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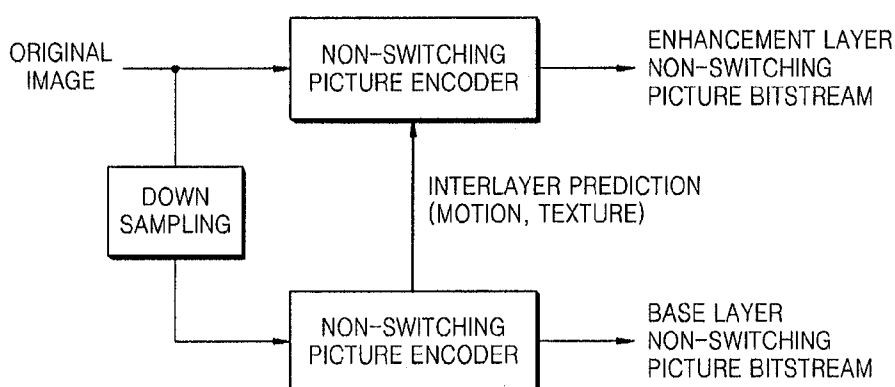
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(54) Title: SCALABLE VIDEO ENCODING AND DECODING METHOD USING SWITCHING PICTURES AND APPARATUS THEREOF



(57) Abstract: A conventional new video coding technology can provide a bitstream switching picture by encoding the bitstream switching picture into an I picture. However, an encoding efficiency is greatly reduced. As such, the new video coding technology does not provide an efficient bitstream switching function. Also, other advantages provided by a switching picture technology such as a random access, error durability, and a bitstream splicing are not provided. Provided is an apparatus for encoding a video bitstream including a base layer bitstream and an enhancement layer bitstream by encoding an enhancement layer picture of the enhancement layer bitstream, which is reproduced immediately after a base layer picture of the base layer bitstream is reproduced, into a non-switching pictures by interlayer prediction using a reference image generated by decoding a pre-encoded base layer picture or by motion prediction using another reference image generated by decoding a pre-encoded enhancement layer picture, and into a switching picture, which is decoded into the same image as the non-switching picture, by an interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture, while the base layer picture is being reproduced.

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SCALABLE VIDEO ENCODING AND DECODING METHOD USING SWITCHING PICTURES AND APPARATUS THEREOF

TECHNICAL FIELD

The present invention relates to a scalable video encoding/reproducing method using switching pictures and an apparatus thereof, and more particularly, to a method and apparatus for performing an interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream in which a scalable video coding (SVC) technology is adopted.

BACKGROUND ART

In general, video data is compressed to be stored or transmitted due to its large data size and the compressed video data is decoded so as to be reproduced.

FIG. 1 is a diagram illustrating a conventional video compression method.

Referring to FIG. 1, video compression is performed in units of still images included in video data.

In terms of a compression method, an original input image may be compressed by using a P/B frame method in which temporal redundancy is removed by motion prediction and motion compensation using a reference image, or an I frame method in which the image is directly compressed not by using the motion vectors.

In block-based video compression, an image is divided into macroblocks and sub-blocks and then is compressed by performing motion prediction in block units.

In the I frame method, the original image is compressed by discrete cosine transform (DCT), quantization and entropy encoding and is stored into a buffer by inverse quantization and inverse discrete cosine transform (IDCT) so as to be used as a reference image when a temporal redundancy of P and B frames is removed by motion prediction.

In the P/B frame method, the motion prediction and the motion compensation are performed on the original input image using the stored reference image and a difference image between the original image and the reference image is obtained. Then, the difference image is compressed by DCT, quantization, and entropy encoding and motion vectors are encoded.

The above-described image compressed by using the P/B frame method may be stored as a reference image for an image to be input later by inverse quantization and IDCT and by being combined with a motion-compensated reference image.

For the motion prediction and the motion compensation, one reference image is used in a P frame method and two reference images are used in a B frame method.

FIG. 2 is a diagram illustrating a method of reproducing a bitstream compressed by the method illustrated in FIG. 1.

Text information and motion vectors having losses are input. An I frame is reproduced after being entropy-decoded, inverse quantized and IDCT-converted, and the reproduced image is used as a reference image.

A P or B frame is reproduced by being entropy decoded, inverse quantized, and IDCT-converted, and then motion-compensated by using input motion vectors and the reference image. The reproduced image may be used as a reference image.

Conventional H.264 video coding standards provide a switching picture technology which efficiently allows a method of lossless encoding of a decoded image. The technology includes an encoding technology for a non-switching picture, a SI picture, and a switching picture. One non-switching picture included in a bitstream may be lossless-encoded and switched by a SI picture or a switching picture.

FIG. 3 is a diagram for illustrating a disadvantage of switching picture bitstreams in a conventional H.264 video coding technology.

Video data is compressed into a high quality video bitstream and a low quality video bitstream in IPPPP structure by separately using a video compressor. A user is watching image P_{l5} of the low quality video bitstream being reproduced at a predetermined time point.

In order for the user to continuously watch the video data while changing from low quality video bitstream to high quality video bitstream in accordance with the wishes of the user, the user has to reproduce next image P_{h6} in the high quality video bitstream.

However, in order to reproduce image P_{h6} , reference image P_{h5} has to be reproduced and thus, the high quality video bitstream has to be decoded from I_{h1} .

FIG. 4 is a diagram for illustrating a disadvantage of switching picture bitstreams in a scalable video coding (SVC) technology.

A video data is compressed into an enhancement layer video bitstream and a base layer video bitstream in IPPPP structure by using a new different video compressor.

Here, P is compressed by using, for example, an interlayer motion prediction and an interlayer texture prediction used for a new video compressing technology.

A user is watching image P_{l5} of the base layer video bitstream being reproduced at a predetermined time point.

In order for the user to continuously watch the video data while changing from low quality video bitstream to high quality video bitstream in accordance with the wishes of the user, the user has to reproduce next image P_{h6} in the enhancement layer video bitstream. However, in order to reproduce image P_{h6} , reference image P_{h5} has to be reproduced and thus, the high quality video bitstream has to be decoded from I_{h1} .

The above described new encoding technology can provide a bitstream switching picture by encoding the bitstream switching picture into an I picture. However, an encoding efficiency is greatly reduced.

As described above, the new video coding technology does not provide an efficient bitstream switching function. Also, other advantages provided by a switching picture technology such as a random access, error durability, and a bitstream splicing are not provided.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram illustrating a conventional video compression method.

FIG. 2 is a diagram illustrating a method of reproducing a bitstream compressed by the method illustrated in FIG. 1.

FIG. 3 is a diagram for illustrating a disadvantage of switching picture bitstreams in a conventional H.264 video coding technology.

FIG. 4 is a diagram for illustrating a disadvantage of switching picture bitstreams in a scalable video coding (SVC) technology.

FIG. 5 is a diagram for illustrating a video encoding method according to a conventional SVC technology.

FIG. 6 is a diagram for illustrating a method of decoding the base layer video bitstream and the enhancement layer video bitstream generated as illustrated in FIG. 5.

FIG. 7 is a diagram for illustrating a method of switching picture bitstreams using switching pictures, according to an embodiment of the present invention.

FIG. 8 is a diagram for illustrating a method of encoding a non-switching picture, according to conventional H.264 video standards.

5 FIG. 9 is a diagram for illustrating a method of decoding the non-switching
picture encoded according to conventional H.264 video standards as illustrated in FIG.
8.

FIG. 10 is a diagram for illustrating a method of encoding a switching picture, according to conventional H.264 video standards.

FIG. 11 is a diagram for illustrating a method of decoding the switching picture encoded according to conventional H.264 video standards as illustrated in FIG. 10.

FIG. 12 is a diagram for illustrating a method of encoding a bitstream which includes a non-switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

15 FIG. 13 is a diagram for illustrating a method of decoding a bitstream which includes a non-switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

FIG. 14 is a diagram for illustrating a method of encoding a bitstream which includes a switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

FIG. 15 is a diagram for illustrating a method of decoding a bitstream which includes a switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

FIG. 16 is a flowchart illustrating a method of encoding an enhancement layer
25 bitstream in which a SVC technology is adopted, according to an embodiment of the
present invention.

FIG. 17 is a flowchart illustrating a method of decoding a bitstream in which a SVC technology is adopted, according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

The present invention provides various advantages such as efficient bitstream switching, a random access, error durability, and a bitstream splicing to new video data

by combining a scalable video coding (SVC) technology and a switching picture technology.

TECHNICAL SOLUTION

5 According to an aspect of the present invention, there is provided an apparatus for encoding a video bitstream including a base layer bitstream and an enhancement layer bitstream by encoding an enhancement layer picture of the enhancement layer bitstream, which can be reproduced immediately after a base layer picture of the base layer bitstream is reproduced, into switching and non-switching pictures, while the base
10 layer picture is being reproduced.

ADVANTAGEOUS EFFECTS

As described above, the present invention provides various functions such as a random access, bitstream switching, fast forward, and fast backward to new video
15 bitstreams by adopting a switching picture technology to a video coding unit.

BEST MODE

According to an aspect of the present invention, there is provided an apparatus for encoding a video bitstream including a base layer bitstream and an enhancement
20 layer bitstream, wherein an enhancement layer picture of the enhancement layer bitstream is encoded into switching picture and non-switching picture, wherein, during reproduction of the base layer picture of the base layer bitstream, the enhancement layer picture is able to be reproduced consecutively after one of the reproduced base layer pictures.

25 The non-switching picture may be encoded by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture included in the original image, and the switching picture may be encoded by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer
30 picture.

The switching and non-switching pictures may be decoded into the same image.

The reference image used for the prediction when the switching picture is encoded may be different from the reference image used for the prediction when the non-switching picture is encoded.

According to another aspect of the present invention, there is provided an apparatus for encoding a non-switching picture in which a base layer bitstream and an enhancement layer bitstream are encoded for interlayer reproduction conversion of an original image to be encoded, wherein the non-switching picture is encoded by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

The apparatus may include an enhancement layer non-switching picture encoding unit which encodes the non-switching picture by prediction using a reference image reference image generated by decoding a pre-encoded base layer picture or a pre-encoded encoded enhancement layer picture.

