

Citation List

Non Patent Literature

- [0013] NPL 1 : Benjamin Bross, Gary J. Sullivan, Ye-Kui Wang, "'Editors' proposed corrections to HEVC version 1'", JCTVC-M0432_v3, 2013. 4. 18-4. 26

Summary of Invention

Technical Problem

- [0014] However, conversion into an image which is intended by a producer is not considered when conversion of a dynamic range is converted.
- [0015] It is desirable to convert a decoded image into a desired image with a different dynamic range.

Solution to Problem

- [0016] ~~According to an embodiment of the present disclosure, there is provided a decoding device including: circuitry configured to receive coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and decode the received coded data so as to generate the image, wherein the conversion uses a knee function.~~

According to a first aspect of the present invention, there is provided a decoding device comprising: circuitry configured to receive coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and decode the received coded data so as to generate the image, wherein the conversion uses a knee function, and the conversion information includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images.

- [0017] ~~A decoding method of causing a decoding device to perform: receiving coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and decoding the received coded data so as to generate the image, wherein the conversion uses a knee function.~~

According to a second aspect of the present invention, there is provided a decoding method of causing a decoding device to perform: receiving coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and

decoding the received coded data so as to generate the image, wherein the conversion uses a knee function, and the conversion information includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images.

[0018] ~~A coding device including: circuitry configured to set conversion information pertaining to a conversion of dynamic range of a luminance of an image from a first dynamic range into a second dynamic range; and code the image having luminance in the first dynamic range so as to generate coded data, wherein the conversion uses a knee function.~~

According to a third aspect of the present invention, there is provided a coding device comprising: circuitry configured to set conversion information pertaining to a conversion of dynamic range of a luminance of an image from a first dynamic range into a second dynamic range; and code the image having luminance in the first dynamic range so as to generate coded data, wherein the conversion uses a knee function, and the conversion information includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images.

[0019] ~~A non-transitory computer-readable medium having stored thereon coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range, wherein a decoding device decodes coded data, generates the image based on the decoded data, and converts the dynamic range based on the conversion information including a knee point.~~

According to a fourth aspect of the present invention, there is provided a non-transitory computer-readable medium having stored thereon coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range, wherein a decoding device decodes the coded data, generates the image based on the decoded data, and converts the dynamic range based on the conversion information including a knee point, and the conversion information further includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images.

[0020] ~~According to an embodiment of the present disclosure, there is provided~~ Disclosed herein is a decoding

device including an extraction unit that extracts coded data and conversion information from a coded stream including the coded data of a first image which is an image having luminance in a first dynamic range and the conversion information regarding conversion of a dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and a decoding unit that decodes the coded data extracted by the extraction unit so as to generate the first image.

[0021] ~~A~~Disclosed herein is a decoding method according to ~~an embodiment of the present disclosure corresponds to the above disclosed~~ decoding device ~~according to the embodiment of the present disclosure.~~

[0022] According to ~~an~~ embodiments of the present ~~disclosure~~invention, coded data and conversion information are extracted from a coded stream including the coded data of a first image which is an image having luminance in a first dynamic range and the conversion information which is information regarding conversion of a dynamic range of the luminance of the image from the first dynamic range into a second dynamic range, and the extracted coded data is decoded so that the first image is generated.

[0023] ~~According to another embodiment of the present disclosure, there is provided~~ Disclosed herein is a coding device including a setting unit that sets conversion information which is information regarding conversion of a dynamic range of luminance of an image from a first dynamic range into a second dynamic range; a coding unit that codes a first image which is the image having luminance in the first dynamic range so as to generate coded data; and a transmission unit that transmits a coded stream including the conversion information set by the setting unit and the coded data of the first image generated by the coding unit.

[0024] ~~A~~Disclosed herein is a coding method ~~of another embodiment of the present disclosure corresponds corresponding to the above disclosed~~ coding device ~~according to another embodiment of the present disclosure.~~

[0025] According to ~~an~~ embodiments of the present ~~disclosure~~invention, conversion information is set which is information regarding conversion of a dynamic range of luminance of an image from a first dynamic range into a second dynamic range, a first image which is the image having luminance in the first dynamic range is coded so that coded data is generated, and a coded stream including the conversion information and the coded data of the first image is transmitted.

