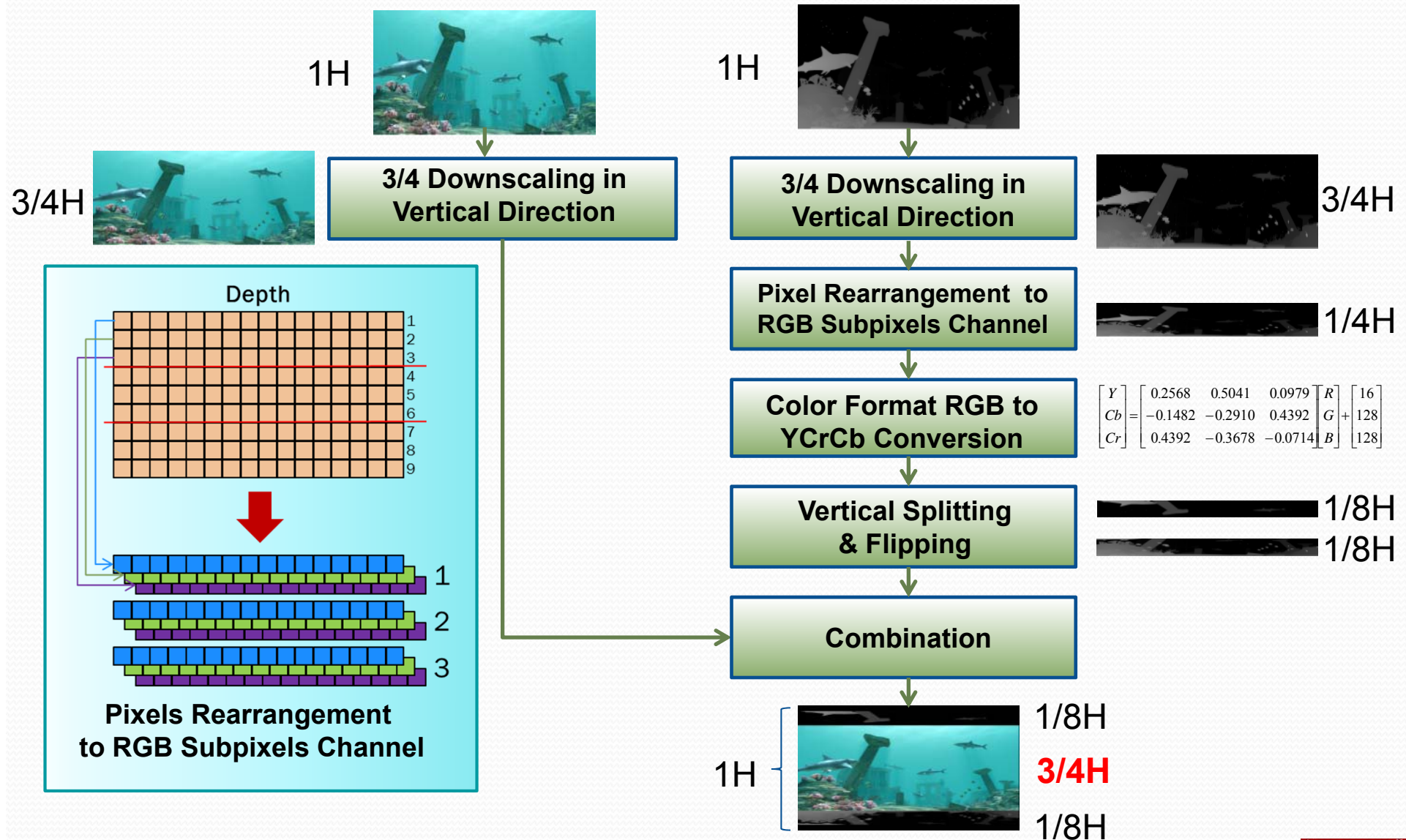
3D Broadcasting System with CTDP Format



Outlooks of CTDPs (texture 3/4, 7/8, 15/16)