The enhancement layer non-switching picture encoding unit may include a motion prediction unit which generates prediction information and a prediction image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture; an image conversion unit which generates a bitstream by compressing a residual image which corresponds to the difference between the original image and the prediction image; and a multiplexing unit which combines and outputs a bitstream generated by the image conversion unit and the prediction information.

According to another aspect of the present invention, there is provided an apparatus for encoding a switching picture in which a base layer bitstream and an enhancement layer bitstream are generated for interlayer reproduction conversion of an original image to be encoded by using the base layer bitstream and the enhancement layer bitstream which includes a non-switching picture, wherein a switching picture, which represents the same decoded image as the non-switching picture, is encoded by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

The apparatus may include an enhancement layer switching picture encoding unit which encodes the switching picture, which represents the same decoded image as the non-switching picture, in accordance with the interlayer prediction using the base layer picture.

The enhancement layer switching picture encoding unit may include a motion prediction unit which generates prediction information and a prediction image by interlayer prediction using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture; an image conversion unit
5 which compresses a residual image which corresponds to the difference between the non-switching picture and the prediction information; and a multiplexing unit which combines and outputs image information generated by the image conversion unit and the prediction information.

According to another aspect of the present invention, there is provided an
10 encoder for encoding a base layer bitstream and an enhancement layer bitstream for interlayer reproduction conversion of an original image to be encoded, the encoder including a non-switching picture encoding unit which encodes the non-switching picture by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer
15 picture.

The non-switching picture encoding unit may include an enhancement layer non-switching picture encoding unit which encodes the non-switching picture by prediction using a reference image generated by decoding a pre-encoded base layer picture or a pre-encoded enhancement layer picture.

20 The enhancement layer non-switching picture encoding unit may include a motion prediction unit which generates prediction information and a prediction image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture; an image conversion unit which generates a bitstream by compressing a residual image which
25 corresponds to the difference between the original image and the prediction image; and a multiplexing unit which combines and outputs a bitstream generated by the image conversion unit and the prediction information.

The encoder may further include a switching picture encoding unit which encodes a switching picture, which represents the same decoded image as the
30 non-switching picture, by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

The switching picture encoding unit may include an enhancement layer switching picture encoding unit which encodes the switching picture, which represents the same

decoded image as the non-switching picture, in accordance with the interlayer prediction using the base layer picture.

The enhancement layer switching picture encoding unit may include a motion prediction unit which generates prediction information and a prediction image by interlayer prediction using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture; an image conversion unit which compresses a residual image which corresponds to the difference between the non-switching picture and the prediction information; and a multiplexing unit which combines and outputs image information generated by the image conversion unit and the prediction information.

According to another aspect of the present invention, there is provided an apparatus for decoding a non-switching picture by decoding a bitstream including switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer picture is to be reproduced while a base layer picture of a base layer bitstream is being reproduced, a non-switching picture included in the enhancement layer bitstream is decoded by using prediction information used when the non-switching picture was encoded.

According to another aspect of the present invention, there is provided an apparatus for decoding a switching picture by decoding a bitstream including switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer picture is to be reproduced while a base layer picture of a base layer bitstream is being reproduced, a switching picture included in an enhancement layer bitstream is decoded by using prediction information used when the switching picture was encoded.

According to another aspect of the present invention, there is provided a decoder for decoding a non-switching picture by decoding a bitstream including switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein the decoder includes a non-switching picture decoding unit which decodes an enhancement layer picture by using a non-switching picture included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

The decoder may further include a switching picture decoding unit which decodes an enhancement layer picture by using a switching picture included in the bitstream, if the enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

5 Each of the non-switching picture decoding unit and the switching picture decoding unit may include a motion compensation unit which receives prediction information included in the bitstream and predicts an image to be decoded; and an image reproduction unit which receives residual image information included in the bitstream, adds the prediction image and the residual image information, and generates
10 an image to be reproduced.

According to another aspect of the present invention, there is provided a codec for performing interlayer reproduction conversion between a base layer bitstream and an enhanced layer bitstream, the codec including an encoder which encodes a non-switching picture by predicting an enhancement layer picture to be encoded using
15 a reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture, and encodes the enhancement layer bitstream by interlayer prediction using a switching picture which represents the same decoded image as the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture; and a decoder which decodes an enhancement layer
20 bitstream to be reproduced by using a switching picture included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

The encoder may include a non-switching picture encoding unit which encodes the non-switching picture by prediction using an original image and a reference image
25 generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

The non-switching picture encoding unit may include an enhancement layer non-switching picture encoding unit which encodes the non-switching picture by prediction using a reference image generated by decoding a pre-encoded basic layer
30 picture or a pre-encoded enhancement layer picture.

The enhancement layer non-switching picture encoding unit may include a motion prediction unit which generates prediction information and a prediction image by using the original image, and the reference image generated by decoding a

pre-encoded basic layer picture or a pre-encoded enhancement layer picture; an image conversion unit which generates a bitstream by compressing a residual image which corresponds to the difference between the original image and the prediction image; and a multiplexing unit which combines and outputs a bitstream generated by the image conversion unit and the prediction information.

The encoder may further include a switching picture encoding unit which encodes a switching picture, which represents the same decoded image as the non-switching picture, by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

The switching picture encoding unit may include an enhancement layer switching picture encoding unit which encodes the switching picture, which represents the same decoded image as the non-switching picture, in accordance with the interlayer prediction using the base layer picture.

The enhancement layer switching picture encoding unit may include a motion prediction unit which generates prediction information and a prediction image by an interlayer prediction using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture; an image conversion unit which compresses a residual image which corresponds to the difference between the non-switching picture and the prediction information; and a multiplexing unit which combines and outputs image information generated by the image conversion unit and the prediction information.

The decoder may include a non-switching picture decoding unit which decodes an enhancement layer picture by using a non-switching picture included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced; and a switching picture decoding unit which decodes an enhancement layer picture by using a switching picture included in the bitstream, if the enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

Each of the non-switching picture decoding unit and the switching picture decoding unit may include a motion compensation unit which receives prediction information included in the bitstream and predicts an image to be decoded; and an image reproduction unit which receives residual image information included in the

bitstream, adds the prediction image and the residual image information, and generates an image to be reproduced.

According to another aspect of the present invention, there is provided a method for encoding a video bitstream including a base layer bitstream and an enhancement layer bitstream, wherein an enhancement layer picture of the enhancement layer bitstream is encoded into switching picture and non-switching picture, wherein, during reproduction of the base layer picture of the base layer bitstream, the enhancement layer picture is able to be reproduced consecutively after one of the reproduced base layer pictures.

According to another aspect of the present invention, there is provided a method of encoding a non-switching picture in which a base layer bitstream and an enhancement layer bitstream are encoded for interlayer reproduction conversion of an original image to be encoded, wherein the non-switching picture is encoded by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

According to another aspect of the present invention, there is provided a method of encoding a switching picture, in which a base layer bitstream and an enhancement layer bitstream are generated for interlayer reproduction conversion of an original image to be encoded by using the base layer bitstream and the enhancement layer bitstream which includes a non-switching picture, wherein a switching picture, which represents the same decoded image as the non-switching picture, is encoded by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

According to another aspect of the present invention, there is provided a method of encoding a base layer bitstream and an enhancement layer bitstream for interlayer reproduction conversion of an original image to be encoded, the method including encoding the non-switching picture by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

According to another aspect of the present invention, there is provided a method of decoding a non-switching picture by decoding a bitstream including switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer picture is to be

reproduced while a base layer picture of a base layer bitstream is being reproduced, a non-switching picture included in an enhancement layer bitstream is decoded by using prediction information used when the non-switching picture was encoded.

According to another aspect of the present invention, there is provided a method of decoding a switching picture by decoding a bitstream including switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer picture is to be reproduced while a base layer picture of a base layer bitstream is being reproduced, a switching picture included in an enhancement layer bitstream is decoded by using prediction information used when the switching picture was encoded.

According to another aspect of the present invention, there is provided a method of decoding a non-switching picture by decoding a bitstream including switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, the method including decoding an enhancement layer picture by using a non-switching picture included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

According to another aspect of the present invention, there is provided a method of coding for performing interlayer reproduction conversion between a base layer bitstream and an enhanced layer bitstream, the method including encoding a non-switching picture by predicting an enhancement layer picture to be encoded using a reference image reference image generated by decoding a pre-encoded base layer picture or a pre-encoded encoded enhancement layer picture, and encoding the enhancement layer bitstream by interlayer prediction using a switching picture which represents the same decoded image as the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture; and decoding an enhancement layer bitstream to be reproduced by using a switching picture included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

MODE OF THE INVENTION

FIG. 5 is a diagram for illustrating a video encoding method according to a conventional scalable video coding (SVC) technology.

Referring to FIG. 5, a video encoder includes an image quality reducer 500, a base layer video compressor 510, a base layer video decoder 520, an enhancement layer video compressor 530, an enhancement layer video decoder 540, and a predictor 550.

5 MPEG-2 and MPEG-4 video standards and Joint Video Team (JVT) SVC standards, which are currently established, provide a method of encoding scalable video data including a base layer and an enhancement layer and thereby providing an efficient encoding method in order to transmit and reproduce video data by applying different video qualities in accordance with a user's environment.

10 Original images included in video data to be compressed are generated into base layer images by the image quality reducer 500. The base layer images are compressed by the base layer video compressor 510 and are generated into a base layer video bitstream.

Residual images between the original images and prediction images predicted
15 by the predictor 550 are input to the enhancement layer video decoder 540 and are generated into an enhancement layer video bitstream. The predictor 550 receives information on base layer images compressed by the base layer video compressor 510 and decoded by the base layer video decoder 520, and receives information on enhancement layer images compressed by the enhancement layer video compressor
20 530 and decoded by the enhancement layer video decoder 540 and predicts the original images.

