【DESCRIPTION】

【Invention Title】

IMAGE ENCODING METHOD

【Technical Field】

The present invention relates to an image processing apparatus and method, and more particularly, to an apparatus for reducing the amount of residual signals of an image and entropy-coding the residual signals.

【Background Art】

To efficiently transmit a moving picture signal at a low data rate while maintaining high image quality, various digital moving picture compression technologies have been proposed. These moving picture compression technologies include H.261, Motion Picture Experts Group (MPEG)-2/H.262, H.263, MPEG-4, Advanced Video Coding (AVC)/H.264, and so on. The compression technologies include a discrete cosine transform (DCT) scheme, a motion compensation (MC) scheme, a quantization scheme, an entropy coding scheme, and so on.

For image coding, each picture is divided into a plurality of slices, and each slice is divided into a plurality of coding blocks of a predetermined size. Since an image of a high-definition (HD) grade or above has many flat areas, an image compression can be improved by encoding the image with coding blocks that are larger than a macroblock (MB).

Therefore, new prediction technique is required and changes in transform coding, entropy coding, intra prediction and inter prediction is required as the size of

the coding unit increases to increase image compression ratio without increase of the complexity of image compression.

【Disclosure】

【Technical Problem】

The present invention is directed to an apparatus for encoding a moving picture, and more particularly, to an apparatus for effectively encoding transformed residual signals of a moving picture having a predetermined size or more.

【Technical Solution】

One aspect of the present invention provides an image encoding method, including: determining, by a coding mode determiner, a size and a prediction mode of a predictive coding block for image or video data; transforming and quantizing, by a transform/quantization unit, a residual block of a prediction block generated by intra prediction to generate a quantized block; inversely quantizing and inversely transforming, by an inverse quantization/transform unit, the quantized block; applying, by a de-blocking filtering unit, a de-blocking filter to image data received from the inverse quantization/transform unit; and determining, by an intra prediction unit, an intra prediction mode; generating, by the intra prediction unit, the prediction block according to the intra prediction mode; and entropy-coding, by an entropy coder, quantized coefficients of the quantized block, wherein, when a size of the quantized block is equal to 8x8, the coefficients of the quantized block are divided into a plurality of subsets, and the plurality of subsets are scanned using a scan pattern determined according to the intra prediction mode, wherein a scan pattern for

scanning non-zero coefficients of each subset is same with the scan pattern for the plurality of subsets, wherein a scan pattern for scanning flags indicating non-zero coefficients of each subset is same with the scan pattern for scanning non-zero coefficients of each subset, wherein the plurality of subsets are composed of a main subset and a plurality of remaining subsets and the main subset includes a DC coefficient

In an example, an image encoding apparatus may be provided, including: a coding mode determiner configured to determine a size and a prediction mode of a predictive coding block; a transform/quantization unit configured to transform and quantize a residual block of a prediction block generated by intra prediction to generate a quantized block; an inverse quantization/transform unit configured to inversely quantize and inversely transform the quantized block; a de-blocking filtering unit configured to apply a de-blocking filter to an image data received from the inverse quantization/transform unit; and an intra prediction unit configured to determine an intra prediction mode and generate the prediction block according to the intra prediction mode; and an entropy coder configured to entropy-code quantized coefficients of the quantized block, wherein, when a size of the quantized block is equal to 8x8, the coefficients of the quantized block are divided into a plurality of subsets, and the plurality of subsets are scanned using a scan pattern determined according to the intra prediction mode, wherein a scan pattern for scanning non-zero coefficients of each subset is same with the scan pattern for the plurality of subsets, wherein a scan pattern for scanning flags indicating non-zero coefficients of each subset is same with the scan pattern for scanning non-zero

coefficients of each subset, wherein the plurality of subsets are composed of a main subset and a plurality of remaining subsets and the main subset includes a DC coefficient.

Preferably, the quantized coefficients of each subset are scanned in a reverse direction according to a scan pattern determined by the intra prediction mode.

Preferably, the plurality of subsets are scanned in a reverse direction.

Preferably, when the intra prediction mode is a vertical mode, the scan pattern is a horizontal scan.

Preferably, when the intra prediction mode is a horizontal mode, the scan pattern is a vertical scan.

Preferably, the intra prediction unit generates reference pixels when unavailable reference pixels exist.

Preferably, the intra prediction mode is encoded using an upper intra prediction mode and a left intra prediction mode

Preferably, when the upper intra prediction mode is unavailable, the upper intra prediction mode is set to a DC mode.

【Description of Drawings】

FIG. 1 shows a block division structure according to an exemplary embodiment of the present invention.

FIG. 2 illustrates a method of determining a coding mode according to the present invention.

FIG. 3 illustrates an apparatus for encoding a moving picture according to the present invention.

FIGS. 4 to 6 are diagrams illustrating an adaptive block division method according to the present invention.

FIG. 7 is a diagram illustrating a method of encoding a residual signal.

CLAIMS

1. An image encoding method, comprising:

determining, by a coding mode determiner, a size and a prediction mode of a predictive coding block for image or video data;

transforming and quantizing, by a transform/quantization unit, a residual block of a prediction block generated by intra prediction to generate a quantized block;

inversely quantizing and inversely transforming, by an inverse quantization/transform unit, the quantized block;

applying, by a de-blocking filtering unit, a de-blocking filter to image data received from the inverse quantization/transform unit; and

determining, by an intra prediction unit, an intra prediction mode;

generating, by the intra prediction unit, the prediction block according to the intra prediction mode; and

entropy-coding, by an entropy coder, quantized coefficients of the quantized block,

wherein, when a size of the quantized block is equal to 8x8, the coefficients of the quantized block are divided into a plurality of subsets, and the plurality of subsets are scanned using a scan pattern determined according to the intra prediction mode,

wherein a scan pattern for scanning non-zero coefficients of each subset is same with the scan pattern for the plurality of subsets,

wherein a scan pattern for scanning flags indicating non-zero coefficients of each subset is same with the scan pattern for scanning non-zero coefficients of each subset,

wherein the plurality of subsets are composed of a main subset and a plurality of remaining subsets and the main subset includes a DC coefficient.

2. The method of claim 1, wherein the quantized coefficients of each subset are scanned in a reverse direction according to a scan pattern determined by the intra prediction mode.

3. The method of claim 1, wherein the plurality of subsets are scanned in a reverse direction.

4. The method of claim 1, wherein, when the intra prediction mode is a vertical mode, the scan pattern is a horizontal scan.

5. The method of claim 1, wherein, when the intra prediction mode is a horizontal mode, the scan pattern is a vertical scan.

6. The method of claim 1, further comprising generating, by the intra prediction unit, reference pixels when unavailable reference pixels exist.

7. The method of claim 1, wherein the intra prediction mode is encoded using an upper intra prediction mode and a left intra prediction mode

8. The method of claim 7, wherein, when the upper intra prediction mode is unavailable, the upper intra prediction mode is set to a DC mode.