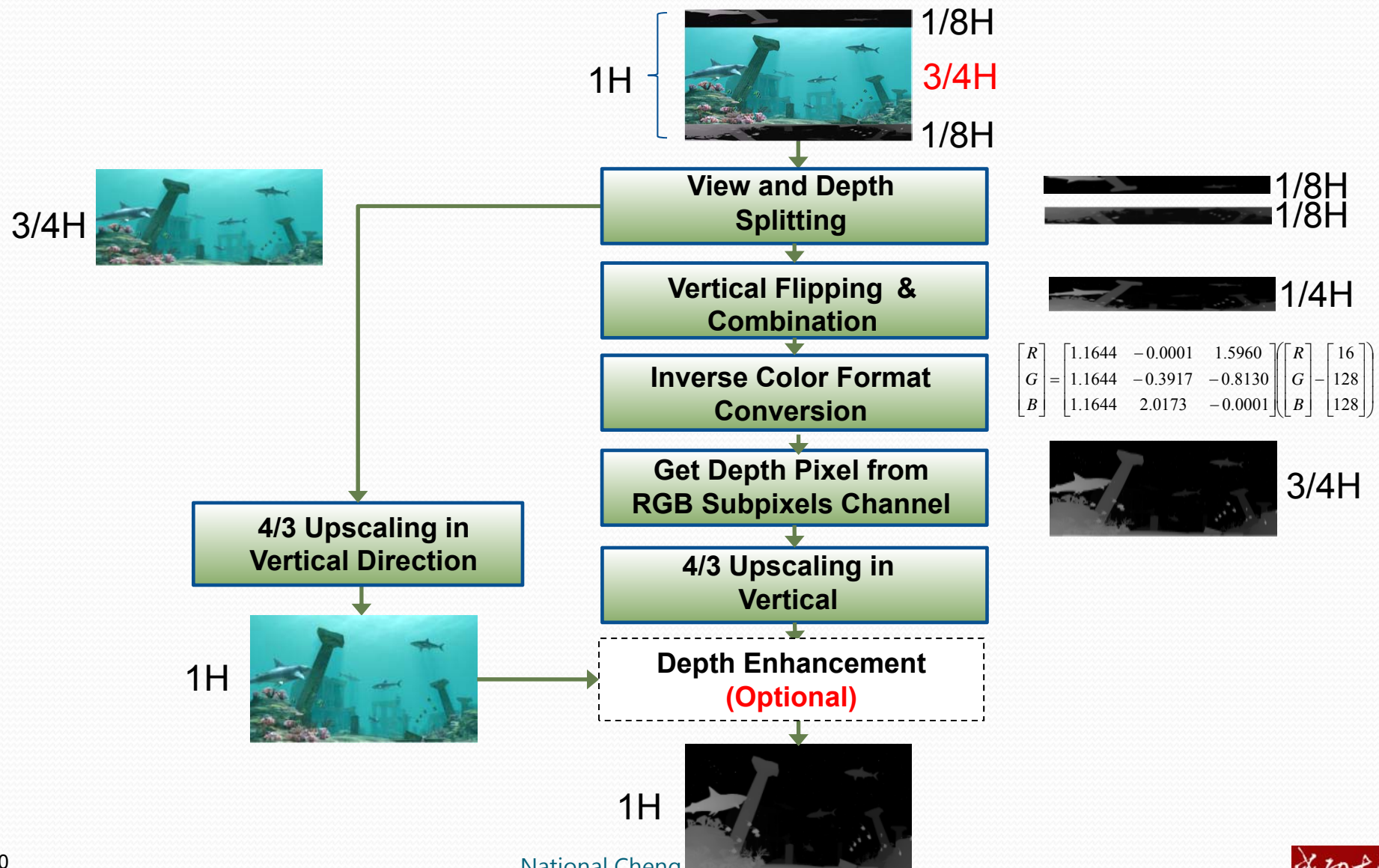
Texture-3/4 CTDP Packing Procedure



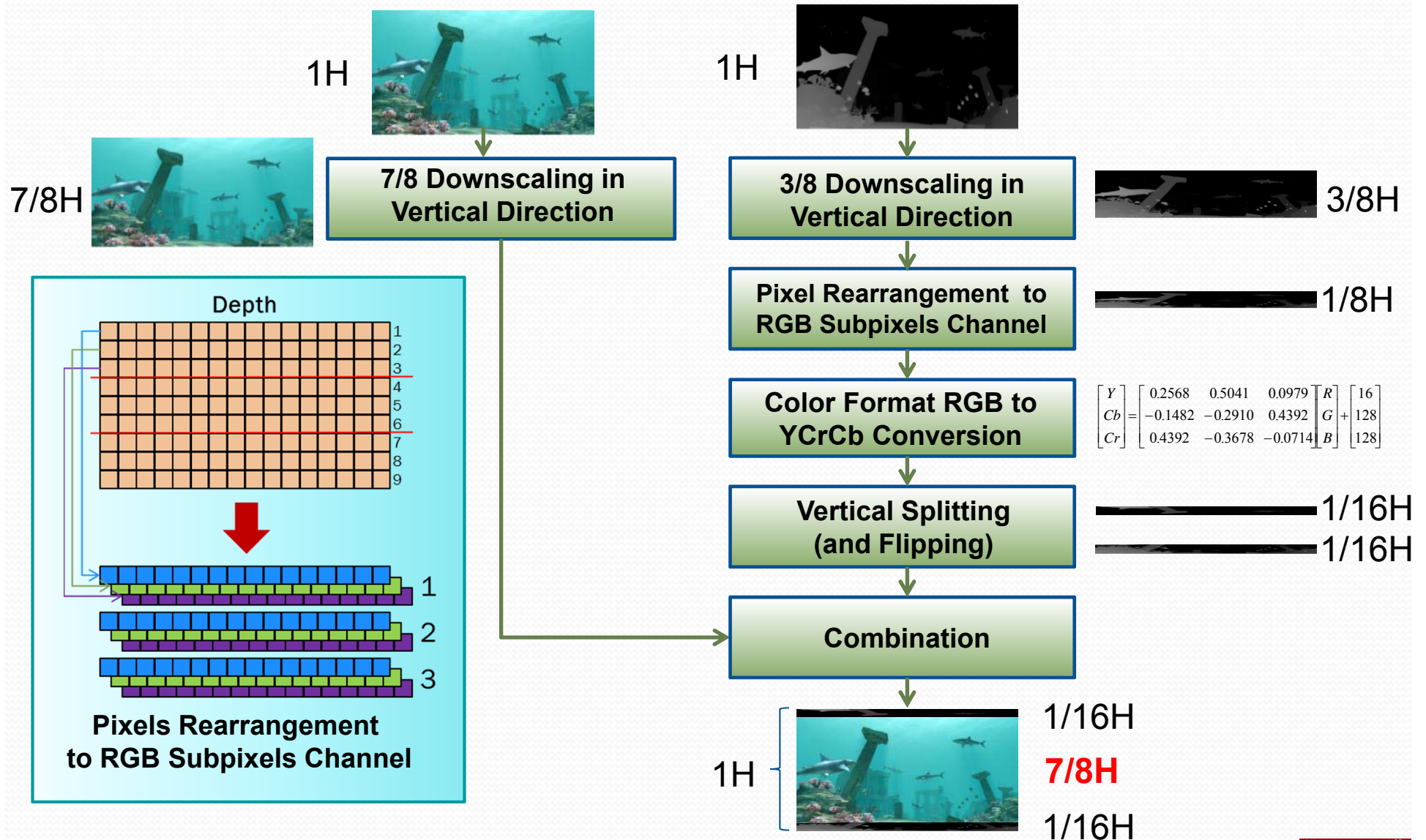
Packed Frame with Texture-3/4 CTDP Format



