[0019]

In the case of executing the dither or the error diffusion, flattening of the pixel values is reduced as illustrated on the right side of Fig. 23(c). As a result, expressing the gradation closer to the original 16-bit image data can be achieved as illustrated on the left side of Fig. 23(c). Thus, it can be grasped that dither and error diffusion are the methods to express the gradation with dot density.

CITATION LIST

PATENT DOCUMENT

[0020]

Patent Document 1: Japanese Patent Application Laid-Open No. 2009-207113

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0021]

In an image transmitting/receiving system, banding suppression processing described above can be executed on a transmitting side, and also can be executed on a receiving side. In the case where banding suppression processing is executed on the transmitting side, the banding suppression processing is not necessary on the receiving side while in the case where the banding suppression processing is not executed on the transmitting side, the banding suppression processing is expected to be executed on the receiving side.

[0022]

Embodiments of the present invention are directed to appropriately executing the banding suppression processing on the receiving side.

SOLUTIONS TO PROBLEMS

[0023]

~~According to first aspect of the present invention, there is provided~~ Disclosed herein is a transmission device comprising: a transmitting unit configured to transmit a container having a predetermined format and including a video stream including encoded image data; and an information inserting unit configured to insert information related to banding suppression processing for the image data into the video stream.

[0024]

According to embodiments of the present invention, the container having the predetermined format and including the video stream including the encoded image data is transmitted by the transmitting unit. For example, the transmitting unit may transmit the container having the predetermined format in response to a request from the receiving side. For example, the container may be a transport stream (MPEG-2 TS) adopted in the digital broadcasting standards. Further, for example, the container may be a container having a MP4 format used in the Internet delivery, or other formats.

[0025]

The information related to banding suppression processing for the image data is inserted into the video stream by the information inserting unit. For example, the information inserting unit may insert the information related to the banding suppression processing into the video stream per picture or per scene.

[0026]

For example, the information related to banding suppression processing may include information indicating whether the banding suppression processing has been applied to the image data. Further, in this case, the information related to banding suppression processing may include information indicating a type of the banding suppression processing applied to the image data.

[0027]

Moreover, for example, the information related to the banding suppression processing may include information indicating whether the banding suppression processing should be applied to the image data. Furthermore, for example, the information related to the banding suppression processing may include information indicating whether gradation number reducing processing has been applied to the image data. Further, in this case, the information related to the banding suppression processing may include information indicating a gradation number before the gradation number reducing processing.

[0028]

Thus, according to embodiments of the present invention, the information related to the banding suppression processing for the image data is inserted into the video stream. Therefore, on the receiving side, the banding suppression processing can be appropriately executed based on the information related to the banding suppression processing. For example, control can be made such that the banding suppression processing is executed only in the case where the banding suppression processing has not been executed on the transmitting side. Further, for example, control can be made such that the banding suppression processing is executed only to the image data that should be applied with the banding suppression processing.

[0029]

Meanwhile, according to embodiments of the present invention, an identifying information inserting unit configured to insert, for example, into a layer of the container, identifying information indicating whether the information related to the banding suppression processing is inserted into the video stream. In this case, for example, the container is a transport stream, and the identifying

information inserting unit may insert the identifying information under a video elementary loop of a program map table included in the transport stream. In this case, a receiver can detect whether the information related to the banding suppression processing is inserted into the video stream without decoding the video stream, and can appropriately extract the information.

[0029a]

~~According to a second aspect of the present invention, there is provided~~ Disclosed herein is a transmitting method, comprising: transmitting a container having a predetermined format and including a video stream including encoded image data; and inserting information related to banding suppression processing for the image data into the video stream.

[0030]

According to a ~~third~~ first aspect of the present invention, there is provided a reception device comprising: a receiving unit configured to receive a container having a predetermined format and including a video stream, the video stream including encoded image data and inserted with information related to banding suppression processing for the image data; a decoding unit configured to decode the video stream and obtain image data; a processing unit configured to apply banding suppression processing to the decoded image data; and a control unit configured to control the processing unit based on the information related to banding suppression processing, inserted into the video stream.

