



JVET-X0151

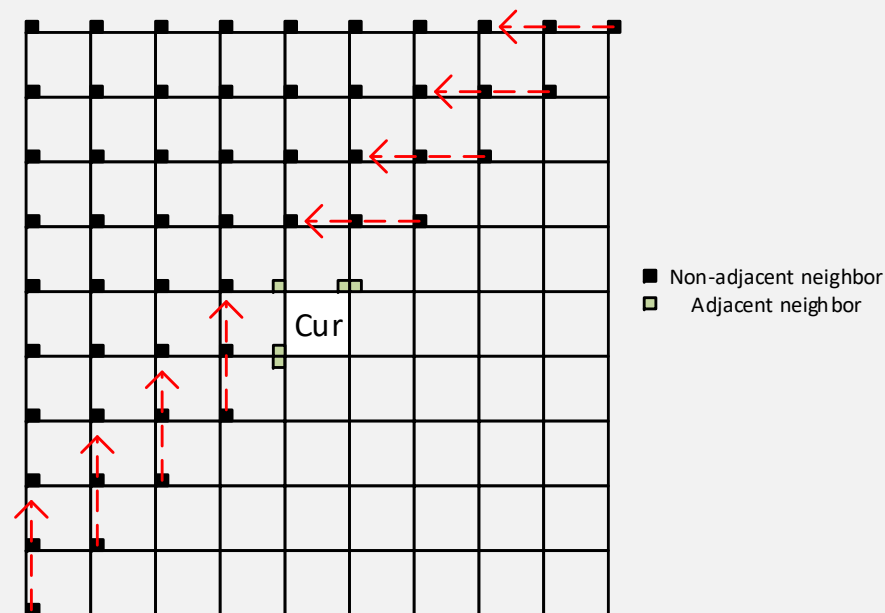
# AHG12: NON-ADJACENT SPATIAL NEIGHBORS FOR AFFINE MERGE MODE

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- Background
  - In VVC, only adjacent spatial neighbors are considered for regular merge mode and affine merge mode.
  - In ECM2.0, non-adjacent spatial candidates are included into merge candidate list.
- It is proposed to use non-adjacent spatial neighbors for affine merge mode.
  - Non-adjacent inherited affine merge candidates
  - Non-adjacent constructed affine merge candidates

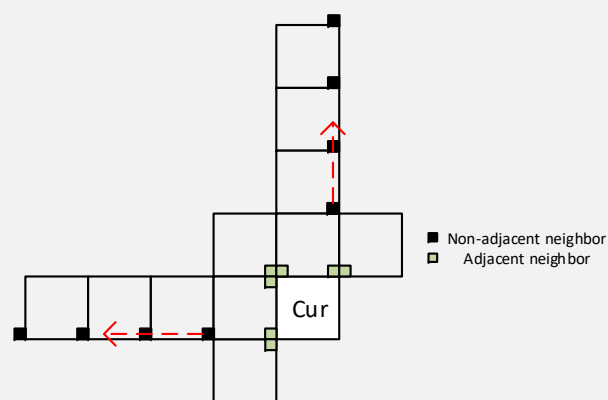
# Proposal

- Non-adjacent neighbors for inherited affine merge candidates
  - Distance of non-adjacent neighbors to one CU is defined based on the width/height of the CU
  - The checking order of non-adjacent spatial neighbors:
    - **Distance:** from near to far
    - **Direction:** Bottom-to-up and right-to-left for left and above neighbors
    - At a specific distance, **the first available neighbor** from each side is selected.
  - The core derivation is kept **exactly the same** as the existing affine inherited merge

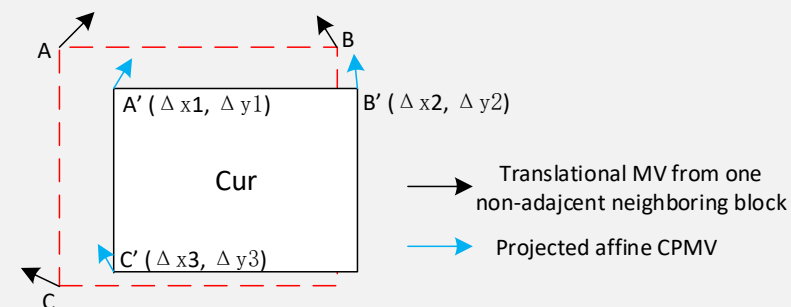


# Proposal

- Non-adjacent neighbors for constructed affine merge candidates
  - The same positions and checking orders of non-adjacent neighbors as non-adjacent inherited merge candidates
  - Derivation method
    - **Step One:** selecting left and above neighbors; then determining top-left neighbor to form a virtual block.
    - **Step Two:** generating the CPMVs at the A, B and C of the virtual block.
    - **Step Three:** projecting the CPMVs of the virtual block to the current CU.