Texture-3/4 CTDP Depacking Procedure



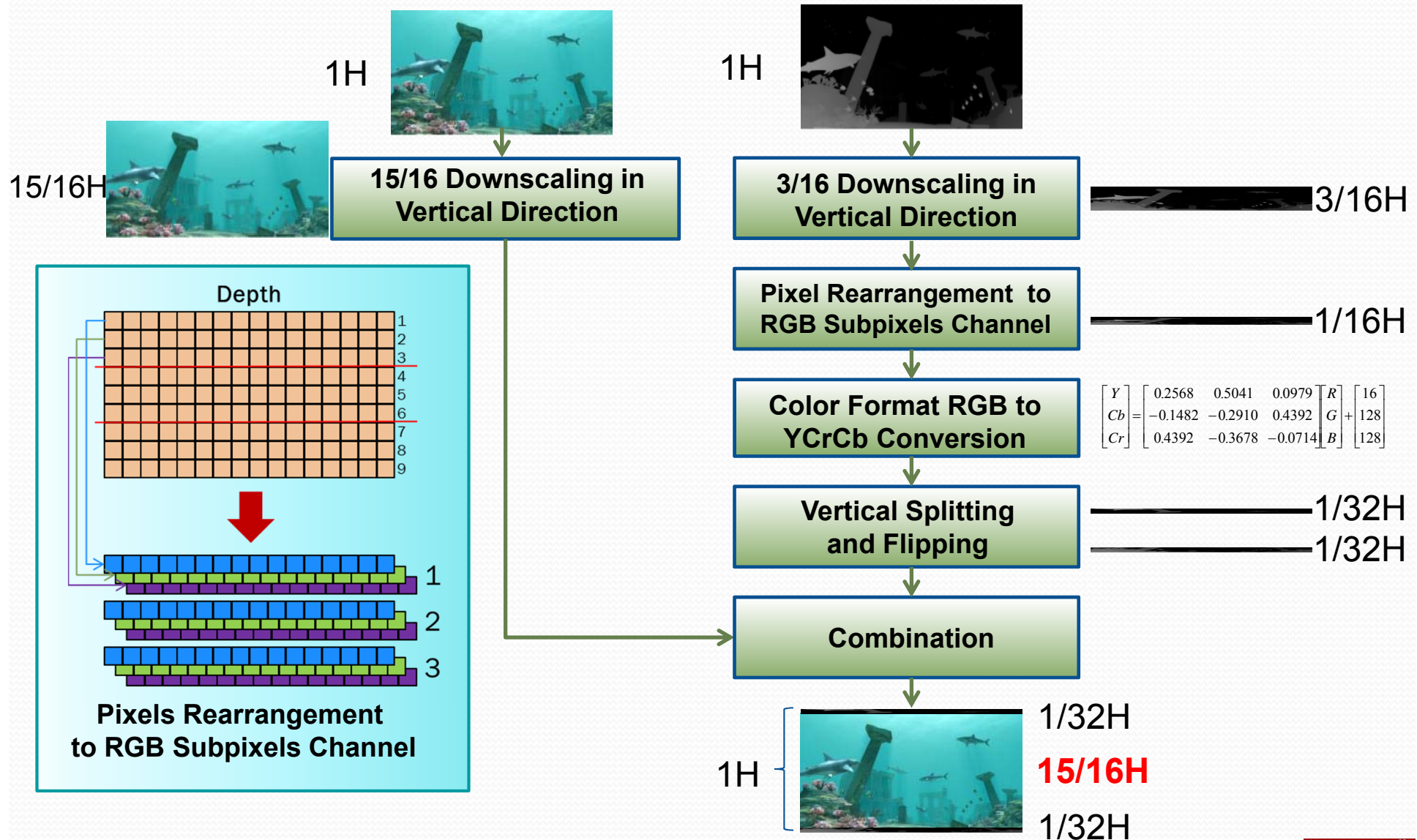
Texture-7/8 CTDP Packing Procedure



Packed Frame with Texture-7/8 CTDP Format



Texture-15/16 CTDP Packing Procedure



Packed Frame with Texture-15/16 CTDP Format



Experimental Results

1. Environment Setting
2. Coding performance comparison in HM 13.0

Environment Setting

Test sequences (Nature)