[0026] In addition, the decoding device and the coding device according to the embodiments may be implemented by executing a program in a computer.

[0027] Further, the program executed in the computer in order to implement the decoding device and the coding device according to an embodiment may be provided by transmitting the program via a transmission medium or by recording the program on a recording medium.

[0028] The decoding device and the coding device according to embodiments may be

standalone devices, and may be an internal block forming a single apparatus.

Advantageous Effects of Invention

[0029] According to ~~an~~ embodiments of the present ~~disclosure~~ invention, it is possible to decode coded data of an image. In addition, according to ~~the~~ embodiments of the present ~~disclosure~~ invention, it is possible to convert a decoded image into a desired image with a different dynamic range.

[0030] According to ~~another~~ embodiments of the present ~~disclosure~~ invention, it is possible to code an image. In addition, according to ~~another~~ embodiments of the present ~~disclosure~~ invention, it is possible to code an image so that a decoded image can be converted into a desired image with a different dynamic range during decoding.

[0031] In addition, the effects described here are not necessarily limited, and there may be any one of effects described in the present disclosure.

Brief Description of Drawings

[0032] [fig. 1] Fig. 1 is a diagram illustrating an SDR image.

[fig. 2] Fig. 2 is a diagram illustrating an HDR image.

[fig. 3] Fig. 3 is a diagram illustrating an overview of coding in an embodiment of the present disclosure.

[fig. 4] Fig. 4 is a diagram illustrating an overview of decoding in an embodiment of the present disclosure.

[fig. 5] Fig. 5 is a diagram illustrating knee decompression.

[fig. 6] Fig. 6 is a block diagram illustrating a configuration example of an embodiment of a coding device to which the present disclosure is applied.

[fig. 7] Fig. 7 is a diagram illustrating an example of syntax of knee_function_info SEI.

[fig. 8] Fig. 8 is a diagram illustrating each piece of information set in the knee_function_info SEI of Fig. 7.

[fig. 9] Fig. 9 is a diagram illustrating an example of conversion information set in the knee_function_info SEI.

[fig. 10] Fig. 10 is a diagram illustrating an example of conversion information set in the knee_function_info SEI.

[fig. 11] Fig. 11 is a flowchart illustrating a stream generation process performed by the coding device.

[fig. 12] Fig. 12 is a block diagram illustrating a configuration example of an embodiment of a decoding device to which the present disclosure is applied.

[fig. 13] Fig. 13 is a flowchart illustrating an image generation process performed by the decoding device of Fig. 12.

[fig. 14] Fig. 14 is a diagram illustrating another example of syntax of the knee_function_info SEI.

Claims

- [Claim 1] A decoding device comprising:
circuitry configured to
receive coded data and conversion information, the coded data
pertaining to an image having luminance in a first dynamic range and
the conversion information pertaining to a conversion of dynamic range
of the luminance of the image from the first dynamic range into a
second dynamic range; and
decode the received coded data so as to generate the image,
wherein the conversion uses a knee function.
- [Claim 2] The decoding device according to claim 1, wherein the conversion uses
a knee point.
- [Claim 3] The decoding device according to claim 2, wherein the conversion uses
the knee function to map the dynamic range of the luminance of the
image from the first dynamic range into the second dynamic range, and
the knee function is defined by the knee point.
- [Claim 4] The decoding device according to claim 3, wherein the conversion in-
formation includes pre-conversion information indicating a range of
luminance which is a knee function target in the first dynamic range
and post-conversion information indicating a range of luminance in the
second dynamic range that corresponds to the range of luminance
which is the knee function target in the first dynamic range.
- [Claim 5] The decoding device according to claim 4, wherein the pre-conversion
information indicates the range of luminance which is converted by
knee function at a same conversion ratio as a conversion range of the
first dynamic range.
- [Claim 6] The decoding device according to claim 1, wherein the conversion uses
the knee function which is defined by a plurality of knee points.
- [Claim 7] The decoding device according to claim 6, wherein the conversion in-
formation includes a plurality of pairs of the pre-conversion in-
formation and the post-conversion information.
- [Claim 8] The decoding device according to claim 1, wherein the conversion uses
the knee function by mapping the dynamic range of the luminance of
the image from the first dynamic range into the second dynamic range,
and a plurality of adjacent segments of the first dynamic range of the
luminance are mapped to a corresponding plurality of adjacent
segments of the second dynamic range of the luminance based on

boundaries between adjacent segments defined by a plurality of knee points.

