COMBINATION OF SUBPICTURES AND SCALABILITY

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application is a national phase of International Application No. PCT/CN2021/082029, filed on March 22, 2021, which ~~Under the applicable patent law and/or rules pursuant to the Paris Convention, this application is made to timely~~ claims the priority to and benefits of International Patent Application No. PCT/CN2020/080533, filed on March 21, 2020. ~~For all purposes under the law, t~~The entire disclosure of the aforementioned application is incorporated by reference as part of the disclosure of this application.

TECHNICAL FIELD

[002] This patent document relates to image and video coding and decoding.

BACKGROUND

[003] Digital video accounts for the largest bandwidth use on the internet and other digital communication networks. As the number of connected user devices capable of receiving and displaying video increases, it is expected that the bandwidth demand for digital video usage will continue to grow.

SUMMARY

[004] The present document discloses techniques that can be used by video encoders and decoders for processing coded representation of video using control information useful for decoding of the coded representation.

[005] In one example aspect, a video processing method is disclosed. The method includes performing a conversion between a current picture of a video and a bitstream of the video according to a rule. The rule specifies that multiple syntax elements are used to specify usage of a reference picture resampling tool in which a reference picture that has a different resolution than the current picture is resampled for the conversion.

[006] In another example aspect, a video processing method is disclosed. The method includes performing a conversion between a current picture of a video and a bitstream of the video according to a rule. The rule specifies that a syntax element that has a non-binary value is used to specify usage of (1) a reference picture resampling tool in which a reference picture that has a

CLAIMS

1. A video processing method, comprising:

performing a conversion between a video comprising multiple layers and a bitstream of the video according to a rule,

wherein the rule specifies that, in case a subpicture is treated as a video picture for the conversion, a cross-layer alignment restriction is applied to less than all of the multiple layers comprising a current layer that includes the subpicture and a subset of layers associated with the current layer, wherein the cross-layer alignment restriction includes a restriction of at least a dimension of the video picture, a number of subpictures within the video picture, a location of at least one subpicture, or an identification of a subpicture.

2. The method of claim 1, wherein the subset of layers includes all higher layers that depend on the current layer.

3. The method of claim 1 or 2, wherein the subset of layers excludes all lower layers of the current layer and higher layers that do not depend on the current layer.

4. The method of claim 1, wherein the subset of layers includes all layers that are higher than the current layer.

5. The method of claim 1, wherein the subset of layers includes all higher layers that are in a same output layer set as the current layer.

6. The method of claim 1, wherein the subset of layers includes all lower layers that are reference layers of the current layer.

7. The method of claim 1, wherein the subset of layers includes all layers that are lower than the current layer.

1. A video processing method, comprising:

performing a conversion between a video comprising multiple layers and a bitstream of the video according to a rule,

wherein the rule specifies that, in case a subpicture with a first subpicture index of i is treated as a video picture for the conversion, a cross-layer alignment restriction is applied to a current layer that includes the subpicture and a subset of layers associated with the current layer,

wherein the cross-layer alignment restriction includes a restriction of at least:

a value of a first syntax element specifying a dimension of a video picture,

a value of a second syntax element included in a sequence parameter set indicating number of subpictures in a video picture,

a value of a third syntax element indicating a dimension of an i-th subpicture,

a value of a fourth syntax element indicating a location of the i-th subpicture, or

an identification value of the i-th subpicture.

2. The method of claim 1, wherein the subset of layers associated with the current layer includes one or more higher layers that depend on the current layer.

3. The method of claim 1 or 2, wherein the subset of layers associated with the current layer excludes all higher layers that do not depend on the current layer.

4. The method of any one of claims 1 to 3, wherein the subset of layers associated with the current layer excludes all lower layers of the current layer.

5. The method of any one of claims 1 to 4, wherein the subset of layers associated with the current layer are a subset of a dependency tree associated with the current layer,

wherein the dependency tree associated with the current layer includes the current layer, all layers that have the current layer as a reference layer, and all reference layers of the current layer.

8. The method of claim 1, wherein the subset of layers includes all lower layers that are in a same output layer set as the current layer.

9. The method of claim 1, wherein the subset of layers includes all layers that are lower than a highest layer.

10. The method of claim 1, wherein the subset of layers includes all layers that are higher than a lowest layer.

11. A video processing method, comprising:

performing a conversion between a current layer of a video and a bitstream of the video according to a rule,

wherein the rule specifies that a cross-layer alignment restriction is applied to all layers in a dependency tree associated with the current layer regardless of whether any of the all layers is an output layer in an output layer set, wherein the cross-layer alignment restriction includes a restriction of at least a dimension of a video picture, a number of subpictures within a video picture, a location of at least one subpicture, or an identification of a subpicture, and wherein the all layers in the dependency tree include the current layer, all layers that have the current layer as a reference layer, and all reference layers of the current layer.