No.	Sequence	Size	Frames	Fps
S01	Poznan Hall	1920*1088	200	25
S02	Poznan Street	1920*1088	250	25
S05	Kendo	1024*768	300	30
S06	Balloons	1024*768	300	30
S08	Newspaper	1024*768	300	30

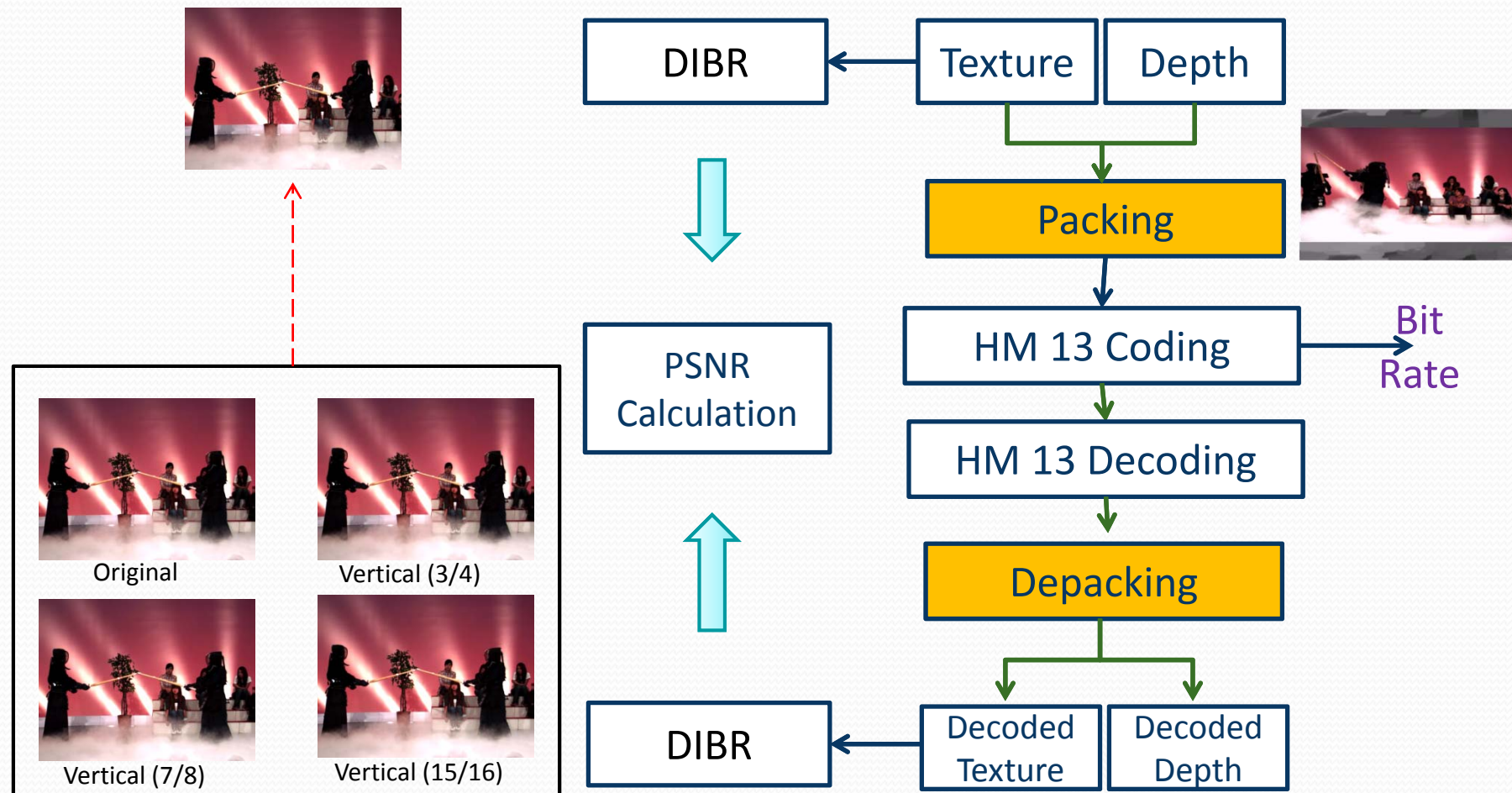


Experimental Setting

- Encoding Mode
 - All Intra (ai) 、 Low delay (ld) 、 Random access (ra)
- QP
 - 22,27,32,37
- Image Resizing (Open issue)
 - Bilateral
- Planar format Conversion(Open issue)
 - Nearest

The diagram illustrates the HM 13 video coding process flow. It starts with an input of Texture and Depth maps. These are combined in the Packing block, followed by HM 13 Coding, which outputs the Bit Rate. The process then continues through HM 13 Decoding and Depacking, resulting in Decoded Texture and Decoded Depth maps. A PSNR Calculation block is shown, which takes the original and decoded maps as input to evaluate the quality of the reconstruction.