In the image quality reducer 500, a method such as a down-sampling method or a quantization parameter (QP) method may be used. In the predictor 550, a method such as a motion prediction method or an up-sampling method may be used.

25 FIG. 6 is a diagram for illustrating a method of decoding the base layer video bitstream and the enhancement layer video bitstream generated by the method illustrated in FIG. 5.

Referring to FIG. 6, a video decoder includes a base layer video decoder 600, an enhancement layer video decoder 610, and a predictor 620.

30 The base layer video bitstream is decoded by the base layer video decoder 600 and is reproduced as low quality video data.

At the same time, the enhancement layer video bitstream is input to and decoded by the enhancement layer video decoder 610 and then residual images are

output. High quality original images are decoded by combining the residual images and prediction images output from the predictor 620.

The predictor 620 outputs the prediction images by using images decoded by the enhancement layer video decoder 610 and images decoded by the base layer video
5 decoder 600.

According to the above-described method, video data may be efficiently compressed such that low quality video data may be reproduced by using only the base layer video bitstream and high quality video data may be reproduced by using both the base layer video bitstream and the enhancement layer video bitstream in accordance
10 with a user environment.

FIG. 7 is a diagram for illustrating a method of switching picture bitstreams using switching pictures, according to an embodiment of the present invention.

A switching picture SPns5 and a non-switching picture SPh5 are encoded at desired locations of low quality and high quality video bitstreams.

Referring to FIG. 7, the non-switching picture SPh5 is encoded with reference to a picture SPh4 and the switching picture SPns5 is encoded with reference to a picture PI5. The switching picture SPns5 and a non-switching picture SPh5 are decoded into the same image. Each of the low quality and high quality video bitstreams may be
15 independently processed and reproduced.

In an example identical to the example illustrated in FIG. 3, a user is watching a picture PI4 and wishes to continuously watch the next picture of the high quality video
20 bitstream.

Here, the switching picture SPns5 is completely losslessly encoded with reference to the non-switching picture SPh5 and the picture PI4 of the currently
25 decoded low quality video bitstream.

Accordingly, the user may watch the picture PI4 and the switching picture SPns5, and then continuously watch high quality video data by decoding a picture PI6 with reference to the switching picture SPns5.

FIG. 8 is a diagram for illustrating a method of encoding a non-switching picture,
30 according to conventional H.264 video standards.

Referring to FIG. 8, a non-switching picture encoding unit includes a motion prediction unit 800, an image conversion unit 810, and a multiplexing unit 820.

An I-macroblock is encoded by using a conventional I-macroblock encoding method. A non I-macroblock is encoded as below.

First, a prediction image is generated by using an original image and a decoded previous image stored in a frame buffer.

5 Discrete cosine transform (DCT) conversion is performed on the prediction image and the original image. Then, the prediction image is quantized and inverse quantized by SPQP parameters, thereby generating prediction DCT coefficients. The differences between the prediction DCT coefficients and DCT coefficients of the original image are input to a QP quantizer and form a bitstream and the bitstream and motion
10 vectors are output to the multiplexing unit 820.

Residual DCT coefficients output from the QP quantizer are combined with DCT coefficients of the prediction image through a QP inverse quantizer and the combined DCT coefficients are stored in the frame buffer.

FIG. 9 is a diagram for illustrating a method of decoding the non-switching
15 picture encoded according to conventional H.264 video standards as illustrated in FIG. 8.

Referring to FIG. 9, a non-switching picture decoding unit includes a motion compensation unit 900 and an image reproduction unit 910.

The method illustrated in FIG. 9 is performed in reverse order of the method
20 illustrated in FIG. 8.

FIG. 10 is a diagram for illustrating a method of encoding a switching picture, according to conventional H.264 video standards.

Referring to FIG. 10, a switching picture encoding unit includes a motion prediction unit 1000 and a multiplexing unit 1010.

25 A decoded image of a non-switching picture is represented as DCT coefficients quantized by SPQP quantization parameters.

The DCT coefficients quantized by the SPQP quantization parameters of the non-switching picture generate the decoded image through an inverse quantizer and an inverse DCT converter. The decoded image is motion compensated by using a
30 reference image stored in a frame buffer, thereby generating a prediction image.

The prediction image passes through a DCT converter and is quantized by SPQP coefficients. Difference coefficients between the quantized SPQP coefficients of the prediction image and the DCT coefficients quantized by the SPQP quantization

parameters of the input non-switching picture are encoded and output to the multiplexing unit 1010.

FIG. 11 is a diagram for illustrating a method of decoding the switching picture encoded according to conventional H.264 video standards as illustrated in FIG. 10.

5 Referring to FIG. 11, a switching picture decoding unit includes a motion compensation unit 1100 and an image reproduction unit 1110.

A prediction image is generated by using the frame buffer and motion vectors and the prediction image is DCT converted and is quantized by SPQP coefficients.

10 The quantized coefficients are included to DCT coefficients quantized by the SPQP coefficients and input from an inverse multiplexer and thereby generating DCT coefficients of a decoded image quantized by the SPQP coefficients. The DCT coefficients of the decoded image quantized by the SPQP coefficients are inverse quantized by the SPQP coefficients and inverse DCT converted and thereby reproducing the image.

15 According to the above-described method, switching and non-switching pictures are encoded and decoded by using a reference image.

FIG. 12 is a diagram for illustrating a method of encoding a bitstream which includes a non-switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

20 A method of encoding a non-switching picture of a base layer follows H.264 video standards.

An original image is down-sampled and is input to a base layer non-switching picture encoder, thereby generating a base layer non-switching picture bitstream.

25 The original image is also input to an enhancement layer non-switching picture encoder, thereby generating an enhancement layer non-switching picture bitstream.

Here, in the enhancement layer non-switching picture encoder, an encoded and decoded picture of the base layer may be used as a reference image in order to generate a prediction image by an interlayer prediction.

30 Alternatively, in the enhancement layer non-switching picture encoder, an encoded and decoded picture of the enhancement layer may be used as a reference image in order to generate a prediction image by motion prediction.

FIG. 13 is a diagram for illustrating a method of decoding a bitstream which includes a non-switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

An enhancement layer non-switching picture decoder receives an enhancement
5 layer non-switching picture bitstream and decodes a non-switching picture by using the same prediction method used when the non-switching picture has been encoded and by using a decoded base layer picture or enhancement layer picture used when an enhancement non-switching picture has been encoded as a reference image, according to conventional H.264 video standards.

10 FIG. 14 is a diagram for illustrating a method of encoding a bitstream which includes a switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

A base layer non-switching picture composed of DCT coefficients quantized by SPQP quantization coefficients according to conventional H.264 video standards is
15 input to a base layer switching picture encoder and is predicted using an encoded and decoded image of a frame buffer as a reference image such that a switching picture is generated and encoded.

An enhancement layer non-switching picture quantized by SPQP quantization coefficients is input to an enhancement layer switching picture encoder and is
20 generated into a prediction image by an interlayer prediction using an encoded and decoded image of the base layer frame buffer as a reference image such that a switching picture is generated. In this case, other processes except for the generation of the prediction image follow H.264 standards.

Here, the reference image used for the enhancement layer switching picture
25 encoder is different from the reference image that was used to encode a non-switching picture.

FIG. 15 is a diagram for illustrating a method of decoding a bitstream which includes a switching picture and in which a SVC technology is adopted, according to an embodiment of the present invention.

30 A switching picture stream including DCT coefficients quantized by SPQP quantization coefficients is input to a base layer switching picture decoder according to H.264 video standards and decodes a base layer switching picture.

A switching picture bitstream, which is encoded from a prediction image generated by an interlayer prediction using an encoded and decoded image of a base layer frame buffer as a reference image, is input to an enhancement layer switching picture decoder and is generated into an enhancement layer switching picture.

5 Here, the reference image used for the enhancement layer switching picture decoder is different from the reference image that was used to encode an enhancement layer non-switching picture.

In this case, the enhancement layer switching picture decoder uses a prediction image predicted by an interlayer prediction using an encoded and decoded image of a base layer which is used when an enhancement layer switching picture is encoded as a reference image, according to conventional H.264 standards.

FIG. 16 is a flowchart illustrating a method of encoding an enhancement layer bitstream in which a SVC technology is adopted, according to an embodiment of the present invention.

15 Original video data is input and low quality video data created by, for example, down-sampling is generated into a base layer video bitstream by using a conventional video encoder in S1600.

Whether to encode each picture P included in an enhancement layer video data into a switching picture or not is determined in S1610 and S1620.

20 If it is determined that a picture P is not to be encoded into a switching picture, the enhancement layer is encoded by using a conventional video encoding method so as to generate an image bitstream in S1650.

If it is determined that a picture P is to be encoded into a switching picture, the picture P is generated into a non-switching picture bitstream by using a non-switching picture encoding method in S1630.

25 The non-switching picture is generated into a switching picture bitstream by using a switching picture encoding method in S1640.

FIG. 17 is a flowchart illustrating a method of decoding a bitstream in which a SVC technology is adopted, according to an embodiment of the present invention.

30 A base layer video bitstream is input and base layer images are decoded and reproduced by using a base layer video decoding method in S1700.

Whether to decode a switching picture of an enhancement layer or not is determined by, for example, a user's selection in S1710.

If it is determined that the switching picture of the enhancement layer is not to be decoded, whether the next enhancement layer image to be decoded is a non-switching picture or not is determined in S1730.

If it is determined that the next enhancement layer image to be decoded is not a non-switching picture, the enhancement layer image is decoded and reproduced by using a conventional video enhancement layer image decoding method in S1750.

If it is determined that the next enhancement layer image to be decoded is a non-switching picture, the enhancement layer image is decoded and reproduced by using a non-switching picture decoding method in S1740.

If it is determined that the switching picture of the enhancement layer is to be decoded, a base layer picture used as a reference image when the enhancement layer has been encoded is decoded and the switching picture of the enhancement layer is decoded and reproduced by using a switching picture decoding method in S1720.