12. The method of claim 11, wherein the cross-layer alignment restriction further includes a restriction regarding whether a subpicture in a video picture is treated as a picture across the all layers.

13. The method of claim 11 or 12, wherein the cross-layer alignment restriction does not limit whether a loop filtering operation is applied on boundaries of subpictures within a video picture across the all layers.

14. The method of any of claims 11 to 13, wherein the rule further specifies that the cross-layer alignment restriction is not applied in case a syntax element in a sequence parameter set indicates that a video picture includes a single subpicture.

6. The method of claim 5, wherein the subset of layers associated with the current layer are the subset of the dependency tree regardless of whether any of the subset of the dependency tree is an output layer in an output layer set.

7. The method of any one of claims 1 to 6, wherein the cross-layer alignment restriction further includes a restriction regarding a value of a fifth syntax element, and wherein the current layer and the subset of layers associated with the current layer have a same value of the fifth syntax element,

wherein the fifth syntax element specifies whether the subpicture of each coded picture in a coded layer video sequence is treated as a picture in the decoding process excluding in-loop filtering operations.

8. The method of any one of claims 1 to 7, wherein the cross-layer alignment restriction excludes a value of a sixth syntax element,

wherein the sixth syntax element specifies whether an in-loop filtering operation across subpicture boundaries is enabled.

9. The method of any one of claims 1 to 8, wherein the rule further specifies that the cross-layer alignment restriction is not applied in case the second syntax element indicates that the video picture includes a single subpicture.

10. The method of any one of claims 1 to 9, wherein the rule further specifies that the cross-layer alignment restriction is not applied in case a seventh syntax element included in a sequence parameter set indicates that subpicture information is not present.

11. The method of any one of claims 1 to 10, wherein the rule further specifies that the cross-layer alignment restriction is applied to pictures in a target set of access units.

12. The method of any one of claims 1 to 11, wherein, for each CLVS of the current layer referring to a sequence parameter set, the target set of access units includes all access units

15. The method of any of claims 11 to 14, wherein the rule further specifies that the cross-layer alignment restriction is not applied in case a syntax element indicates that subpicture information is omitted in a sequence parameter set.

16. The method of any of claims 11 to 15, wherein the rule further specifies that the cross-layer alignment restriction is applied to pictures in a target set of access units.

17. The method of claim 16, wherein, for each CLVS of the current layer referring to a sequence parameter set, the target set of access units includes all access units starting from a first access unit that includes a first picture of the CLVS to a second access unit that includes a last picture of the CLVS according to a decoding order.

18. The method of any of claims 11 to 17, wherein the cross-layer alignment restriction further includes a scaling window offset parameter, the scaling window offset parameter comprising at least one of: (1) a left offset of a scaling window, (2) a right offset of the scaling window, (3) a top offset of the scaling window, or (4) a bottom offset of the scaling window.

19. A video processing method, comprising:

performing a conversion between a current picture of a video and a bitstream of the video according to a rule,

wherein the rule specifies that resampling of a reference picture that is in a same layer as the current picture is enabled regardless of a value of a syntax element specifying whether a change of a picture resolution is allowed in a Coded Layer Video Sequence (CLVS).

20. The method of claim 19, wherein in case the syntax element indicates that a change of the picture resolution is disallowed in the CLVS, a reference picture resampling tool in which a reference picture that has a different picture resolution than the current picture is resampled is enabled for the reference picture.

21. A method of processing video, comprising:

starting from a first access unit that includes a first picture of the CLVS to a second access unit that includes a last picture of the CLVS according to a decoding order.

13. The method of any one of claims 1 to 12, wherein the conversion comprises encoding the video into the bitstream.

14. The method of any one of claims 1 to 12, wherein the conversion comprises decoding the bitstream to generate the video.

15. 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 multiple layers and a bitstream of the video according to a rule,

wherein the rule specifies that, in case a subpicture with a first subpicture index of i is treated as a video picture for the conversion, a cross-layer alignment restriction is applied to a current layer that includes the subpicture and a subset of layers associated with the current layer,

wherein the cross-layer alignment restriction includes a restriction of at least:

a value of a first syntax element specifying a dimension of a video picture,

a value of a second syntax element included in a sequence parameter set indicating number of subpictures in a video picture,

a value of a third syntax element indicating a dimension of an i-th subpicture,

a value of a fourth syntax element indicating a location of the i-th subpicture, or

an identification value of the i-th subpicture.

