

AHG16/NON-CE5: A CLEAN-UP FOR ALF SAMPLE PADDING (JVET-P0053)



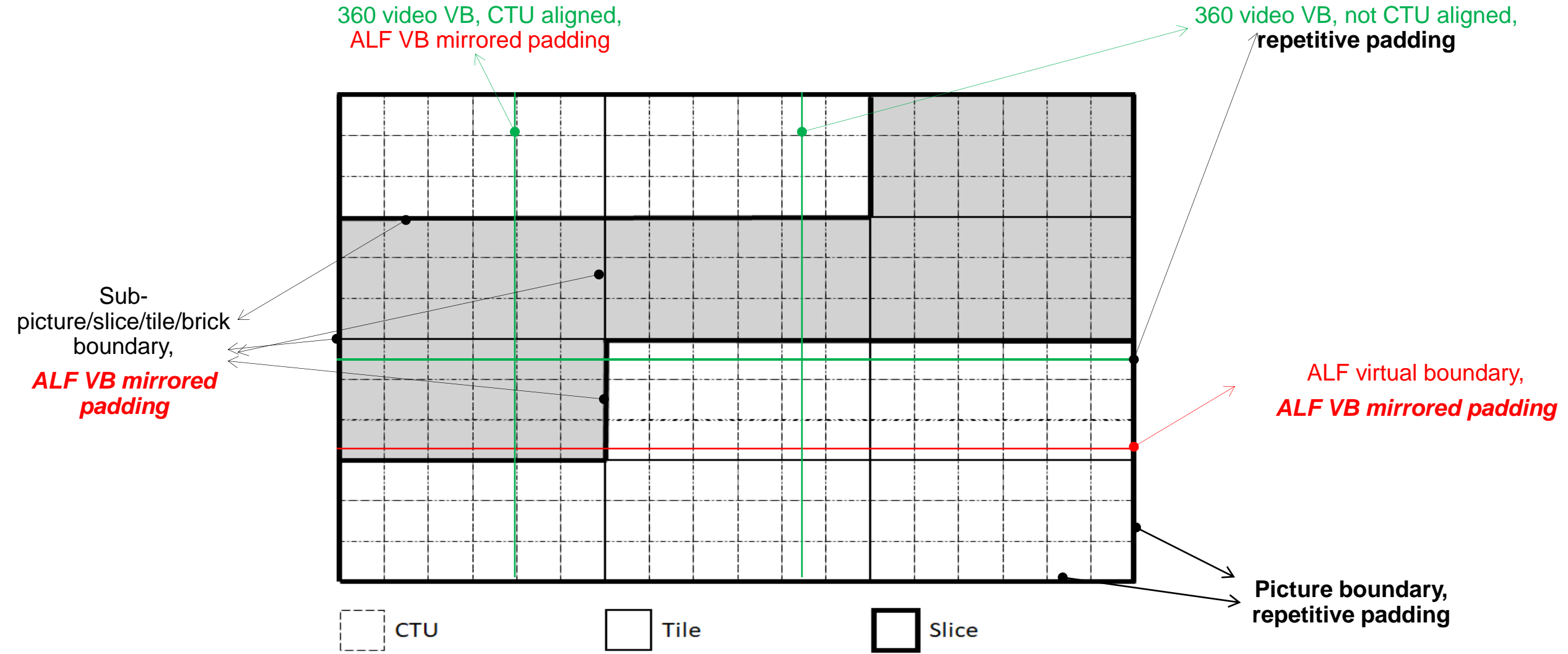
Minhua Zhou

Broadcom Inc.

Background

- In the current design, the following boundaries are supported
 - Picture boundaries
 - Sub-picture/slice/tile/brick boundaries (always CTU boundary aligned)
 - 360 video virtual boundaries (8 luma sample lines or columns aligned)
 - ALF virtual boundaries (horizontal only, 4 luma lines above the bottom CTU boundary)
- The ALF sample padding is required along all those boundaries when the ALF classification and filtering are not allowed to use samples on the other side of the boundary.

ALF Sample Padding In the Current Design (1)



ALF Sample Padding In the Current Design (2)

- As shown in the previous slide, the repetitive padding is applied to
 - 1) Picture boundaries
 - 2) 360 video virtual boundaries (VBs) that are not aligned with the CTU boundaries (in this case, the de-blocking and SAO are disabled along those 360 virtual boundaries when the ALF sample padding takes place).
- While the ALF virtual boundary mirrored padding is applied to
 - 3) ALF virtual boundaries (located at 4 luma lines above the bottom CTU boundaries, horizontal only)
 - 4) Sub-picture/slice/tile/brick boundaries, and 360 video virtual boundaries that are aligned with the CTU boundaries (in this case, the de-blocking and SAO are disabled along those boundaries when the ALF sample padding takes place).

Comments on the Current Design

- The ALF virtual boundary mirrored padding is generally more complex than the simple repetitive padding, but all the CTU boundary aligned edges use it in the current design.
- Along the sub-picture/slice/tile/brick boundaries and the CTU-boundary aligned 360 video virtual boundaries, the mirrored padding is used for the ALF luma filtering but the repetitive padding is used for the luma ALF filter classification.
- Sub-pictures and tiles may be used for encoder parallel processing (i.e. multi-core encoder implementations). On potential complication that an encoder would need to implement both the mirrored padding and repetitive padding along the picture boundaries, so that it could be configured to encode an incoming picture as a picture or as a sub-picture/tile.
- Two kinds of padding going on for the 360 video virtual boundaries, i.e. the repetitive padding for those not aligned with the CTU boundaries and the mirrored padding for the CTU boundary aligned ones.
- It is unlikely that the mirrored padding and repetitive padding will make big visual quality difference in the context of disabled de-blocking and SAO.

ALF Sample Padding - Potential Simplification (1)

- To simplify the design and improve the design consistency, it is proposed
 - 1) to apply the ALF virtual boundary mirrored padding only to the ALF virtual boundaries.
 - 2) to apply the repetitive padding to all the other boundaries (i.e. picture/sub-picture/slice/tile/brick boundaries and 360 video virtual boundaries).
 - 3) and to remove the 360 video virtual boundaries that are not CTU boundary aligned.
- In addition to the improved design consistency, the perceived simplifications are:
 - 1) Along the sub-picture/slice/tile/brick boundaries and the 360 video virtual boundaries, the simple repetitive padding is used for both the ALF luma filtering and the ALF luma filter classification.
 - 2) The mirrored padding is no longer needed along the vertical boundaries.
 - 3) The conditional checks along the 360 video virtual boundaries that are not CTU boundaries aligned are removed.

ALF Sample Padding - Potential Simplification (2)

