Description

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a transformation coding device which applies a highly efficient coding to a digital image signal.

Description of the Prior Art

Fig. 1 is a block connection diagram showing a conventional transformation coding device described in, for example, the paper entitled "A proposal of a coding control method in a MC-DCT coding system" by Kato et al., at the National Conference on Information and System Dept. (1-204) of the Institute of Electronics, Information and Communication Engineers, 1987. A similar device is known from US-A-4 821 119. In Fig. 1, reference numeral 11 is a subtractor which performs subtraction between an input signal 101 as a digital image input signal series and a prediction signal 102 between movement compensating frames, 1 is an orthogonal transformation unit which performs orthogonal transformation for a difference signal 103 between frames, 2b is a quantization unit which applies a threshold processing to a transformation coefficient 104 obtained by the orthogonal transformation in accordance with an amount of data storage in a buffer and then outputs a quantization index 106, 3b is a quantization decoding unit which applies a quantization decoding to the quantization index 106 and outputs a quantization transformation coefficient 107, 4 is an inverse orthogonal transformation unit which applies inverse orthogonal transformation to the quantization transformation coefficient 107 and produces a difference signal 108 between decoding frames, 12 is an adder, 5 is a frame memory which produces the prediction signal 102 between movement compensating frames, 6 is a movement compensating unit, 7 is a variable length coding unit, 111 is coded data, 8 is a buffer for transmission, and 113 is transmitted data.

Next, the operation will be described. The difference between the input signal 101 and the prediction signal 102 between movement compensating frames is obtained using the subtractor 11 to produce the difference signal 103 between frames from which redundant components are removed. In the orthogonal transformation unit 1, the difference signal 103 between frames is transformed into a spatial frequency region using orthogonal transformation to produce the transformation coefficient 104. In the quantization unit 2b, the transformation coefficient 104 is subjected to the following threshold processing based on an amount of buffer data storage described later.

An amount of buffer storage: Large
⇒ Threshold value Th: Large
An amount of buffer storage: Small
⇒ Threshold value Th: Small
Ci ≦ Th ⇒ Ci: Insignificant coefficient
Ci > Th ⇒ Ci: Significant coefficient
where Ci: transformation coefficient

The transformation coefficient 104 which is a significant coefficient as the result of the threshold processing is quantized in the quantization unit 2b and output as a corresponding quantization index 106. On the other hand, the transformation coefficient 104 which is an insignificant coefficient is output as the quantization index 106 corresponding to zero. The quantization index 106 is subjected to a variable length coding together with a movement vector 105 described later and output as a coded data 111 from the variable length coding unit 7. On the other hand, the quantization index 106 is simultaneously transformed into the quantization transformation coefficient 107 as the result of quantization decoding in the quantization decoding unit 3b. In the inverse orthogonal transformation unit 4, the quantization transformation coefficient 107 is transformed into the difference signal 108 between decoding frames. Subsequently, in the adder 12, the difference signal 108 between decoding frames and the above-mentioned prediction signal 102 between movement compensating frames are added to produce a decoded signal 109. The decoded signal 109 is temporarily stored in the frame memory 5 to produce the prediction signal 102 between movement compensating frames as the result of the movement compensation. Also, in the movement compensating unit 6, after the input signal 101 is divided into a plurality of blocks, displacement between the most similar portions, defined by the sum of the absolute value of the difference between two blocks or the sum of squares of the difference etc. is calculated using a preceding frame demodulated signal 110 located at the spatially same position or in the vicinity for each block, portions which provide the minimum displacement are detected from image signal 110 of the preceding frame, and the minimum amount of spatial displacement is output as the movement vector 105. The above-mentioned coded data 111 is temporarily stored in the buffer 8 for transmission, output as transmitted data 113 with a fixed bit rate, and at the same time, an amount of buffer data storage is outputted as a feedback signal 112 in order to prevent buffer overflow. Since the conventional transformation coding device is constituted as described above and a selection of quantization characteristics is performed by using only an amount of buffer data storage for transmission, there is a defect that it is difficult to carry out adaptive quantization in accordance with statistical properties of an input signal such as power and frequency characteristics, and it is impossible to compress a signal efficiently.

SUMMARY OF THE INVENTION

This invention is devised in order to solve such problems, and it is an object of this invention to obtain a transformation coding device capable of quantizing a signal efficiently in accordance with statistical properties of the input signal.

In order to achieve the above-mentioned objectives, a transformation coding device related to this invention prepares a plurality of quantization characteristics, and selects one quantization characteristic adaptively in accordance with a predicted distortion for an input signal and a sequence of transformation coefficients.

