CLAIMS

1. A method of video processing, comprising:

performing a conversion between a video comprising one or more pictures comprising one or more subpictures and a bitstream of the video,

wherein the bitstream conforms to a format rule that specifies that a subpicture cannot be a random access decodable leading subpicture or a random access skipped leading subpicture when the subpicture is not a leading subpicture of an intra random access point subpicture, and

wherein the leading subpicture precedes the intra random access point subpicture in output order.

2. The method of claim 1, wherein the intra random access point subpicture is a subpicture for which all video coding layer (VCL) network abstraction layer (NAL) units have a same value of NAL unit type in the range of IDR_W_RADL to CRA_NUT, inclusive,

wherein the random access decodable leading subpicture is a subpicture for which each VCL NAL unit has NAL unit type equal to RADL_NUT, and

wherein the random access skipped leading subpicture is a subpicture for which each video coding layer (VCL) network abstraction layer (NAL) has NAL unit type equal to RASL_NUT.

3. The method of claim 1 or 2, wherein the format rule further specifies that a first subpicture precedes a second subpicture in a recovery point picture in an output order in response to:

the first subpicture and the second subpicture having a same layer identifier of a network abstraction layer (NAL) unit and a same subpicture index, and

the first subpicture preceding the second subpicture in a decoding order.

4. The method of any one of claims 1-3, wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein when a current subpicture is a clean random access subpicture, the format rule disallows an entry in a reference picture list of the current slice from including a first picture that

precedes, according to a first order, a second picture that precedes, according to a second order, the current picture,

wherein the second picture comprises an intra random access point subpicture having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the clean random access subpicture is an intra random access point subpicture for which each VCL NAL unit has nal_unit_type equal to CRA_NUT.

5. The method of claim 4, wherein the first order comprises a decoding order or an output order,

wherein the second order comprises a decoding order, and

wherein the reference picture list includes a List 0 reference picture list or a List 1 reference picture list.

6. The method of any one of claims 1-3, wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein the format rule disallows an active entry in a reference picture list of the current slice from including a first picture that precedes a second picture according to a first order,

wherein the second picture comprises an intra random access point subpicture having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the current subpicture follows the intra random access point subpicture in a second order.

7. The method of claim 6, wherein the first order comprises a decoding order or an output order, and the second order comprises a decoding order and an output order,

wherein the active entry corresponds to an entry that is available for use as a reference index in an inter prediction of the current slice, and

wherein the reference picture list includes a List 0 reference picture list or a List 1 reference picture list.

8. The method of any one of claims 1-3, wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein the format rule disallows an entry in a reference picture list of the current slice from including a first picture that precedes a second picture according to a first order or a second order,

wherein the second picture comprises an intra random access point subpicture having zero or more associated leading subpictures and having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the current subpicture follows the intra random access point subpicture and the zero or more associated leading subpictures in the first order and the second order.

9. The method of claim 8, wherein the first order comprises a decoding order, and the second order comprises an output order, and

wherein the reference picture list includes a List 0 reference picture list or a List 1 reference picture list.

10. The method of any one of claims 1-9, wherein the format rule further specifies that in response to a current subpicture being a random access decodable leading subpicture, an active entry of a reference picture list of the current slice is disallowed from including any one or more of:

a first picture including a random access skipped leading subpicture having a same subpicture index as that of the current subpicture, and

a second picture that precedes a third picture including an intra random access point subpicture associated with the random access decodable leading subpicture in a decoding order.

11. The method of claim 10, wherein the active entry corresponds to an entry that is available for use as a reference index in an inter prediction of the current slice, and

wherein the reference picture list includes a List 0 reference picture list or a List 1 reference picture list.

12. The method of any one of claims 1-11, wherein the performing the conversion comprising encoding the video into the bitstream.

13. The method of any one of claims 1-11, wherein the performing the conversion comprises decoding the video from the bitstream.

14. An apparatus for processing video data comprising a processor and a non-transitory memory with instructions thereon, wherein the instructions upon execution by the processor, cause the processor to:

perform a conversion between a video comprising one or more pictures comprising one or more subpictures and a bitstream of the video,

wherein the bitstream conforms to a format rule that specifies that a subpicture cannot be a random access decodable leading subpicture or a random access skipped leading subpicture when the subpicture is not a leading subpicture of an intra random access point subpicture, and

wherein the leading subpicture precedes the intra random access point subpicture in output order.

15. The apparatus of claim 14, wherein the intra random access point subpicture is a subpicture for which all video coding layer (VCL) network abstraction layer (NAL) units have a same value of NAL unit type in the range of IDR_W_RADL to CRA_NUT, inclusive,

wherein the random access decodable leading subpicture is a subpicture for which each VCL NAL unit has NAL unit type equal to RADL_NUT, and

wherein the random access skipped leading is a subpicture for which each video coding layer (VCL) network abstraction layer (NAL) has NAL unit type equal to RASL_NUT.

