



MITSUBISHI ELECTRIC RESEARCH LABORATORIES
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JCTVC-F591

Modified Selection of 4x4 Mode-Dependent Transforms

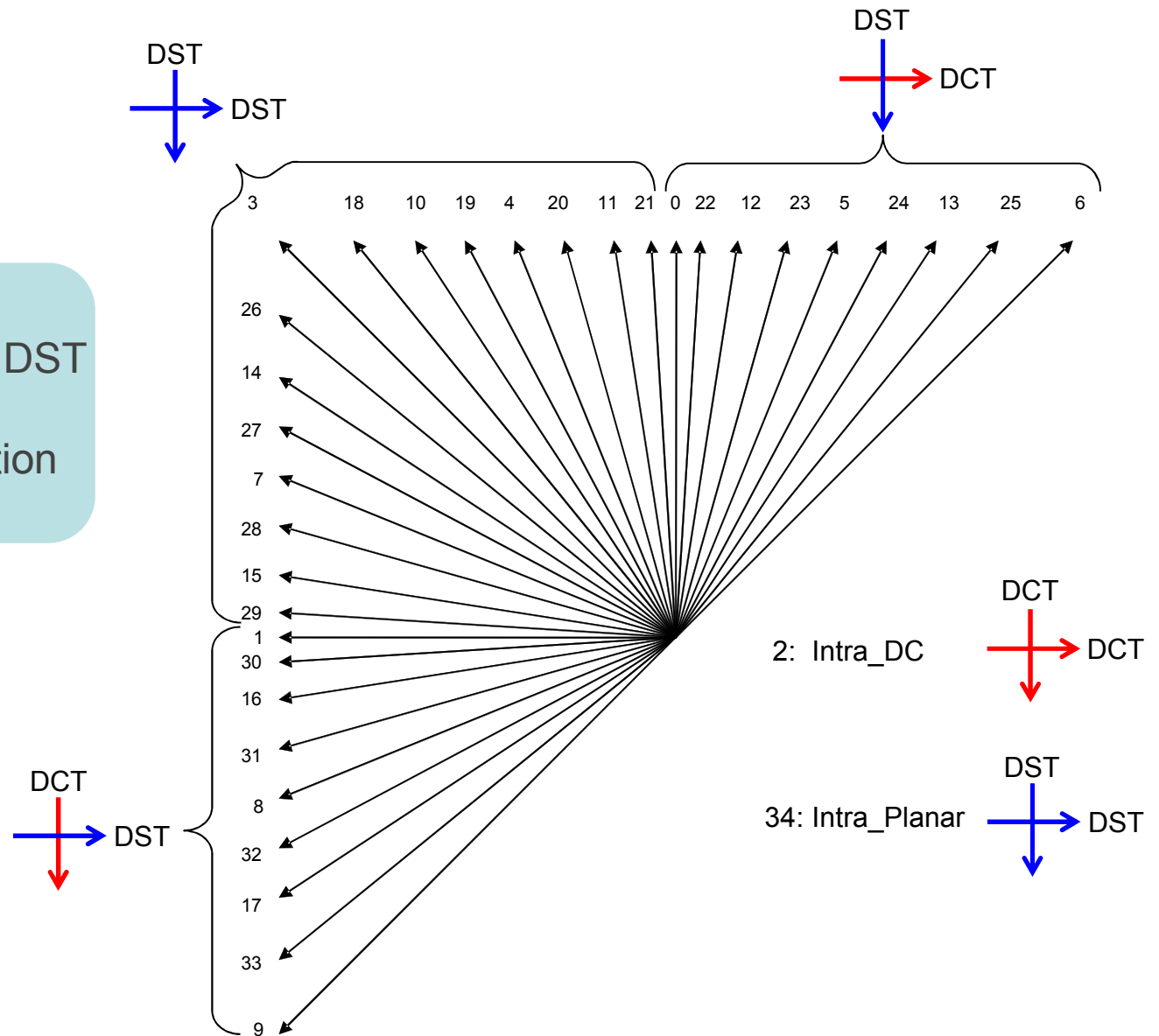
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4x4 DCT/DST mode mapping currently in HM 3.0