16. The apparatus of claim 15, wherein the subset of layers associated with the current layer includes one or more higher layers that depend on the current layer.

17. The apparatus of claim 15 or 16, wherein the subset of layers associated with the current layer excludes all higher layers that do not depend on the current layer.

performing a conversion between a current picture of a video comprising multiple layers and a bitstream of the video according to a rule,

wherein the rule specifies one of: (1) a reference picture of the current picture is disallowed to be collocated, or (2) in case that the reference picture of the current picture is collocated, then motion vectors pointing to the reference picture are used during the conversion of the current picture without scaling.

22. The method of claim 21, wherein the reference picture is a long-term reference picture.

23. The method of claim 21, wherein the reference picture is an inter-layer reference picture.

24. A video processing method, comprising:

performing a conversion between a video and a bitstream of the video according to a rule,

wherein the rule specifies that a scaling window offset parameter is same for any two video pictures in a same Coded Layer Video Sequence (CLVS) or a Coded Video Sequence (CVS) that have a same dimension represented in a number of luma samples.

25. The method of claim 24, wherein the scaling window offset parameter includes at least one of: (1) a left offset of a scaling window, (2) a right offset of the scaling window, (3) a top offset of the scaling window, or (4) a bottom offset of the scaling window.

26. The method of claim 24 or 25, wherein the dimension includes a width or a height of a picture.

27. The method of any of claims 24 to 26, wherein the rule further specifies that the any two video pictures belong to a same layer.

28. The method of any of claims 24 to 26, wherein the rule further specifies that the any two video pictures belong to two layers comprising a first layer and a second layer, wherein the first layer is a reference layer of the second layer.

18. The apparatus of any one of claims 15 to 17, wherein the subset of layers associated with the current layer excludes all lower layers of the current layer.

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

perform a conversion between a video comprising multiple layers and a bitstream of the video according to a rule,

wherein the rule specifies that, in case a subpicture with a first subpicture index of i is treated as a video picture for the conversion, a cross-layer alignment restriction is applied to a current layer that includes the subpicture and a subset of layers associated with the current layer,

wherein the cross-layer alignment restriction includes a restriction of at least:

a value of a first syntax element specifying a dimension of a video picture,

a value of a second syntax element included in a sequence parameter set indicating number of subpictures in a video picture,

a value of a third syntax element indicating a dimension of an i-th subpicture,

a value of a fourth syntax element indicating a location of the i-th subpicture, or an identification value of the i-th subpicture.

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 multiple layers according to a rule,

wherein the rule specifies that, in case a subpicture with a first subpicture index of i is treated as a video picture for the conversion, a cross-layer alignment restriction is applied to a current layer that includes the subpicture and a subset of layers associated with the current layer,

wherein the cross-layer alignment restriction includes a restriction of at least:

a value of a first syntax element specifying a dimension of a video picture,

29. A video processing method, comprising:

performing a conversion between a current picture of a video and a bitstream of the video according to a rule,

wherein the rule specifies that, in response to a picture resolution of the current picture being different than at least one other picture in a same access unit of the current picture, an inter-layer prediction coding tool is enabled only in case that the current picture is an intra random access point (IRAP) picture.

30. The method of any of claims 1 to 29, wherein a change of a picture resolution of a reference picture being disallowed indicates that the picture resolution of the reference picture is same as the picture resolution of the current picture.

31. The method of any of claims 1 to 30, wherein the picture resolution of a video picture includes a width or a height of the video picture.

32. The method of any of claims 1 to 30, wherein the picture resolution of a video picture includes a width, a height, and/or a top-left position of a scaling window or a conformance window of the video picture.

33. The method of any of claims 1 to 32, wherein the conversion comprises encoding the video into the bitstream.

34. The method of any of claims 1 to 32, wherein the conversion comprises decoding the bitstream to generate the video.

35. A method for storing bitstream of a video, comprising:

generating a bitstream of the video from multiple layers of the video according to a rule,

wherein the rule specifies that, in case a subpicture is treated as a video picture for the conversion, a cross-layer alignment restriction is applied to less than all of the multiple layers comprising a current layer that includes the subpicture and a subset of layers associated with the current layer, wherein the cross-layer alignment restriction includes a restriction of at least a

a value of a second syntax element included in a sequence parameter set indicating number of subpictures in a video picture,

a value of a third syntax element indicating a dimension of an i-th subpicture,

a value of a fourth syntax element indicating a location of the i-th subpicture, or

an identification value of the i-th subpicture.

dimension of the video picture, a number of subpictures within the video picture, a location of at least one subpicture, or an identification of a subpicture.