The invention can also be embodied as computer readable codes on a computer readable recording medium. The computer readable recording medium is any data storage device that can store data which can be thereafter read by a computer system. Examples of the computer readable recording medium include read-only memory (ROM), random-access memory (RAM), CD-ROMs, magnetic tapes, floppy disks, optical data storage devices, and carrier waves (such as data transmission through the Internet). The computer readable recording medium can also be distributed over network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. The exemplary embodiments should be considered in a descriptive sense only and not for purposes of limitation. Therefore, the scope of the invention is defined not by the detailed description of the invention but by the appended claims, and all differences within the scope will be construed as being included in the present invention.

CLAIMS

1. An apparatus for encoding a video bitstream including a base layer bitstream and an enhancement layer bitstream, wherein an enhancement layer picture of the enhancement layer bitstream is encoded into switching picture and non-switching picture, wherein, during reproduction of the base layer picture of the base layer bitstream, the enhancement layer picture is able to be reproduced consecutively after one of the reproduced base layer pictures.

2. The apparatus of claim 1, wherein the non-switching picture is encoded by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and pre-encoded enhancement layer picture, and the switching picture is encoded by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

3. The apparatus of claim 2, wherein the switching and non-switching pictures are decoded into the same image.

4. The apparatus of claim 2, wherein the reference image used for the prediction when the switching picture is encoded is different from the reference image used for the prediction when the non-switching picture is encoded.

5. An apparatus for encoding a non-switching picture in which a base layer bitstream and an enhancement layer bitstream are encoded for interlayer reproduction conversion of an original image to be encoded, wherein the non-switching picture is encoded by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

6. The apparatus of claim 5, comprising an enhancement layer non-switching picture encoding unit which encodes the non-switching picture by prediction using a reference image generated by decoding a pre-encoded base layer picture or a pre-encoded enhancement layer picture.

7. The apparatus of claim 6, wherein the enhancement layer non-switching picture encoding unit comprises:

a motion prediction unit which generates prediction information and a prediction
5 image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture;

an image conversion unit which generates a bitstream by compressing a residual image which corresponds to the difference between the original image and the prediction image; and

10 a multiplexing unit which combines and outputs a bitstream generated by the image conversion unit and the prediction information.

8. An apparatus for encoding a switching picture in which a base layer bitstream and an enhancement layer bitstream are generated for interlayer reproduction
15 conversion of an original image to be encoded by using the base layer bitstream and the enhancement layer bitstream which comprises a non-switching picture, wherein a switching picture, which represents the same decoded image as the non-switching picture, is encoded by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

20 9. The apparatus of claim 8, comprising an enhancement layer switching picture encoding unit which encodes the switching picture, which represents the same decoded image as the non-switching picture, in accordance with the interlayer prediction using the base layer picture.

25 10. The apparatus of claim 9, wherein the enhancement layer switching picture encoding unit comprises:

a motion prediction unit which generates prediction information and a prediction image by interlayer prediction using the non-switching picture, and the reference image
30 generated by decoding a pre-encoded base layer picture;

an image conversion unit which compresses a residual image which corresponds to the difference between the non-switching picture and the prediction information; and

a multiplexing unit which combines and outputs image information generated by the image conversion unit and the prediction information.

11. An encoder for encoding a base layer bitstream and an enhancement layer bitstream for interlayer reproduction conversion of an original image to be encoded, the encoder comprising a non-switching picture encoding unit which encodes the non-switching picture by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

12. The encoder of claim 11, wherein the non-switching picture encoding unit comprises an enhancement layer non-switching picture encoding unit which encodes the non-switching picture by prediction using a reference image generated by decoding a pre-encoded base layer picture or a pre-encoded enhancement layer picture.

13. The encoder of claim 12, wherein the enhancement layer non-switching picture encoding unit comprises:

a motion prediction unit which generates prediction information and a prediction image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture;

an image conversion unit which generates a bitstream by compressing a residual image which corresponds to the difference between the original image and the prediction image; and

a multiplexing unit which combines and outputs a bitstream generated by the image conversion unit and the prediction information.

14. The encoder of claim 11, further comprising a switching picture encoding unit which encodes a switching picture, which represents the same decoded image as the non-switching picture, by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

15. The encoder of claim 14, wherein the switching picture encoding unit comprises an enhancement layer switching picture encoding unit which encodes the

switching picture, which represents the same decoded image as the non-switching picture, in accordance with the interlayer prediction using the base layer picture.

16. The encoder of claim 15, wherein the enhancement layer switching
5 picture encoding unit comprises:

a motion prediction unit which generates prediction information and a prediction image by interlayer prediction using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture;

10 an image conversion unit which compresses a residual image which corresponds to the difference between the non-switching picture and the prediction information; and

a multiplexing unit which combines and outputs image information generated by the image conversion unit and the prediction information.

17. An apparatus for decoding a non-switching picture by decoding a
15 bitstream comprising switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer picture is to be reproduced while a base layer picture of a base layer bitstream is being reproduced, a non-switching picture comprised in the enhancement layer bitstream is decoded by using prediction information used when the
20 non-switching picture was encoded.

18. An apparatus for decoding a switching picture by decoding a bitstream comprising switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer
25 picture is to be reproduced while a base layer picture of a base layer bitstream is being reproduced, a switching picture comprised in an enhancement layer bitstream is decoded by using prediction information used when the switching picture was encoded.

19. A decoder for decoding a non-switching picture by decoding a bitstream
30 comprising switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein the decoder comprises a non-switching picture decoding unit which decodes an enhancement layer picture by using a non-switching picture included in the enhancement layer bitstream, if an

enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

20. The decoder of claim 19, further comprising a switching picture decoding unit which decodes an enhancement layer picture by using a switching picture included in the bitstream, if the enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

21. The decoder of any one of claims 19 and 20, wherein each of the non-switching picture decoding unit and the switching picture decoding unit comprises:
a motion compensation unit which receives prediction information included in the bitstream and predicts an image to be decoded; and
an image reproduction unit which receives residual image information comprised in the bitstream, adds the prediction image and the residual image information, and generates an image to be reproduced.

22. A codec for performing interlayer reproduction conversion between a base layer bitstream and an enhanced layer bitstream, the codec comprising:

an encoder which encodes a non-switching picture by predicting an enhancement layer picture to be encoded using a reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture, and encodes the enhancement layer bitstream by interlayer prediction using a switching picture which represents the same decoded image as the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture; and

a decoder which decodes an enhancement layer bitstream to be reproduced by using a switching picture comprised in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

23. The codec of claim 22, wherein the encoder comprises a non-switching picture encoding unit which encodes the non-switching picture by prediction using an

original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

24. The codec of claim 23, wherein the non-switching picture encoding unit
5 comprises an enhancement layer non-switching picture encoding unit which encodes the non-switching picture by prediction using a reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture.

25. The codec of claim 24, wherein the enhancement layer non-switching
10 picture encoding unit comprises:

a motion prediction unit which generates prediction information and a prediction image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture;

an image conversion unit which generates a bitstream by compressing a residual
15 image which corresponds to the difference between the original image and the prediction image; and

a multiplexing unit which combines and outputs a bitstream generated by the image conversion unit and the prediction information.

26. The codec of claim 23, wherein the encoder further comprises a switching
20 picture encoding unit which encodes a switching picture, which represents the same decoded image as the non-switching picture, by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

27. The codec of claim 26, wherein the switching picture encoding unit
25 comprises an enhancement layer switching picture encoding unit which encodes the switching picture, which represents the same decoded image as the non-switching picture, in accordance with the interlayer prediction using the base layer picture.

28. The codec of claim 27, wherein the enhancement layer switching picture
30 encoding unit comprises:

a motion prediction unit which generates prediction information and a prediction image by an interlayer prediction using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture;

an image conversion unit which compresses a residual image which corresponds to the difference between the non-switching picture and the prediction information; and

a multiplexing unit which combines and outputs image information generated by the image conversion unit and the prediction information.

29. The codec of claim 22, wherein the decoder comprises:

a non-switching picture decoding unit which decodes an enhancement layer picture by using a non-switching picture included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced; and

a switching picture decoding unit which decodes an enhancement layer picture by using a switching picture included in the bitstream, if the enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

30. The codec of claim 29, wherein each of the non-switching picture decoding unit and the switching picture decoding unit comprises:

a motion compensation unit which receives prediction information included in the bitstream and predicts an image to be decoded; and

an image reproduction unit which receives residual image information included in the bitstream, adds the prediction image and the residual image information, and generates an image to be reproduced.

31. A method for encoding a video bitstream including a base layer bitstream and an enhancement layer bitstream, wherein an enhancement layer picture of the enhancement layer bitstream is encoded into switching picture and non-switching picture, wherein, during reproduction of the base layer picture of the base layer bitstream, the enhancement layer picture is able to be reproduced consecutively after one of the reproduced base layer pictures.

32. The method of claim 31, wherein the non-switching picture is encoded by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture, and the switching picture is encoded by interlayer prediction using a reference image generated by decoding a pre-encoded base layer picture.

33. The method of claim 32, wherein the switching and non-switching pictures represent the same decoded image.

34. The method of claim 32, wherein the reference image used for the prediction when the switching picture is encoded is different from the reference image used for the prediction when the non-switching picture is encoded.

35. A method of encoding a non-switching picture in which a base layer bitstream and an enhancement layer bitstream are encoded for interlayer reproduction conversion of an original image to be encoded, wherein the non-switching picture is encoded by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

36. The method of claim 35, comprising (a) encoding the non-switching picture by prediction using a reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture.

37. The method of claim 36, wherein operation (a) comprises:
generating prediction information and a prediction image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture;
generating a bitstream by compressing a residual image which corresponds to the difference between the original image and the prediction image; and
combining and outputting a bitstream generated by the image conversion unit and the prediction information.

38. A method of encoding a switching picture, in which a base layer bitstream and an enhancement layer bitstream are generated for interlayer reproduction conversion of an original image to be encoded by using the base layer bitstream and the enhancement layer bitstream which comprises a non-switching picture, wherein a
5 switching picture, which represents the same decoded image as the non-switching picture, is encoded by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

39. The method of claim 38, comprising (b) encoding the switching picture
10 which represents the same decoded image as the non-switching picture in accordance with the interlayer prediction using the base layer picture.

