INTRA RANDOM ACCESS POINTS FOR PICTURE CODING

CROSS-REFERENCE TO RELATED APPLICATIONS

[001] This application is based on International Patent Application No. PCT/US2021/022572, filed on March 16, 2021, which claims~~Under the applicable patent law and/or rules pursuant to the Paris Convention, this application is made to timely~~ claim the priority to and benefits of U.S. Provisional Patent Application No. US 62/992,046 filed on March 19, 2020. All the aforementioned patent applications are hereby incorporated by reference in their entireties~~For all purposes under the law, 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 a bitstream syntax that provides improved performance. The disclosed methods may be used by apparatus that performs video processing such as video encoding or video decoding or video transcoding.

[005] In one example aspect, a video processing method is disclosed. The method includes performing a conversion between a video having one or more video layers comp\rising one or more video pictures and a coded representation of the video; wherein the coded representation is organized according to a rule that specifies that a first video picture that is an intra random access point picture of a second picture and the second picture are constrained to belong to a same video layer.

[006] In another example aspect, another video processing method is disclosed. The method includes performing a conversion between a video having one or more video layers comprising one or more video pictures and a coded representation of the video, wherein the coded representation conforms to a format rule that specifies that a trailing picture in the coded

CLAIMS

1. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a format rule, and

wherein the format rule specifies that a first video picture that is an associated intra random access point picture of a second picture and the second picture are constrained to belong to a same video layer.

2. The method of claim 1, wherein, between the first video picture and the second picture in decoding order, there is no gradual decoding refresh picture in the same video layer.

3. The method of claim 1, wherein the first video picture and the second picture have a same identifier of a layer to which a video coding layer network abstraction layer unit belongs or a same identifier of a layer to which a non-video coding layer network abstraction layer unit applies.

4. The method of any of claims 1-3, wherein, between the first video picture and the second picture in decoding order, there is no gradual decoding refresh picture with the same identifier.

5. The method of claim 1, wherein the format rule further specifies that a trailing picture follows an associated intra random access point picture or a gradual decoding refresh picture in an output order.

6. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a format rule, and

wherein the format rule specifies that a trailing picture in the bitstream is permitted to be associated with a gradual decoding refresh picture.

1. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a first rule, and

wherein the first rule specifies to apply a first constraint on a decoding order of a current picture associated with an intra random access point picture and a non-leading picture if and only if the current picture, the intra random access point picture and the non-leading picture are in a same layer.

2. The method of claim 1, wherein the first constraint specifies that in case that a value of a field sequence flag is equal to 0 and the current picture with a NAL (network abstraction layer) unit header layer identifier equal to a particular value is a leading picture associated with the intra random access point picture, the current picture precedes, in the decoding order, all non-leading pictures that are associated with the intra random access point picture.

3. The method of claim 2, wherein if the value of the field sequence flag is equal to 1, let picA and picB be the first and the last leading pictures, in decoding order, associated with an IRAP picture, respectively, there is at most one non-leading picture with NAL unit header layer identifier equal to layerId preceding picA in decoding order, and there is no non-leading picture with NAL unit header layer identifier equal to layerId between picA and picB in decoding order.

4. The method of claim 2, wherein the value of the field sequence flag that is equal to 0 indicates that a coded layer video sequence conveys pictures that represent frames.

5. The method of any one of claims 1-4, wherein the conversion is performed according to a second rule;

wherein the second rule specifies that when a current picture, with NAL unit header layer identifier equal to a particular value layerId, is a specific picture, there is no picture referred to by an entry in RefPicList[0] or RefPicList[1] that precedes, in output order or decoding order,

7. The method of claim 6, wherein the trailing picture is a picture for which each video coding layer network abstraction layer unit has a trail network abstraction layer unit type.

8. The method of claim 6 or 7, wherein the trailing picture is permitted to be associated with an intra random access point picture.

9. The method of any of claims 6-8, wherein the trailing picture associated with an intra random access point picture or a gradual decoding refresh picture follows the intra random access point picture or the gradual decoding refresh picture in decoding order.

