JCTVC-F092: Coding tree pruning based CU early termination

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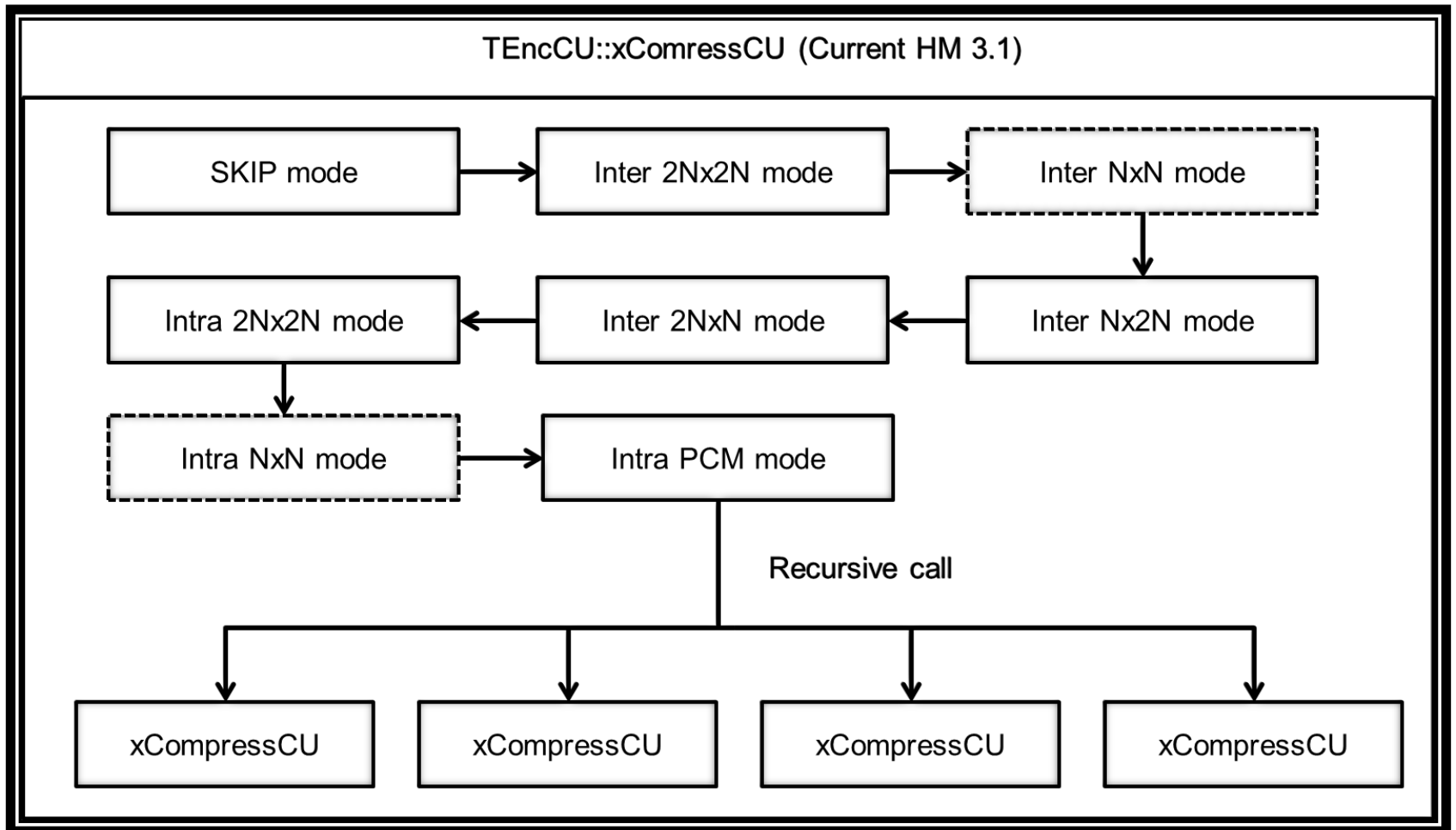
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Overall Summary

- Coding tree pruning based CU early termination is suggested for reducing the encoding time in the HEVC test model.

