

# Fixed Probability coding for Intra Mode Coding

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## Motivation

- ✓ To reduce complexity for intra mode parsing process
- ✓ To consider fixed probability coding in addition to bypass coding

## Current design of HEVC

- ✓ Dependency of neighbouring data is in current intra mode parsing (e.g., NumCand MPM >1 or not should be known before the parsing )
  - ✓ Single context is used for all bins of intra mode  
→ it may not so good for probability learning system.
  - ✓ Fixed probability coding is only allowed with even probability
- The complexity reduction could be done  
by Fixed probability or bypass coding of intra mode

## Proposed Solution for 1<sup>st</sup> part

### Current HM/WD

Value of rem_intra_luma_pred_mode	Bin string
less than 32	FL, cMax = cNumBins
32	111110
33	111111

# If NumMPM Cand >1, max number of rem\_intra\_luma\_pred\_mode is „32“ instead of „33“ since the max number is driven by „intra\_luma\_pred\_mode - NumMPM Cand“

Same issue is raised by HKUST (JCTVC-F190)

### Proposed (1) Removing that redundant bin

Value of rem_intra_luma_pred_mode	Bin string
less than 32 or equal to 32 (with NumMPM Cand>1)	FL, cMax = cNumBins
32	111110
33	111111

## Proposed Solution for 2<sup>nd</sup> part Fixed Probability

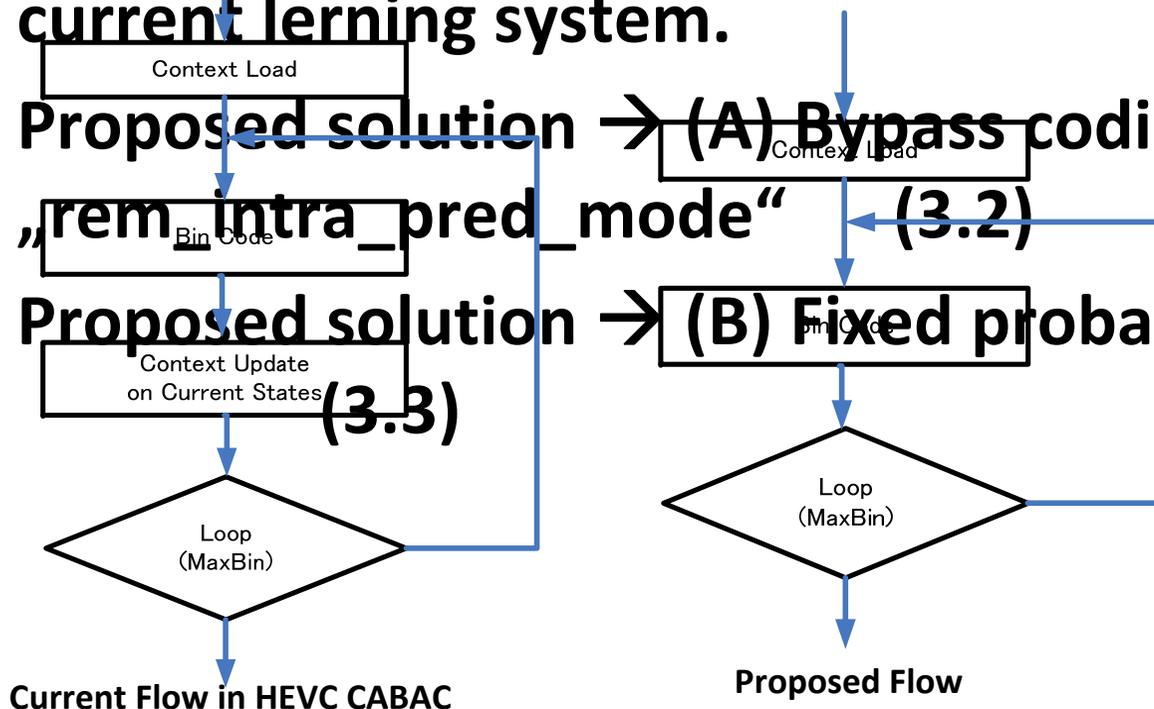
### Current HM/WD

rem\_intra\_luma\_pred\_mode : One context is used for all bins continuously.

The probability of the symbol is not so efficient for current learning system.

Proposed solution → (A) Bypass coding for „rem\_intra\_pred\_mode“ (3.2)

Proposed solution → (B) Fixed probability coding for that (3.3)



## Advantage of proposed solution

- ✓ To remove redundant bin situation from current binarization
- ✓ To increase throughput for parsing process

## Simulation Results

	remove redundant bin			bypass			Fixed Probability		
	All Intra HE			All Intra HE			All Intra HE		
	Y	U	V	Y	U	V	Y	U	V
<b>Overall</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>-0.1</b>	<b>0.0</b>	<b>0.0</b>
Enc Time[%]	100%			99%			100%		
Dec Time[%]	100%			98%			100%		

	remove redundant bin			bypass			Fixed Probability		
	Random Access HE			Random Access HE			Random Access HE		
	Y	U	V	Y	U	V	Y	U	V
<b>Overall</b>	<b>0.0</b>	<b>0.0</b>	<b>-0.1</b>	<b>0.0</b>	<b>-0.1</b>	<b>-0.2</b>	<b>-0.1</b>	<b>-0.1</b>	<b>-0.2</b>
Enc Time[%]	100%			100%			100%		
Dec Time[%]	102%			101%			102%		

# NOTE: Current initial context values is used for Fixed Probability

**By our proposal,  
no context updating for intra mode coding  
is realized without any performance drop.**

**Context updating delay is proposed by JCTVC-E225, F552.  
(inifinite delay is equal to fixed probability)**

Fixed probability of I-slice coefficient level coding show  
small gain (0.2% for All Intra HE) compared to F552  
by cross-verification of F552 (JCTVC-F654)

## **Recommendation**

**To be adopted simple intra mode coding in HM/WD.**

**To be considered fixed probability coding with not even probability  
in CE/AHG.**