36. A method for storing bitstream of a video, comprising:

generating a bitstream of the video from a current layer of the video according to a rule,

wherein the rule specifies that, a cross-layer alignment restriction is applied to all layers in a dependency tree associated with the current layer regardless of whether any of the all layers is an output layer in an output layer set, wherein the cross-layer alignment restriction includes a restriction of at least a dimension of a video picture, a number of subpictures within a video picture, a location of at least one subpicture, or an identification of a subpicture, and wherein the all layers in the dependency tree include the current layer, all layers that have the current layer as a reference layer, and all reference layers of the current layer.

37. A method for storing bitstream of a video, comprising:

generating a bitstream of the video from a current picture of the video according to a rule,

wherein the rule specifies that resampling of a reference picture that is in a same layer as the current picture is enabled regardless of a value of a syntax element specifying whether a change of a picture resolution is allowed in a Coded Layer Video Sequence (CLVS).

38. A method for storing bitstream of a video, comprising:

generating a bitstream of the video from a current picture of the video according to a rule,

wherein the rule specifies one of: (1) a reference picture of the current picture is disallowed to be collocated, or (2) in case that the reference picture of the current picture is collocated, then motion vectors pointing to the reference picture are used during the conversion of the current picture without scaling.

39. A method for storing bitstream of a video, comprising:

generating a bitstream of the video from the video according to a rule,

wherein the rule specifies that a scaling window offset parameter is same for any two video pictures in a same Coded Layer Video Sequence (CLVS) or a Coded Video Sequence (CVS) that have a same dimension represented in a number of luma samples.

40. A method for storing bitstream of a video, comprising:

generating a bitstream of the video from a current picture of the video according to a rule,

wherein the rule specifies that, in response to a picture resolution of the current picture being different than at least one other picture in a same access unit of the current picture, an inter-layer prediction coding tool is enabled only in case that the current picture is an intra random access point (IRAP) picture.

41. A video decoding apparatus comprising a processor configured to implement a method recited in any of claims 1 to 40.

42. A video encoding apparatus comprising a processor configured to implement a method recited in any of claims 1 to 40.

43. A computer program product having computer code stored thereon, the code, when executed by a processor, causes the processor to implement a method recited in any of claims 1 to 40.

44. 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 a bitstream of the video from multiple layers of the video according to a rule,

wherein the rule specifies that, in case a subpicture is treated as a video picture for the conversion, a cross-layer alignment restriction is applied to less than all of the multiple layers comprising a current layer that includes the subpicture and a subset of layers associated with the current layer, wherein the cross-layer alignment restriction includes a restriction of at least a dimension of the video picture, a number of subpictures within the video picture, a location of at least one subpicture, or an identification of a subpicture.

45. 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 a bitstream of the video from a current layer of the video according to a rule,

wherein the rule specifies that, a cross-layer alignment restriction is applied to all layers in a dependency tree associated with the current layer regardless of whether any of the all layers is an output layer in an output layer set, wherein the cross-layer alignment restriction includes a restriction of at least a dimension of a video picture, a number of subpictures within a video picture, a location of at least one subpicture, or an identification of a subpicture, and wherein the all layers in the dependency tree include the current layer, all layers that have the current layer as a reference layer, and all reference layers of the current layer.

46. 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 a bitstream of the video from a current picture of the video according to a rule,

wherein the rule specifies that resampling of a reference picture that is in a same layer as the current picture is enabled regardless of a value of a syntax element specifying whether a change of a picture resolution is allowed in a Coded Layer Video Sequence (CLVS).

47. 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 a bitstream of the video from a current picture of the video according to a rule,

wherein the rule specifies one of: (1) a reference picture of the current picture is disallowed to be collocated, or (2) in case that the reference picture of the current picture is collocated, then motion vectors pointing to the reference picture are used during the conversion of the current picture without scaling.

~~48. 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 a bitstream of the video from the video according to a rule,~~

~~wherein the rule specifies that a scaling window offset parameter is same for any two video pictures in a same Coded Layer Video Sequence (CLVS) or a Coded Video Sequence (CVS) that have a same dimension represented in a number of luma samples.~~

~~49. 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 a bitstream of the video from a current picture of the video according to a rule,~~

~~wherein the rule specifies that, in response to a picture resolution of the current picture being different than at least one other picture in a same access unit of the current picture, an inter-layer prediction coding tool is enabled only in case that the current picture is an intra random access point (IRAP) picture.~~

~~50. A method, apparatus or system described in the present document.~~