10. The method any of claims 6-8, wherein pictures that follow the associated intra random access point picture in output order and precede the associated intra random access point picture in decoding order are not allowed.

11. The method of claim 6, wherein the format rule further specifies that, for each layer, each picture of the layer, except the first picture in the layer in the bitstream, is specified to be associated with a closer one of a previous intra random access point or a gradual decoder refresh picture of the same layer in decoding order.

12. The method of claim 6 or 11, wherein the trailing picture is required to follow the associated intra random access point or gradual decoder refresh picture in output order.

13. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a format rule, and

wherein the format rule specifies that a constraint for an output order of pictures preceding an intra random access point in a decoding order is applicable to pictures in a same video layer.

14. The method of claim 13, wherein the constraint specifies that any picture having a NAL (network abstraction layer) unit header layer identifier equal to a particular value and preceding, in a decoding order, an intra random access point picture with the NAL unit header layer identifier

any preceding IRAP picture with NAL unit header layer identifier equal to layerId in decoding order.

6. The method of claim 5, wherein the specific picture is an IRAP picture or a clean random access picture.

7. The method of any one of claims 1-6, wherein the conversion is performed according to a third rule;

wherein the third rule specifies that a first video picture that is an associated intra random access point picture of a second picture and the second picture are constrained to belong to a same video layer.

8. The method of claim 7, wherein, between the first video picture and the second picture in decoding or output order, there is no gradual decoding refresh picture in the same video layer.

9. The method of claim 7, wherein the first video picture and the second picture have a same identifier of a layer to which a video coding layer network abstraction layer unit belongs or a same identifier of a layer to which a non-video coding layer network abstraction layer unit applies.

10. The method of any one of claims 1-9, the conversion is performed according to a fourth rule;

wherein the fourth rule specifies that a trailing picture in the bitstream is permitted to be associated with a gradual decoding refresh picture or an intra random access point picture.

11. The method of claim 10, wherein the trailing picture is a picture for which each video coding layer network abstraction layer unit has a trail network abstraction layer unit type.

12. The method of claim 10, wherein the trailing picture associated with an intra random access point picture or a gradual decoding refresh picture follows the intra random access point picture or the gradual decoding refresh picture in decoding or output order.

equal to the particular value is required to precede, in an output order, the intra random access point picture and all associated random access decodable leading pictures.

15. The method of claim 14, wherein the NAL (network abstraction layer) unit header layer identifier is nuh_layer_id.

16. The method of claim 14, wherein the NAL (network abstraction layer) unit header layer identifier specifies the identifier of a layer to which a video coding layer network abstraction layer unit belongs or the identifier of a layer to which a non-video coding layer network abstraction layer unit applies.

17. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a format rule, and

wherein the format rule specifies a constraint that (1) a trailing picture follows an associated intra random access point picture or a gradual decoder refresh picture in an output order, or (2) a picture having a same NAL (network abstraction layer) unit header layer identifier as that of the gradual decoder refresh picture precedes, in the output order, the gradual decoder refresh picture and all associated pictures of the gradual decoder refresh picture.

18. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a rule, and

wherein the rule specifies to apply a constraint on a decoding order of a picture associated with an intra random access point picture and a non-leading picture if and only if the picture, the intra random access point picture and the non-leading picture are in a same layer.

19. The method of claim 18, wherein the constraint specifies that in case that a value of a field sequence flag is equal to 0 and the picture with a NAL (network abstraction layer) unit header layer identifier equal to a particular value is a leading picture associated with the intra random

13. The method claim 10, wherein pictures that follow the associated intra random access point picture in output order and precede the associated intra random access point picture in decoding order are not allowed.

14. The method of claim 10, wherein the fourth rule further specifies that, for each layer, each picture of the layer, except the first picture in the layer in the bitstream, is specified to be associated with a closer one of a previous intra random access point or a gradual decoder refresh picture of the same layer in decoding order.

15. The method of any one of claims 1-14, wherein the conversion is performed according to a fifth rule;

wherein the fifth rule specifies that a fifth constraint for an output order of pictures preceding an intra random access point in a decoding order is applicable to pictures in a same video layer.