40. The method of claim 39, wherein operation (b) comprises:
generating prediction information and a prediction image by interlayer prediction
15 using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture;
compressing a residual image which corresponds to the difference between the non-switching picture and the prediction information; and
combining and outputting image information generated by the image conversion
20 unit and the prediction information.

41. A method of encoding a base layer bitstream and an enhancement layer bitstream for interlayer reproduction conversion of an original image to be encoded, the method comprising encoding the non-switching picture by prediction using an original
25 image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

42. The method of claim 41, wherein the encoding of the non-switching picture comprises (a) encoding the non-switching picture by prediction using a
30 reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture.

43. The method of claim 42, wherein operation (a) comprises:

generating prediction information and a prediction image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture;

generating a bitstream by compressing a residual image which corresponds to the difference between the original image and the prediction image; and

combining and outputting a bitstream generated by the image conversion unit and the prediction information.

44. The method of claim 41, further comprising encoding a switching picture, which represents the same decoded image as the non-switching picture, by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

45. The method of claim 44, wherein the encoding of the switching picture comprises (b) encoding the switching picture which represents the same decoded image as the non-switching picture in accordance with the interlayer prediction using the base layer picture.

46. The method of claim 45, wherein operation (b) comprises:

generating prediction information and a prediction image by an interlayer prediction using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture;

compressing a residual image which corresponds to the difference between the non-switching picture and the prediction information; and

combining and outputting image information generated by the image conversion unit and the prediction information.

47. A method of decoding a non-switching picture by decoding a bitstream comprising switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer picture is to be reproduced while a base layer picture of a base layer bitstream is being reproduced, a non-switching picture comprised in an enhancement layer bitstream is

decoded by using prediction information used when the non-switching picture was encoded.

48. A method of decoding a switching picture by decoding a bitstream comprising switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, wherein, if an enhancement layer picture is to be reproduced while a base layer picture of a base layer bitstream is being reproduced, a switching picture comprised in an enhancement layer bitstream is decoded by using prediction information used when the switching picture was encoded.

49. A method of decoding a non-switching picture by decoding a bitstream comprising switching pictures for interlayer reproduction conversion between a base layer bitstream and an enhancement layer bitstream, the method comprising decoding an enhancement layer picture by using a non-switching picture included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

50. The method of claim 49, further comprising decoding an enhancement layer picture by using a switching picture comprised in the bitstream, if the enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

51. The method of any one of claims 49 and 50, wherein the decoding of the base layer picture or the enhancement layer picture comprises:

receiving prediction information included in the bitstream and predicting an image to be decoded; and

receiving residual image information comprised in the bitstream, adding the prediction image and the residual image information, and generating an image to be reproduced.

52. A method of coding for performing interlayer reproduction conversion between a base layer bitstream and an enhanced layer bitstream, the method comprising:

encoding a non-switching picture by predicting an enhancement layer picture to be encoded using a reference image reference image generated by decoding a pre-encoded base layer picture or a pre-encoded encoded enhancement layer picture, and encoding the enhancement layer bitstream by interlayer prediction using a switching picture which represents the same decoded image as the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture; and

decoding an enhancement layer bitstream to be reproduced by using a switching picture comprised in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced.

53. The method of claim 52, wherein the encoding comprises encoding the non-switching picture by prediction using an original image and a reference image generated by decoding a pre-encoded base layer picture and a pre-encoded enhancement layer picture.

54. The method of claim 53, wherein the encoding of the non-switching picture comprises (a) encoding the non-switching picture by prediction using a reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture.

55. The method of claim 54, wherein operation (a) comprises:
generating prediction information and a prediction image by using the original image, and the reference image generated by decoding a pre-encoded basic layer picture or a pre-encoded enhancement layer picture;

generating a bitstream by compressing a residual image which corresponds to the difference between the original image and the prediction image; and

combining and outputting a bitstream generated by the image conversion unit and the prediction information.

56. The method of claim 53, wherein the encoding further comprises encoding a switching picture, which represents the same decoded image as the

non-switching picture, by interlayer prediction using the non-switching picture and a reference image generated by decoding a pre-encoded base layer picture.

57. The method of claim 56, wherein the encoding of the switching picture
5 comprises (b) encoding the switching picture which represents the same decoded image as the non-switching picture in accordance with the interlayer prediction using the base layer picture.

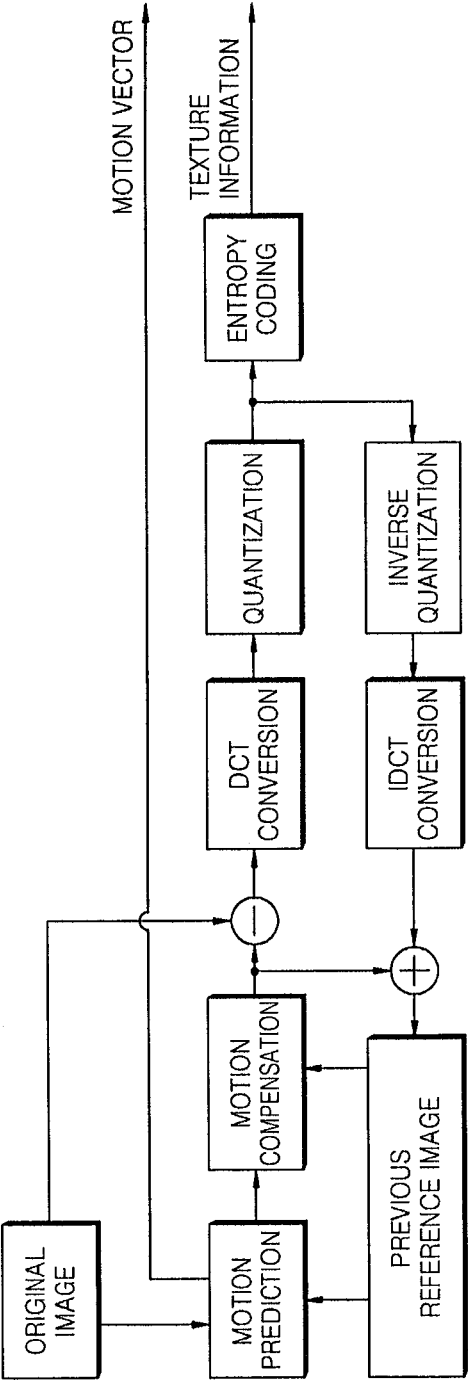
58. The method of claim 57, wherein operation (b) comprises:
10 generating prediction information and a prediction image by interlayer prediction using the non-switching picture, and the reference image generated by decoding a pre-encoded base layer picture;
compressing a residual image which corresponds to the difference between the non-switching picture and the prediction information; and
15 combining and outputting image information generated by the image conversion unit and the prediction information.

59. The method of claim 52, wherein the decoding comprises:
decoding an enhancement layer picture by using a non-switching picture
20 included in the enhancement layer bitstream, if an enhancement layer picture is to be reproduced while a base layer picture of the base layer bitstream is being reproduced; and
decoding an enhancement layer picture by using a switching picture included in the bitstream, if the enhancement layer picture is to be reproduced while a base layer
25 picture of the base layer bitstream is being reproduced.

60. The method of claim 59, wherein the decoding of the enhancement layer picture by using the non-switching picture or the base layer picture comprises:
receiving prediction information comprised in the bitstream and predicting an
30 image to be decoded; and
receiving residual image information comprised in the bitstream, adding the prediction image and the residual image information, and generating an image to be reproduced.

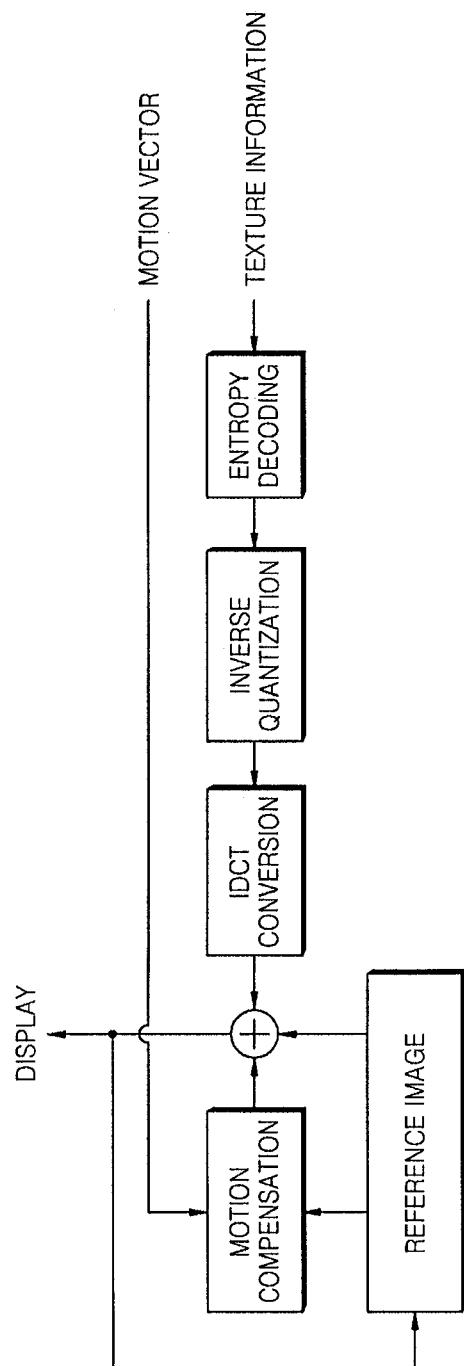
61. A computer readable recording medium having recorded thereon a computer program for executing the method claim 31.

