~~WHAT IS CLAIMED IS:~~

~~1. A decoder, the decoder comprising circuitry configured to:~~

~~receive a coded video bitstream;~~

~~identify, in the bitstream, a current frame, wherein the current frame includes a first region, a second region, and a third region;~~

~~detect, in the bitstream, that the first region is encoded using block differential pulse code modulation;~~

~~detect, in the bitstream, that the second region is encoded using transform skip residual coding; and~~

~~detect, in the bitstream, that the third region is encoded using lossy encoding, wherein the lossy encoding includes at least one of inter-prediction and intra-prediction.~~

~~2. The decoder of claim 1, wherein:~~

~~the bitstream further includes a sub-picture header corresponding to the first region; and~~

~~detecting that the first region is encoded using block differential pulse code modulation further comprises detecting an indication that the at least a first region is encoded using block differential pulse code modulation in the sub-picture header.~~

~~3. The decoder of claim 2, wherein the sub-picture header is explicitly included in data corresponding to the current frame.~~

~~4. The decoder of claim 2, wherein the sub-picture is included by reference to an identifier of a sub-picture header corresponding to a third sub-picture.~~

~~5. The decoder of claim 1, wherein:~~

~~the bitstream further includes a sub-picture header corresponding to the second region; and~~

~~the decoder is further configured to detect the indication that the second using transform skip residual coding is encoded using transform skip residual coding in the sub-picture header.~~

~~6. The decoder of claim 5, wherein the sub-picture header is explicitly included in data corresponding to the current frame.~~

~~7. The decoder of claim 1, wherein the decoder is further configured to~~

~~decode the first region using a first processor thread; and~~

decode the second region element using a second processor thread.

8. The decoder of claim 1, further configured to decode the current frame, wherein decoding the current frame further comprises decoding the first region using a decoding protocol corresponding to block differential pulse code modulation.

9. The decoder of claim 1, further configured to decode the current frame, wherein decoding the current frame further comprises decoding the second region using a decoding protocol corresponding to using transform skip residual coding.

10. The decoder of claim 1, further configured to decode the current frame, wherein decoding the current frame further comprises decoding the third region using a decoding protocol corresponding to the lossy encoding protocol.

11. A method of combined lossless and lossy coding, the method comprising:

receiving, by a decoder, a coded video bitstream;

identifying, by the decoder and in the bitstream, a current frame, wherein the current frame includes a first region, a second region, and a third region;

detecting, by the decoder and in the bitstream, that the first region is encoded using block differential pulse code modulation;

detecting, by the decoder and in the bitstream, that the second region is encoded using transform skip residual coding; and

detecting, by the decoder and in the bitstream, that the third region is encoded using lossy encoding, wherein the lossy encoding includes at least one of inter-prediction and intra-prediction.

12. The method of claim 11, wherein:

the bitstream further includes a sub-picture header corresponding to the first region; and

detecting that the first region is encoded using block differential pulse code modulation further comprises detecting an indication that the at least a first region is encoded using block differential pulse code modulation in the sub-picture header.

13. The method of claim 12, wherein the sub-picture header is explicitly included in data corresponding to the current frame.

14. The method of claim 12, wherein the sub-picture is included by reference to an identifier of a sub-picture header corresponding to a third sub-picture.

~~15. The method of claim 11, wherein:~~

~~the bitstream further includes a sub-picture header corresponding to the second region; and~~

~~the decoder is further configured to detect the indication that the second using transform skip residual coding is encoded using transform skip residual coding in the sub-picture header.~~

~~16. The method of claim 16, wherein the sub-picture header is explicitly included in data corresponding to the current frame.~~

~~17. The method of claim 11, further comprising:~~

~~decoding the first region using a first processor thread; and~~

~~decoding the third region element using a second processor thread.~~

~~18. The method of claim 11, further comprising decoding the current frame, wherein decoding the current frame further comprises decoding the first region using a decoding protocol corresponding to block differential pulse code modulation.~~

~~19. The method of claim 11, further comprising decoding the current frame, wherein decoding the current frame further comprises decoding the second region using a decoding protocol corresponding to using transform skip residual coding.~~

~~20. The method of claim 11, further comprising decoding the current frame, wherein decoding the current frame further comprises decoding the third region using a decoding protocol corresponding to the lossy encoding protocol.~~

~~21. A decoder, the decoder comprising circuitry configured to:~~

~~receive a coded bitstream;~~

~~identify, in the bitstream, a current frame, wherein the current frame includes a first sub-picture and a second sub-picture;~~

~~detect, in the bitstream, an indication that the first sub-picture is encoded according to a lossless encoding protocol; and~~

~~decode the current frame, wherein decoding the current frame further comprises decoding the first sub-picture using a lossless decoding protocol corresponding to the lossless encoding protocol.~~

~~22. The decoder of claim 21, wherein:~~

the bitstream further includes a sub-picture header corresponding to the first sub-picture; and

detecting further comprises detecting the indication that the at least a first sub-picture is encoded according to a lossless encoding protocol in the sub-picture header.