- This contribution proposes a simple tree-pruning algorithm that exploits the observation where the sub-tree computations can be skipped if the best prediction mode of the current CU is SKIP mode

- The experimental results showed that the proposed method achieved about 42% reduction in encoding time compared to the HEVC test model 3.1 encoder with only a negligible loss of luma BD-bitrate (i.e., < 0.6%) and a small gain of chroma BD-bitrate (up to 0.8%).

Outline

- Background

- Proposed encoder modifications

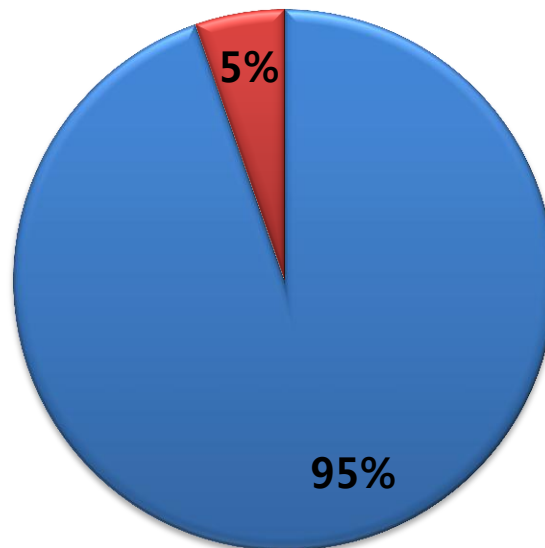- Simulation Results

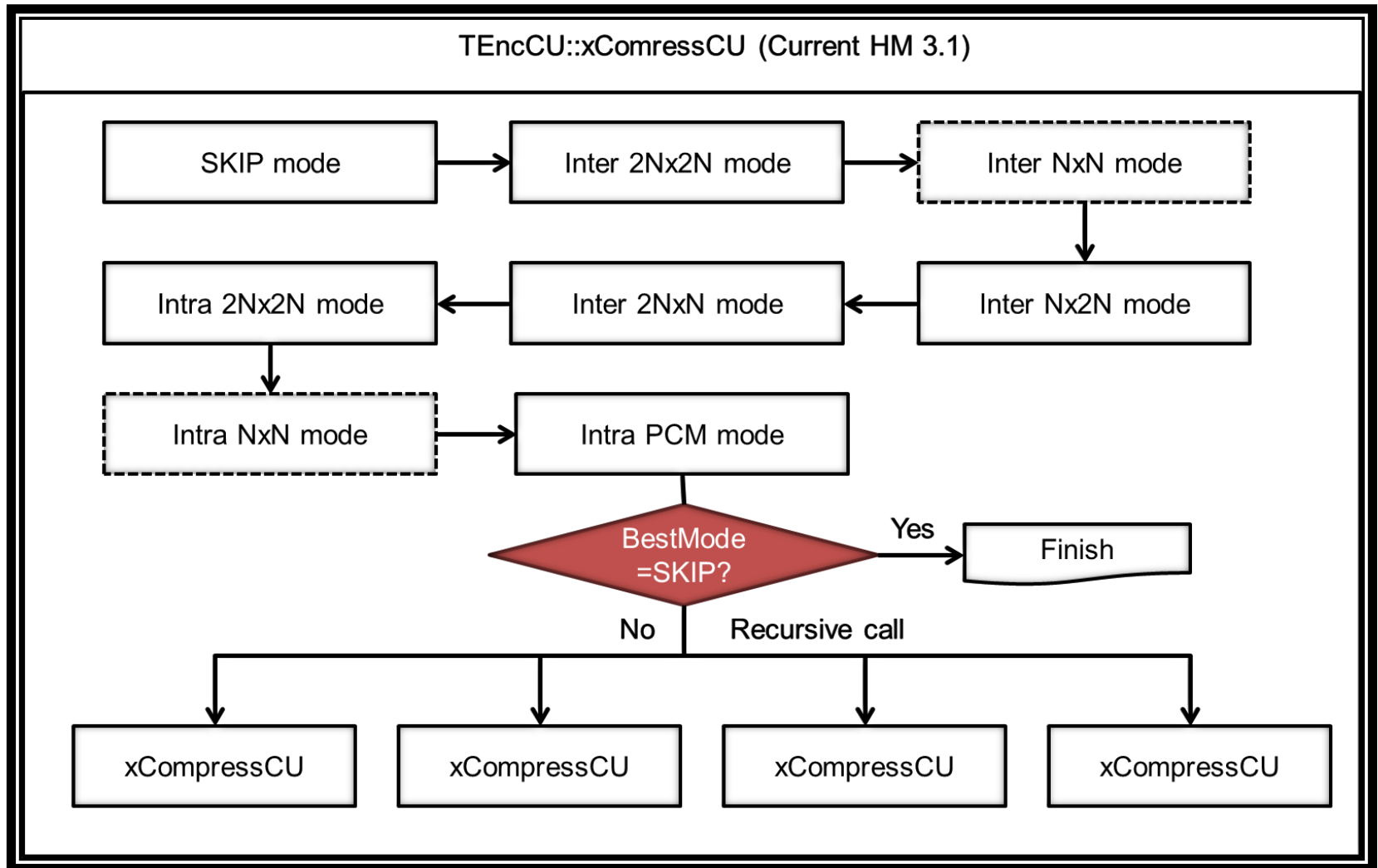# Background (1)

