SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0017]

As described above, according to HEVC standards, no restriction is set to motion vectors in inter prediction. In this case, a decoded image of a different tile at a different time can be used as a reference image. Accordingly, independent encoding and decoding in the time direction for each tile is not allowed.

[0018]

Embodiments of the present invention provide a technique capable of performing encoding and decoding in the time direction independently for each tile.

SOLUTIONS TO PROBLEMS

[0019]

According to a first aspect of the present invention, there is provided a decoding device, comprising: a motion compensation unit generating a prediction image by performing, for each of tiles, motion compensation ~~of~~ with a reference image within a co-located tile ~~based on tile splittable information indicating that decoding is allowed for each of the tiles and~~ motion vector information representing a motion vector used for generating encoded data of a decoding target current image when a picture of the current image is split into the tiles and decoded; and a decoding unit decoding the encoded data using the prediction image generated by the motion compensation unit.

[0020]

According to a second aspect of the present invention, there is provided a decoding method, comprising: a motion compensation step performed by a decoding device which generates a prediction image by performing, for each of tiles, motion

compensation with a reference image within a co-located tile and motion vector information representing a motion vector used for generating encoded data of a decoding target current image when a picture of the current image is split into the tiles and decoded; and a decoding step performed by the decoding device which decodes the encoded data using the prediction image generated by the processing of the motion compensation step.

[0021]

~~According to a second aspect of the present invention, there is provided a decoding method, comprising: a motion compensation step performed by a decoding device which generates a prediction image by performing, for each of tiles, motion compensation of a reference image within a co-located tile based on tile splittable information indicating that decoding is allowed for each of the tiles and motion vector information representing a motion vector used for generating encoded data of a decoding target current image when a picture of the current image is split into the tiles and decoded; and a decoding step performed by the decoding device which decodes the encoded data using the prediction image generated by the processing of the motion compensation step.~~

According to the above aspects of the present invention, a prediction image is generated by performing, for each of tiles, motion compensation ~~of~~ with a reference image within a co-located tile ~~based on tile splittable information indicating that decoding is allowed for each of the tiles~~ and motion vector information representing a motion vector used for generating encoded data of a decoding target current image when a picture of the current image is split into the tiles and decoded. The encoded data is decoded using the prediction image.

[0022]

~~According to a third aspect of the present invention, there is provided~~ Disclosed herein is an encoding device, comprising: a motion compensation unit generating a prediction image by performing motion compensation of a reference image at a time different from the time of an encoding target current image based on a motion vector detected within a tile when a picture of the current image is split into the tiles and encoded; an encoding unit encoding the current image and generating encoded data using the prediction image generated by the motion compensation unit; a setting unit setting tile splittable information indicating that decoding is allowed for each unit of the tiles; and a transmission unit transmitting the encoded data generated by the encoding unit, and the tile splittable information set by the setting unit.

[0023]

Disclosed herein is an encoding method, comprising: a motion compensation step performed by an encoding device which generates a prediction image by performing motion compensation of a reference image at a time different from the time of an encoding target current image based on a motion vector detected within a tile when a picture of the current image is split into the tiles and encoded; an encoding step performed by the encoding device which encodes the current image and generating encoded data using the prediction image generated by the processing of the motion compensation step; a setting step performed by the encoding device which sets tile splittable information indicating that decoding is allowed for each unit of the tiles; and a transmission step performed by the encoding device which transmits the encoded data generated by the processing of the encoding step, and the tile splittable information set by the processing of the setting step.

[0024]

~~According to a fourth aspect of the present invention, there is provided an encoding method, comprising: a motion compensation step performed by an encoding device which generates a prediction image by performing motion compensation of a reference image at a time different from the time of an encoding target current image based on a motion vector detected within a tile when a picture of the current image is split into the tiles and encoded; an encoding step performed by the encoding device which encodes the current image and generating encoded data using the prediction image generated by the processing of the motion compensation step; a setting step performed by the encoding device which sets tile splittable information indicating that decoding is allowed for each unit of the tiles; and a transmission step performed by the encoding device which transmits the encoded data generated by the processing of the encoding step, and the tile splittable information set by the processing of the setting step.~~

According to the above aspects of the present invention, a prediction image is generated by performing motion compensation of a reference image at a time different from the time of an encoding target current image based on a motion vector detected within a tile when a picture of the current image is split into the tiles and encoded. Encoded data is generated by encoding the current image using the prediction image. Tile splittable information indicating that decoding is allowed for each unit of the tiles is set. The encoded data and the tile splittable information are transmitted.

[0025]

Further, the above decoding device and the encoding device can be realized by making a computer execute a program.

[0026]

Moreover, the program executed by the computer for realizing the above decoding device and the encoding device can be provided by transmitting the program via a transmission medium, or by recording the program on a recording medium.

[0027]

In addition, the above decoding device and the encoding device may be separate devices, or may be inside blocks constituting one device.

EFFECTS OF THE INVENTION

[0028]

According to the above aspects of the present invention, independent decoding in the time direction for each tile is allowed.

[0029]

Moreover, according to the above aspects of the present invention, independent encoding in the time direction for each tile is allowed.

BRIEF DESCRIPTION OF DRAWINGS

[0030]

Fig. 1 is a diagram describing a reference image for conventional inter prediction.

Fig. 2 is a block diagram showing a constitution example of a conventional decoding device.

Fig. 3 is a block diagram showing a constitution example of an encoding device to which the present technique is applied according to a first embodiment.

Fig. 4 is a block diagram showing a constitution example of an encoding unit in Fig. 3.