16. The method of claim 15, wherein the fifth constraint specifies that any picture having a NAL unit header layer identifier equal to a particular value and preceding, in a decoding order, an intra random access point picture with the NAL unit header layer identifier equal to the particular value is required to precede, in an output order, the intra random access point picture and all associated random access decodable leading pictures.

17. The method of any one of claims 1-16, wherein the conversion includes encoding the video into the bitstream.

18. The method of any one of claims 1-16, wherein the conversion includes decoding the video from the bitstream.

19. 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:

access point picture, the picture precedes, in the decoding order, all non-leading pictures that are associated with the intra random access point picture.

20. The method of claim 19, wherein the value of the field sequence flag that is equal to 0 indicates that a coded layer video sequence conveys pictures that represent frames.

21. The method of claim 18, wherein the constraint specifies that in case that a value of a field sequence flag is equal to 0 and the picture is a leading picture associated with the intra random access point picture, the picture precedes, in the decoding order, all non-leading pictures that are associated with the intra random access point picture.

22. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a rule, and

wherein the rule specifies an order of a leading picture, a random access decodable leading picture and a random access skipped leading picture associated with a gradual decoding refresh picture.

23. The method of claim 22, wherein the leading picture associated with the gradual decoding refresh picture follows the gradual decoding refresh picture in decoding order and precedes the gradual decoding refresh picture in output order.

24. The method of claim 22, wherein the random access decodable leading pictures associated with the gradual decoding refresh picture is the leading picture associated with the gradual decoding refresh picture and has a NAL (network abstraction layer) unit type corresponding to a coded slice of the random access decodable leading picture.

25. The method of claim 22, wherein the random access decodable leading picture associated with the gradual decoding refresh picture is the leading picture associated with the gradual decoding refresh picture and has a NAL (network abstraction layer) unit type corresponding to a coded slice of the random access decodable leading picture.

perform a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a first rule, and

wherein the first rule specifies to apply a first constraint on a decoding order of a current picture associated with an intra random access point picture and a non-leading picture if and only if the current picture, the intra random access point picture and the non-leading picture are in a same layer.

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

perform a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a first rule, and

wherein the first rule specifies to apply a first constraint on a decoding order of a current picture associated with an intra random access point picture and a non-leading picture if and only if the current picture, the intra random access point picture and the non-leading picture are in a same layer.

21. 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 having one or more video layers comprising one or more video pictures according to a first rule, and

wherein the first rule specifies to apply a first constraint on a decoding order of a current picture associated with an intra random access point picture and a non-leading picture if and only if the current picture, the intra random access point picture and the non-leading picture are in a same layer.

26. A method of video processing, comprising:

performing a conversion between a video having one or more video layers comprising one or more video pictures and a bitstream of the video according to a rule, and

wherein the rule specifies that a constraint for a reference picture list for a slice of a clean random access picture is limited to a layer.

27. The method of claim 26, wherein the constraint specifies that, for a layer having the clean random access picture, a preceding intra random access point picture in a decoding or an output order is not referred to by an entry in the reference picture list.

28. The method of any of claims 1 to 27, wherein the conversion includes encoding the video into the bitstream.

29. The method of any of claims 1 to 27, wherein the conversion includes decoding the video from the bitstream.

30. The method of claims 1 to 27, wherein the conversion includes generating the bitstream from the video, and the method further comprises: storing the bitstream in a non-transitory computer-readable recording medium.

31. A video processing apparatus comprising a processor configured to implement a method recited in any one or more of claims 1 to 30.

32. A method of storing a bitstream of a video, comprising, a method recited in any one of claims 1 to 30, and further including storing the bitstream to a non-transitory computer-readable recording medium.

33. A computer readable medium storing program code that, when executed, causes a processor to implement a method recited in any one or more of claims 1 to 30.

~~34. A computer readable medium that stores a bitstream generated according to any of the above described methods.~~

~~35. A video processing apparatus for storing a bitstream representation, wherein the video processing apparatus is configured to implement a method recited in any one or more of claims 1 to 30.~~