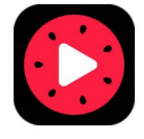


AN IMPROVEMENT TO INTRA BLOCK COPY IN VVC WITH REFERENCE AREA REDEFINITION

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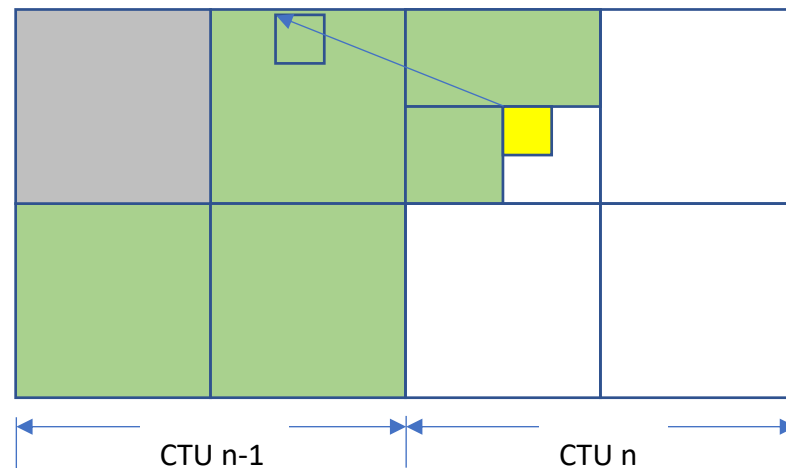


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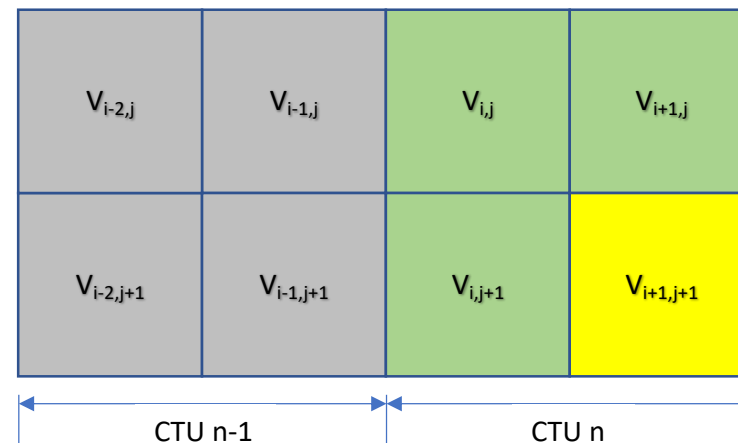
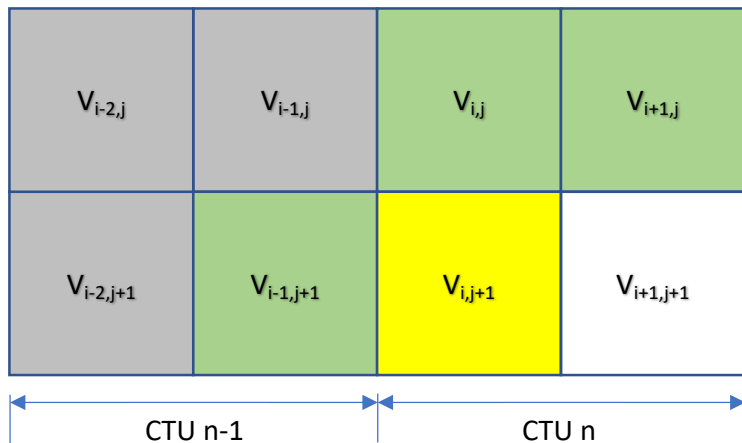
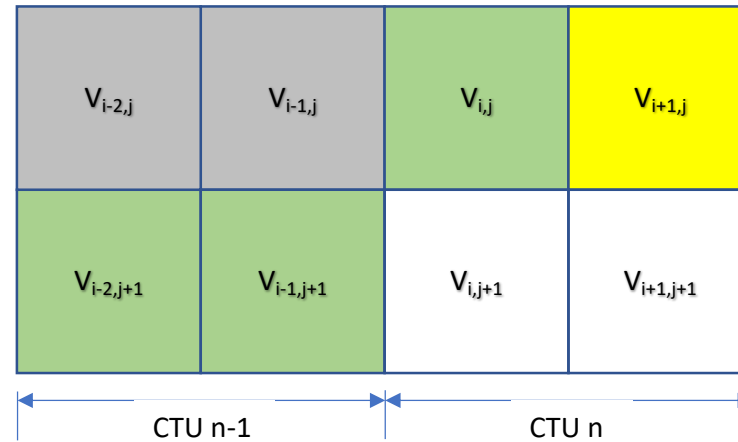
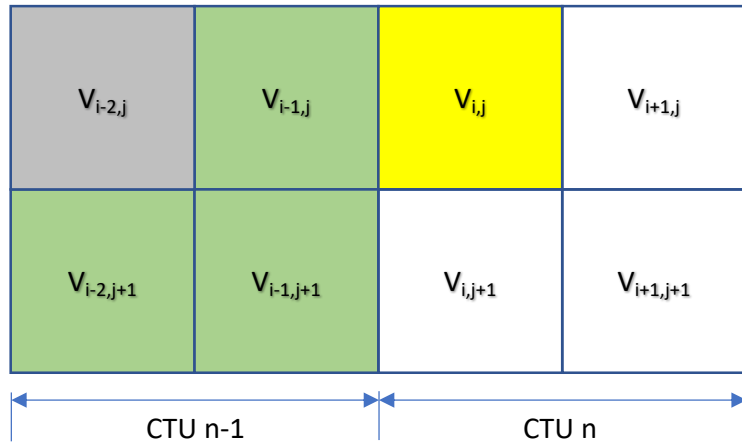