Background (2)

The conditional probability of the CU depth selection
- Candidates: t-depth and $(t+1)$-depth
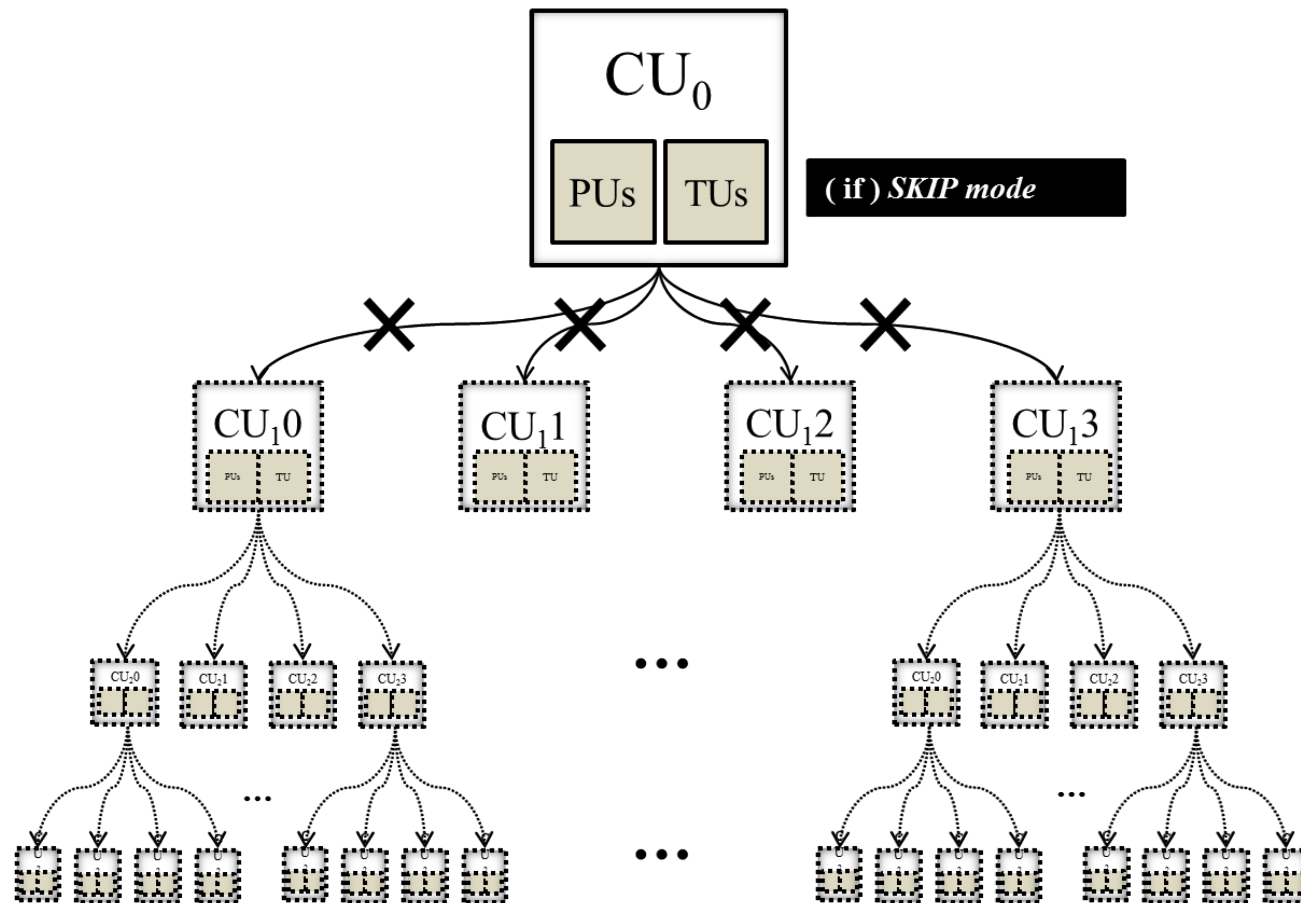- Condition: the current CU (t-depth) selects SKIP mode as the best
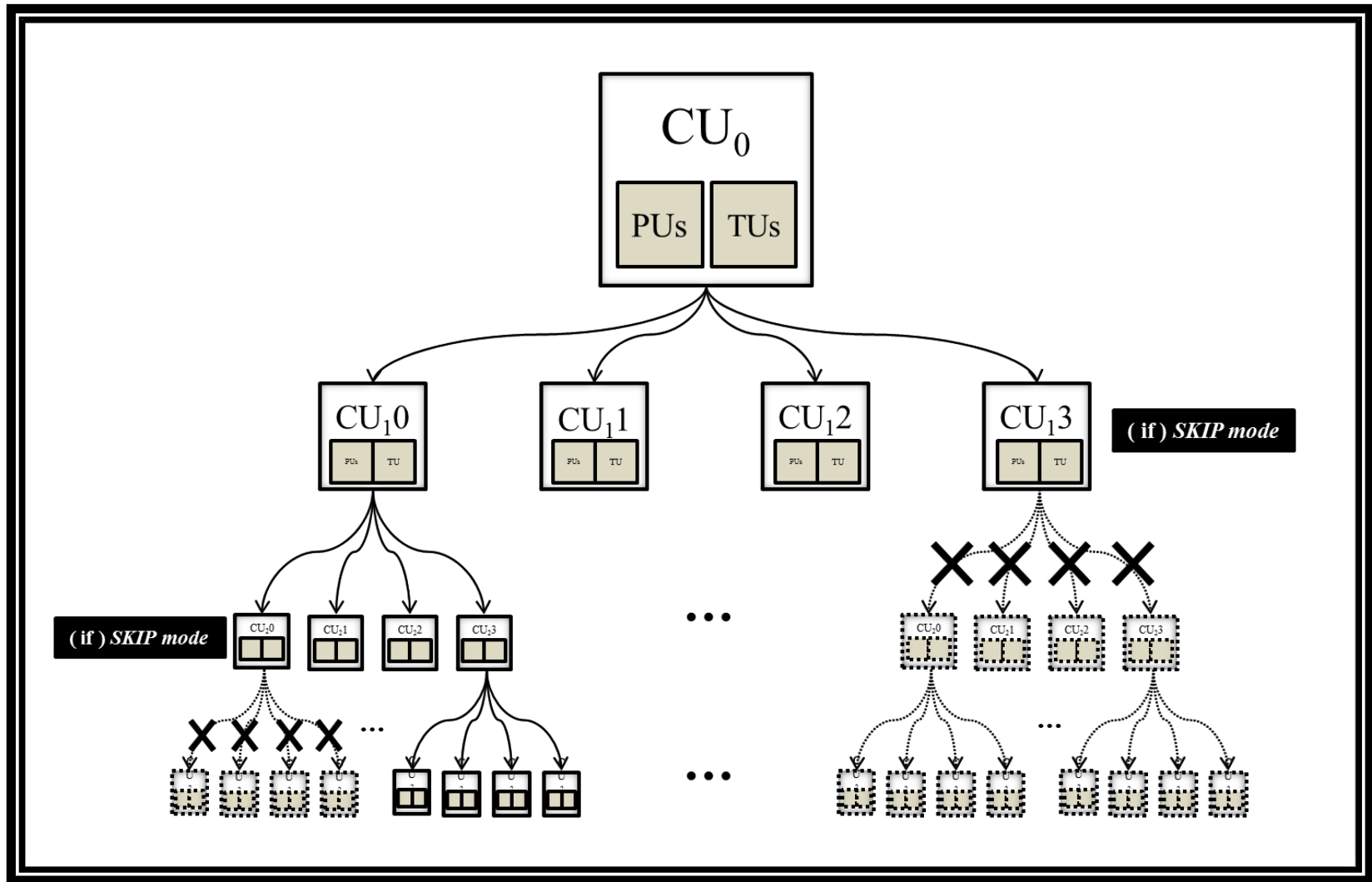
■ t (Current-depth)   ■ t+1 (Sub-depth)

