

# Optimizing the Deblocking Algorithm for H.264 Decoder Implementation

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## What is “deblocking” ?

- Remove the discontinuity across block boundaries resulted from block-based DCT and coarse quantization steps in low bit rate encoding.



[List, Joch, Lainema, Bjøntegaard and Karczewicz, 2003]

# Technical Challenges

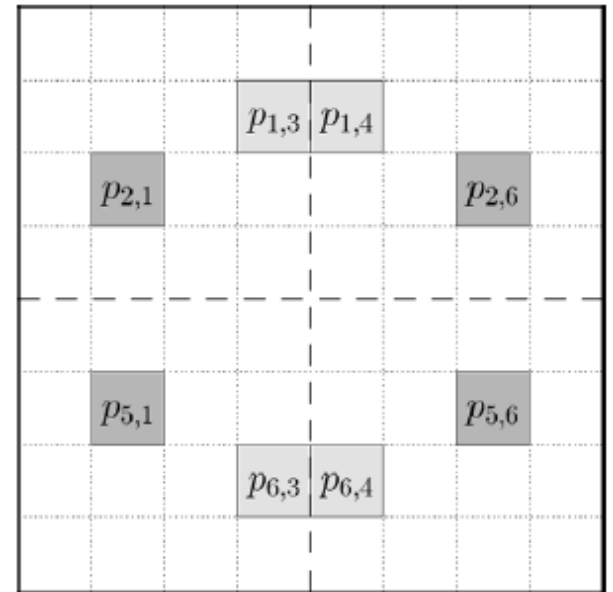
- Remove blocking artifacts without affecting the true edges in the picture so that the overall sharpness of the image is maintained.
  - A low pass filter is an intuitive choice, but the picture is blurred in general.
- Computationally intensive, which requires as much as  $1/3$  of resources of the decoder.
- High implementation complexity with the proposed algorithms based on complex mathematical operations.

# Projection on Convex Sets (POCS) based Iterative Algorithm [Zakhor, 1992]

- One projection is on the set of signals that are bandlimited in both horizontal and vertical directions. Another projection is on the set of quantization intervals of the DCT coefficients.
- Iteratively mapping a pixel value back and forth between the two sets until the value is within both sets.
- There is no guarantee in the time to convergence due to the iterative nature of the algorithm.

# Weighted Sums of Symmetrically Aligned Pixels [Averbuch, Schlar and Donoho, 2005]

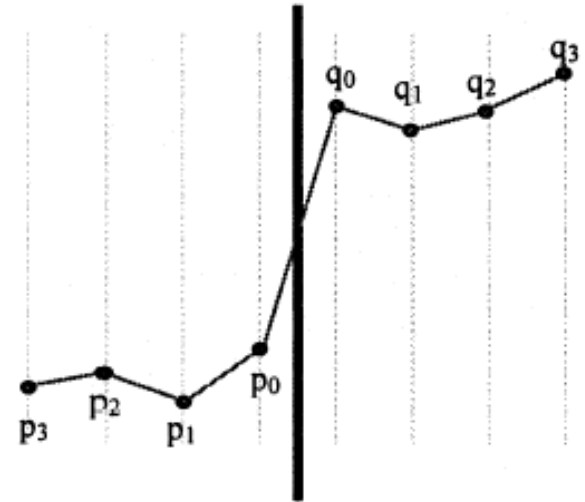
- A pixel's value is recomputed with a weighted sum of itself and the other 3 pixel values which are symmetrically aligned with respect to block boundaries.
- The weights can be linear or quadratic.
- Every pixel of the picture is going through a filtering process.



# Adaptive Deblocking Filter

[List, Joch, Lainema, Bjøntegaard and Karczewicz, 2003]

- An edge is classified with a set of conditions on the data points normal to the edge.
- Filters with different strength are applied to different class of edge. For example, strong filter is applied on smooth blocks.
- The algorithm is adaptive because the conditions are based on the quantization parameters included in the relevant blocks.



# Proposed Works

- A simple blocking artifact detection algorithm which is easier to be implemented.
  - Keeping power consumption minimization in mind.
- An algorithm identifying edges which will not result in a great improvement after filtering, and skip the filtering.
  - Trading off quality for a lower computation complexity.
- Implementing the new algorithm on an open source reference codec and comparing the quality results with some existing algorithms.