Comparisons of Virtual View After DIBR



Coding Performance Comparisons (HM v13.0)

Experimental results

(with respect to color-depth SbS packing format)

- HEVC (No Depth Enhancement)

BDPSNR (dB)									
	Comparisons of Texture and Depth Coding						Comparisons after DIBR		
	Texture			Depth			Virtual View (Texture)		
	3/4	7/8	15/16	3/4	7/8	15/16	3/4	7/8	15/16
ai	2.3789	2.5594	2.6396	-2.161	-4.8921	-7.2828	1.3823	0.5166	-0.4782
ldp	2.5583	2.8770	3.0298	-1.7413	-3.9545	-6.2577	1.5837	0.874	-0.1387
ra	2.5524	2.8218	2.9479	-1.8395	-4.0206	-6.2007	1.7216	0.8133	-0.2372
Ave	2.4965	2.7527	2.8724	-1.9139	-4.2890	-6.5804	1.5625	0.7346	-0.2847

BDBR (%)									
	Comparisons of Texture and Depth Coding						Comparisons after DIBR		
	Texture			Depth			Virtual View (Texture)		
	3/4	7/8	15/16	3/4	7/8	15/16	3/4	7/8	15/16
ai	-47.149	-50.283	-51.643	116.25	576.67	146346	-41.778	-14.213	44.504
ldp	-57.072	-61.617	-63.554	100.48	457.51	13020	-50.764	-30.584	22.943
ra	-58.065	-62.309	-64.174	104.3	462.77	74516	-54.797	-30.906	29.546
Ave	-54.0953	-58.0697	-59.7903	107.01	498.9833	77960.67	-49.113	-25.2343	32.331

Experimental results

(with respect to texture-depth SbS packing format)

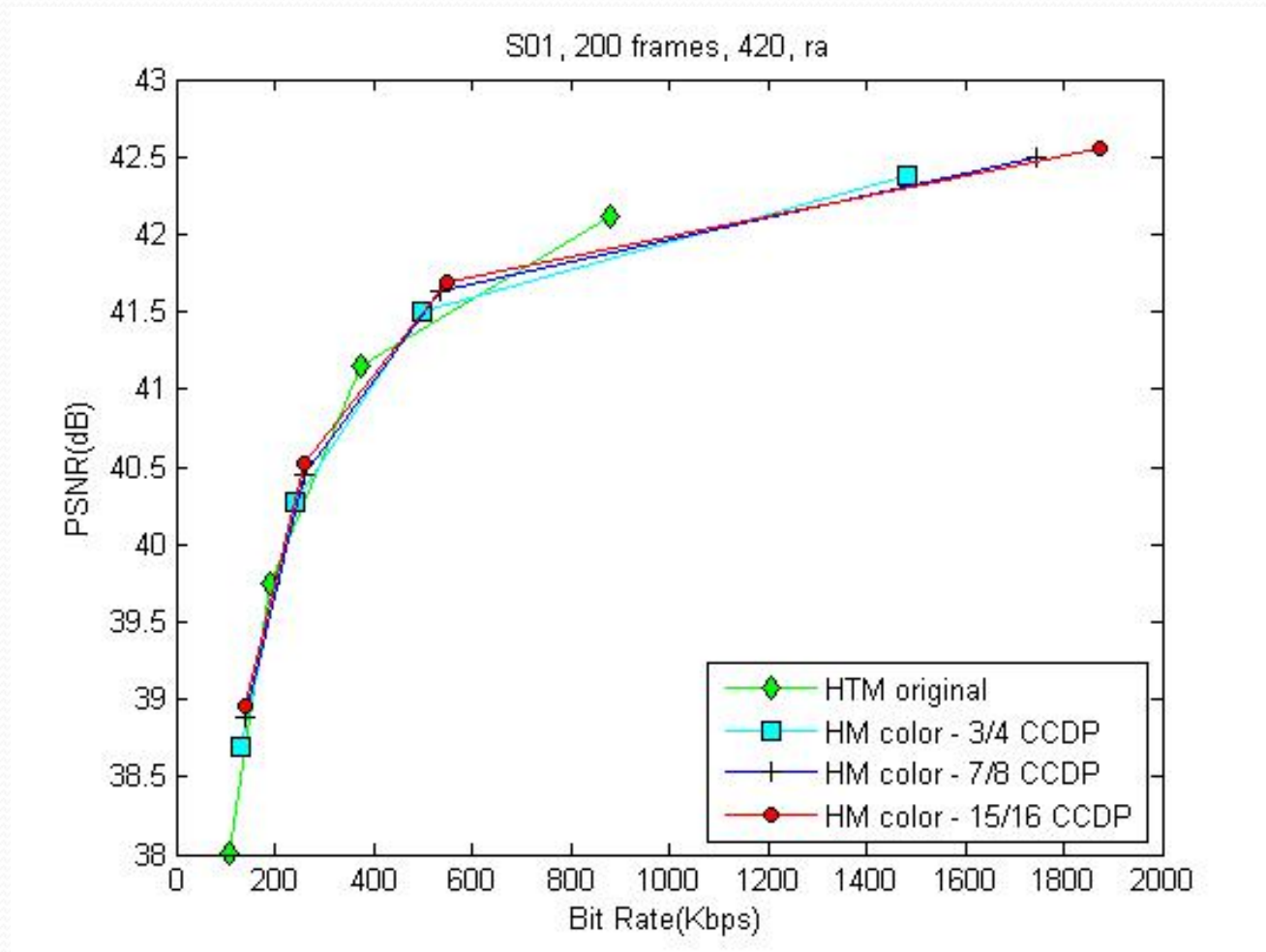
- AVC (No Depth Enhancement)