16. The apparatus of claim 14 or 15, wherein the format rule further specifies that a first subpicture precedes a second subpicture in a recovery point picture in an output order in response to:

the first subpicture and the second subpicture having a same layer identifier of a network abstraction layer (NAL) unit and a same subpicture index, and

the first subpicture preceding the second subpicture in a decoding order.

17. The apparatus of any one of claims 14-16, wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein when a current subpicture is a clean random access subpicture, the format rule disallows an entry in a reference picture list of the current slice from including a first picture that precedes, according to a first order, a second picture that precedes, according to a second order, the current picture,

wherein the second picture comprises an intra random access point subpicture having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the clean random access subpicture is an intra random access point subpicture for which each VCL NAL unit has nal_unit_type equal to CRA_NUT;

wherein the first order comprises a decoding order or an output order,

wherein the second order comprises a decoding order, and

wherein the reference picture list includes a List 0 reference picture list or a List 1 reference picture list.

18. The apparatus of any one of claims 14-16, wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein the format rule disallows an active entry in a reference picture list of the current slice from including a first picture that precedes a second picture according to a first order,

wherein the second picture comprises an intra random access point subpicture having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the current subpicture follows the intra random access point subpicture in a second order;

wherein the first order comprises a decoding order or an output order, and the second order comprises a decoding order and an output order,

wherein the active entry corresponds to an entry that is available for use as a reference index in an inter prediction of the current slice, and

wherein the reference picture list includes a List 0 reference picture list or a List 1 reference picture list.

19. A non-transitory computer-readable storage medium storing instructions that cause a processor to:

perform a conversion between a video comprising one or more pictures comprising one or more subpictures and a bitstream of the video,

wherein the bitstream conforms to a format rule that specifies that a subpicture cannot be a random access decodable leading subpicture or a random access skipped leading subpicture when the subpicture is not a leading subpicture of an intra random access point subpicture, and

wherein the leading subpicture precedes the intra random access point subpicture in output order.

20. A non-transitory computer-readable recording medium storing a bitstream of a video which is generated by a method performed by a video processing apparatus, wherein the method comprises:

generating the bitstream of the video comprising one or more pictures comprising one or more subpictures,

wherein the bitstream conforms to a format rule that specifies that a subpicture cannot be a random access decodable leading subpicture or a random access skipped leading subpicture when the subpicture is not a leading subpicture of an intra random access point subpicture, and

wherein the leading subpicture precedes the intra random access point subpicture in output order.~~1. A method of video processing, comprising:~~

~~performing a conversion between a video comprising one or more pictures comprising one or more subpictures and a bitstream of the video,~~

~~wherein the bitstream conforms to a format rule that specifies that a subpicture cannot be a random access type of subpicture in response to the subpicture not being a leading subpicture of an intra random access point subpicture, and~~

wherein the leading subpicture precedes the intra random access point subpicture in output order.

2. The method of claim 1, wherein the intra random access point subpicture is a subpicture for which all video coding layer (VCL) network abstraction layer (NAL) units have a same value of NAL unit type in the range of IDR_W_RADL to CRA_NUT, inclusive.

3. The method of claim 1, wherein the random access type of subpicture includes a random access decodable leading subpicture.

4. The method of claim 3, wherein the random access decodable leading subpicture is a subpicture for which each video coding layer (VCL) network abstraction layer (NAL) unit has NAL unit type equal to RADL_NUT.

5. The method of claim 1, wherein the random access type of subpicture includes a random access skipped leading subpicture.

6. The method of claim 5, wherein the random access skipped leading subpicture is a subpicture for which each video coding layer (VCL) network abstraction layer (NAL) has NAL unit type equal to RASL_NUT.

7. A method of video processing, comprising:

performing a conversion between a video comprising one or more pictures comprising a plurality of subpictures and a bitstream of the video,

wherein the bitstream conforms to a format rule that specifies that a first subpicture precedes a second subpicture in a recovery point picture in an output order in response to:

the first subpicture and the second picture having a same layer identifier of a network abstraction layer (NAL) unit and a same subpicture index, and

the first subpicture preceding the second subpicture in a decoding order.

8. A method of video processing, comprising:

performing a conversion between a video comprising a current picture comprising a current subpicture comprising a current slice and a bitstream of the video,

wherein the bitstream conforms to a format rule,

wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein the format rule disallows an entry in a reference picture list of the current slice from including a first picture that precedes, according to a first order, a second picture that precedes, according to a second order, the current picture,

wherein the second picture comprises an intra random access point subpicture having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the current subpicture is a clean random access subpicture.