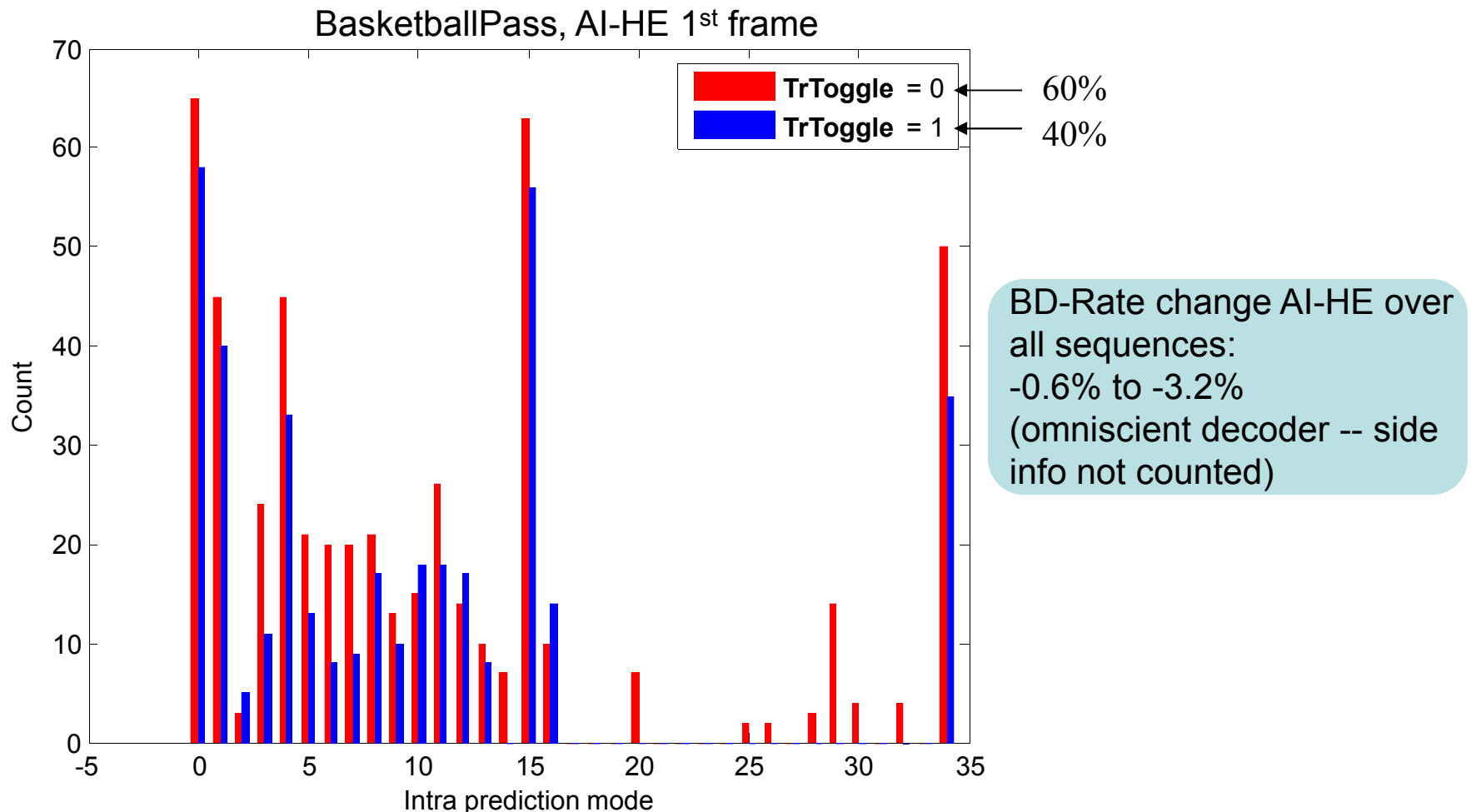
Image model \Rightarrow

For 2-D transform, apply DST along Intra prediction direction; DCT in \perp direction (for 4x4 TUs in HM 3.0)