BDPSNR (dB)									
	Comparisons of Texture and Depth Coding						Comparisons after DIBR		
	Texture			Depth			Virtual View (Texture)		
	3/4	7/8	15/16	3/4	7/8	15/16	3/4	7/8	15/16
ai	2.09762	2.21558	2.26182	-2.78262	-5.34102	-7.89658	1.15348	0.25352	-0.8396
ldp	2.3364	2.5545	2.6701	-2.5931	-4.8405	-7.3083	1.2773	0.4754	-0.5360
ra	2.2205	2.4456	2.5071	-2.3171	-4.8702	-6.5684	1.2118	0.5062	-0.4901
Ave	2.2182	2.4052	2.4797	-2.5643	-5.0172	-7.2578	1.2142	0.4117	-0.6219

BDBR (%)									
	Comparisons of Color and Depth Coding						Comparisons after DIBR		
	Texture			Depth			Virtual View (Texture)		
	3/4	7/8	15/16	3/4	7/8	15/16	3/4	7/8	15/16
ai	-41.6430	-43.8998	-44.8542	165.1893	682.8496	115900.179	-35.7985	-2.9077	68.7556
ldp	-48.2654	-51.2992	-53.3529	172.3632	895.7649	528563.445	-38.3992	-11.8080	58.6390
ra	-44.0361	-46.5163	-47.3085	112.6562	6361.0685	7285.1491	-33.6147	-11.0636	46.4990
Ave	-44.6482	-47.2384	-48.5052	150.0696	2646.5610	217249.591	-35.9374	-8.5931	57.9645

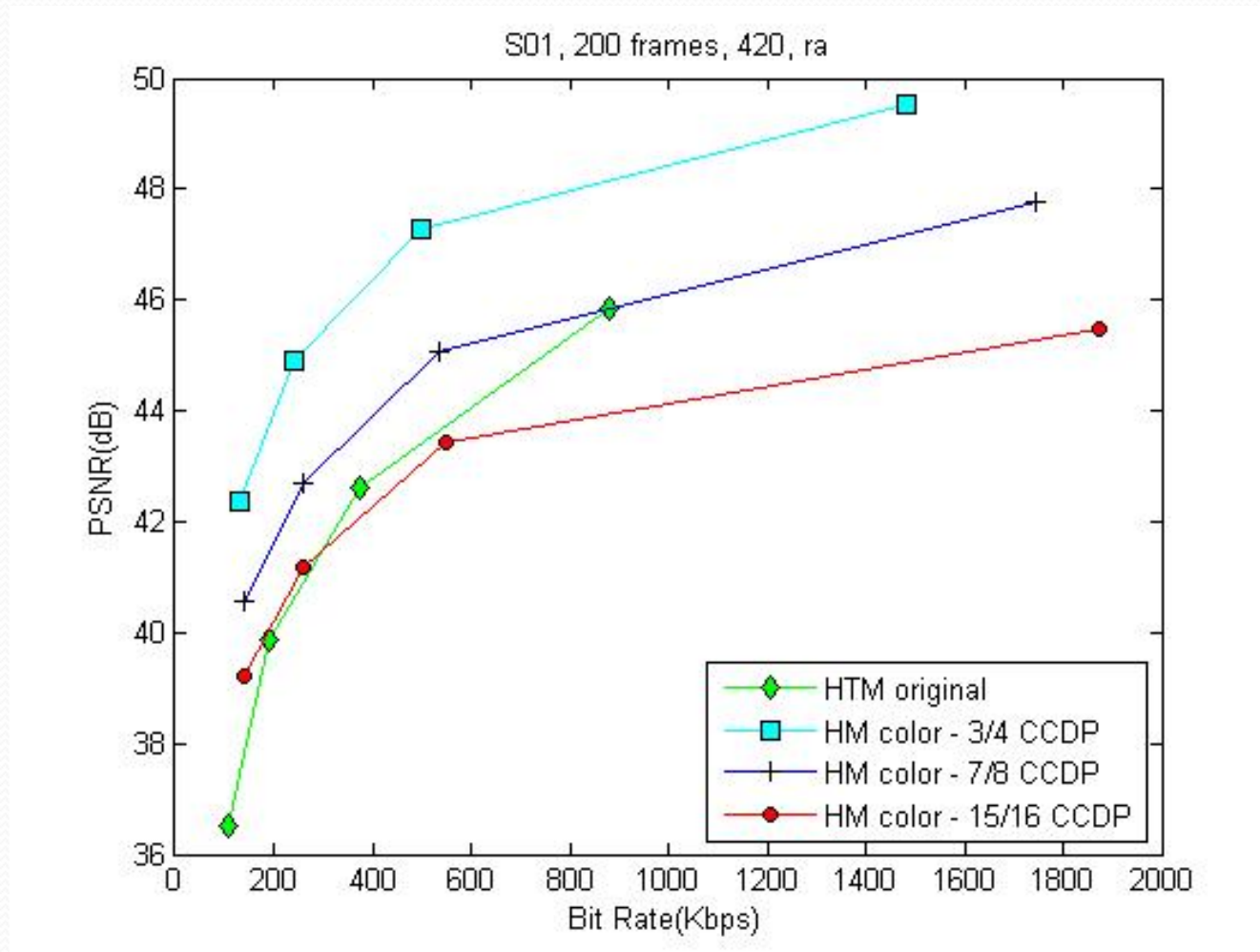
CCDP with HEVC HM 13.0 versus Color and Depth with 3D-HEVC 8.0

