JCTVC-E348

On reference picture list construction for uni-predicted partitions

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- Reference picture list construction process in HEVC WD2

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- JCTVC-E053 approach (my understanding)

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Summary

❑ Proposes a different design for reference picture list construction for the creation of the combined reference picture list, LC, for uni-predicted partitions

  ❑ Same subject as in JCTVC-E053

❑ In the proposed design, LC is not created from the final RefPicList0 and RefPicList1, as is the case in WD2, but rather from all short-term and long-term reference pictures, by reusing existing steps of the reference picture list construction process.

AVC reference picture list construction process

- Step 1: Initialization

- Step 2: Truncation per num_ref_idx_lx_active_minus1

- Step 3: Modification per reference picture list modification syntax in slice header

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Reference picture list construction process in HEVC WD2

- For P slices, same as the AVC process

- For B slices

    - Steps 1-3: same as the AVC process

    - Step 4: Combination (not present in the AVC process)

        - To generate a combined list, LC, for all partitions using only one reference index (i.e. the partitions using the original Pred_L0 or Pred_L1 mode),

        - from the final list 0 and list 1 (output from steps 1-3),

        - as the union of the entries in the final list 0 and list 1 in a specified order (implicit combination), or

        - according to the reference picture combination syntax in the slice header (explicit combination).

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Problems (1/3)

- The reference picture list construction process for B slices in HEVC WD2 has the following shortcomings:
    - It is possible that in the uni-prediction mode, some of its optimal reference pictures are not present in either the final list 0 or 1. This can cause coding efficiency loss in uni-prediction mode.

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Problems (2/3)

- It may be possible to determine the final list 0, list 1 and the combined list LC altogether. However, such a process needs to take into account at least all the following factors:
    - which partitions are coded in BiPred mode and which partitions are coded in uni-predicted mode;
    - which reference pictures are used by each mode;
    - which reference pictures to be included into each of the three lists and at what order;
    - whether the implicit or explicit combination process should be used.

    Thus cause either undesirable increase in encoding complexity or sub-optimal compression efficiency

Problems (3/3)

- At the decoder side, in addition to the existing reference picture list construction process steps that are identical for the creation of list 0 and creation of list 1, two different new processes (implicit combination or explicit combination) for generation of the combined list LC need to be implemented.

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Proposed reference picture list construction process

- For P slices, same as the AVC process

- For B slices

    - Steps 1-3: same as the AVC process

    - Step 4: Generation of LC (not present in the AVC process)

        - To generate a combined list, LC, for all partitions using only one reference index (i.e. the partitions using the original Pred_L0 or Pred_L1 mode), ---- same as for WD2, E053

        - as the final list 0 or list 1, or

        - by applying steps 2-3 to the initial list 0 or list 1

Syntax, semantics and the decoding process text are in the contribution.

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JCTVC-E053 approach (my understanding)

- For P slices, same as the AVC process

- For B slices

    - Steps 1-3: same as the AVC process

    - Step 4: Combination and then modification

        - The combination process is the same as the implicit combination process in WD2 (explicit combination excluded)

        - The modification process is the same as in step 3

            - Except that the number of entries in the final LC is unspecified, and consequently the upper limit of the number of reference picture list modification commands is unspecified.

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Comparison

WD2 approach

❑ LC is a subset of the union of final lists 0 and 1

❑ Implicit and explicit combination processes needed for LC generation

Our approach

❑ LC is a subset of all ref pics

❑ No new process needed for LC generation

E053 approach

❑ LC is a subset of all ref pics

❑ Implicit combination processes needed for LC generation

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Thank you

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