[Claim 9] The decoding device according to claim 3, wherein the conversion uses the knee function by mapping the dynamic range of the luminance of the image from the first dynamic range into the second dynamic range at a first conversion ratio to a point defined by the knee point and at a second conversion ratio from the point defined by the knee point.

[Claim 10] The decoding device according to claim 1, wherein the knee function is specified by an SEI message.

[Claim 11] The decoding device according to claim 10, wherein the SEI message includes a setting of a `knee_function_id`.

[Claim 12] A decoding method of causing a decoding device to perform: receiving coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and decoding the received coded data so as to generate the image, wherein the conversion uses a knee function.

[Claim 13] The decoding method according to claim 12, wherein the conversion information includes pre-conversion information indicating a range of luminance which is a knee function target in the first dynamic range and post-conversion information indicating a range of luminance in the second dynamic range that corresponds to the range of luminance which is the knee function target in the first dynamic range.

[Claim 14] The decoding method according to claim 13, wherein the pre-conversion information indicates the range of luminance which is converted by knee function at a same conversion ratio as a conversion range of the first dynamic range.

[Claim 15] The decoding method according to claim 13, wherein the conversion information includes a plurality of pairs of the pre-conversion information and the post-conversion information.

[Claim 16] The decoding method according to claim 12, wherein the conversion uses the knee function by mapping the dynamic range of the luminance of the image from the first dynamic range into the second dynamic range at a first conversion ratio to a point defined by the knee point and at a second conversion ratio from the point defined by the knee point.

[Claim 17] A coding device comprising:

circuitry configured to
set conversion information pertaining to a conversion of dynamic range
of a luminance of an image from a first dynamic range into a second
dynamic range; and
code the image having luminance in the first dynamic range so as to
generate coded data,
wherein the conversion uses a knee function.

[Claim 18] The coding device according to claim 17, wherein the conversion information includes pre-conversion information indicating a range of luminance which is a knee function target in the first dynamic range and post-conversion information indicating a range of luminance in the second dynamic range that corresponds to the range of luminance which is the knee function target in the first dynamic range.

[Claim 19] The coding device according to claim 18, wherein the pre-conversion information indicates the range of luminance which is converted by knee function at a same conversion ratio as a conversion range of the first dynamic range.

[Claim 20] The coding device according to claim 18, wherein the conversion information includes a plurality of pairs of the pre-conversion information and the post-conversion information.

[Claim 21] The coding device according to claim 17, wherein the conversion uses the knee function by mapping the dynamic range of the luminance of the image from the first dynamic range into the second dynamic range at a first conversion ratio to a point defined by the knee point and at a second conversion ratio from the point defined by the knee point.

[Claim 22] A non-transitory computer-readable medium having stored thereon coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range, wherein

a decoding device decodes coded data, generates the image based on the decoded data, and converts the dynamic range based on the conversion information including a knee point.

[Claim 23] The non-transitory computer-readable medium according to claim 22, wherein the conversion information includes pre-conversion information indicating a range of luminance which is a knee function target in the first dynamic range and post-conversion information in-

dicating a range of luminance in the second dynamic range that corresponds to the range of luminance which is the knee function target in the first dynamic range.

[Claim 24] The non-transitory computer-readable medium according to claim 23, wherein the pre-conversion information indicates the range of luminance which is converted by knee function at a same conversion ratio as a conversion range of the first dynamic range.

[Claim 25] The non-transitory computer-readable medium according to claim 23, wherein the conversion information includes a plurality of pairs of the pre-conversion information and the post-conversion information.

[Claim 26] The non-transitory computer-readable medium according to claim 22, wherein the conversion uses the knee function by mapping the dynamic range of the luminance of the image from the first dynamic range into the second dynamic range at a first conversion ratio to a point defined by the knee point and at a second conversion ratio from the point defined by the knee point.

~~AMENDED CLAIMS~~~~received by the International Bureau on 26 February 2015 (26.02.2015)~~CLAIMS~~[Claim 1](Amended)~~

1. A decoding device comprising:
circuitry configured to
receive coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and
decode the received coded data so as to generate the image,
wherein
the conversion uses a knee function, and
the conversion information includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images.

