

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
5 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
10 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
15 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
20 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
25 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
30 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.
- 5 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
- 10 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;
15 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
20 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
25 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
30 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
5 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:
10 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.
- 15 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
20 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;
25 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.
- 30 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.
- 5 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:
10 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-
15 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.
- 20 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.
- 25 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;
30 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.
- 5 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.
- 10 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;
15 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.
- 20 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.
- 25 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.
- 5 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.
- 10 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
15 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;
20 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.
- 25 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-
30 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.