Color RD Curves (without DIBR)



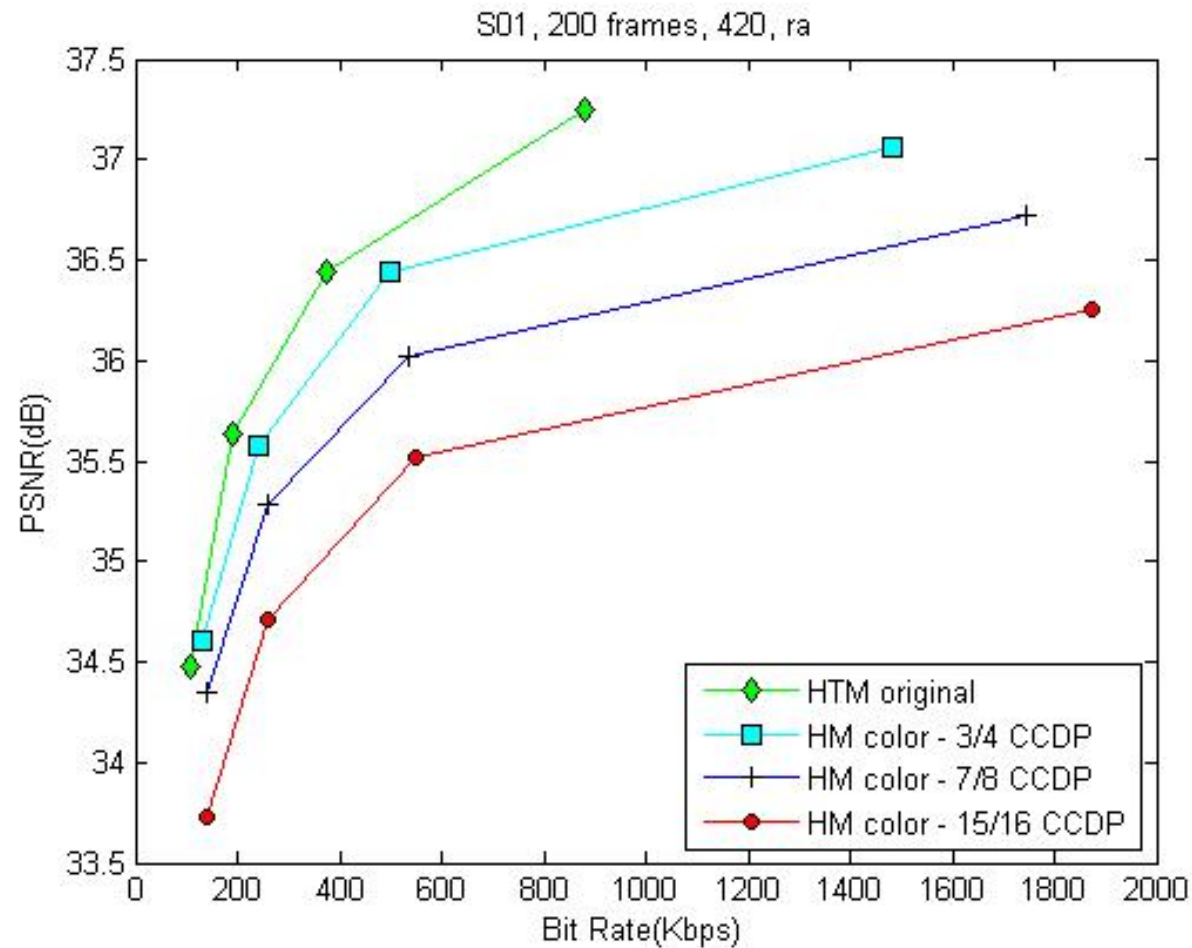
Color Y

Depth RD Curves (without DIBR)



Depth Y

Virtual View RD Curves (with DIBR)



Virtual View (Color)

Experimental results

(with respect to color-depth 3D-HEVC coding)

Average BDPSNR (dB) results for different sequences

BDPSNR (dB)									
	Comparisons of Textrue and Depth Coding						Comparisons after DIBR		
	Texture			Depth			Virtual View (Texture)		
	3/4	7/8	15/16	3/4	7/8	15/16	3/4	7/8	15/16
ra	0.3761	0.6536	0.7888	3.5058	1.2856	-0.9024	-0.2287	-0.9874	-2.0703