FIG. 1



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FIG. 2



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FIG. 3

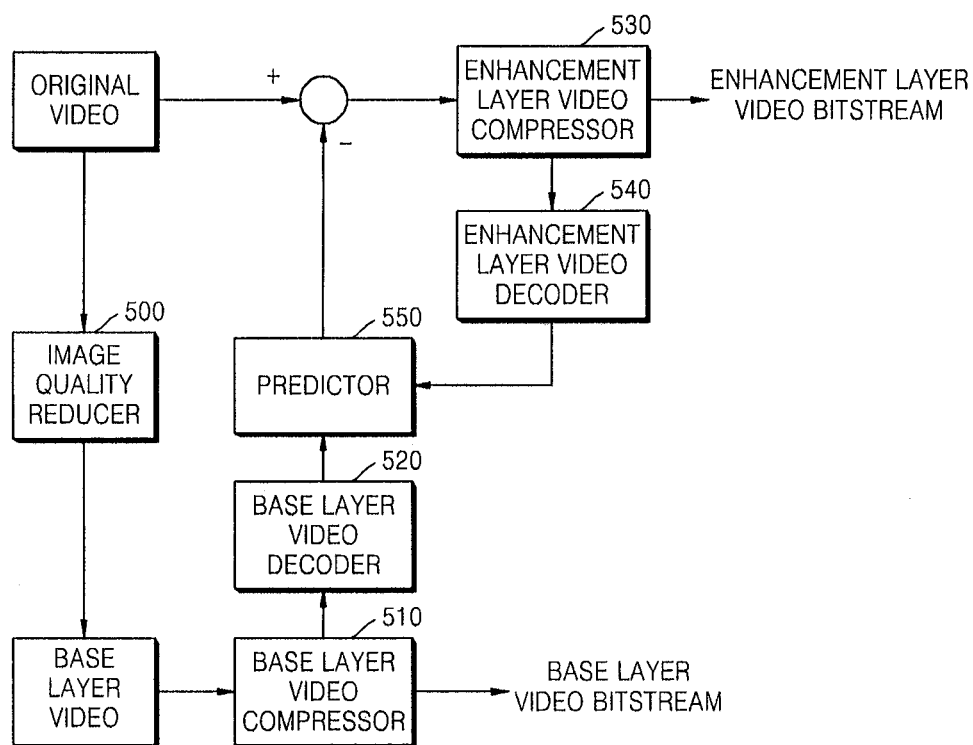
I_{h1} P_{h2} P_{h3} P_{h4} P_{h5} P_{h6} P_{h7} P_{h8} <HIGH QUALITY VIDEO BITSTREAM>
I_{l1} P_{l2} P_{l3} P_{l4} P_{l5} P_{l6} P_{l7} P_{l8} <LOW QUALITY VIDEO BITSTREAM>

FIG. 4

I_{h1} P_{h2} P_{h3} P_{h4} P_{h5} P_{h6} P_{h7} P_{h8} <ENHANCEMENT LAYER VIDEO BITSTREAM>
I_{l1} P_{l2} P_{l3} P_{l4} P_{l5} P_{l6} P_{l7} P_{l8} <BASE LAYER VIDEO BITSTREAM>

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FIG. 5



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FIG. 6

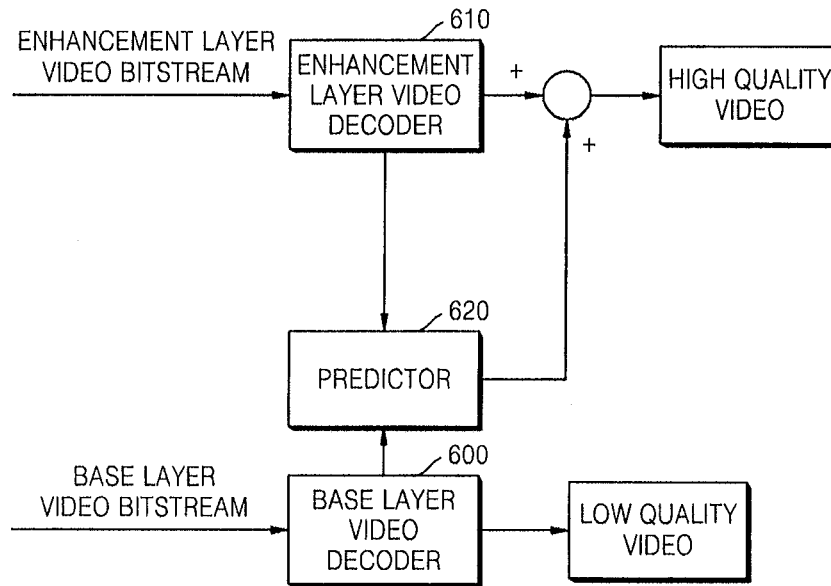


FIG. 7

I_{h1} P_{h2} P_{h3} P_{h4} SP_{h5} P_{h6} P_{h7} P_{h8} <HIGH QUALITY VIDEO BITSTREAM>
 SP_{ns5} <SWITCHING PICTURE>
 I_{l1} P_{l2} P_{l3} P_{l4} P_{l5} P_{l6} P_{l7} P_{l8} <LOW QUALITY VIDEO BITSTREAM>