Fig. 5 is a diagram describing tiles.

Fig. 6 is a diagram describing a restriction set when a motion vector is detected.

Fig. 7 is a diagram describing a reference image for inter prediction.

Fig. 8 is a diagram showing an example of syntax of SPS.

Fig. 9 is a diagram showing an example of syntax of

CLAIMS

1. A decoding device, comprising:

a motion compensation unit generating a prediction image by performing, for each of tiles, motion compensation ~~of~~ with a reference image within a co-located tile ~~based on tile-splittable information indicating that decoding is allowed for each of the tiles~~ and motion vector information representing a motion vector used for generating encoded data of a decoding target current image when a picture of the current image is split into the tiles and decoded; and

a decoding unit decoding the encoded data using the prediction image generated by the motion compensation unit.

2. The decoding device according to claim 1, further comprising:

a vector generation unit generating the motion vector of the encoded data from the motion vector information using a motion vector of an image located adjacent to the current image and contained within the same tile as the tile of the current image,

wherein the motion compensation unit performs motion compensation ~~of~~ with the reference image for each of the tiles based on ~~the tile-splittable information and~~ the motion vector generated by the motion vector generation unit.

3. The decoding device according to claim 1, further comprising:

a filter unit performing filtering of the reference image for each unit of the tiles,

wherein

the filter unit performs the filtering of the reference image for each of the tiles based on filter information representing that filtering of the reference image is not performed across the tiles, and

the motion compensation unit performs, for each of the tiles, the motion compensation ~~of~~ with the reference image obtained after the filtering by the filter unit based on ~~the tile-splittable information and~~ the motion vector information.

4. The decoding device according to claim 3, wherein the filter unit performs, for each of the tiles, the filtering of the reference image using a parameter for the filtering associated with an image contained within the corresponding tile based on the filter information and parameter sharing information representing that the parameter is not shared between the tiles.

5. The decoding device according to claim 1, wherein tile split of a picture contained within the same sequence is the same split.

6. The decoding device according to claim 1, wherein each of the tiles includes one or more slices.

7. The decoding device according to claim 1, wherein

the picture is split into two of the tiles and decoded,

the image of one of the tiles is an image for left eye constituting a 3D image, and

the image of the other tile is an image for right eye constituting a 3D image.

8. A decoding method, comprising:

a motion compensation step performed by a decoding device which generates a prediction image by performing, for each of tiles, motion compensation ~~of~~ with a reference image within a co-located tile ~~based on tile splittable information indicating that decoding is allowed for each of the tiles~~ and motion vector information representing a motion vector used for generating encoded data of a decoding target current image when a picture of the current image is split into the tiles and decoded; and

a decoding step performed by the decoding device which decodes the encoded data using the prediction image generated by the processing of the motion compensation step.

~~9. An encoding device, comprising:~~

~~a motion compensation unit generating a prediction image by performing motion compensation of a reference image at a time different from the time of an encoding target current image based on a motion vector detected within a tile when a picture of the current image is split into the tiles and encoded;~~

~~an encoding unit encoding the current image and generating encoded data using the prediction image generated by the motion compensation unit;~~

~~a setting unit setting tile splittable information indicating that decoding is allowed for each unit of the tiles; and~~

~~a transmission unit transmitting the encoded data generated by the encoding unit, and the tile splittable information set by the setting unit.~~

~~10. The encoding device according to claim 9, further comprising:~~

~~a vector generation unit generating the motion vector information based on a motion vector of an image located adjacent to the current image and contained within the same tile as the tile of the current image, and a motion vector of the current image.~~

~~11. The encoding device according to claim 9, further comprising:~~

~~a filter unit performing filtering of the reference image for each unit of the tiles,~~

~~wherein~~

~~the motion compensation unit performs motion compensation of the reference image obtained after the filtering by the filter unit using the current image and the reference image obtained after filtering by the filter unit based on the motion vector detected within the tile,~~

~~the setting unit sets filter information representing that filtering of the reference image is not performed across the tiles, and~~

~~the transmission unit transmits the filter information set by the setting unit.~~

~~12. The encoding device according to claim 11, wherein~~

~~the filter unit performs, for each of the tiles, the filtering of the reference image using a parameter of an image contained within the corresponding tile,~~

~~the setting unit sets parameter sharing information representing that the parameter is not shared between the tiles, and~~

~~the transmission unit transmits the parameter sharing information set by the setting unit.~~

~~13. The encoding device according to claim 9, wherein tile split of a picture contained within the same sequence is the same split.~~

~~14. The encoding device according to claim 9, wherein each of the tiles includes one or more slices.~~

~~15. The encoding device according to claim 9, wherein~~

~~the picture is split into two of the tiles and encoded,~~

~~the image of one of the tiles is an image for left eye constituting a 3D image, and~~

~~the image of the other tile is an image for right eye constituting a 3D image.~~

~~16. An encoding method, comprising:~~

~~a motion compensation step performed by an encoding device which generates a prediction image by performing motion compensation of a reference image at a time different from the time of an encoding target current image based on a motion vector detected within a tile when a picture of the current image is split into the tiles and encoded;~~

~~an encoding step performed by the encoding device which encodes the current image and generating encoded data using the prediction image generated by the processing of the motion compensation step;~~

~~a setting step performed by the encoding device which sets tile splittable information indicating that decoding is allowed for each unit of the tiles; and~~

~~a transmission step performed by the encoding device which transmits the encoded data generated by the processing of the encoding step, and the tile splittable information set by the processing of the setting step.~~