23. The decoder of claim 22, wherein the sub-picture header is explicitly included in data corresponding to the current frame.

24. The decoder of claim 22, wherein the sub-picture is included by reference to an identifier of a sub-picture header corresponding to a third sub-picture.

25. The decoder of claim 21, wherein the decoder is further configured to:

detect that the second sub-picture is encoded according to a lossy encoding protocol; and

decode the second sub-picture according to a lossy decoding protocol corresponding to the lossless encoding protocol.

26. The decoder of claim 25, wherein:

the bitstream further includes a sub-picture header corresponding to the second sub-picture; and

the decoder is further configured to detect the indication that the second sub-picture is encoded according to a lossy encoding protocol in the sub-picture header.

27. The decoder of claim 26, wherein the sub-picture header is explicitly included in data corresponding to the current frame.

28. The decoder of claim 26, wherein the sub-picture header is included by reference to an identifier of a sub-picture header corresponding to a third sub-picture.

29. The decoder of claim 21, wherein the decoder is further configured to

decode the first sub-picture using a first processor thread; and

decode the second sub-picture element using a second processor thread.

30. The decoder of claim 21, further comprising:

an entropy decoder processor configured to receive the bit stream and decode the bitstream into quantized coefficients;

an inverse quantization and inverse transformation processor configured to process the quantized coefficients including performing an inverse discrete cosine;

a deblocking filter;

~~a frame buffer; and~~

~~an intra prediction processor.~~

~~31. The decoder of claim 21, wherein at least one of the first sub-picture and the second sub-picture forms part of a quadtree plus binary decision tree.~~

~~32. The decoder of claim 21, wherein at least one of the first sub-picture and the second sub-picture includes a coding tree unit.~~

~~33. The decoder of claim 21, wherein at least one of the first sub-picture and the second sub-picture includes a coding unit.~~

~~34. The decoder of claim 21, wherein at least one of the first sub-picture and the second sub-picture includes a prediction unit.~~

~~35. A method of combined lossless and lossy coding, the method comprising:~~

~~receiving, at a decoder, a bitstream;~~

~~identifying, by the decoder and in the bitstream, a current frame, wherein the current frame includes a first sub-picture and a second sub-picture;~~

~~detecting, by the decoder and in the bitstream, an indication that the first sub-picture is encoded according to a lossless encoding protocol; and~~

~~decoding, by the decoder, the current frame, wherein decoding the current frame further comprises decoding the first sub-picture using a lossless decoding protocol corresponding to the lossless encoding protocol.~~

~~36. The method of claim 35, wherein:~~

~~the bitstream further includes a sub-picture header corresponding to the first sub-picture; and~~

~~detecting further comprises detecting the indication that the at least a first sub-picture is encoded according to a lossless encoding protocol in the sub-picture header.~~

~~37. The method of claim 36, wherein the sub-picture header is explicitly included in data corresponding to the current frame.~~

~~38. The method of claim 36, wherein the sub-picture is included by reference to an identifier of a sub-picture header corresponding to a third sub-picture.~~

~~39. The method of claim 39 further comprising:~~

detecting that the second sub-picture is encoded according to a lossy encoding protocol; and

decoding the second sub-picture according to a lossy decoding protocol corresponding to the lossless encoding protocol.

40. The method of claim 39, wherein

the bitstream further includes a sub-picture header corresponding to the second sub-picture; and

detecting further comprises the indication that the second sub-picture is encoded according to a lossy encoding protocol in the sub-picture header.

41. The method of claim 40, wherein the sub-picture header is explicitly included in data corresponding to the current frame.

42. The method of claim 40, wherein the sub-picture header is included by reference to an identifier of a sub-picture header corresponding to a third sub-picture.

43. The method of claim 35, wherein the decoder is further configured to

decode the first sub-picture using a first processor thread; and

decode the second sub-picture element using a second processor thread.

44. The method of claim 35, wherein the decoder further comprises:

an entropy decoder processor configured to receive the bit stream and decode the bitstream into quantized coefficients;

an inverse quantization and inverse transformation processor configured to process the quantized coefficients including performing an inverse discrete cosine;

a deblocking filter;

a frame buffer; and

an intra prediction processor.