[0031]

According to embodiments of the present invention, the container having the predetermined format and including the video stream is received by the receiving unit. In this video stream, the encoded image data is included and further the information related to the banding suppression processing for the image data is inserted. The video stream is decoded by the

decoding unit, and decoded image data is obtained. The banding suppression processing is applied to the decoded image data by the processing unit. Further, the processing unit is controlled by the control unit based on the information related to the banding suppression processing, inserted into the video stream.

[0032]

For example, the information related to the banding suppression processing includes information indicating whether the banding suppression processing should be applied to the image data, and information indicating whether the banding suppression processing has been applied to the image data. The control unit may execute control such that the banding suppression processing is applied to the decoded image data in the control unit when the image data is the image data to which the banding suppression processing should be applied and further the banding suppression processing has not been applied to the image data.

[0033]

Thus, according to embodiments of the present invention, the banding suppression processing for the decoded image data is controlled based on the information related to the banding suppression processing for the image data, inserted into the video stream. Therefore, the banding suppression processing can be appropriately executed.

[0034]

According to a ~~fourth~~ second aspect of the present invention, there is provided a reception device comprising: a receiving unit configured to receive a container having a predetermined format and including a video stream including encoded image data; a decoding unit configured to decode the video stream and obtain image data; a processing unit configured to apply banding suppression processing to the decoded image data; and a control unit configured to control the processing unit such that banding suppression processing

is applied to the decoded image data when a gradation number that can be displayed on a display unit configured to display an image based on the decoded image data differs from a bit number of image data in the video stream.

[0035]

According to embodiments of the present invention, the container having the predetermined format and including the video stream including the encoded image data is received by the receiving unit. The video stream is decoded by the decoding unit, and decoded image data is obtained. The banding suppression processing is applied to the decoded image data by the processing unit.

[0036]

Further, the processing unit is controlled by the control unit. In this case, control is made such that the banding suppression processing is applied to the decoded image data when the gradation number that can be displayed on a display unit configured to display an image based on the decoded image data differs from the bit number of the image data in the video stream. With this configuration, the banding suppression processing is appropriately executed.

[0036a]

According to a ~~fifth~~ third aspect of the present invention, there is provided a receiving method, comprising: receiving a container having a predetermined format and including a video stream, the video stream including encoded image data and inserted with information related to banding suppression processing for the image data; decoding the video stream to obtain image data; and applying banding suppression processing to the decoded image data based on the information related to banding suppression processing, inserted into the video stream.

[0036b]

According to a fourth aspect of the present invention, there is provided a reception method, comprising: receiving a container having a format and including a video stream

including encoded image data; decoding the video stream and obtain image data; applying banding suppression processing to the decoded image data when a gradation number of the decoded image data differs from a bit number of image data in the video stream.

EFFECTS OF THE INVENTION

[0037]

According to embodiments of the present invention, banding suppression processing can be appropriately executed on a receiving side.

BRIEF DESCRIPTION OF DRAWINGS

[0038]

Fig. 1 is a block diagram illustrating an exemplary configuration of an image transmitting/receiving system according to an embodiment.

Fig. 2 is a block diagram illustrating an exemplary transmission device constituting the image transmitting/receiving system.

Fig. 3 is a block diagram illustrating an exemplary configuration of a banding suppression processing unit constituting the transmission device.

Figs. 4(a) and 4(b) are diagrams for describing a picture processing SEI message inserted into a "SEIs" portion of an access unit.

Figs. 5(a) and 5(b) are diagrams illustrating an exemplary structure (Syntax) of the "picture processing SEI message".

Fig. 6 is a diagram illustrating an exemplary structure (Syntax) of "Picture processing_sei ()"

CLAIMS

1. A ~~transmission~~ reception device, comprising:

a ~~transmitting~~ receiving unit configured to ~~transmit~~ receive a container having a ~~predetermined~~ format and including a video stream including encoded image data and inserted with information related to banding suppression processing for the image data; ~~and~~

~~an information inserting unit configured to insert information related to banding suppression processing for the image data into the video stream~~

a decoding unit configured to decode the video stream and obtain image data;

a processing unit configured to apply banding suppression processing to the decoded image data; and

a control unit configured to control the processing unit based on the information related to banding suppression processing, inserted into the video stream.

