Clean Version

Amended Set of Claims

1. A method of decoding video data, the method comprising:

receiving a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of smaller block-sized coded units (CUs) according to a quadtree partitioning scheme

determining if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

decoding one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

2. The method of claim 1, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

3. The method of claim 1, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter for the CU.

4. The method of claim 1, wherein the one or more syntax elements are decoded from a position within the encoded video data that occurs after one or more syntax elements that define coding modes associated with the CUs of the LCU.

5. A method of encoding video data, the method comprising:

determining a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

determining if the CU includes any non-zero transform coefficients;

encoding at least one indication of whether the CU includes any non-zero transform coefficients; and

encoding one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein encoding the one or more syntax elements is avoided if the CU does not include any transform coefficients.

6. The method of claim 5, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

7. The method of claim 5, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter.

8. The method of claim 5, wherein the one or more syntax elements are encoded in the bitstream after one or more syntax elements that define encoding modes associated with the CUs of the LCU.

9. A video decoding device that decodes video data, the video decoding device comprising:

a video decoder that:

receives a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of smaller block-sized coded units (CUs) according to a quadtree partitioning scheme;

determines if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

decodes one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

10. The video decoding device of claim 9, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

11. The video decoding device of claim 9, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter for the CU.

12. The video decoding device of claim 9, wherein the one or more syntax elements are decoded from a position within the encoded video data that occurs after one or more syntax elements that define coding modes associated with the CUs of the LCU.

13. The video decoding device of claim 9, wherein the video decoding device comprises one or more of:

an integrated circuit;

a microprocessor; and

a wireless communication device that includes a video decoder.

14. A video encoding device that encodes video data, the video encoding device comprising:

a video encoder that:

determines a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

determines if the CU includes any non-zero transform coefficients;

encodes at least one indication of whether the CU includes any non-zero transform coefficients; and

encodes one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein encoding the one or more syntax elements is avoided if the CU does not include any transform coefficients.

15. The video encoding device of claim 14, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

16. The video encoding device of claim 14, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter.

17. The video encoding device of claim 14, wherein the one or more syntax elements are encoded in the bitstream after one or more syntax elements that define encoding modes associated with the CUs of the LCU.

18. The video encoding device of claim 14, wherein the video encoding device comprises one or more of:

an integrated circuit;

a microprocessor; and

a wireless communication device that includes a video encoder.

19. A device for decoding video data, the device comprising:

means for receiving a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of smaller block-sized coded units (CUs) according to a quadtree partitioning scheme

means for determining if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

means for decoding one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

20. The device of claim 19, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

21. The device of claim 19, wherein the one or more syntax elements are decoded from a position within the encoded video data:

after encoding modes associated with the CUs of the LCU.

22. A device for encoding video data, the device comprising:

means for determining a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

means for determining if the CU includes any non-zero transform coefficients;

means for encoding at least one indication of whether the CU includes any non-zero transform coefficients; and

means for encoding one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the means for encoding avoids encoding the one or more syntax elements if the CU does not include any transform coefficients.

23. The device of claim 22, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

24. The device of claim 22, wherein the means for encoding the one or more syntax elements encodes the one or more syntax elements in the encoded bitstream:

after syntax elements that define encoding modes associated with the CUs of the LCU.

25. A computer-readable medium comprising instructions that upon execution cause a processor to decode video data, wherein the instructions cause the processor to:

upon receiving a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of block-sized coded units (CUs) according to a quadtree partitioning scheme;

determine if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

decode one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients is a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

26. The computer-readable medium of claim 25, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

27. The computer-readable medium of claim 25, wherein the one or more syntax elements are decoded from a position within the encoded video data:

after one or more syntax elements that define encoding modes associated with the CUs of the LCU.

28. A computer-readable medium comprising instructions that upon execution cause a processor to encode video data, wherein the instructions cause the processor to:

determine a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

determine if the CU includes any non-zero transform coefficients;

encode at least one indication of whether the CU includes any non-zero transform coefficients; and

encode one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the instructions cause the processor to avoid encoding the one or more syntax elements if the CU does not include any transform coefficients.

29. The computer-readable medium of claim 28, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

30. The computer-readable medium of claim 28, wherein the instructions cause the processor to encode the one or more syntax elements in the encoded bitstream:

after one or more syntax elements that define encoding modes associated with the CUs of the LCU.

CLAIMS

1. A method of decoding video data, the method comprising:

receiving a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of smaller block-sized coded units (CUs) according to a quadtree partitioning scheme

determining if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

decoding one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

2. The method of claim 1, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

3. The method of claim 1, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter for the CU.

4. The method of claim 1, wherein the one or more syntax elements are decoded from a position within the encoded video data that occurs after one or more syntax

elements that define coding modes associated with the CUs of the LCU.

5. A method of encoding video data, the method comprising:

determining a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

determining if the CU includes any non-zero transform coefficients;

encoding at least one indication of whether the CU includes any non-zero transform coefficients; and

encoding one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not encoded if the CU does not include any transform coefficients.

