

AHG8: Reference Picture Extension of ACP format for 360-degree video (JVET-G0058)

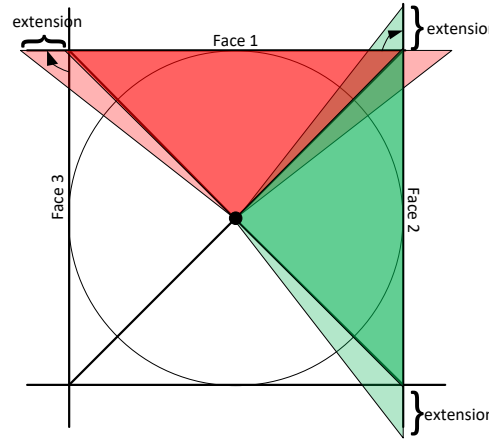
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Introduction

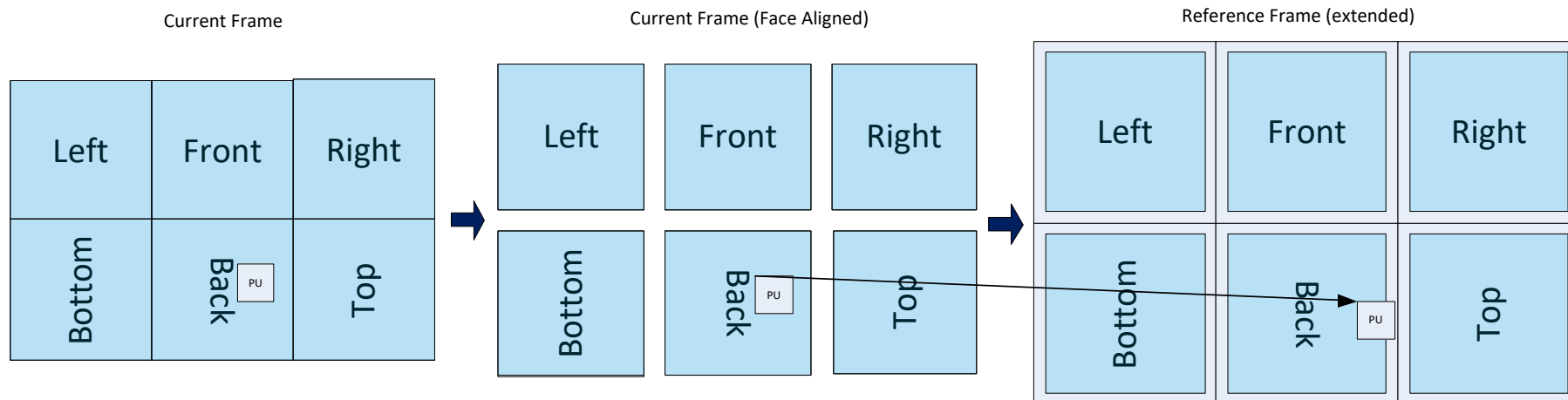
- Adjusted Cubemap Projection (ACP) has discontinuities around its cube faces
 - Due to inherent geometric distortion around the face boundaries
 - Due to packing of faces into a picture format
- Impacts coding gain for sequences with motion across face boundaries
- Geometric padding addresses discontinuity issues within the vicinity of the face boundaries

ACP Reference Picture Extension

- Extend decoded cube faces by projecting to the extended regions using the ACP projection



- Pack decoded frame faces in 3x2 packing scheme for reference frames



Example

- ACP 3x2 PoleVault Sequence with 64-pixel extension



Original



Extended

Results

- CTC comparison vs ACP (HM 16.15 based)
 - 64-pixel extension
 - CTC motion search