2. The ~~transmission~~ reception device according to claim 1, wherein

the information related to banding suppression processing includes information indicating whether banding suppression processing ~~has been~~ should be applied to the image data and information indicating whether the banding suppression processing has been applied to the image data, and

the control unit controls the banding suppression processing to be applied to the decoded image data when the image data is image data to which banding suppression processing should be applied and the banding suppression processing has not been applied to the image data.

3. The ~~transmission~~ recption device according to claim 2, wherein the information related to banding suppression processing includes information indicating a type of banding suppression processing applied to the image data.

4. The ~~transmission~~reception device according to claim 1, wherein the information related to banding suppression processing includes information indicating whether banding suppression processing should be applied to the image data.

5. The ~~transmission~~reception device according to claim 1, wherein the information related to banding suppression processing includes information indicating whether gradation number reducing processing has been applied to the image data.

6. The ~~transmission~~reception device according to claim 5, wherein the information related to banding suppression processing includes information indicating a gradation number before the gradation number reducing processing.

7. The ~~transmission~~reception device according to claim 1, wherein the ~~information inserting unit inserts the information related~~ processing unit is configured to banding suppression processing into the video stream per picture or per scene.

8. The ~~transmission~~ reception device according to claim 1, ~~further including an~~ wherein identifying information is included in ~~identifying information inserting unit configured to insert, into~~ a layer of the container~~, identifying information indicating~~ and indicates whether the information related to banding suppression processing is inserted into the video stream.

9. The ~~transmission~~ reception device according to claim 8, wherein the container is a transport stream, and ~~the identifying information inserting unit inserts~~ wherein the identifying information under a video elementary loop of a program map table is included in the transport stream.

10. The ~~transmission~~ reception device according to claim 1, wherein the ~~transmitting unit transmits~~ wherein the reception device is configured to receive the container having the ~~predetermined~~ format in response to a request sent by the reception device ~~from a receiving side~~.

~~11. A transmitting method, comprising:~~

~~transmitting a container having a predetermined format and including a video stream including encoded image data; and~~

~~inserting information related to banding suppression processing for the image data into the video stream.~~

~~12. A reception device, comprising:~~

~~a receiving unit configured to receive a container having a predetermined format and including a video stream, the video stream including encoded image data and inserted with information related to banding suppression processing for the image data;~~

~~a decoding unit configured to decode the video stream and obtain image data;~~

~~a processing unit configured to apply banding suppression processing to the decoded image data; and~~

~~a control unit configured to control the processing unit based on the information related to banding suppression processing, inserted into the video stream.~~

~~13. The reception device according to claim 12, wherein~~

~~the information related to banding suppression processing includes information indicating whether banding suppression processing should be applied to the image data and information indicating whether the banding suppression processing has been applied to the image data, and~~

~~the control unit controls the banding suppression processing to be applied to the decoded image data when the image data is image data to which banding suppression processing should be applied and the banding suppression processing has not been applied to the image data.~~

~~14~~11. A receiving method, comprising:

receiving a container having a ~~predetermined~~ format and including a video stream, the video stream including encoded image data and inserted with information related to banding suppression processing for the image data;

decoding the video stream to obtain image data; and

applying banding suppression processing to the decoded image data based on the information related to banding suppression processing, inserted into the video stream.

~~15~~12. A reception device, comprising:

a receiving unit configured to receive a container having a ~~predetermined~~ format and including a video stream including encoded image data;

a decoding unit configured to decode the video stream and obtain image data;

a processing unit configured to apply banding suppression processing to the decoded image data; and

a control unit configured to control the processing unit

such that banding suppression processing is applied to the decoded image data when a gradation number that can be displayed on a display unit configured to display an image based on the decoded image data differs from a bit number of image data in the video stream.

13. A reception method, comprising:

receiving a container having a format and including a video stream including encoded image data;

decoding the video stream and obtain image data;

applying banding suppression processing to the decoded image data when a gradation number of the decoded image data differs from a bit number of image data in the video stream.