Intra block copy (IBC) in VVC

- IBC - motion compensation within the current picture
 - Use reconstructed samples in the same picture to form the prediction for the current block
 - Effective for screen content coding
- IBC in VVC
 - VVC uses Virtual Pipeline Data Unit (VPDU) as a base unit in hardware pipeline design
 - Reference samples are restricted to the current VPDU + 3 neighboring VPDUs
 - VPDUs, e.g. in 64x64 luma size, are stored in on-chip memory. One CTU is consist of 4 VPDUs.
 - The design is a tradeoff between on-chip memory size and coding efficiency

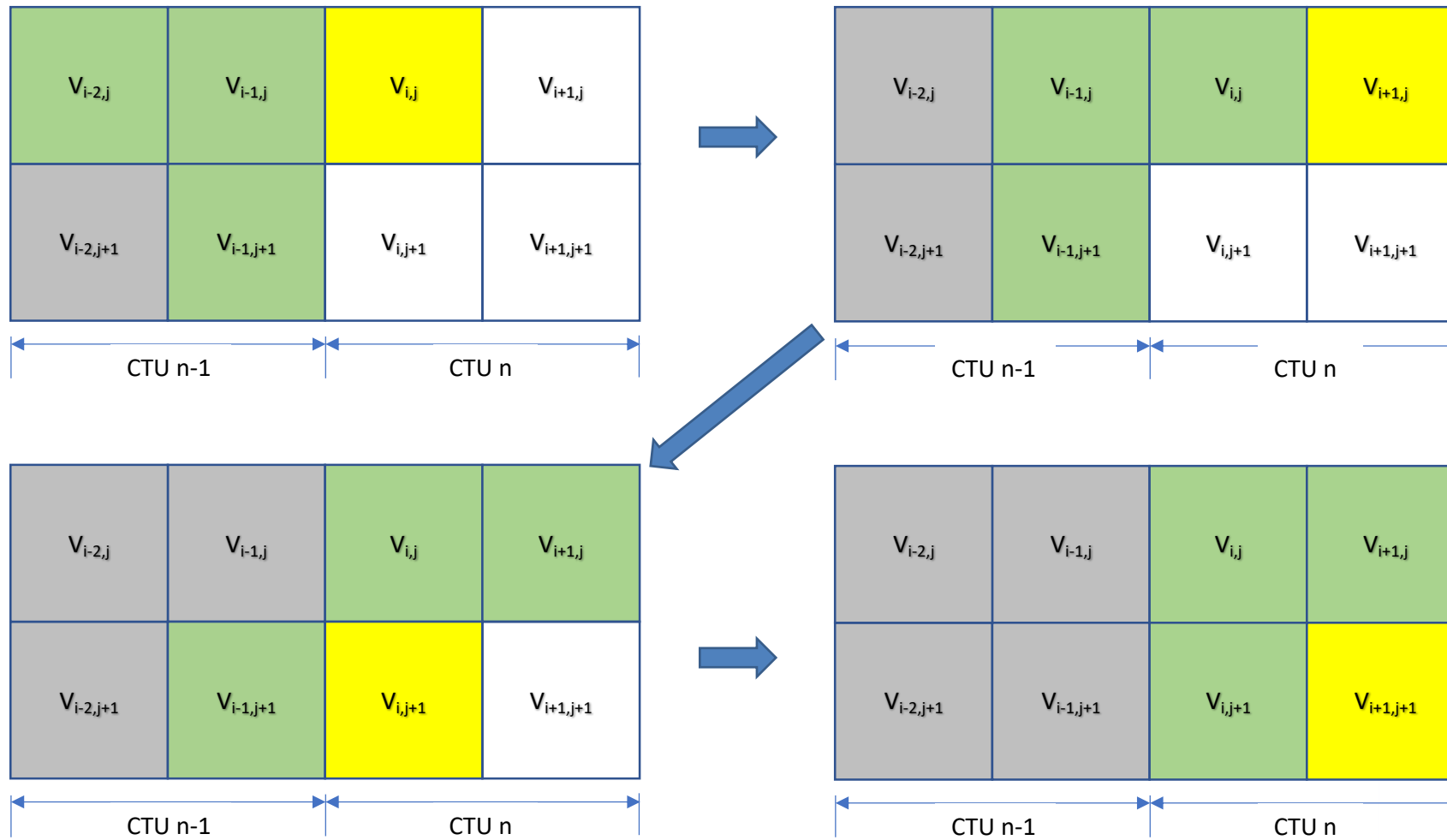


Reference Area for IBC in VVC



-  Current VPDU
-  Reference area
-  Invalid for reference

Propose to Redefine Reference Area



Average Prediction Distance and BD-rate Results

VPDU	Average distance in the VVC scheme	Average distance in proposed scheme
$V_{i,j}$	2	1.67
$V_{i+1,j}$	2.67	2
$V_{i,j+1}$	1.33	1.33
$V_{i+1,i+1}$	1.33	1.33

	Sequence	All-intra			Random-access			Low-delay B-picture		
