

JCTVC-G440

Modified probability model update for complexity reduction

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Summary

- **CABAC in HM4**

- Context Model (CM)
 - Use the spatial correlation of neighboring data
- Probability model update (PMU)
 - Use probability adaptation bin-by-bin

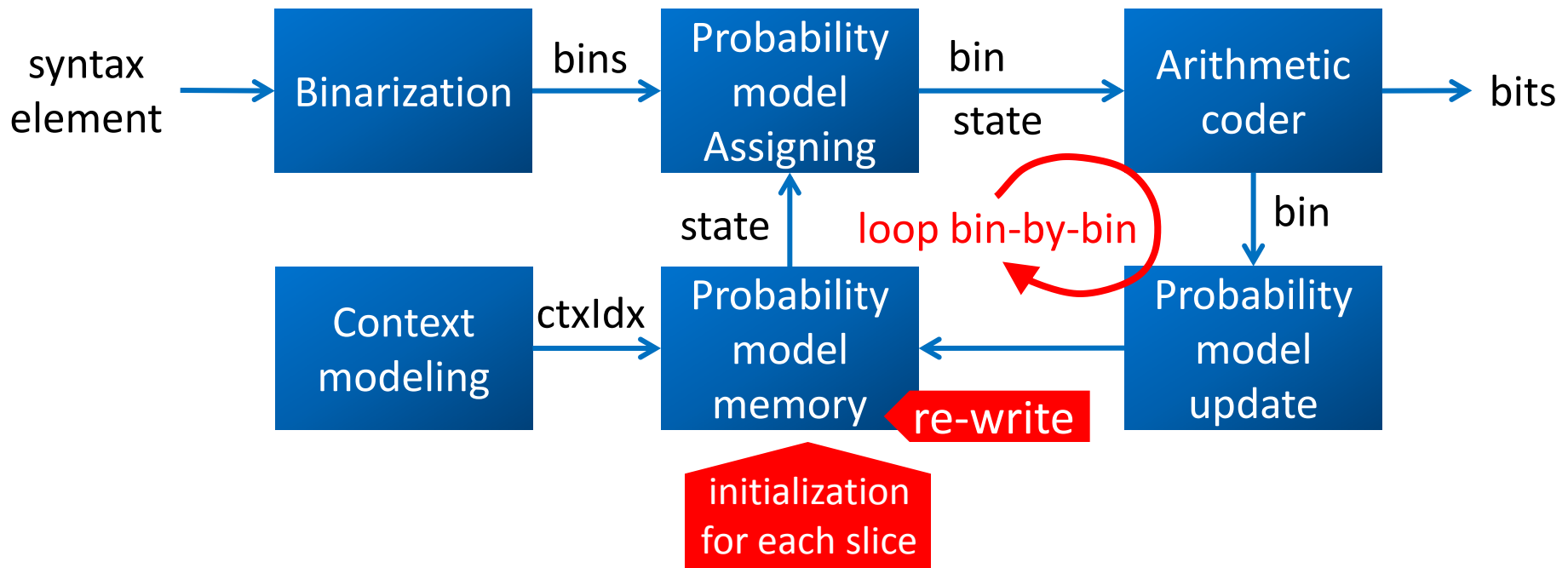
- **This contribution**

- Evaluate coding efficiency of probability model update for syntax elements
- Propose recommended combination of PMU on/off → Partial PMU
 - Disabling PMU for **six** syntax elements
- Result:
 - less than 0.1% BD-rate performance change for four(IO/RA/LB/LP) HE conditions.
 - 0 – 1 % decoding time reduction

