

JCTVC-C124

# **TE1 report: implicit direct vector derivation**

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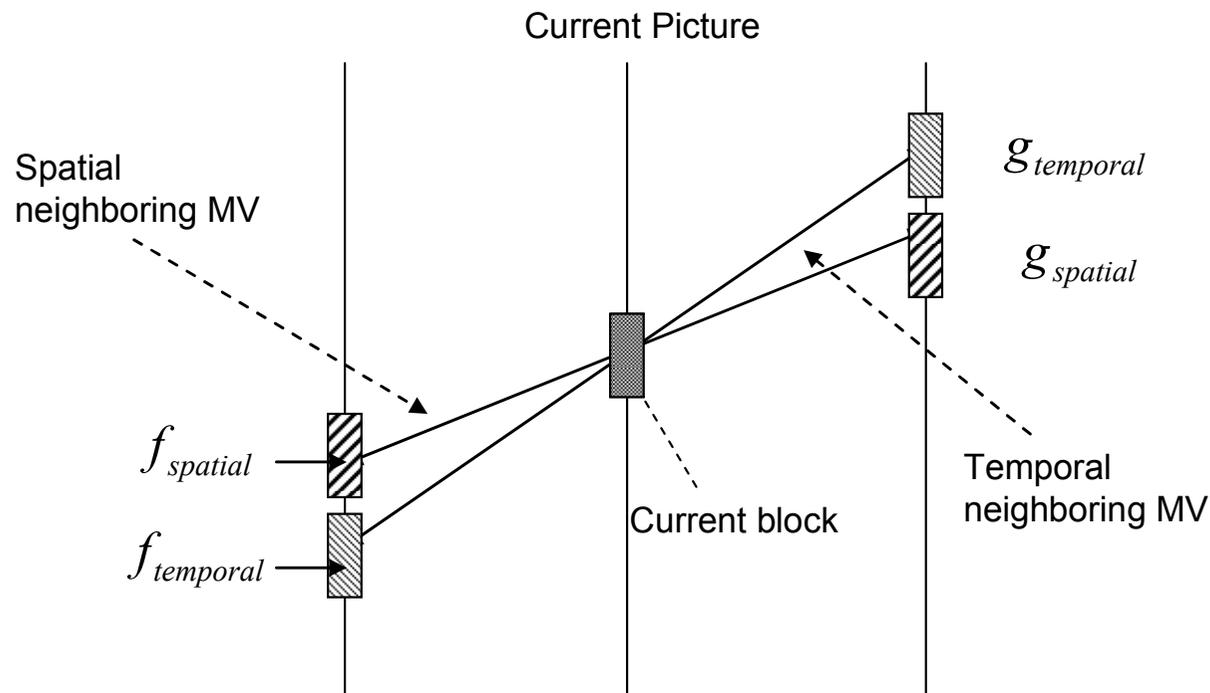
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# Summary

- ***Implicit Direct Vector Derivation (IDVD) technique (A107,A122,B068) evaluated as a part of TE1(B301)***
  - Adaptive direct vector derivation without any side information, by relying on decoder-side assistance
  - 1.8% average gain, 3.5% at maximum
    - Especially, efficient for low bitrate condition
  - Simplest model of DMVD concept
  - Cross-verified by two independent parties (C024, C098)

# IDVD overview

- Adaptive direct MV derivation from spatial and temporal candidates
  - Without sending any signaling bit by employing very simple SAD competition at both encoder and decoder
  - Used also as B-Skip MV



# Implementation details

- Employs the TMuC process for derivation of spatial median vector and temporal co-located vector
  - `colocated_from_I0_flag = 0` for temporal co-located vector derivation
  - If temporal co-located vector is “intra”, zero vector is used as co-located vector as an **available candidate**
- Derives two pairs of prediction samples with the spatial/temporal neighboring MV candidates
  - Current implementation is specific to status transition of reference picture lists driven by B300 random access/low delay conditions
- Select the best MV candidate by SAD competition using the two pairs of predictions, with completely the same process at both encoder and decoder
  - No need to perform RDO based decision at encoder to derive the best direct vector

# Performance Evaluation

- Software: TMuC v0.7.0
- Test conditions: B301
  - Disable CU merging and AMVP relative to B300
  - Only for Random Access & Low-Delay cases for HE condition

# R-D performance at Low-Delay condition

	BD-Rate[%]		
	Y	U	V
Average Class B	-0.2	-0.6	-0.6
Average Class C	-0.3	-0.3	-0.3
Average Class D	-0.6	-0.4	-0.4
Average Class E	-0.6	-1.8	-1.4
Average All	-0.4	-0.7	-0.6

# R-D performance at Random Access condition

	BD-Rate[dB]		
	Y	U	V
Average Class A	-2.3	-2.1	-2.0
Average Class B	-1.7	-1.1	-1.3
Average Class C	-1.5	-1.3	-1.4
Average Class D	-1.9	-1.7	-1.7
Average All	-1.8	-1.4	-1.5

# Encoding/Decoding time at Low-Delay condition

	Increasing Ratio of encoding time [%]	Increasing Ratio of decoding time [%]
Average Class B	0.07	5.38
Average Class C	0.14	4.22
Average Class D	0.18	5.20
Average Class E	0.32	6.69
Average all	0.16	5.29

# Encoding/Decoding time at Random Access condition

	Increasing Ratio of encoding time [%]	Increasing Ratio of decoding time [%]
Average Class B	-0.06	10.98
Average Class C	-0.29	16.32
Average Class D	0.39	11.69
Average Class E	1.14	11.45
Average all	0.30	13.07

# Discussions

- Encoder Complexity
  - No need to perform RDO based decision from multiple candidates as in AMVP process
- Decoder Complexity
  - Doubled memory access for B-skip/B-direct mode to obtain prediction block pairs for SAD competition
  - Computation for SAD competition
- Efficiency of adaptive selection of temporal MV candidate has been confirmed especially in sequences having stable background or uniform global motion
- Possible to share the same IP for direct vector derivation process at both encoder and decoder
  - Efficient for H/W codec development

# Conclusion

- Performance of IDVD has been verified in the TE1 framework
- Simplest DMVD model
  - Provide a guideline useful for further evaluation of other DMVD tools
- Recommendations
  - Continue further study on impact of IDVD within upcoming test model by establishing relevant TE/CE