JCTVC-R0162
NON-SCCE1: Intra block copy hash search enhancement

invention | collaboration | contribution

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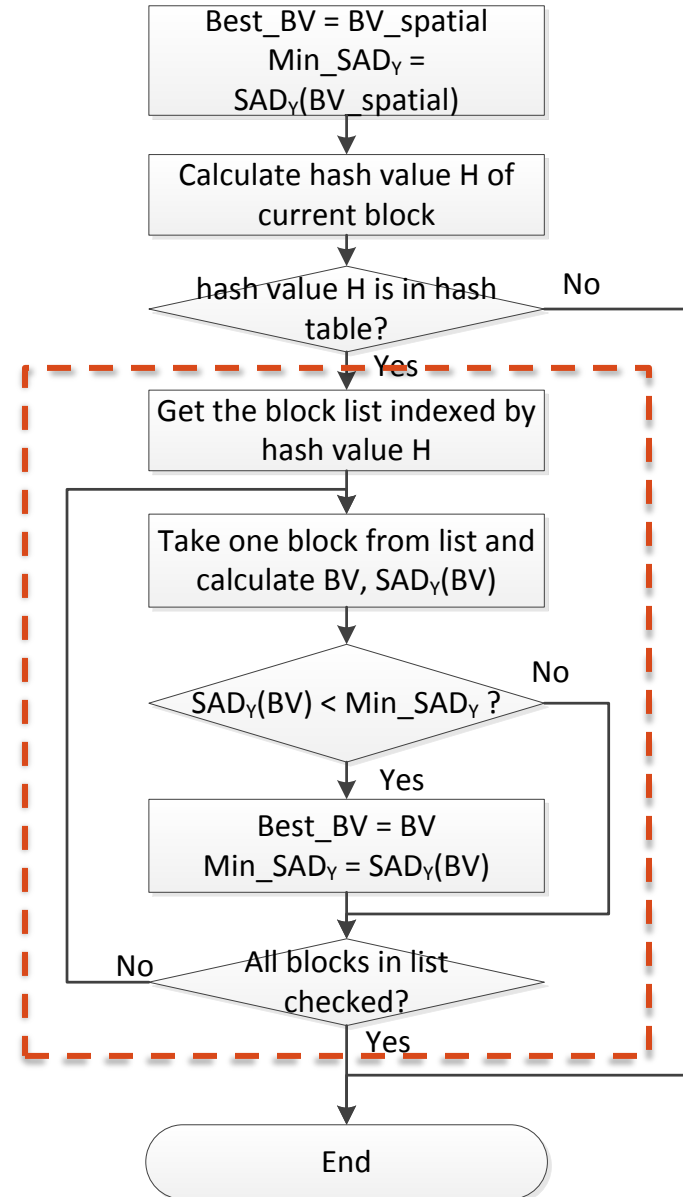InterDigital Communications, Inc.

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Introduction

- Two search stages in the existing BV search for 8x8 CU in SCM-1.0
  - Spatial BV search with luma component in local search range, then BV refinement with chroma components
  - Hash based search with luma component, and compete with the best BV obtained in spatial search
- BV chroma refinement is only applied in spatial search
- This contribution proposes to apply the BV chroma refinement in hash based search stage

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Hash based BV search in SCM-1.0

- Take the BV obtained in spatial BV search as initial best BV

- If hash of current block is found in the hash table, then search block list using luma SAD

Best_BV = BV_spatial
$Min\_SAD_Y = SAD_Y(BV\_spatial)$

Calculate hash value H of current block

hash value H is in hash table? → No

Yes

Get the block list indexed by hash value H

Take one block from list and calculate BV, $SAD_Y(BV)$

$SAD_Y(BV) < Min\_SAD_Y$? → No

Yes

Best_BV = BV
$Min\_SAD_Y = SAD_Y(BV)$

All blocks in list checked? → No

Yes

End

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Hash based BV search with chroma refinement

- Separate hash based BV search into two steps
  - Step 1: find the best N BVs with luma SAD, instead of only finding the best BV in SCM-1.0
  - Step 2: refine the best BV by comparing SAD of three components among those best N BVs obtained in step 1
- Chroma refinement in spatial search can be reused in step 2.
- N is set to 4 in simulations

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Simulation results: lossy coding compared with SCCE1 full frame IBC anchor

	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	-0.6%	-0.8%	-0.7%	-0.4%	-0.5%	-0.6%	-0.3%	-0.5%	-0.3%
RGB, text & graphics with motion,720p	-0.7%	-0.9%	-0.9%	-0.4%	-0.5%	-0.5%	-0.4%	-0.2%	-0.3%
RGB, mixed content, 1440p	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.1%	-0.4%	-0.1%
RGB, mixed content, 1080p	-0.2%	-0.3%	-0.3%	-0.1%	-0.1%	-0.3%	-0.2%	-0.1%	-0.5%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-0.4%	-0.7%	-0.7%	-0.2%	-0.5%	-0.6%	-0.3%	-0.5%	-0.5%
YUV, text & graphics with motion,720p	-0.6%	-0.9%	-1.0%	-0.2%	-0.6%	-0.6%	0.0%	0.1%	0.1%
YUV, mixed content, 1440p	-0.1%	-0.4%	-0.3%	0.0%	-0.4%	-0.3%	0.0%	-0.4%	-0.4%
YUV, mixed content, 1080p	-0.2%	-0.4%	-0.4%	-0.2%	-0.4%	-0.1%	0.0%	-0.5%	0.3%
YUV, Animation, 720p	0.0%	-0.1%	0.0%	0.0%	-0.3%	0.1%	-0.1%	-0.2%	-0.3%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	-0.1%
Enc Time[%]	100%			101%			100%		
Dec Time[%]	95%			97%			97%		

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Conclusions

- This contribution proposes an encoder only change
  - Extend chroma refinement in spatial BV stage to hash based BV search
- Proposed method improves coding efficiency in full frame IBC configuration without complexity increase
- For example, for "RGB, text & graphics with motion, 1080p"
  - AI: {-0.6%, -0.8%, -0.7%}
  - RA: {-0.4%, -0.5%, -0.3%}
  - LD: {-0.3%, -0.5%, -0.3%}
- The changes to SCM-1.0 encoder are small

Thanks Qualcomm for cross-checking! (JCTVC-R0212)

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