6. The method of claim 5, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

7. The method of claim 5, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter.

8. The method of claim 5, wherein the one or more syntax elements are encoded in the bitstream after one or more syntax elements that define encoding modes

associated with the CUs of the LCU.

9. A video decoding device that decodes video data, the video decoding device comprising:

a video decoder that:

receives a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of smaller block-sized coded units (CUs) according to a quadtree partitioning scheme;

determines if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

decodes one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

10. The video decoding device of claim 9, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

11. The video decoding device of claim 9, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter for the CU.

12. The video decoding device of claim 9, wherein the one or more syntax elements are decoded from a position within the encoded video data that occurs after one or more syntax elements that define coding modes associated with the CUs of the LCU.

13. The video decoding device of claim 9, wherein the video decoding device comprises one or more of:

an integrated circuit;

a microprocessor; and

a wireless communication device that includes a video decoder.

14. A video encoding device that encodes video data, the video encoding device comprising:

a video encoder that:

determines a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

determines if the CU includes any non-zero transform coefficients;

encodes at least one indication of whether the CU includes any non-zero transform coefficients; and

encodes one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not encoded if the CU does not include any transform coefficients.

15. The video encoding device of claim 14, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

16. The video encoding device of claim 14, wherein the one or more syntax elements comprises a delta quantization parameter indicating the change in the quantization parameter relative to the predicted quantization parameter.

17. The video encoding device of claim 14, wherein the one or more syntax elements are encoded in the bitstream after one or more syntax elements that define encoding modes associated with the CUs of the LCU.

18. The video encoding device of claim 14, wherein the video encoding device comprises one or more of:

an integrated circuit;

a microprocessor; and

a wireless communication device that includes a video encoder.

19. A device for decoding video data, the device comprising:

means for receiving a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of smaller block-sized coded units (CUs) according to a quadtree partitioning scheme

means for determining if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

means for decoding one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

20. The device of claim 19, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

21. The device of claim 19, wherein the one or more syntax elements are decoded from a position within the encoded video data:

after encoding modes associated with the CUs of the LCU.

22. A device for encoding video data, the device comprising:

means for determining a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

means for determining if the CU includes any non-zero transform coefficients;

means for encoding at least one indication of whether the CU includes any non-zero transform coefficients; and

means for encoding one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the means for encoding does not encode the one or more syntax elements if the CU does not include any transform coefficients.

23. The device of claim 22, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

24. The device of claim 22, wherein the means for encoding the one or more syntax elements encodes the one or more syntax elements in the encoded bitstream:

after syntax elements that define encoding modes associated with the CUs of the LCU.

25. A computer-readable medium comprising instructions that upon execution cause a processor to decode video data, wherein the instructions cause the processor to:

receive a largest coding unit (LCU) of encoded video data, wherein the LCU is partitioned into a set of block-sized coded units (CUs) according to a quadtree partitioning scheme;

determine if a CU includes any non-zero transform coefficients, at least in part by decoding encoded data to reproduce at least one indication of whether the CU includes any non-zero transform coefficients; and

decode one or more syntax elements for the CU to indicate a change in a quantization parameter for the CU relative to a predicted quantization parameter for the CU only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are decoded from a position within the encoded video data:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients is a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the one or more syntax elements are not included with the CU if the CU does not include any non-zero transform coefficients.

26. The computer-readable medium of claim 25, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

27. The computer-readable medium of claim 25, wherein the one or more syntax elements are decoded from a position within the encoded video data:

after one or more syntax elements that define encoding modes associated with the CUs of the LCU.

28. A computer-readable medium comprising instructions that upon execution cause a processor to encode video data, wherein the instructions cause the processor to:

determine a change in a quantization parameter for a coding unit (CU) of encoded video data relative to a predicted quantization parameter for the CU, wherein the CU is partitioned from a largest coding unit (LCU) according to a quadtree partitioning scheme;

determine if the CU includes any non-zero transform coefficients;

encode at least one indication of whether the CU includes any non-zero transform coefficients; and

encode one or more syntax elements for the CU to indicate the change in the quantization parameter only if the CU includes any non-zero transform coefficients, wherein the one or more syntax elements are encoded in a bitstream:

a) after an indication that the CU will include at least some non-zero transform coefficients, wherein the indication that the CU will include at least some non-zero transform coefficients includes a coded block flag (CBF), and

b) before the transform coefficients for the CU, and

wherein the instructions cause the processor not to encode the one or more syntax elements if the CU does not include any transform coefficients.

29. The computer-readable medium of claim 28, wherein a size of the CU meets or exceeds a threshold size at which quantization changes are allowed.

30. The computer-readable medium of claim 28, wherein the instructions cause the processor to encode the one or more syntax elements in the encoded bitstream:

after one or more syntax elements that define encoding modes associated with the CUs of the LCU.