Probability model update (PMU) in HM4

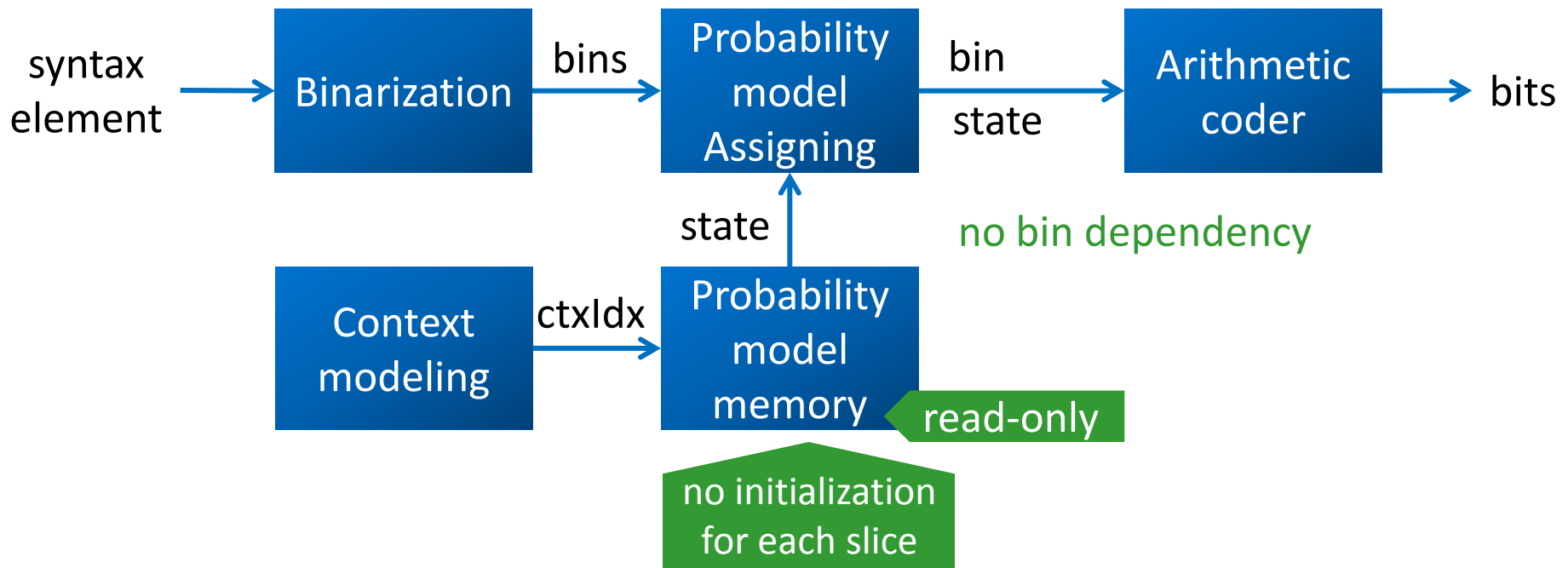
- **Probability Model adaptation bin-by-bin**

- needs initialization of probability model for each slice
- bin dependency for one syntax element decoding
- needs re-writability for probability model memory



Proposal: Partial PMU

- **Disabling PMU brings complexity reduce**
 - no probability model initialization for each slice
 - no bin dependency
 - consider probability model memory as read-only



Proposal: Partial PMU

- **PMU is disable for syntax elements for all slice types.**
 - mpm_idx
 - rem_intra_luma_pred_mode
 - sao_split_flag
 - sao_type_idx
 - split_coding_unit_flag
 - coeff_abs_level_greater2_flag

Simulation results

- **HM 4.0 (HM4.0-dev-bugfix, rev1358) with four HE common configurations(JCTVC-F900)**

	IO-HE			RA-HE			LB-HE			LP-HE		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A	-0.04	0.10	0.13	0.27	0.57	-0.43						
Class B	0.04	0.17	0.18	0.04	0.14	0.06	0.03	-0.13	-0.49	0.02	0.16	-0.41
Class C	-0.03	0.03	0.01	-0.03	-0.08	-0.09	-0.02	-0.08	-0.14	-0.05	-0.16	-0.18
Class D	-0.13	-0.18	-0.19	0.05	0.03	-0.30	0.01	0.50	0.17	0.04	-0.27	-0.23
Class E	-0.04	0.19	0.31				0.36	-0.85	0.84	0.33	-0.36	-0.24
All	-0.04	0.06	0.08	0.08	0.16	-0.18	0.08	-0.10	0.01	0.07	-0.12	-0.28
Enc Time	100			100			100			100		
Dec Time	100			100			99			99		

- **Complexity:** **0 – 1 % decoding time reduction**
- **BD-Rate:** **negligible change (less than 0.1%)**

Simulation results (cond.)

- Results of disabling PMU for each syntax
- HM 4.0 (HM4.0-dev-bugfix, rev1358) with four HE common configurations(JCTVC-F900)

BD-rate Y [%]	IO-HE	RA-HE	LB-HE	LP-HE
mpm_idx	-0.02	n/a	n/a	n/a
rem_intra_luma_pred_mode	-0.10	n/a	n/a	n/a
sao_split_flag	0.00	0.00	0.00	0.00
sao_type_idx	0.00	0.00	0.01	0.03
split_coding_unit_flag	0.01	0.02	0.05	0.05
coeff_abs_level_greater2_flag	-0.04	0.06	0.03	0.03

Conclusion

- **Modified probability model update**

- Partial PMU : disabling PMU for some syntax elements
 - advantage of disabling PMU
 - no PM initialization, no bin dependency and read-only
 - six syntax elements
 - mpm_idx, rem_intra_luma_pred_mode, sao_split_flag, sao_type_idx, split_coding_unit_flag and coeff_abs_level_greater2_flag

- **Simulation results**

- four HE common conditions (JCTVC-F900)
 - Complexity: 0 – 1 % decoding time reduction
 - BD-Rate: negligible change

- **Recommendation**

- Further discussion and tests of other syntax elements in CE