45. The method of claim 35, wherein at least one of the first sub-picture and the second sub-picture forms part of a quadtree plus binary decision tree.

46. The method of claim 35, wherein at least one of the first sub-picture and the second sub-picture includes a coding tree unit.

47. The method of claim 35, wherein at least one of the first sub-picture and the second sub-picture includes a coding unit.

~~48. The method of claim 35, wherein at least one of the first sub-picture and the second sub-picture includes a prediction unit.~~

Claims

1. A decoder, the decoder comprising circuitry configured to:

receive, in a bitstream, a coded picture, the picture comprising

a first region, a second region, and a third region, wherein the first region is a first independently coded sub-picture, the second region is a second independently coded sub-picture and the third region is the remainder of the picture;

detect, in the bitstream, that the first region is encoded using block differential pulse code modulation;

detect, in the bitstream, that the second region is encoded using transform skip mode but not block differential pulse code modulation; and

detect, in the bitstream, that the third region is encoded using lossy encoding, wherein the lossy encoding includes at least one of inter-prediction or intra-prediction, discrete cosine transform of residual pixel values, and quantization of transform coefficients.

2. The decoder of claim 1, wherein the first region is an independently coded sub-picture.

3. The decoder of claim 1, wherein the second region is an independently coded sub-picture.

4. The decoder of claim 1, wherein the first region is a first independently coded sub-picture and the second region is a second independently coded sub-picture.

5. The decoder of claim 1, wherein:

the bitstream further includes a sub-picture header corresponding to the second region; and

the decoder is further configured to detect the indication that the second using transform skip residual coding is encoded using transform skip residual coding in the sub-picture header.

6. The decoder of claim 1, wherein the decoder is further configured to

decode the first region using a first processor thread; and

decode the second region using a second processor thread.

7. The decoder of claim 1, further configured to decode a current frame, wherein decoding the current frame further comprises decoding the first region using a decoding protocol corresponding to block differential pulse code modulation.

8. The decoder of claim 1, further configured to decode a current frame, wherein decoding the current frame further comprises decoding the third region using a decoding protocol corresponding to the lossy encoding protocol.

9. The decoder of claim 1 wherein the first region comprises a first plurality of coding units, the second region comprises a second plurality of coding units and the third region comprises the remainder of the picture.

10. The decoder of claim 1 wherein the first sub-picture includes a first group of one or more coding tree units, the second sub-picture includes a second group of one or more coding tree units and the remainder of the picture includes a third group of coding tree units.

11. A method of combined lossless and lossy decoding, the method comprising:

receiving, by a decoder comprising circuitry, in a bitstream, a coded picture, the picture comprising

a first region, a second region, and a third region, wherein the first region is a first independently coded sub-picture, the second region is a second independently coded sub-picture and the third region is the remainder of the picture;

detecting, by the decoder and in the bitstream, that the first region is encoded using block differential pulse code modulation;

detecting, by the decoder and in the bitstream, that the second region is encoded using transform skip mode but not block differential pulse code modulation; and

detecting, by the decoder and in the bitstream, that the third region is encoded using lossy encoding, wherein the lossy encoding includes at least one of inter-prediction or intra-prediction, discrete cosine transform of residual pixel values, and quantization of transform coefficients.

12. The method of claim 11, wherein the first region is an independently coded sub-picture.

13. The method of claim 11, wherein the second region is an independently coded sub-picture.

14. The method of claim 11, wherein the third region is an independently coded sub-picture.

15. The method of claim 11, wherein:

the bitstream further includes a sub-picture header corresponding to the second region: and

the decoder is further configured to detect the indication that the second using transform skip residual coding is encoded using transform skip residual coding in the sub-picture header.

16. The method of claim 11, further comprising:

decoding the first region using a first processor thread; and

decoding the third region element using a second processor thread.

17. The method of claim 11, further comprising decoding a current frame, wherein decoding the current frame further comprises decoding the first region using a decoding protocol corresponding to block differential pulse code modulation.

18. The decoder of claim 10 where the location of the first sub-picture in the picture is signaled in the bitstream and the location of the second sub-picture in the picture is signaled in the bitstream.

19. A decoder comprising circuitry configured to decode a coded picture received in a bitstream, the coded picture including:

a first region coded using block differential pulse code modulation (BDPCM),

a second region coded using transform skip mode but not BDPCM, and

a third region coded using lossy, wherein lossy coding includes at least one of inter-prediction or intra-prediction, transform of residual pixel values, and quantization of transform coefficients, wherein the first region is a first independently coded-sub-picture, the second region is a second independently coded sub-picture and the third region is the remainder of the picture.