9. The method of claim 8, wherein the first order comprises a decoding order or an output order.

10. The method of any of claims 8-9, wherein the second order comprises a decoding order.

11. The method of any of claims 8-10, wherein the reference picture list includes a List 0 reference picture list.

12. The method of any of claims 8-10, wherein the reference picture list includes a List 1 reference picture list.

13. The method of any of claims 8-12, wherein the clean random access subpicture is an intra random access point subpicture for which each video coding layer (VCL) NAL unit has NAL unit type equal to CRA_NUT.

14. A method of video processing, comprising:

performing a conversion between a video comprising a current picture comprising a

current subpicture comprising a current slice and a bitstream of the video,

wherein the bitstream conforms to a format rule,

wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein the format rule disallows an active entry in a reference picture list of the current slice from including a first picture that precedes a second picture according to a first order,

wherein the second picture comprises an intra random access point subpicture having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the current subpicture follows the intra random access point subpicture in a second order.

15. The method of claim 14, wherein the first order comprises a decoding order or an output order.

16. The method of any of claims 14 to 15, wherein the active entry corresponds to an entry that is available for use as a reference index in an inter prediction of the current slice.

17. The method of claim 14, wherein the second order comprises a decoding order and an output order.

18. The method of any of claims 14-17, wherein the reference picture list includes a List 0 reference picture list.

19. The method of any of claims 14-17, wherein the reference picture list includes a List 1 reference picture list.

20. A method of video processing, comprising:

performing a conversion between a video comprising a current picture comprising a current subpicture comprising a current slice and a bitstream of the video,

wherein the bitstream conforms to a format rule,

wherein the format rule specifies an order by which pictures are indicated in the bitstream,

wherein the format rule disallows an entry in a reference picture list of the current slice from including a first picture that precedes a second picture according to a first order or a second order,

wherein the second picture comprises an intra random access point subpicture having zero or more associated leading subpictures and having a same layer identifier of a network abstraction unit (NAL) unit and a same subpicture index as the current subpicture, and

wherein the current subpicture follows the intra random access point subpicture and the zero or more associated leading subpictures in the first order and the second order.

21. The method of claim 20, wherein the first order comprises a decoding order.

22. The method of claim 20, wherein the second order comprises an output order.

23. The method of any of claims 20-22, wherein the reference picture list includes a List 0 reference picture list.

24. The method of any of claims 20-22, wherein the reference picture list includes a List 1 reference picture list.

25. A method of video processing, comprising:

performing a conversion between a video comprising a current picture comprising a current subpicture comprising a current slice and a bitstream of the video,

wherein the bitstream conforms to a format rule that specifies that in response to the current subpicture being a random access decodable leading subpicture, an active entry of a reference picture list of the current slice is disallowed from including any one or more of:

a first picture including a random access skipped leading subpicture having a same subpicture index as that of the current subpicture, and

a second picture that precedes a third picture including an intra random access

~~point subpicture associated with the random access decodable leading subpicture in a decoding order.~~

~~26. The method of claim 25, wherein the active entry corresponds to an entry that is available for use as a reference index in an inter prediction of the current slice.~~

~~27. The method of claim 25, wherein the reference picture list includes a List 0 reference picture list.~~

~~28. The method of claim 25, wherein the reference picture list includes a List 1 reference picture list.~~

~~29. The method of any of claims 1 to 28, wherein the performing the conversion comprising encoding the video into the bitstream.~~

~~30. The method of any of claims 1 to 28, wherein the performing the conversion comprises generating the bitstream from the video, and the method further comprises storing the bitstream in a non-transitory computer-readable recording medium.~~

~~31. The method of any of claims 1 to 28, wherein the performing the conversion comprises decoding the video from the bitstream.~~

~~32. A video decoding apparatus comprising a processor configured to implement a method recited in one or more of claims 1 to 31.~~

~~33. A video encoding apparatus comprising a processor configured to implement a method recited in one or more of claims 1 to 31.~~

~~34. A computer program product having computer instructions stored thereon, the instructions, when executed by a processor, causes the processor to implement a method recited in any of claims 1 to 31.~~

35. A non-transitory computer-readable storage medium that stores a bitstream generated according to the method in any one of claims 1 to 31.

36. A non-transitory computer-readable storage medium storing instructions that cause a processor to implement a method recited in any of claims 1 to 31.

37. A method of bitstream generation, comprising:

generating a bitstream of a video according to a method recited in any of claims 1 to 31, and

storing the bitstream on a computer-readable program medium.

38. A method, an apparatus, a bitstream generated according to a disclosed method or a system described in the present document.