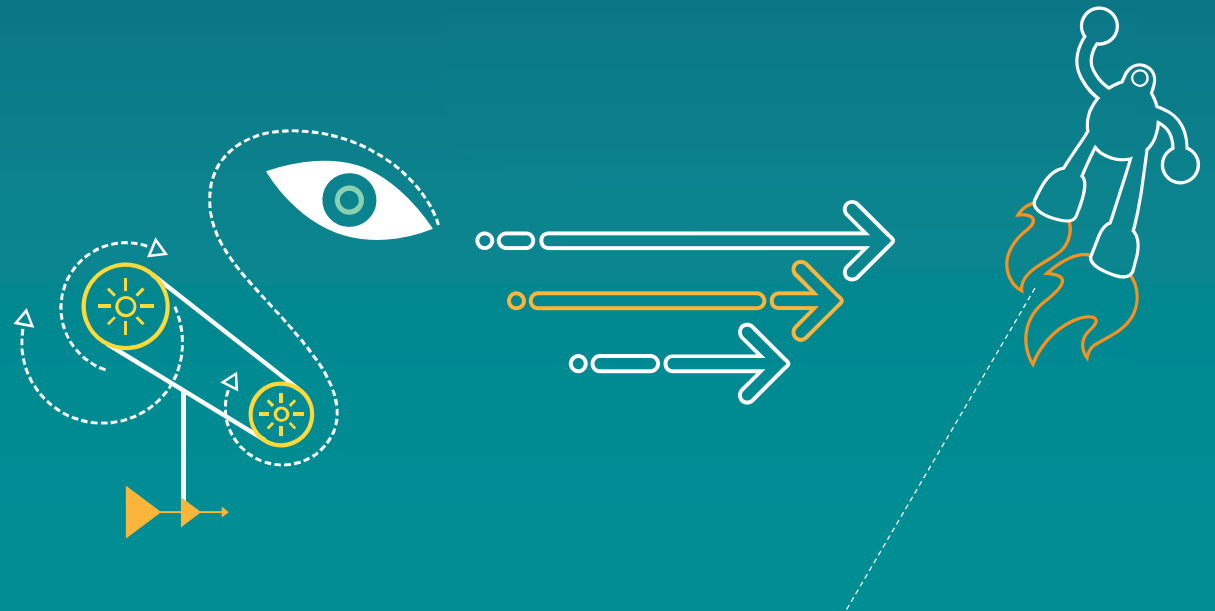


Chao Pang, Vadim Seregin, Marta Karczewicz

---

# Non-CE2: Zero merging candidates derivation for Intra BC/Inter signalling unification

---



---

# Intra BC/Inter signaling unification

- In CE2 Test 1, Intra BC/Inter signalling unification is investigated.
- Current picture is added to the reference picture list.
- Intra BC can be differentiated from the conventional inter by checking whether the reference picture is the current picture.
- Zero merging candidates are used in case the merge candidate list is not full; however, zero MVs are always invalid for Intra BC.

---

# Proposed method

- For zero merging candidates, the derivation process for reference indices is kept the same as in HEVC;
- When the reference picture is the current picture, predefined MVs, instead of zero MVs, are used;
  - 5 predefined MVs,  $\{(-4 * CUs, 0), (-8 * CUs, 0), (0, -4 * CUs), (0, -8 * CUs), (-4 * CUs, -4 * CUs)\}$ .
- The proposed method only changes the MVs in zero merging candidates for Intra BC.

# Experimental results

## 4:4:4 lossy coding in CE2 Test 1

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.6%	-2.0%	-2.0%	-2.2%	-4.0%	-3.9%	-2.3%	-3.8%	-3.7%
RGB, mixed content, 1440p & 1080p	-0.7%	-1.5%	-1.6%	-0.7%	-2.2%	-2.4%	-0.9%	-2.5%	-2.5%
RGB, Animation, 720p	0.0%	0.0%	0.1%	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	-0.2%
RGB, camera captured, 1080p	0.1%	0.0%	0.1%	-0.2%	-0.1%	-0.2%	0.1%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.7%	-2.0%	-2.2%	-2.4%	-4.0%	-4.3%	-2.5%	-3.9%	-4.1%
YUV, mixed content, 1440p & 1080p	-0.6%	-1.7%	-1.7%	-0.9%	-2.7%	-2.8%	-1.4%	-3.9%	-4.2%
YUV, Animation, 720p	0.0%	0.0%	-0.1%	-0.2%	-0.3%	0.0%	0.0%	0.2%	0.2%
YUV, camera captured, 1080p	0.1%	0.1%	0.1%	-0.2%	0.0%	-0.1%	0.0%	0.0%	0.2%
Enc Time[%]	117%			103%			102%		
Dec Time[%]	102%			96%			102%		

## 4:4:4 lossy coding with proposed method

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-1.2%	-2.7%	-2.6%	-2.4%	-4.2%	-4.2%	-2.4%	-3.7%	-3.6%
RGB, mixed content, 1440p & 1080p	-0.8%	-1.4%	-1.5%	-0.9%	-2.3%	-2.4%	-1.1%	-2.3%	-2.6%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	-0.2%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	-0.3%	-0.1%	-0.2%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-1.6%	-2.9%	-3.0%	-2.6%	-4.3%	-4.4%	-2.4%	-4.0%	-4.0%
YUV, mixed content, 1440p & 1080p	-1.1%	-2.0%	-2.1%	-1.2%	-3.0%	-3.3%	-1.4%	-4.0%	-4.2%
YUV, Animation, 720p	-0.1%	-0.3%	-0.3%	-0.2%	-0.7%	-0.3%	0.0%	-0.2%	-0.1%
YUV, camera captured, 1080p	0.0%	-0.1%	-0.1%	-0.2%	-0.2%	-0.2%	-0.1%	0.1%	-0.1%
Enc Time[%]	109%			103%			102%		
Dec Time[%]	98%			96%			100%		

---

# Discussion on Intra BC constraints

- In current SCC, the following constraints applied for Intra BC:
  - The reference block should be within the same slice/tile.
  - The reference block cannot overlap with current CU.
  - The whole reference block should be in the causal neighborhood.
  - The reference block should be within a certain region due to the parallelization implementation consideration.
  - When constrained intra prediction is enabled, the reference block cannot include any pixel coded with the conventional inter mode.
- To avoid nonconforming bitstreams, two possible solutions.
  - At decoder side, convert the final BV to a valid BV if possible.
  - Replace the unavailable pixels with predefined values, such as 0, or  $1 \ll (B - 1)$ .

---

# Conclusions

- Proposed zero merging candidate derivation method
  - Used for Intra BC/Inter signalling unification.
  - Use predefined MVs for zero merging candidate when the reference picture is the current picture.
- Recommend to be adopted if Intra BC/Inter signalling is unified.