		BD-rate(Y)	BD-rate(U)	BD-rate(V)	BD-rate(Y)	BD-rate(U)	BD-rate(V)	BD-rate(Y)	BD-rate(U)	BD-rate(V)
ClassF	ArenaOfValor	-0.07%	-0.13%	-0.12%	0.02%	-0.02%	0.06%	-0.01%	0.27%	0.17%
	BasketballDrillText	-0.09%	-0.05%	0.04%	0.06%	0.20%	-0.48%	-0.06%	-0.33%	0.20%
	SlideEditing	-1.67%	-1.69%	-1.80%	-1.55%	-1.78%	-1.51%	-0.46%	-0.46%	-1.06%
	SlideShow	-1.16%	-0.94%	-0.39%	-0.63%	-0.72%	-0.80%	-0.35%	2.85%	-1.06%
classTGM	FlyingGraphic	-1.27%	-1.34%	-1.30%	-0.58%	-0.54%	-0.56%	-0.33%	-0.31%	-0.22%
	Desktop	-2.48%	-2.46%	-2.55%	-1.25%	-1.46%	-1.37%	-0.24%	-0.23%	-0.25%
	Console	-1.51%	-1.38%	-1.39%	-0.74%	-0.80%	-0.84%	-0.62%	-0.52%	-0.68%
	ChineseEditing	-1.11%	-1.04%	-1.02%	-0.84%	-0.75%	-0.93%	-0.49%	-0.34%	-0.54%
	Average encoding time ratio	1.02			0.99			1.01		
	Average decoding time ratio	1.00			1.02			1.01		

Conclusions and Further Work

- By redefining the reference are for IBC, the coding efficiency can be improved.
 - *Due to a shorter prediction distance*
 - *No change of the on-chip memory size*
- Is the pattern optimal?
 - *Seems so*

Thanks