HDR CE2.a-1: Report on LCS

Adarsh K. Ramasubramonian, Joel Sole, Dmytro Rusanovskyy, Done Bugdayci Sansli, Marta Karczewicz

Qualcomm

Overview - LCS

- Luma-based chroma scaling (LCS)
  - Contribution m37245
- Specific test conducted
  - Cross-plane mode in ETM
  - Use the existing luma reshaper used for Mode 0 (ETM released on Jan 21)
  - Scale with which the chroma sample values are scaled is determined based on a function of luma

Scaling function for chroma

$$f(Y', S_{max}) = \frac{S_{max} - 1.0}{\left(1 + 0.5e^{\frac{-(Y' - 0.5)}{0.15}}\right)} + 1.0$$

Value of S_{max} to be used for content with different gamuts

Colour gamut of the sequences	For Cb	For Cr
709	2.3	3.9
DCI-P3	1.2	2.8
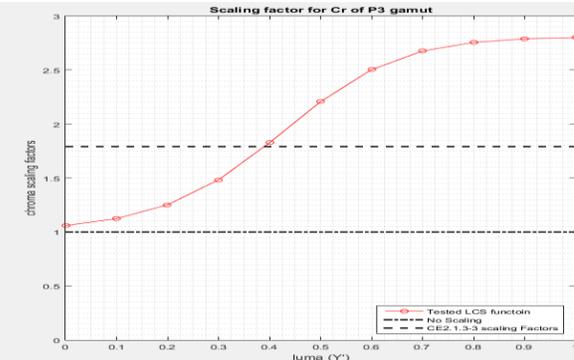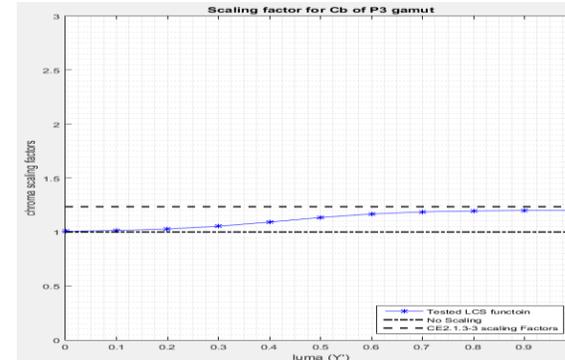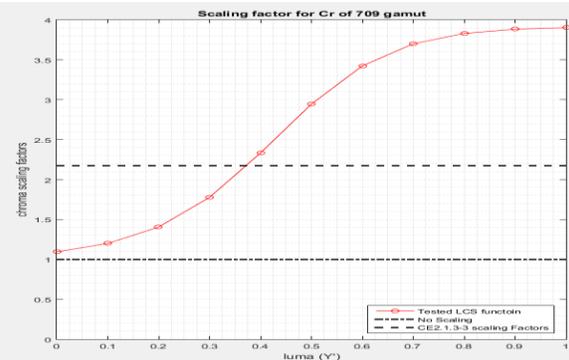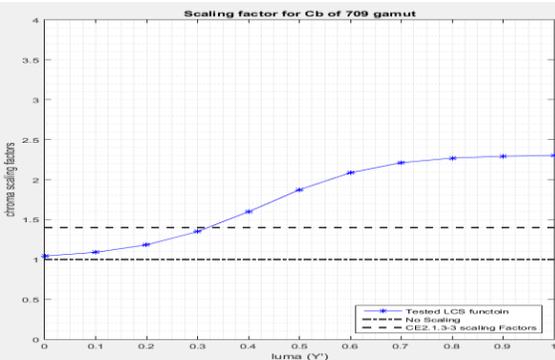
Content with 709 gamut

Content with DCI-P3D65 gamut

Objective results

		X	Y	Z	XYZ	tOSNR-XYZ	DE100	MD100	PSNRL100	PSNR Y	PSNR U	PSNR V
class A	FireEaterClip4000r1	2.0%	4.5%	2.7%	2.9%	0.7%	-1.4%	-43.8%	12.2%	-3.8%	234.6%	0.0%
	Market3Clip4000r2	18.5%	17.5%	13.6%	16.3%	9.1%	3.0%	-60.1%	-6.2%	9.0%	505.9%	0.0%
	SunRise	-3.3%	-1.3%	-13.1%	-6.8%	-3.7%	-31.3%	-69.2%	21.7%	19.1%	0.0%	0.0%
class B	BikeSparklers cut 1	-7.2%	-7.4%	4.0%	-3.4%	-3.9%	-2.7%	-57.5%	-0.9%	-4.0%	128.3%	0.0%
	BikeSparklers cut 2	-4.0%	-3.4%	8.1%	-0.1%	1.4%	1.9%	-39.2%	2.8%	2.4%	117.5%	0.0%
	GarageExit	27.9%	26.3%	39.6%	32.5%	24.6%	17.1%	-50.0%	7.1%	-17.7%	56.0%	0.0%
class C	ShowGirl2Teaser	12.0%	12.2%	27.6%	17.2%	24.9%	5.3%	-52.0%	2.5%	-19.2%	52.0%	0.0%
class D	StEM_MagicHour cut 1	-3.9%	-1.8%	9.2%	3.1%	3.4%	-4.5%	-15.3%	-0.4%	19.7%	61.6%	419.9%
	StEM_MagicHour cut 2	-1.6%	-0.9%	6.5%	2.4%	2.7%	-2.4%	-14.1%	0.1%	0.0%	39.8%	342.5%
	StEM_MagicHour cut 3	-1.1%	-0.8%	10.2%	4.8%	4.7%	2.5%	17.8%	1.0%	17.0%	37.6%	405.8%
	StEM_WarmNight cut 1	-1.8%	-1.7%	5.8%	1.4%	1.4%	-3.1%	4.8%	0.3%	27.2%	50.7%	0.0%
	StEM_WarmNight cut 2	0.7%	2.1%	0.0%	0.6%	3.9%	-10.5%	-76.9%	-3.7%	-23.1%	10.6%	122.9%
class G	BalloonFestival	35.5%	46.2%	15.4%	29.8%	17.3%	0.6%	0.0%	-2.0%	-25.4%	113.6%	0.0%
class H	EBU_04_Hurdles	22.0%	12.8%	14.7%	16.0%	3.7%	24.0%	29.5%	-10.5%	157.5%	0.0%	0.0%
	EBU_06_Start	41.3%	32.3%	28.8%	33.7%	20.3%	20.8%	-39.3%	-5.1%	8.1%	375.1%	0.0%
	Overall	9.1%	9.1%	11.5%	10.0%	7.4%	1.3%	-31.0%	1.3%	11.1%	118.9%	86.1%

Discussion

- Chroma artefacts are reduced for samples that have higher luma values
- Tool can provide improved subjective quality in some sequences

- Thanks to Technicolor for cross-check.