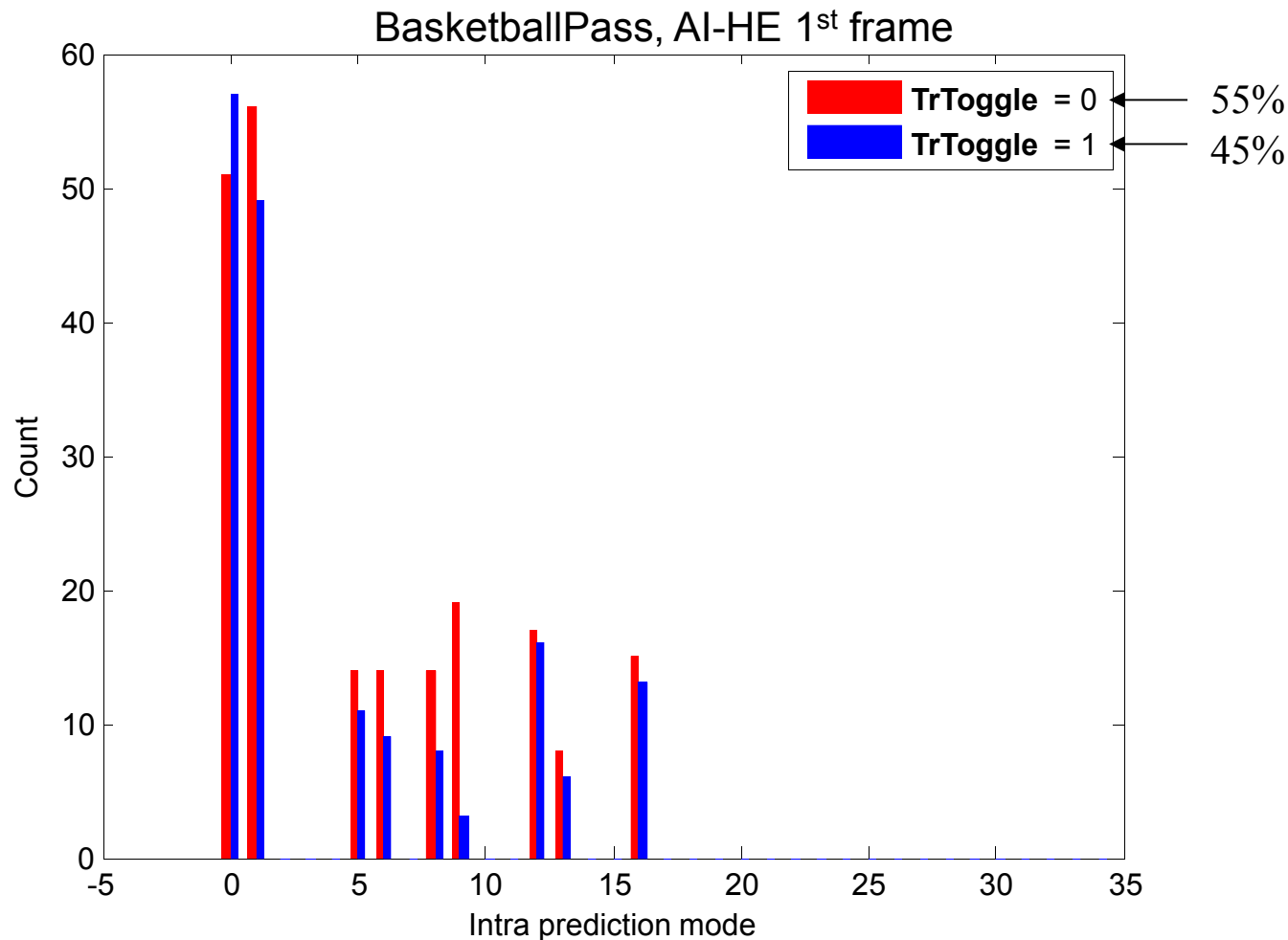
What if actual data doesn't match image model?

- Experiment: Choose between default mapping and inverted mapping.
- Mapping table entries inverted (XOR with 1); **ignore side info for now**.
- Decision to invert is applied over all applicable (nonzero cbf, 4x4, Luma, Intra, etc.) TUs in an Intra PU.



Proposed tool

- Side info too costly if flag sent for all Intra prediction modes.
- Apply method for 4x4 modes for which horiz. and vert. transforms differ
- Equivalent to a flag indicating a swap of DCT/DST directions



Performance summary

BD-Rate change (%) for proposed method; reference is HM 3.0

	All intra HE			All intra LC		
	Y	U	V	Y	U	V
Class A	0.0	0.3	0.3	0.0	0.3	0.4
Class B	0.0	0.5	0.5	0.0	0.6	0.6
Class C	-0.2	0.7	0.7	-0.1	0.8	0.7
Class D	-0.2	0.7	0.7	-0.2	0.8	0.8
Class E	0.1	0.5	0.5	0.1	0.5	0.5
Overall	0.0	0.5	0.5	0.0	0.6	0.6
Enc Time[%]	109%			114%		
Dec Time[%]	101%			102%		

	Random access HE			Random access LC		
	Y	U	V	Y	U	V
Class A	0.0	0.2	0.4	0.0	0.1	0.2
Class B	0.0	0.3	0.3	0.0	0.3	0.4
Class C	-0.1	0.4	0.3	-0.1	0.3	0.3
Class D	-0.1	0.1	0.4	-0.1	0.1	0.3
Class E						
Overall	-0.1	0.3	0.3	-0.1	0.2	0.3
Enc Time[%]	100%			99%		
Dec Time[%]	103%			74% (due to platform)		

Summary and Conclusions

- A good percentage of the 4x4 TUs could benefit from a transform toggle. Two main concepts presented here:
 - Uses existing mapping table: XOR output with one bit
 - Flag sent only for first applicable TU in PU. Remaining applicable TUs in that PU use the same flag (complete syntax available document).
- Next: merge with existing contributions to reduce side info and complexity:
 - combine toggle flag with cbf/split flag [JCTVC-E404]
 - Use embedding to eliminate extra flag bit [JCTVC-E428]
 - Use faster decision methods to compute flag [JCTVC-F229]
- Syntax can be used by others to signal TU data once/PU
- Recommendation: Further study, combine with above earlier contributions.