Average BDBR (dB) results for different sequences

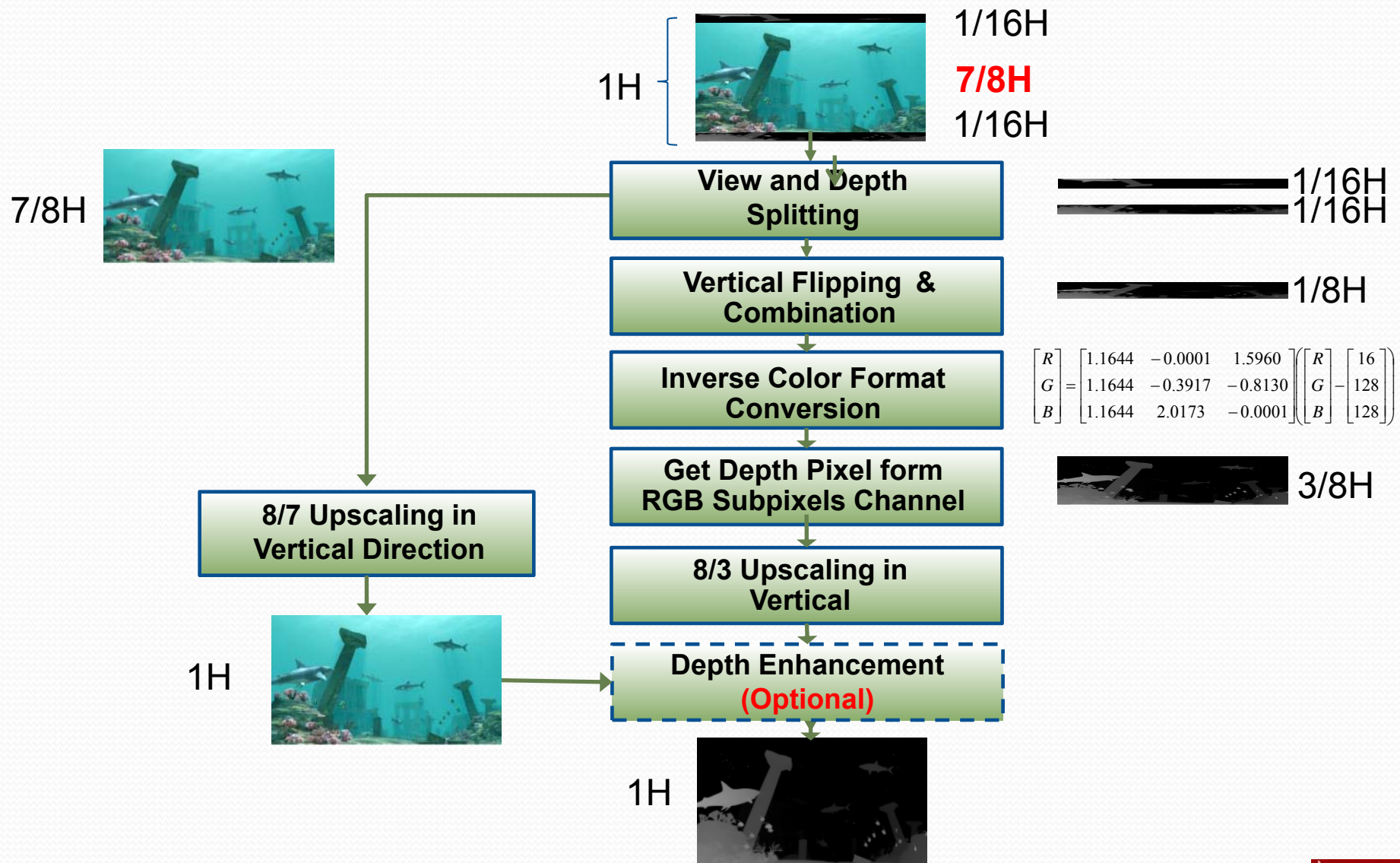
BDBR (%)									
	Comparisons of Texture and Depth Coding						Comparisons after DIBR		
	Texture			Depth			Virtual View (Color)		
	3/4	7/8	15/16	3/4	7/8	15/16	3/4	7/8	15/16
ra	-5.7811	-12.5321	-15.5193	-59.5028	-26.5578	26.6362	15.1971	70.7927	258.2328

Conclusions

- The detailed concept of centralized texture-depth packing formats is introduced. The packing and unpacking procedures for CTDP formats are overviewed.
- The objective quality measurements of texture-3/4, 7/8 and 15/16 CTDP formats based on texture depth packing SbS are presented.
- For color and depth quality measures, we found that texture-15/16 CTDP format achieves the best in color frames (best for 2D displays). In average, the texture-3/4 CTDP has best coding performance without any depth enhancement.
- Without any depth enhancement, we recommended adopting the proposed texture-3/4 CTDP format rather than the others since it can achieve the best 3D quality and similar 2D quality.
- Comparing to traditional frame compatible SbS packing format, the proposed CTDP formats attain better image quality for both 2D-TV or 3D-TV displays.

Thanks for your kind attention
Q&A

Texture-7/8 CTDP Depacking Procedure



Texture-15/16 CTDP Depacking Procedure

