

*m54808:*

[G-PCC][EE13.42 related]

*Study on parsing issue for attribute predicting  
transform coding*

# m44804: original CE13.6 result (single vs adaptive)

- Original adaptive predictor was implemented on **TMC13v3**

numberOfNearestNeighborsInPrediction = 3 (default)

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Total	Colour	Reflectance	Geometry
Cat1-A average	99.3%	99.0%		100.0%
Cat1-B average	100.0%	#VALUE!		100.0%
Cat3-fused average	97.7%	94.7%	98.3%	100.0%
Cat3-frame average	99.7%		98.5%	100.0%
<b>Overall average</b>	99.5%	#VALUE!	98.4%	100.0%
Avg. Enc Time [%]			97%	
Avg. Dec Time [%]			98%	
CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	-3.2%	-3.2%	-3.2%	
Cat3-fused average	-11.3%	-11.3%	-11.3%	-4.1%
Cat3-frame average				-2.9%
<b>Overall average</b>	-4.6%	-4.6%	-4.6%	-3.5%
Avg. Enc Time [%]			98%	
Avg. Dec Time [%]			98%	

For cat3 content,

- 5.3% gain for color and 1.6% gain for reflectance in lossless attributes
- 11.3% gain for color and 3.5% gain for reflectance in near-lossless attributes

# TMC13v10 (single vs adaptive)

- Change CTC as following,
  - colour space conversion: disabled (RGB domain)
  - colour matrix: RGB=0

ICP = Inter Component Prediction

Single vs adaptive predictor with ICP disabled

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	99.1%		99.3%
Cat1-B average	100.0%	98.0%		99.2%
Cat3-fused average	100.0%	94.4%	99.1%	97.7%
Cat3-frame average	100.0%		99.6%	99.9%
<b>Overall average</b>	100.0%	98.1%	99.4%	99.2%
Avg. Enc Time [%]			102%	
Avg. Dec Time [%]			101%	

+ICP

Single vs adaptive predictor with ICP enabled

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	99.4%		99.6%
Cat1-B average	100.0%	99.3%		99.8%
Cat3-fused average	100.0%	96.8%	99.1%	98.7%
Cat3-frame average	100.0%		99.6%	99.9%
<b>Overall average</b>	100.0%	99.2%	99.4%	99.7%
Avg. Enc Time [%]			101%	
Avg. Dec Time [%]			100%	

CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	-2.6%	-2.6%	-2.6%	
Cat1-B average	-4.7%	-4.7%	-4.7%	
Cat3-fused average	-11.1%	-11.1%	-11.1%	-2.2%
Cat3-frame average				-0.8%
<b>Overall average</b>	-4.1%	-4.1%	-4.1%	-1.2%
Avg. Enc Time [%]			100%	
Avg. Dec Time [%]			101%	

CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	-1.3%	-1.3%	-1.3%	
Cat1-B average	-1.7%	-1.7%	-1.7%	
Cat3-fused average	-6.2%	-6.2%	-6.2%	-2.2%
Cat3-frame average				-0.8%
<b>Overall average</b>	-1.8%	-1.8%	-1.8%	-1.2%
Avg. Enc Time [%]			100%	
Avg. Dec Time [%]			100%	

Similar result as m44804  
could be gotten in TMC13v10

Gain decrease →  
ICP conflicts adaptive predictor selection

# TMC13v10 (single vs multi predictor, no parsing dependency)

- Change CTC as following,
  - colour space conversion: disabled (RGB domain)
  - colour matrix: RGB=0

ICP = Inter Component Prediction

Single vs multi predictor with ICP disabled

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	95.6%		96.8%
Cat1-B average	100.0%	93.8%		97.5%
Cat3-fused average	100.0%	94.4%	113.6%	99.6%
Cat3-frame average	100.0%		121.0%	104.1%
<b>Overall average</b>	100.0%	94.5%	118.1%	98.1%
Avg. Enc Time [%]			104%	
Avg. Dec Time [%]			101%	

  

CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	1.9%	1.9%	1.9%	
Cat1-B average	-4.2%	-4.2%	-4.2%	
Cat3-fused average	-8.0%	-8.0%	-8.0%	24.4%
Cat3-frame average				118.5%
<b>Overall average</b>	-1.7%	-1.7%	-1.7%	90.2%
Avg. Enc Time [%]			103%	
Avg. Dec Time [%]			101%	

+ICP

Single vs multi predictor with ICP enabled

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	103.3%		102.2%
Cat1-B average	100.0%	102.3%		100.8%
Cat3-fused average	100.0%	99.9%	113.6%	101.8%
Cat3-frame average	100.0%		121.0%	104.1%
<b>Overall average</b>	100.0%	102.5%	118.1%	101.5%
Avg. Enc Time [%]			102%	
Avg. Dec Time [%]			99%	

  

CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	10.6%	10.6%	10.6%	
Cat1-B average	6.7%	6.7%	6.7%	
Cat3-fused average	-0.9%	-0.9%	-0.9%	24.4%
Cat3-frame average				118.5%
<b>Overall average</b>	8.0%	8.0%	8.0%	90.2%
Avg. Enc Time [%]			102%	
Avg. Dec Time [%]			100%	

Color → multi, Reflectance → single predictor  
looks better in terms of coding performance

Huge loss →  
ICP conflicts adaptive predictor selection

# TMC13v10 (adaptive vs single, adaptive vs multi, no parsing issue)

- Change CTC as following,
  - colour space conversion: disabled (RGB domain)
  - **inter component prediction: disabled**
  - colour matrix: RGB=0

## Adaptive vs Single predictor

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	101.0%		100.7%
Cat1-B average	100.0%	102.0%		100.8%
Cat3-fused average	100.0%	105.9%	100.9%	102.3%
Cat3-frame average	100.0%		100.4%	100.1%
<b>Overall average</b>	100.0%	101.9%	100.6%	100.8%
Avg. Enc Time [%]			98%	
Avg. Dec Time [%]			99%	

  

CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	2.7%	2.7%	2.7%	
Cat1-B average	5.1%	5.1%	5.1%	
Cat3-fused average	12.5%	12.5%	12.5%	2.3%
Cat3-frame average				0.8%
<b>Overall average</b>	4.5%	4.5%	4.5%	1.2%
Avg. Enc Time [%]			100%	
Avg. Dec Time [%]			99%	

## Adaptive vs Multi predictor

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	96.5%		97.5%
Cat1-B average	100.0%	95.7%		98.3%
Cat3-fused average	100.0%	99.9%	114.6%	101.9%
Cat3-frame average	100.0%		121.5%	104.2%
<b>Overall average</b>	100.0%	96.3%	118.8%	98.9%
Avg. Enc Time [%]			102%	
Avg. Dec Time [%]			100%	

  

CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	4.5%	4.5%	4.5%	
Cat1-B average	0.6%	0.6%	0.6%	
Cat3-fused average	3.5%	3.5%	3.5%	27.2%
Cat3-frame average				120.2%
<b>Overall average</b>	2.5%	2.5%	2.5%	92.3%
Avg. Enc Time [%]			102%	
Avg. Dec Time [%]			100%	

Color → multi predictor, Reflectance → single predictor  
looks reasonable to resolve parsing issue

# TMC13v10 (adaptive vs single, adaptive vs multi, no parsing issue)

- Change CTC as following,
  - colour space conversion: disabled (RGB domain)
  - **inter component prediction: enabled**
  - colour matrix: RGB=0

## Adaptive vs Single predictor

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	100.6%		100.4%
Cat1-B average	100.0%	100.7%		100.2%
Cat3-fused average	100.0%	103.3%	100.9%	101.3%
Cat3-frame average	100.0%		100.4%	100.1%
<b>Overall average</b>	100.0%	100.9%	100.6%	100.4%
Avg. Enc Time [%]			99%	
Avg. Dec Time [%]			100%	
CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	1.4%	1.4%	1.4%	
Cat1-B average	1.8%	1.8%	1.8%	
Cat3-fused average	6.6%	6.6%	6.6%	2.3%
Cat3-frame average				0.8%
<b>Overall average</b>	1.9%	1.9%	1.9%	1.2%
Avg. Enc Time [%]			100%	
Avg. Dec Time [%]			100%	

## Adaptive vs Multi predictor

CW_ai	lossless geometry, lossless attributes [all intra]			
	bpip ratio [%]			
	Geometry	Colour	Reflectance	Total
Cat1-A average	100.0%	103.9%		102.6%
Cat1-B average	100.0%	103.0%		101.0%
Cat3-fused average	100.0%	103.2%	114.6%	103.1%
Cat3-frame average	100.0%		121.5%	104.2%
<b>Overall average</b>	100.0%	103.3%	118.8%	101.9%
Avg. Enc Time [%]			101%	
Avg. Dec Time [%]			99%	
CY_ai	lossless geometry, near-lossless attributes [all intra]			
	EtE Hausdorff BD-AttrRate [%]			
	Luma	Chroma Cb	Chroma Cr	Reflectance
Cat1-A average	12.0%	12.0%	12.0%	
Cat1-B average	8.5%	8.5%	8.5%	
Cat3-fused average	5.6%	5.6%	5.6%	27.2%
Cat3-frame average				120.2%
<b>Overall average</b>	9.9%	9.9%	9.9%	92.3%
Avg. Enc Time [%]			102%	
Avg. Dec Time [%]			100%	

Multi predictor becomes worse →  
ICP conflicts adaptive predictor selection

# Conclusion

- Original gain of adaptive predictor selection was confirmed in the following setting in TMC13v10,
  - RGB coding
  - ICP (Inter Component Prediction) disabled
- In case of ICP disabled, the following setting could be considered as one candidate to resolve parsing issue,
  - Color: multi predictor, Reflectance: single predictor
- There seems to be some conflicts between ICP and multi predictor
- It is recommended to continue to study this aspect
  - RDO on ICP, etc