~~[Claim 2]~~

2. The decoding device according to claim 1, wherein the conversion uses a knee point.

~~[Claim 3]~~

3. The decoding device according to claim 2, wherein the conversion uses the knee function to map the dynamic range of the luminance of the image from the first dynamic range into the second dynamic range, and the knee function is defined by the knee point.

~~[Claim 4]~~

4. The decoding device according to claim 3, wherein the conversion information includes pre-conversion information indicating a range of luminance which is a knee function target in the first dynamic range and post-conversion information indicating a range of luminance in the second dynamic range that corresponds to the range of luminance which is the knee function target in the first dynamic range.

~~[Claim 5]~~

5. The decoding device according to claim 4, wherein the pre-conversion information indicates the range of luminance which is converted by knee function at a same conversion ratio as a conversion range of the first dynamic range.

~~[Claim 6]~~

6. The decoding device according to claim 1, wherein the conversion uses the knee function which is defined by a plurality of knee points.

~~[Claim 7]~~

7. The decoding device according to claim 6, wherein the conversion information includes a plurality of pairs of the pre-conversion information and the post-conversion information.

~~[Claim 8]~~

8. The decoding device according to claim 1, wherein the conversion uses the knee function by mapping the dynamic range of the luminance of the image from the first dynamic

range of the luminance of the image from the first dynamic range into the second dynamic range, and a plurality of adjacent segments of the first dynamic range of the luminance are mapped to a corresponding plurality of adjacent segments of the second dynamic range of the luminance based on boundaries between adjacent segments defined by a plurality of knee points.

~~[Claim 9]~~

9. The decoding device according to claim 3, wherein the conversion uses the knee function by mapping the dynamic range of the luminance of the image from the first dynamic range into the second dynamic range at a first conversion ratio to a point defined by the knee point and at a second conversion ratio from the point defined by the knee point.

~~[Claim 10]~~

10. The decoding device according to claim 1, wherein the knee function is specified by an SEI message.

~~[Claim 11]~~

11. The decoding device according to claim 10, wherein the SEI message includes a setting of a knee_function_id.

~~[Claim 12](Amended)~~

12. A decoding method of causing a decoding device to perform:
 receiving coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range; and
 decoding the received coded data so as to generate the image,
 wherein
 the conversion uses a knee function, and
 the conversion information includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images.

~~[Claim 13](Cancelled)~~

~~[Claim 14](Cancelled)~~

~~[Claim 15](Cancelled)~~

~~[Claim 16](Cancelled)~~

~~[Claim 17](Amended)~~

13. A coding device comprising:
 circuitry configured to
 set conversion information pertaining to a conversion of dynamic range of a luminance of an image from a first dynamic range into a second dynamic range; and
 code the image having luminance in the first dynamic range so as to generate coded data,
 wherein
 the conversion uses a knee function, and
 the conversion information includes the conversion persistence

information which indicates whether or not the conversion information is applied to a plurality of continuous images.

~~[Claim 18](Cancelled)~~

~~[Claim 19](Cancelled)~~

~~[Claim 20](Cancelled)~~

~~[Claim 21](Cancelled)~~

~~[Claim 22](Amended)~~

14. A non-transitory computer-readable medium having stored thereon coded data and conversion information, the coded data pertaining to an image having luminance in a first dynamic range and the conversion information pertaining to a conversion of dynamic range of the luminance of the image from the first dynamic range into a second dynamic range,

wherein

a decoding device decodes the coded data, generates the image based on the decoded data, and converts the dynamic range based on the conversion information including a knee point, and

the conversion information further includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images.

~~[Claim 23](Cancelled)~~

~~[Claim 24](Cancelled)~~

~~[Claim 25](Cancelled)~~

~~[Claim 26](Cancelled)~~

Statement under Article 19(1)

Claims 1, 12, 17, and 22 clarify that the conversion information includes the conversion persistence information which indicates whether or not the conversion information is applied to a plurality of continuous images. The present disclosure relates to a decoding device and a decoding method, and a coding device, and a non-transitory computer-readable medium capable of converting a decoded image into a desired image with a different dynamic range.