

WHAT IS CLAIMED IS:

1. A method for video encoding at an encoder, the method comprising:
 - determining an offset of a quantization parameter for a chroma component of a coding region based on one of (i) a pixel value range of the chroma component, (ii) a complexity level of the chroma component, or (iii) a noise level of the chroma component;
 - performing a quantization process on a transform coefficient of the coding region based on the quantization parameter and the determined offset; and
 - generating a video bitstream that includes the quantized transform coefficient.
2. The method of claim 1, wherein the generating comprises:
 - generating the video bitstream that includes the offset of the quantization parameter.
3. The method of claim 1, wherein the determining comprises:
 - determining a pixel value range of a luma component of the coding region;
 - determining a range ratio between the pixel value range of the luma component and the pixel value range of the chroma component; and
 - determining the offset of the quantization parameter based on a comparison between the range ratio and a range threshold.
4. The method of claim 3, wherein for each of the luma component and the chroma component, the pixel value range of the respective component is a difference between a maximum pixel value and a minimum pixel value of pixels of the respective component.
5. The method of claim 1, wherein the determining comprises:
 - determining a complexity level of a luma component of the coding region;
 - determining a complexity ratio between the complexity level of the luma component and the complexity level of the chroma component; and
 - determining the offset of the quantization parameter based on a comparison between the complexity ratio and a complexity threshold.

6. The method of claim 5, wherein for each of the luma component and the chroma component, the complexity level of the respective component is based on one of (i) a variance of pixel values of pixels of the respective component, (ii) a sum of absolute differences of residuals of the respective component, or (iii) a sum of absolute transformed differences of the residuals of the respective component.
7. The method of claim 1, wherein the determining comprises:
 - determining the offset of the quantization parameter based on a comparison between the noise level of the chroma component and a noise threshold.
8. The method of claim 1, wherein the determining comprises:
 - determining a noise level of a luma component of the coding region;
 - determining a noise ratio between the noise level of the luma component and the noise level of the chroma component; and
 - determining the offset of the quantization parameter based on a comparison between the noise ratio and a noise ratio threshold.
9. The method of claim 8, wherein for each of the luma component and the chroma component, the noise level of the respective component is based on an edge detection being applied to pixels of the respective component and a Laplacian convolution being applied to a result of the edge detection.
10. An apparatus, comprising:
 - processing circuitry configured to:
 - determine an offset of a quantization parameter for a chroma component of a coding region based on one of (i) a pixel value range of the chroma component, (ii) a complexity level of the chroma component, or (iii) a noise level of the chroma component;
 - perform a quantization process on a transform coefficient of the coding region based on the quantization parameter and the determined offset; and
 - generate a video bitstream that includes the quantized transform coefficient.

11. The apparatus of claim 10, wherein the processing circuitry is further configured to:
generate the video bitstream that includes the offset of the quantization parameter.
12. The apparatus of claim 10, wherein the processing circuitry is further configured to:
determine a pixel value range of a luma component of the coding region;
determine a range ratio between the pixel value range of the luma component and the pixel value range of the chroma component; and
determine the offset of the quantization parameter based on a comparison between the range ratio and a range threshold.
13. The apparatus of claim 12, wherein for each of the luma component and the chroma component, the pixel value range of the respective component is a difference between a maximum pixel value and a minimum pixel value of pixels of the respective component.
14. The apparatus of claim 10, wherein the processing circuitry is further configured to:
determine a complexity level of a luma component of the coding region;
determine a complexity ratio between the complexity level of the luma component and the complexity level of the chroma component; and
determine the offset of the quantization parameter based on a comparison between the complexity ratio and a complexity threshold.
15. The apparatus of claim 14, wherein for each of the luma component and the chroma component, the complexity level of the respective component is based on one of (i) a variance of pixel values of pixels of the respective component, (ii) a sum of absolute differences of residuals of the respective component, or (iii) a sum of absolute transformed differences of the residuals of the respective component.
16. The apparatus of claim 10, wherein the processing circuitry is further configured to:

determine the offset of the quantization parameter based on a comparison between the noise level of the chroma component and a noise threshold.

17. The apparatus of claim 10, wherein the processing circuitry is further configured to:
- determine a noise level of a luma component of the coding region;
 - determine a noise ratio between the noise level of the luma component and the noise level of the chroma component; and
 - determine the offset of the quantization parameter based on a comparison between the noise ratio and a noise ratio threshold.

18. The apparatus of claim 17, wherein for each of the luma component and the chroma component, the noise level of the respective component is based on an edge detection being applied to pixels of the respective component and a Laplacian convolution being applied to a result of the edge detection.

19. A non-transitory computer-readable storage medium storing instructions which, when executed by at least one processor, cause the at least one processor to perform:
- determining an offset of a quantization parameter for a chroma component of a coding region based on one of (i) a pixel value range of the chroma component, (ii) a complexity level of the chroma component, or (iii) a noise level of the chroma component;
 - performing a quantization process on a transform coefficient of the coding region based on the quantization parameter and the determined offset; and
 - generating a video bitstream that includes the quantized transform coefficient.

20. The non-transitory computer-readable storage medium of claim 19, wherein the stored instructions cause the at least one processor to perform:
- generating the video bitstream that includes the offset of the quantization parameter.