5%

95%

Proposed encoder modifications

Behavior example (1)

Behavior example (2)

Simulation Results (1)

Random Access & Low delay B (Software: HM 3.1)

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.4	-0.5	-0.5	0.4	-0.5	-0.6
Class B	0.6	-0.5	-0.6	0.7	-0.5	-0.5
Class C	0.5	-0.2	-0.2	0.7	-0.2	-0.1
Class D	0.5	-0.4	-0.3	0.7	-0.5	-0.2
Class E						
Overall	**0.5**	**-0.4**	**-0.4**	**0.6**	**-0.4**	**-0.4**
Enc Time[%]	**62%**			**52%**		
Dec Time[%]	**100%**			**100%**		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.3	-0.3	-0.3	0.5	-0.3	-0.4
Class C	0.3	-0.2	-0.2	0.3	-0.1	0.1
Class D	0.2	-0.3	-0.3	0.3	-0.9	-0.6
Class E	0.5	-0.3	-1.1	0.4	-0.7	-0.6
Overall	**0.3**	**-0.3**	**-0.4**	**0.4**	**-0.5**	**-0.4**
Enc Time[%]	**63%**			**54%**		
Dec Time[%]	**101%**			**101%**		

Simulation Results (2)

Low delay P (Software: HM 3.1)

	Low delay P HE			Low delay P LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.5	-0.7	-0.8	0.6	-0.6	-1.0
Class C	0.3	-0.5	-0.3	0.3	-0.4	0.0
Class D	0.3	-0.6	-0.2	0.4	-0.9	-1.2
Class E	0.4	-1.8	-1.5	0.4	-1.4	-1.5
Overall	**0.4**	**-0.8**	**-0.7**	**0.4**	**-0.8**	**-0.9**
Enc Time[%]	**62%**			**56%**		
Dec Time[%]	**99%**			**100%**		

Conclusion

- In this contribution, we proposed a fast CU decision method for HEVC by early determination of the CU size based on coding tree pruning

- The proposed method yielded a reduction in encoding time of approximately 42% reduction in encoding time compared to the HEVC test model 3.1 encoder with only a negligible loss of luma BD-bitrate (i.e., < 0.6%) and a small gain of chroma BD-bitrate (up to 0.8%).

- The proposed method does not change a syntax.

- It is recommended to adopt this proposal in HM encoder design