

Intra-prediction Mode Propagation for Inter-pictures



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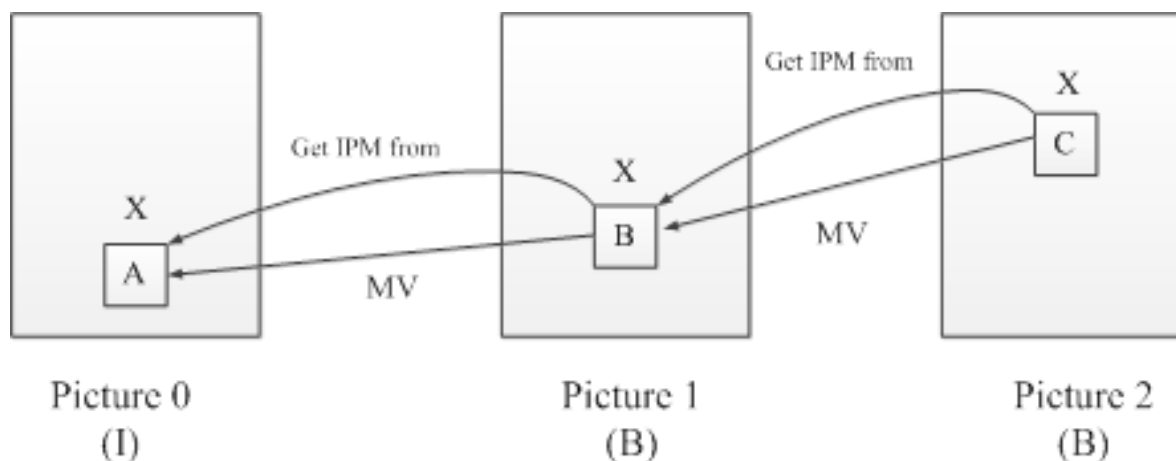
Introduction

Current Design in JEM

- A CU can be either inter-coded or intra-coded in an inter-picture
 - Intra-coded: Predicted by intra-prediction with an Intra-Prediction Mode (IPM)
 - No motion information in CU
 - Inter-coded: Predicted by inter-prediction with motion information
 - No IPM in the CU
- This uni-mode design has two problems
 - Temporal correlation and spatial correlation cannot be utilized at the same time
 - Inter-coded neighbouring blocks cannot be used to predict the IPM of an intra-coded CU in an inter-picture

Proposed: IPM Propagation (IPMP)

- IPM propagation is performed for each 4×4 sub-block in an inter-coded CU.
 - The propagated IPM is fetched from a reference block located with the MV
 - The reference block may be intra-coded or inter-coded. In the latter case, the propagated IPM of the reference block is further propagated



Proposed: An example of IPMP

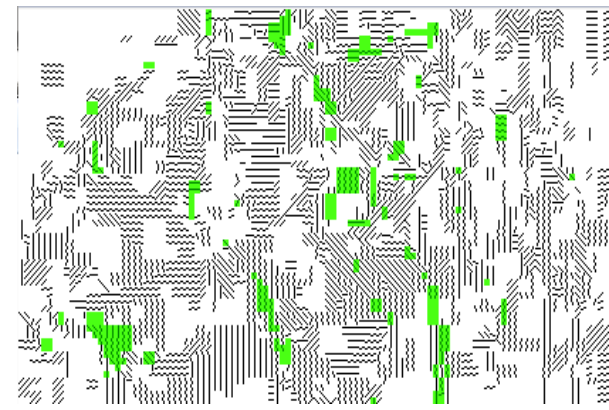
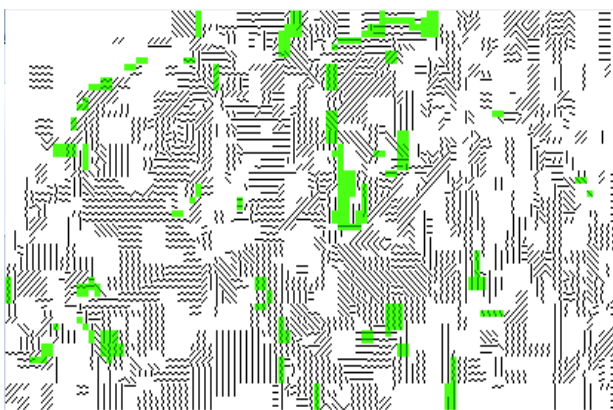
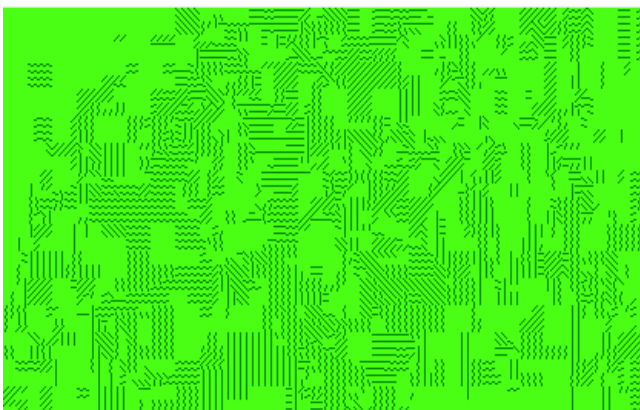
Frame 0 (I)