ACP(ext) vs. ACP	FW	FH	SPSNR-NN (End to End)			SPSNR-I (End to End)			CPP-PSNR (End to End)			WS-PSNR (End to End)		
			Y	U	V	Y	U	V	Y	U	V	Y	U	V
Trolley	1184	1184	-0.1%	-0.2%	-0.3%	-0.1%	-0.2%	-0.2%	-0.1%	-0.2%	-0.2%	-0.1%	-0.2%	-0.2%
GasLamp	1184	1184	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
Skateboarding_in_lot	1184	1184	-1.6%	-2.6%	-2.9%	-1.6%	-2.6%	-2.9%	-1.5%	-2.6%	-2.9%	-1.5%	-2.6%	-2.9%
Chairlift	1184	1184	-2.7%	-2.8%	-2.4%	-2.7%	-2.8%	-2.4%	-2.7%	-2.9%	-2.4%	-2.7%	-2.9%	-2.4%
KiteFlite	1184	1184	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
Harbor	1184	1184	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
PoleVault	960	960	-0.2%	-0.1%	-0.2%	-0.2%	-0.1%	-0.2%	-0.1%	-0.1%	-0.2%	-0.2%	-0.1%	-0.2%
AerialCity	960	960	-1.8%	-1.6%	-1.7%	-1.7%	-1.6%	-1.6%	-1.8%	-1.6%	-1.6%	-1.8%	-1.6%	-1.7%
DrivingInCity	960	960	-0.8%	-1.0%	-1.1%	-0.8%	-1.0%	-1.1%	-0.8%	-1.0%	-1.0%	-0.8%	-1.0%	-1.1%
DrivingInCountry	960	960	-3.1%	-3.5%	-3.3%	-3.1%	-3.5%	-3.2%	-3.1%	-3.5%	-3.2%	-3.1%	-3.6%	-3.3%
Overall			-1.0%	-1.2%	-1.2%	-1.0%	-1.2%	-1.2%	-1.0%	-1.2%	-1.2%	-1.0%	-1.2%	-1.2%

Results

- CTC comparison vs ACP (HM 16.15 based)
 - 64-pixel extension
 - CTC motion search
 - Global motion (rotation) introduced to input sequences (JVET-G0100)

ACP(ext) vs. ACP	FW	FH	SPSNR-NN (End to End)			SPSNR-I (End to End)			CPP-PSNR (End to End)			WS-PSNR (End to End)		
			Y	U	V	Y	U	V	Y	U	V	Y	U	V
Trolley	1184	1184	-3.7%	-3.5%	-3.6%	-3.7%	-3.5%	-3.6%	-3.7%	-3.5%	-3.6%	-3.7%	-3.5%	-3.6%
GasLamp	1184	1184	-4.1%	-4.0%	-3.8%	-4.1%	-4.0%	-3.8%	-4.1%	-4.0%	-3.8%	-4.1%	-4.0%	-3.8%
Skateboarding_in_lot	1184	1184	-1.8%	-3.1%	-3.1%	-1.8%	-3.0%	-3.1%	-1.8%	-3.1%	-3.1%	-1.8%	-3.1%	-3.1%
Chairlift	1184	1184	-3.1%	-3.6%	-3.6%	-3.1%	-3.6%	-3.5%	-3.1%	-3.7%	-3.5%	-3.1%	-3.7%	-3.6%
KiteFlite	1184	1184	-3.6%	-3.5%	-3.5%	-3.6%	-3.5%	-3.4%	-3.5%	-3.5%	-3.4%	-3.6%	-3.5%	-3.5%
Harbor	1184	1184	-3.9%	-3.8%	-3.8%	-3.9%	-3.8%	-3.8%	-3.9%	-3.8%	-3.8%	-3.9%	-3.8%	-3.8%
PoleVault	960	960	-3.4%	-3.3%	-3.3%	-3.4%	-3.3%	-3.3%	-3.4%	-3.3%	-3.3%	-3.5%	-3.3%	-3.3%
AerialCity	960	960	-5.2%	-5.1%	-5.1%	-5.2%	-5.0%	-5.1%	-5.2%	-5.0%	-5.1%	-5.2%	-5.1%	-5.1%
DrivingInCity	960	960	-2.4%	-3.1%	-2.9%	-2.4%	-3.1%	-2.9%	-2.4%	-3.1%	-2.9%	-2.4%	-3.1%	-2.9%
DrivingInCountry	960	960	-3.7%	-4.5%	-4.4%	-3.7%	-4.5%	-4.3%	-3.7%	-4.5%	-4.3%	-3.7%	-4.5%	-4.4%
Overall			-3.5%	-3.8%	-3.7%	-3.5%	-3.7%	-3.7%	-3.5%	-3.7%	-3.7%	-3.5%	-3.8%	-3.7%

Conclusion

- Reference face extension/packing scheme for ACP was presented
- For sequences with motion across face boundaries, BD rate gains 3-4% is reported