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FIG. 8

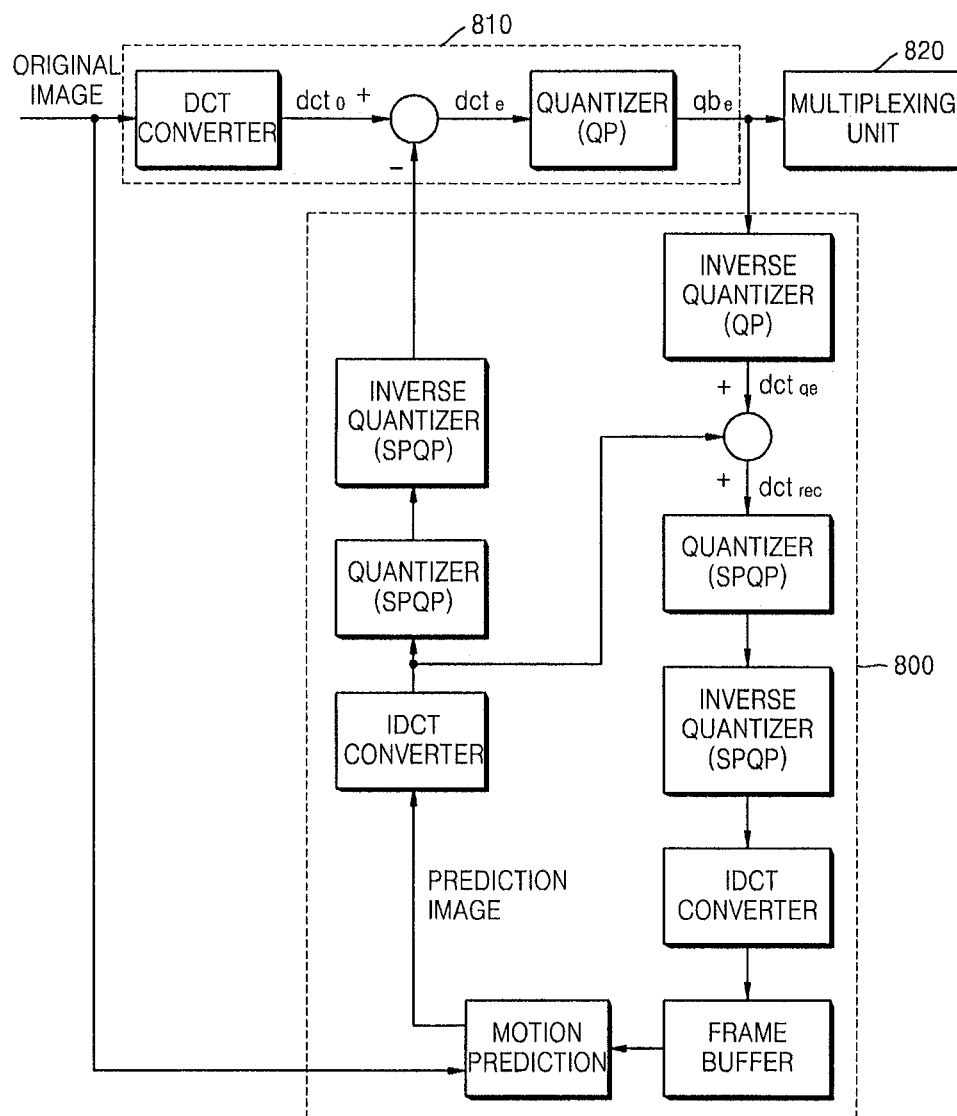


FIG. 9

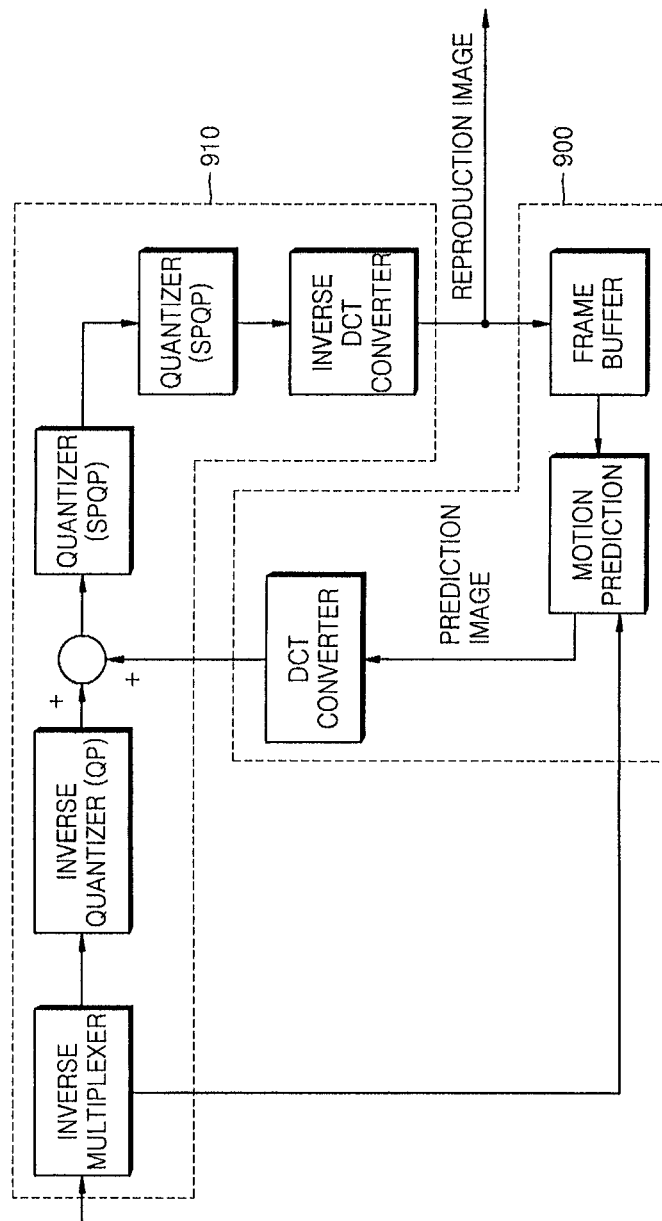
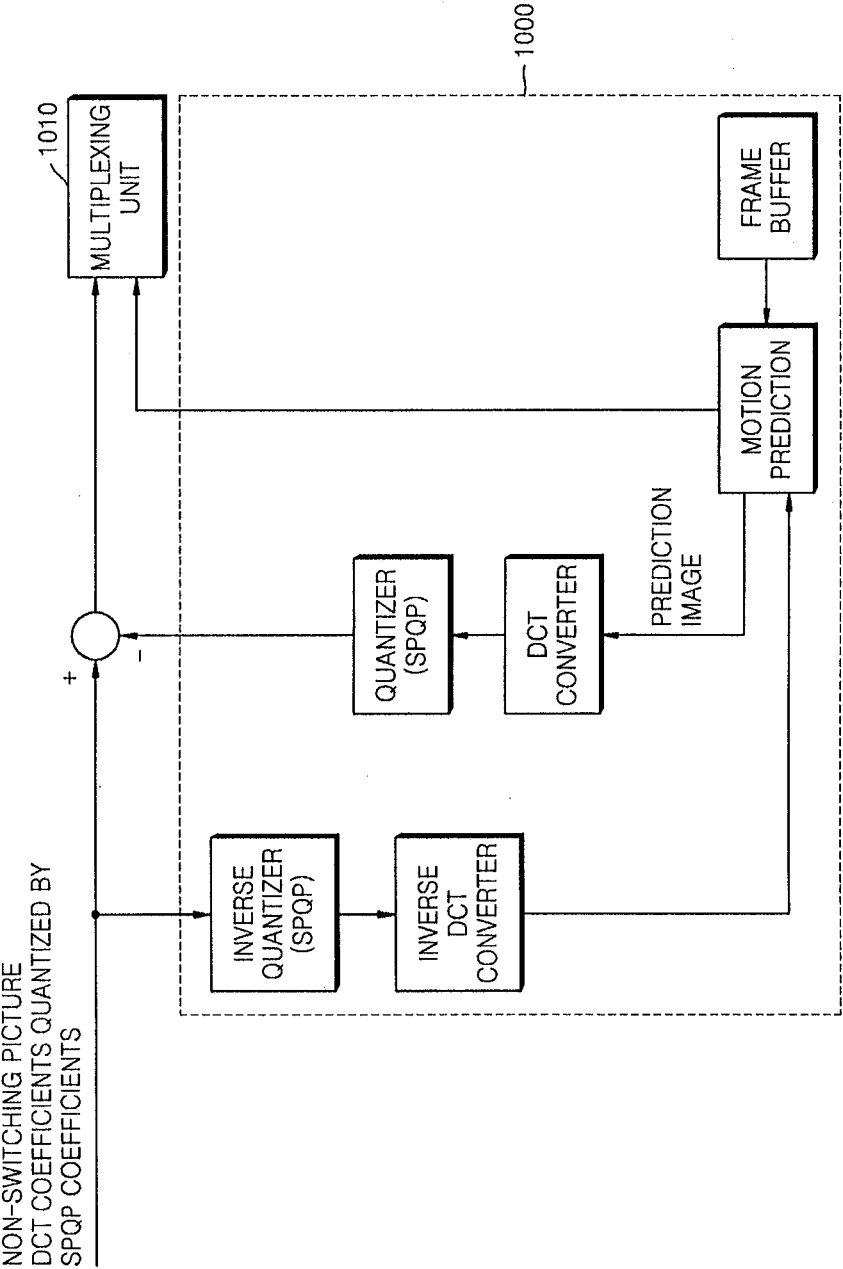
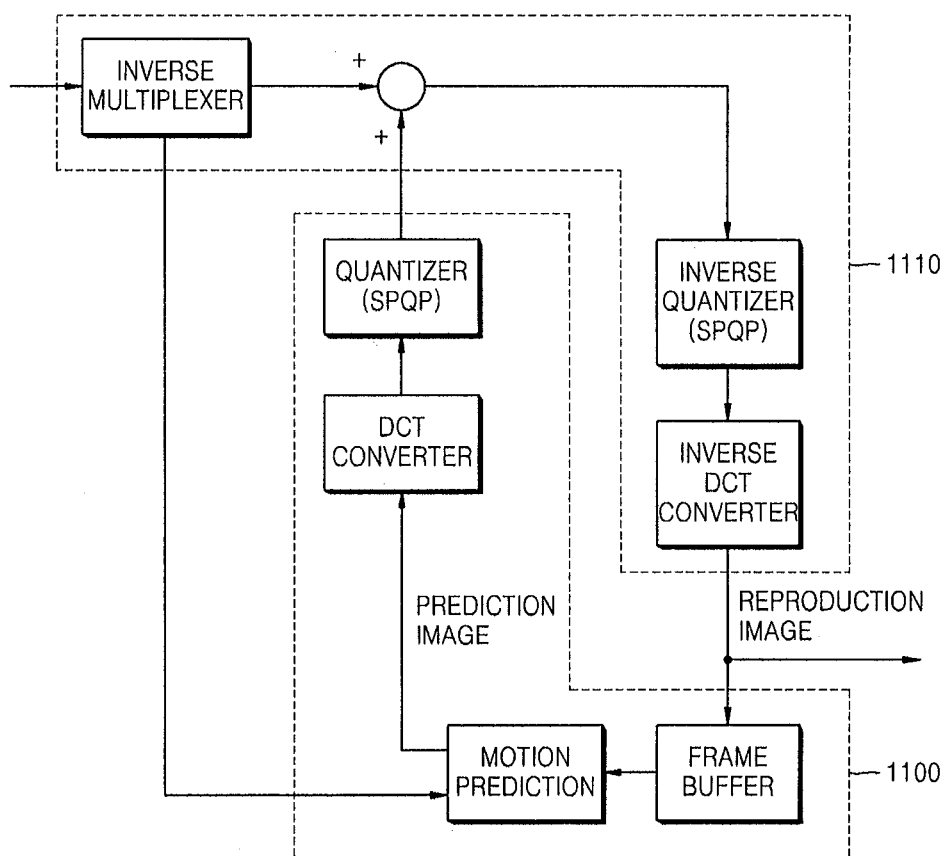


FIG. 10



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FIG. 11



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FIG. 12

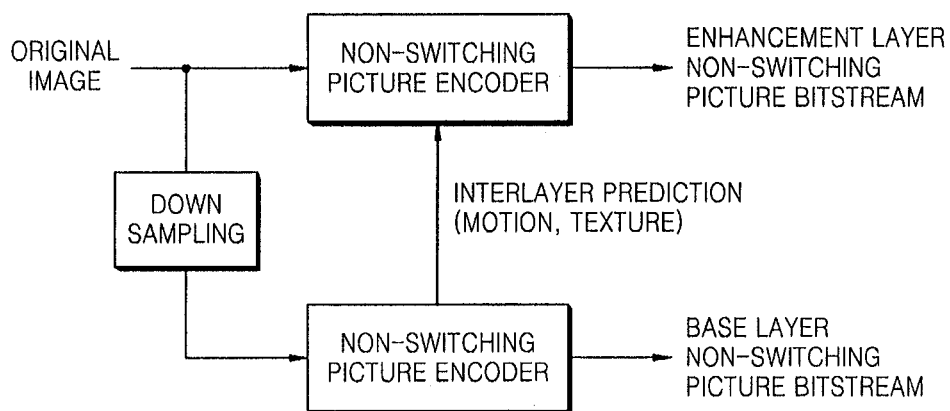
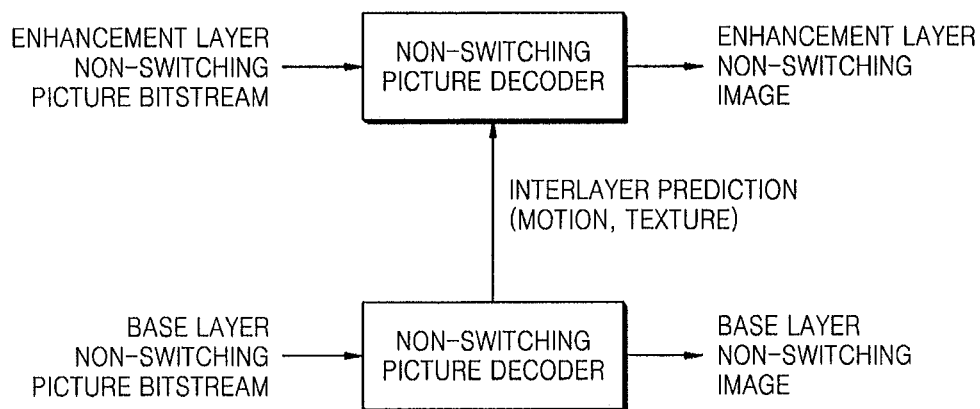