Pattern of non-adjacent spatial neighbors for deriving constructed affine merge candidates



Derivation method

- The modified affine merge candidate list
  1. SbTMVP candidate, if available
  2. Inherited from adjacent neighbors
  3. **Inherited from non-adjacent neighbors**
  4. Constructed from adjacent neighbors
  5. **Constructed from non-adjacent neighbors**
  6. Zero MVs
- The size of the existing affine merge candidate list is increased from 5 to 15.

# Performance evaluation

**Anchor:** ECM-2.0

**Tested:** The proposed method

|                | Over ECM-2.0  |               |               |             |             |               |               |               |             |             |
|----------------|---------------|---------------|---------------|-------------|-------------|---------------|---------------|---------------|-------------|-------------|
|                | Random Access |               |               |             |             | Low Delay B   |               |               |             |             |
|                | Y             | U             | V             | EncT        | DecT        | Y             | U             | V             | EncT        | DecT        |
| Class A1       | -0.23%        | -0.06%        | -0.23%        | 102%        | 101%        |               |               |               |             |             |
| Class A2       | -0.37%        | -0.26%        | -0.24%        | 102%        | 102%        |               |               |               |             |             |
| Class B        | -0.23%        | -0.13%        | -0.12%        | 102%        | 104%        | -0.36%        | -0.03%        | -0.03%        | 102%        | 102%        |
| Class C        | -0.17%        | -0.12%        | 0.04%         | 102%        | 101%        | -0.37%        | -0.11%        | -0.16%        | 102%        | 103%        |
| Class E        |               |               |               |             |             | -0.05%        | 0.06%         | -0.40%        | 103%        | 103%        |
| <b>Overall</b> | <b>-0.24%</b> | <b>-0.14%</b> | <b>-0.12%</b> | <b>102%</b> | <b>102%</b> | <b>-0.28%</b> | <b>-0.04%</b> | <b>-0.16%</b> | <b>102%</b> | <b>103%</b> |
| Class D        | -0.13%        | -0.27%        | 0.19%         | 103%        | 103%        | -0.46%        | 0.19%         | -0.28%        | 102%        | 104%        |
| Class F        | -0.17%        | -0.20%        | -0.05%        | 101%        | 102%        | -0.65%        | -0.68%        | -0.48%        | 101%        | 101%        |

# Performance evaluation

**Anchor:** ECM-2.0

**Tested:** Only increasing the affine merge list to 15

|                | Over ECM-2.0  |              |              |             |             |              |              |               |             |             |
|----------------|---------------|--------------|--------------|-------------|-------------|--------------|--------------|---------------|-------------|-------------|
|                | Random Access |              |              |             |             | Low Delay B  |              |               |             |             |
|                | Y             | U            | V            | EncT        | DecT        | Y            | U            | V             | EncT        | DecT        |
| Class A1       | 0.00%         | -0.07%       | -0.02%       | 100%        | 99%         |              |              |               |             |             |
| Class A2       | -0.01%        | 0.03%        | 0.08%        | 100%        | 99%         |              |              |               |             |             |
| Class B        | 0.00%         | 0.06%        | 0.03%        | 101%        | 101%        | -0.04%       | 0.24%        | 0.16%         | 101%        | 100%        |
| Class C        | -0.03%        | 0.09%        | 0.08%        | 102%        | 100%        | -0.08%       | -0.09%       | 0.21%         | 101%        | 100%        |
| Class E        |               |              |              |             |             | 0.19%        | 0.34%        | -0.66%        | 102%        | 101%        |
| <b>Overall</b> | <b>-0.01%</b> | <b>0.04%</b> | <b>0.04%</b> | <b>101%</b> | <b>100%</b> | <b>0.01%</b> | <b>0.16%</b> | <b>-0.03%</b> | <b>101%</b> | <b>100%</b> |
| Class D        | 0.00%         | -0.13%       | 0.14%        | 104%        | 104%        | 0.09%        | -0.41%       | -0.46%        | 102%        | 99%         |
| Class F        | -0.03%        | -0.01%       | 0.00%        | 102%        | 101%        | -0.13%       | -0.06%       | 0.32%         | 101%        | 99%         |

## Summary

- Performance of the proposed non-adjacent affine merge candidates

|     | Y      | U      | V      | Enc  | Dec  |
|-----|--------|--------|--------|------|------|
| RA  | -0.24% | -0.14% | -0.12% | 102% | 102% |
| LDB | -0.28% | -0.04% | -0.16% | 102% | 103% |

- It is recommended to further study the proposed method in the next EE.

Thanks to Tencent for the crosschecking!