Frame 1 (B)



Frame 2 (B)

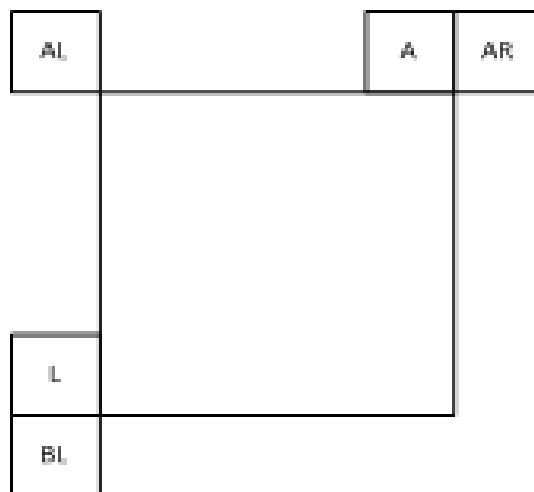


Usage of IPMP: Inter-intra-prediction

- With inter-intra prediction on the luma component
 - Prediction block $P1$ is generated using intra-prediction with the propagated IPM
 - Prediction block $P2$ is generated using inter-prediction with motion information
 - The final prediction block P is generated as the weighted sum of $P1$ and $P2$
$$P(x, y) = (w1(x, y) \times P1(x, y) + w2(x, y) \times P2(x, y)) \gg s$$
$$w1(x, y) + w2(x, y) = 2^s$$
 - the weighting values are calculated by a quadratic function
$$w1(x, y) = (a \times x^2 + b \times y^2 + c \times x \times y + d \times x + e \times y + f) \gg s$$
 - The parameters are off-line trained.
- For chroma coding, $P1$ is always generated with the MMLM mode
- The inter-intra prediction can be applied to merge-mode or FRUC-mode
 - For merge-mode, up to four inter-intra merge candidates are inserted, which copy the motion information of normal merge candidates previously inserted
 - For FRUC-mode, a flag is signaled to indicate whether to use inter-intra prediction

Usage of IPMP: IPM coding for inter-pictures

- Propagated IPMs of neighboring blocks are used to construct the Most Probable Mode (MPM) list for inter-pictures
 - The checking order of five spatial neighbors (L, A, BL, AR, AL) is
 - IPMs of L and A if they are intra coded,
 - Propagated IPMs of L and A if they are available,
 - IPM of BL, AR and AL if they are intra-coded,
 - Propagated IPMs of BL, AR and AL if they are available.



Experimental Results on JEM-7.1

CTC, RA

	Y	U	V	EncT	DecT
Class A1	-1.0%	-1.7%	-2.3%	111%	111%
Class A2	-0.5%	-1.6%	-1.2%	108%	105%
Class B	-0.4%	-0.8%	-0.2%	107%	104%
Class C	-0.3%	-0.8%	-0.8%	110%	105%
Class D	-0.1%	-0.4%	-0.7%	111%	103%
Class E					
Overall (Ref)	-0.5%	-1.0%	-1.0%	109%	106%

Summary

- Intra-prediction mode propagation is proposed
- It can be used in two aspects:
 - Inter-intra prediction
 - MPM list construction for inter-pictures
- 0.5%, 1.0% and 1.0% BD rate savings on Y, Cb and Cr components respectively for RA configuration

Thank you!