FIG. 13



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FIG. 14

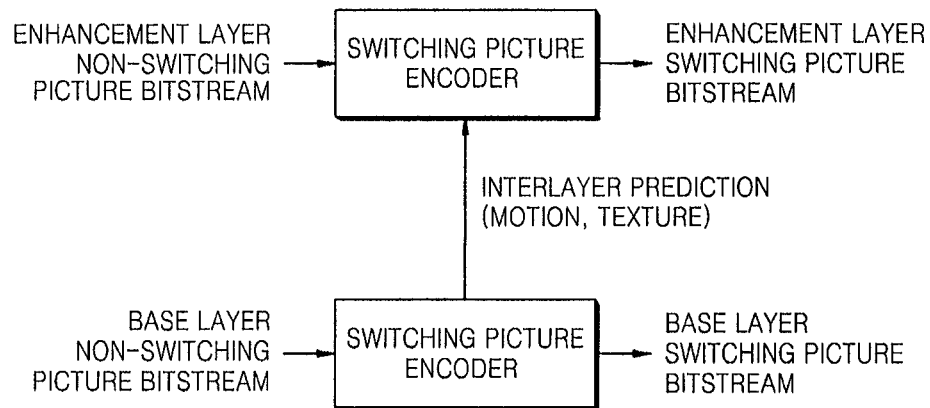
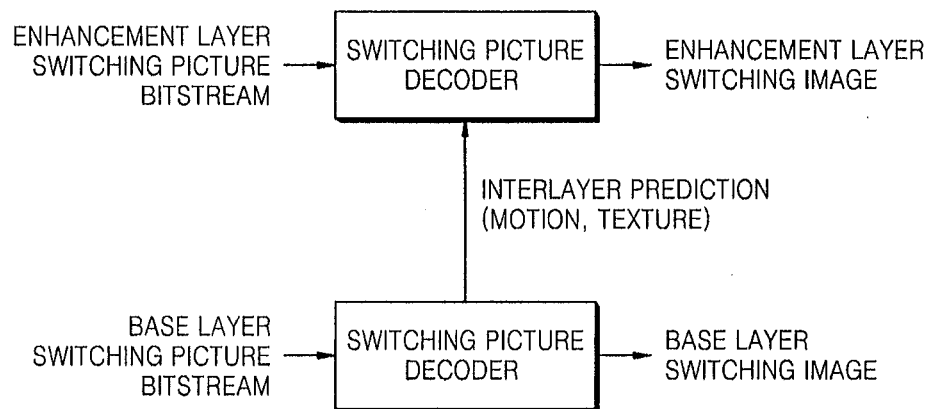
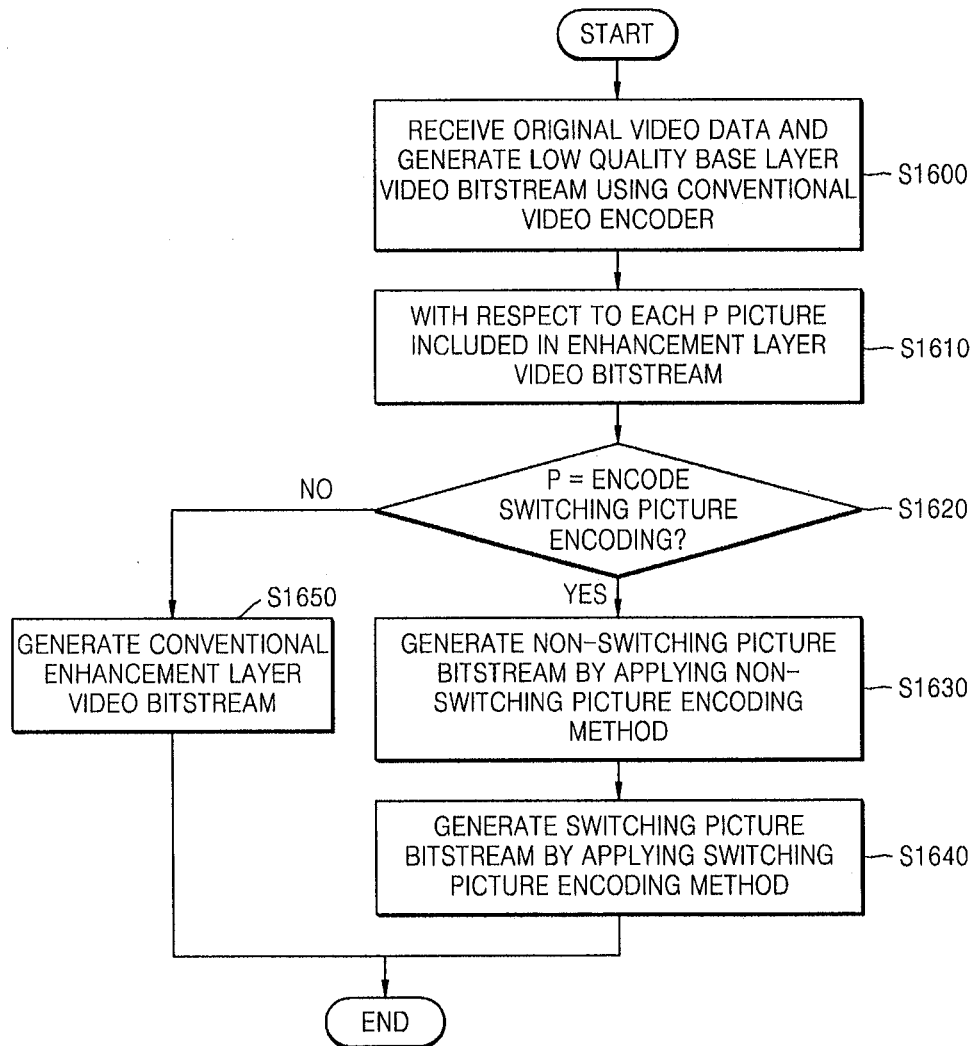


FIG. 15



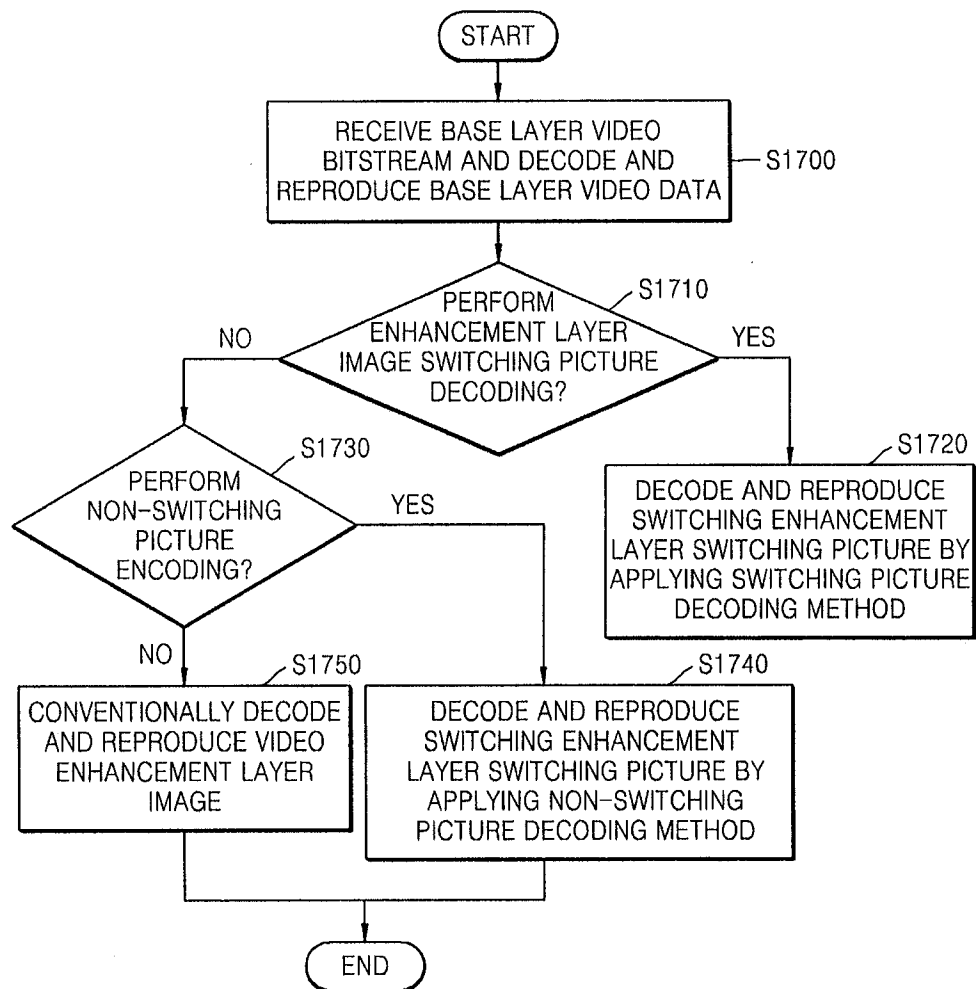
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FIG. 16



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FIG. 17



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2007/001505**A. CLASSIFICATION OF SUBJECT MATTER****H04N 7/24(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility Models: IPC as aboveElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS(KIPO internal): "Scalable, SI-frame, SP-frame"**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KARCZEWICZ, M. KURCEREN, R., 'The SP- and SI-frames design for H.264/AVC', Circuits and Systems for Video Technology, IEEE Transactions on Volume 13, Issue 7, July 2003, Page(s):637 - 644. See abstract, Section II and III.	1-61
A	KARCZEWICZ, M. KURCEREN, R., "Improved SP-frame encoding", ITU-T video coding experts group meeting, Austin, USA, April 2001. See abstract, Section 1 and 2.	1-61
A	X SUN, S LI, F WU, J SHEN, W GAO, 'The improved SP frame coding technique for the JVT standard', Image Processing, 2003, Proceedings, 2003 International, Page(s):497 - 500. See abstract, Section II and III.	1-61
A	KARCZEWICZ, M. KURCEREN, R., The SP frames design for JVT/H. 26L, Image Processing, 2002, International, Synchronization-predictive coding for video compression, Page(s):297 - 300. See abstract, Section II and III.	1-61



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

05 JULY 2007 (05.07.2007)

Date of mailing of the international search report

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