



ITRI

Industrial Technology
Research Institute

JCTVC-T0087

Improved Palette Table Generation

C. -H. Hung, C. -L. Lin, Y. -J. Chang, C. -C. Lin, J. -S. Tu
ITRI International

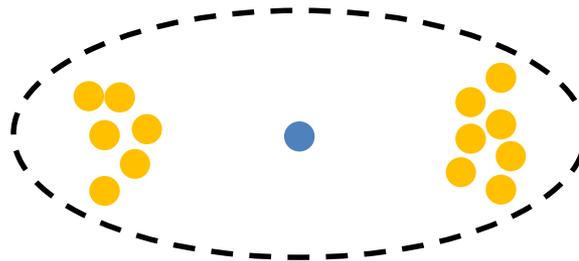


ITRI

Industrial Technology
Research Institute

Current palette table generation

- The SCM3.0 uses the K-means method to generate palettes to represent the pixels in the current CU.
 - Each palette is a mean for a group of pixels
- Problems
 - However, the generated major colors may be far away from the original colors



Concept of our modification

- Create the histogram of the current CU pixels
- Select several significant colors as initial color groups from the histogram
 - Initial color groups contain non-zero averages and pixel numbers
- If the current pixel is different from any pixel in the initial color groups, use original K-means method to classify this pixel

Lossy results of JCTVC-T0087

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.2%	-0.2%	-0.2%	-0.5%	-0.4%	-0.4%	-0.1%	-0.1%	-0.1%
RGB, mixed content, 1440p & 1080p	-0.2%	-0.2%	-0.2%	-0.3%	-0.4%	-0.4%	-0.3%	-0.2%	-0.3%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	-0.1%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
YUV, text & graphics with motion, 1080p & 720p	-0.5%	-0.3%	-0.3%	-0.7%	-0.8%	-0.9%	-0.2%	-0.3%	-0.4%
YUV, mixed content, 1440p & 1080p	-0.5%	-0.4%	-0.1%	-0.6%	-0.9%	-0.7%	-0.8%	-0.7%	-0.6%
YUV, Animation, 720p	0.0%	0.0%	-0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	-0.1%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
Enc Time[%]	98%			97%			99%		
Dec Time[%]	98%			101%			101%		

All Intra Lossy results

Test 1: T0087

Test 2: T0087 & T0169 version 1

Test 3: T0087 & T0169 version 2

	Test 1			Test 2			Test 3		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.2%	-0.2%	-0.2%	-0.3%	-0.3%	-0.3%	-0.5%	-0.4%	-0.4%
RGB, mixed content, 1440p & 1080p	-0.2%	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.3%	-0.4%	-0.4%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.5%	-0.3%	-0.3%	-0.5%	-0.4%	-0.4%	-0.6%	-0.6%	-0.7%
YUV, mixed content, 1440p & 1080p	-0.5%	-0.4%	-0.1%	-0.5%	-0.5%	-0.2%	-0.6%	-0.7%	-0.5%
YUV, Animation, 720p	0.0%	0.0%	-0.1%	0.0%	-0.1%	-0.1%	0.0%	-0.2%	-0.2%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	98%			87%			89%		
Dec Time[%]	98%			98%			98%		

Random Access Lossy results

Test 1: T0087

Test 2: T0087 & T0169 version 1

Test 3: T0087 & T0169 version 2

	Test 1			Test 2			Test 3		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.5%	-0.4%	-0.4%	-0.5%	-0.5%	-0.5%	-0.6%	-0.6%	-0.5%
RGB, mixed content, 1440p & 1080p	-0.3%	-0.4%	-0.4%	-0.3%	-0.5%	-0.4%	-0.4%	-0.5%	-0.5%
RGB, Animation, 720p	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.7%	-0.8%	-0.9%	-0.7%	-0.8%	-1.0%	-0.8%	-1.0%	-1.1%
YUV, mixed content, 1440p & 1080p	-0.6%	-0.9%	-0.7%	-0.6%	-0.9%	-0.6%	-0.7%	-1.0%	-0.6%
YUV, Animation, 720p	0.0%	0.0%	0.1%	-0.1%	-0.1%	-0.1%	0.0%	-0.2%	0.1%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Enc Time[%]	97%			98%			120%		
Dec Time[%]	101%			96%			135%		

Low Delay B Lossy results

Test 1: T0087

Test 2: T0087 & T0169 version 1

Test 3: T0087 & T0169 version 2

	Test 1			Test 2			Test 3		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.1%	-0.1%	-0.1%	-0.2%	-0.2%	-0.2%	-0.3%	-0.3%	-0.3%
RGB, mixed content, 1440p & 1080p	-0.3%	-0.2%	-0.3%	-0.4%	-0.5%	-0.5%	-0.4%	-0.4%	-0.5%
RGB, Animation, 720p	0.0%	0.1%	-0.1%	0.0%	0.1%	-0.1%	0.1%	0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%
YUV, text & graphics with motion, 1080p & 720p	-0.2%	-0.3%	-0.4%	-0.3%	-0.4%	-0.4%	-0.5%	-0.6%	-0.6%
YUV, mixed content, 1440p & 1080p	-0.8%	-0.7%	-0.6%	-0.7%	-1.3%	-0.6%	-0.8%	-1.5%	-1.0%
YUV, Animation, 720p	0.0%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	0.1%	-0.2%	-0.1%
YUV, camera captured, 1080p	0.0%	0.2%	0.0%	0.0%	0.1%	0.0%	-0.1%	0.0%	0.0%
Enc Time[%]	99%			98%			109%		
Dec Time[%]	101%			95%			137%		

Conclusions

- An improved major color generation method is proposed.
- Proposed method could be easily combined with T0169 for coding efficiency improvement.
- For “RGB, text & graphics with motion, 1080p & 720p” and “YUV, text & graphics with motion, 1080p & 720p” all intra lossy condition, the coding gain are:
 - Test1: T0087: -0.2% and -0.5%
 - Test2: T0087 & T0169 version 1: -0.3% and -0.5%
 - Test3: T0087 & T0169 version 2: -0.5% and -0.6%

Recommendation

- We recommend to adopt the proposed encoding method for Screen Content Coding

Acknowledgement

- We thank Qualcomm for crosschecking our proposal.

Thank you for your attention!

Any questions?

Appendix

Lossless results of T0087

	All Intra				Random Access				Low Delay B			
	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)
RGB, text & graphics with motion, 1080p & 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, mixed content, 1440p & 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, mixed content, 1440p & 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	97%				99%				99%			
Dec Time[%]	99%				98%				98%			

Lossless results of T0087 & T0169 version 1

	All Intra				Random Access				Low Delay B			
	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)
RGB, text & graphics with motion, 1080p & 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, mixed content, 1440p & 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, mixed content, 1440p & 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	98%				99%				99%			
Dec Time[%]	97%				95%				94%			