TECHNIQUES FOR IMPLEMENTING A DECODING ORDER WITHIN A CODED PICTURE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] ~~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 US Provisional Application No. 62/953,812 filed on December 26, 2019 and US Provisional Application No. 62/954,375 filed on December 27, 2019. For all purposes under the law, the entire disclosures of the aforementioned applications are incorporated by reference as part of the disclosure of this application.~~This application is a national phase of International Patent Application No. PCT/US2020/066356, filed on December 21, 2020, which claims the priority to and benefits of US Provisional Application No. 62/953,812 filed on December 26, 2019 and US Provisional Application No. 62/954,375 filed on December 27, 2019. The entire disclosures of the aforementioned applications are incorporated by reference as part of the disclosure of this application.

TECHNICAL FIELD

[0002] This document is related to video coding techniques, systems and devices.

BACKGROUND

[0003] 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

[0004] Devices, systems and methods related to digital video coding, which include specifying a decoding order of video coding layer (VCL) network abstraction layer (NAL) units within a coded picture, are described. The described methods may be applied to both the existing video coding standards (e.g., High Efficiency Video Coding (HEVC) and/or Versatile Video Coding (VVC)) and future video coding standards or video codecs.

[0005] In one representative aspect, the disclosed technology may be used to provide a

method for video processing. This method includes performing a conversion between a video comprising one or more pictures comprising one or more subpictures comprising one or more slices and a bitstream representation of the video according to a rule, and wherein the bitstream representation includes a number of coded units, wherein the rule specifies that a decoding order

WHAT IS CLAIMED IS:

1. A method of video processing, comprising:

performing a conversion between a video comprising one or more pictures comprising one or more subpictures comprising one or more slices and a bitstream representation of the video according to a rule, and

wherein the bitstream representation includes a number of coded units,

wherein the rule specifies that a decoding order of coded units within a subpicture is in an increasing order of subpicture level slice index values of the coded units.

2. The method of claim 1, wherein the coded units correspond to video coded layer (VCL) network abstraction layer (NAL) units.

3. The method of claim 1, wherein the rule is applied in a case that a slice mode is a rectangular slice mode.

4. The method of claim 1, wherein a subpicture-level slice index value is a value of a slice_address syntax element in a slice header that specifies a slice address of a slice.

5. The method of any of claims 1 to 4, wherein a value of a slice_subpic_id parameter is inferred upon a determination that the bitstream representation excludes the slice_subpic_id parameter.

6. The method of claim 5, wherein the slice_subpic_id parameter specifies a subpicture identification (ID) of the subpicture that contains the slice.

7. The method of claim 5, wherein the value of the slice_subpic_id parameter is inferred to be equal to 0 upon the determination.

1. A method of video processing, comprising:

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

wherein the bitstream includes a number of coded units, and

wherein the rule specifies that a decoding order of coded units within a subpicture is in an increasing order of values of slice_address syntax elements in slice headers that specify slice addresses of slices corresponding to the coded units.

2. The method of claim 1, wherein the coded units correspond to video coded layer (VCL) network abstraction layer (NAL) units.

3. The method of claim 1 or claim 2, wherein when a slice mode is a rectangular slice mode, a value of a slice_address syntax element in a slice header is equal to a subpicture-level slice index.

4. The method of any one of claims 1-3, wherein the subpicture-level slice index specifies an index of a slice to a list of slices in a subpicture in the order as they are signalled in a picture parameter set.

5. The method of any one of claims 1-4, wherein a value of a slice_subpic_id parameter is inferred upon a determination that the bitstream excludes the slice_subpic_id parameter, and

wherein the slice_subpic_id parameter specifies a subpicture identification (ID) of the subpicture that contains the slice.

6. The method of any one of claims 1-5, wherein the value of the slice_subpic_id parameter is inferred to be equal to 0 upon the determination.

8. The method of any of claims 1-7, wherein subpicture ID values of subpictures comprising the plurality of the coded units monotonically increase with the subpicture index values of subpictures comprising the plurality of the coded units.

9. The method of any of claims 5 to 7, wherein the decoding order of the coded units within a picture including a first slice network abstraction layer (NAL) unit and a second slice NAL unit is specified such that the first slice NAL unit precedes the second slice NAL unit in a case that i) a subpicture-level slice index value of the first slice NAL unit is less than a subpicture-level slice index value of the second slice NAL unit, or ii) the subpicture-level slice index value of the first slice NAL unit is equal to the subpicture-level slice index value of the second slice NAL unit and a value of a slice_address syntax element of the first slice NAL unit is less than a value of a slice_adress syntax element of the second slice NAL unit.

10. A method of video processing, comprising:

performing a conversion between a video comprising one or more pictures comprising one or more subpictures comprising one or more slices and a bitstream representation of the video according to a rule, and

wherein the bitstream representation includes a number of coded units,

wherein the rule specifies that a decoding order of coded units is in an increasing order of subpicture related values of subpictures from the one or more subpictures that include the coded units.

11. The method of claim 10, wherein the coded units correspond to video coded layer (VCL) network abstraction layer (NAL) units.

12. The method of claim 10, wherein the rule is applied in a case that a slice mode is a rectangular slice mode.

13. The method of claim 10, wherein the subpicture related values correspond to identification (ID) values of subpictures comprising the coded units.

7. The method of any one of claims 1-6, wherein subpicture ID values of subpictures comprising the number of the coded units monotonically increase with subpicture index values of subpictures comprising the number of the coded units.

8. The method of any one of claims 1-7, wherein the decoding order of coded units within a picture including a first slice network abstraction layer (NAL) unit and a second slice NAL unit is specified such that the first slice NAL unit precedes the second slice NAL unit in a case that i) a subpicture index value of the first slice NAL unit is less than a subpicture index value of the second slice NAL unit, or ii) the subpicture index value of the first slice NAL unit is equal to the subpicture index value of the second slice NAL unit and a value of the slice_address syntax element of the first slice NAL unit is less than a value of the slice_adress syntax element of the second slice NAL unit.

9. The method of any one of claims 1-8, wherein the conversion includes encoding the video into the bitstream.

10. The method of any one of claims 1-8, wherein the conversion includes decoding the video from the bitstream.

11. 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 comprising one or more slices and a bitstream of the video according to a rule,

wherein the bitstream includes a number of coded units, and

wherein the rule specifies that a decoding order of coded units within a subpicture is in an increasing order of values of slice_address syntax elements in slice headers that specify slice addresses of slices corresponding to the coded units.

12. The apparatus of claim 11, wherein the coded units correspond to video coded layer (VCL) network abstraction layer (NAL) units.

14. The method of claim 10, wherein the subpicture related values correspond to subpicture index values of subpictures comprising the coded units.

15. The method of any of claims 10 to 14, wherein a value of a slice_subpic_id parameter is inferred upon a determination that the bitstream representation excludes the slice_subpic_id parameter.

16. The method of claim 15, wherein the value of the slice_subpic_id parameter is inferred to be equal to 0 upon the determination.

17. The method of any of claims 10 to 16, wherein subpicture ID values of subpictures comprising the coded units monotonically increase with the subpicture index values of subpictures comprising the plurality of the coded units.

18. The method of any of claims 10 to 16, wherein the conversion includes encoding the video into the bitstream representation.

19. The method of any of claims 10 to 16, wherein the conversion includes decoding the video from the bitstream representation.

20. A video processing apparatus comprising a processor configured to implement a method recited in any one or more of claims 1 to 19.

21. 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 19.

22. A computer readable medium that stores a coded representation or a bitstream representation generated according to any of the above described methods.

13. The apparatus of claim 11 or claim 12, wherein when a slice mode is a rectangular slice mode, a value of a slice_address syntax element in a slice header is equal to a subpicture-level slice index, and

wherein the subpicture-level slice index specifies an index of a slice to a list of slices in a subpicture in the order as they are signalled in a picture parameter set.

14. The apparatus of any one of claims 11-13, wherein the decoding order of coded units within a picture including a first slice network abstraction layer (NAL) unit and a second slice NAL unit is specified such that the first slice NAL unit precedes the second slice NAL unit in a case that i) a subpicture index value of the first slice NAL unit is less than a subpicture index value of the second slice NAL unit, or ii) the subpicture index value of the first slice NAL unit is equal to the subpicture index value of the second slice NAL unit and a value of the slice_address syntax element of the first slice NAL unit is less than a value of the slice_adress syntax element of the second slice NAL unit.

15. 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 comprising one or more slices and a bitstream of the video according to a rule, wherein the bitstream includes a number of coded units, and

wherein the rule specifies that a decoding order of coded units within a subpicture is in an increasing order of values of slice_address syntax elements in slice headers that specify slice addresses of slices corresponding to the coded units.

16. The non-transitory computer-readable storage medium of claim 15, wherein when a slice mode is a rectangular slice mode, a value of a slice_address syntax element in a slice header is equal to a subpicture-level slice index, and

wherein the subpicture-level slice index specifies an index of a slice to a list of slices in a subpicture in the order as they are signalled in a picture parameter set.

17. The non-transitory computer-readable storage medium of claim 15 or claim 16, wherein the decoding order of coded units within a picture including a first slice network abstraction

~~23. 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 19.~~

layer (NAL) unit and a second slice NAL unit is specified such that the first slice NAL unit precedes the second slice NAL unit in a case that i) a subpicture index value of the first slice NAL unit is less than a subpicture index value of the second slice NAL unit, or ii) the subpicture index value of the first slice NAL unit is equal to the subpicture index value of the second slice NAL unit and a value of the slice_address syntax element of the first slice NAL unit is less than a value of the slice_adress syntax element of the second slice NAL unit.

18. 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 comprising one or more slices according to a rule,

wherein the bitstream includes a number of coded units, and

wherein the rule specifies that a decoding order of coded units within a subpicture is in an increasing order of values of slice_address syntax elements in slice headers that specify slice addresses of slices corresponding to the coded units.

19. The non-transitory computer-readable recording medium of claim 18, wherein when a slice mode is a rectangular slice mode, a value of a slice_address syntax element in a slice header is equal to a subpicture-level slice index, and

wherein the subpicture-level slice index specifies an index of a slice to a list of slices in a subpicture in the order as they are signalled in a picture parameter set.

20. The non-transitory computer-readable recording medium of claim 18, wherein the decoding order of coded units within a picture including a first slice network abstraction layer (NAL) unit and a second slice NAL unit is specified such that the first slice NAL unit precedes the second slice NAL unit in a case that i) a subpicture index value of the first slice NAL unit is less than a subpicture index value of the second slice NAL unit, or ii) the subpicture index value of the first slice NAL unit is equal to the subpicture index value of the second slice NAL unit and a value of the slice_address syntax element of the first slice NAL unit is less than a value of the slice_adress syntax element of the second slice NAL unit.