In other words, the conversion coding device in this invention selects one quantization characteristic from among a plurality of quantization characteristics prepared in accordance with a predicted distortion for an input signal and a sequence of transformation coefficients and functions so as to quantize the transformation coefficient.

The above-mentioned and other objects and features of this invention will become clearer from the following detailed description in conjunction with the accompanying diagrams. The drawings are provided for purposes of explanation only and do not limit the scope of this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block connection diagram showing a conventional transformation coding device;
Fig. 2 is a block diagram showing the constitution of a transformation coding device according to an embodiment of this invention; and
Fig. 3 is an explanatory diagram showing the relationship among the transformation coefficient sequence, the magnitude of a movement compensating predicted distortion, and the quantization characteristic employed in the case where three kinds of quantization characteristics having different quantization step sizes in this invention are prepared.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereinafter, an embodiment according to this invention will be described with reference to the drawings. In Fig. 2, reference numerals 2a and 3a are an adaptive quantization unit and an adaptive quantization decoding unit respectively both of which select an appropriate one from among a plurality of quantization characteristics and use it in accordance with spatial frequencies corresponding to a movement compensating predicted distortion signal 114 at the time of a input signal 101 and a sequence of transformation coefficients 104, respectively. Incidentally, the same blocks and signals as those shown in Fig. 1 are identified by the same numerals, and the duplicated-description is omitted.

Next, the operation will be described. In general, it is difficult to visually recognize distortion which occur on portions changed with time rapidly as a movement region, and which have a high spatial frequency. Further, a portion of large movement compensating predicted distortion is frequently the movement region and the dynamic-range for signals is broad. In an allocation of coding words of the quantization index a short coding word is allocated to the quantization index corresponding to a quantization central value in the vicinity of zero.

Accordingly, in the case where a movement compensating predicted distortion is large and a sequence of transformation coefficients is high, the quantization is performed in a large step-size of quantization so that a highly efficient coding is obtained by holding the subjective image quality deterioration small. Also, in a portion of small predicted distortion, even if the quantization output is rendered zero, there are not many problems for visual sensation and highly efficient coding is obtained, therefore a large quantization step size is selected.

Fig. 3 shows a relationship among the sequence of transformation coefficients the magnitude of a movement compensating predicted distortion, and the quantization characteristic employed in the case where three kinds of quantization characteristics are developed.

Further, a classification for the sequence of transformation coefficients and the predicted distortion is performed by threshold processing through setting the threshold value. A transformation coefficient 104 and a movement compensating predicted distortion signal 114 at the time of movement compensation both obtained by a processing similar to the conventional processing are input into the adaptive quantization unit 2a. In the adaptive quantization unit 2a, as shown in Fig. 3, an appropriate quantization characteristic is selected in accordance with a sequence of the transformation coefficient 104 and the magnitude of the movement compensating predicted distortion signal 114 and the unit 2a applies quantization to the transformation coefficient 104 which was significant as the result of threshold processing based on an amount of buffer data storage. On the other hand, in the adaptive quantization decoding unit 3a, like the adaptive quantization unit 2a, an appropriate quantization characteristic is selected in accordance with a sequence of the transformation coefficient 104 and the magnitude of the movement compensating predicted distortion signal 114, thereby performing quantization decoding. In order to make the quantization characteristic on the coding side coincide with that on the decoding side, the movement compensating predicted distortion signal 114 is sub-

jected to variable length coding in the variable length coding unit 7, and then sent to the decoding side. The other portions are subjected to the same processing as the conventional one.

Incidentally, in the above-mentioned embodiment, there is shown the case where a quantization characteristic is changed over in accordance with a spatial frequency component corresponding to a sequence of the transformation coefficient 104 and the magnitude of a movement compensating predicted distortion signal 114. But in the case where the movement compensating predicted distortion signal 114 is smaller than an arbitrarily determined threshold value, if control is effected so as to block all sequences of the transformation coefficient, there is an effect that noises in the time direction are reduced.

As described above, according to this invention, since a plurality of quantization characteristics are prepared, and these quantization characteristics are used properly in accordance with the sequence of the transformation coefficient and the magnitude of the distortion at the time of movement compensating prediction, there can be obtained such a transformation coding device that the quantization in accordance with statistical properties of an input signal is implemented, and at the same time, a signal can be compressed efficiently.

Claims

1. A transformation coding device comprising:
a movement compensating unit (6) which divides a digital image input signal series (101) into a plurality of blocks, and thereafter compares respective blocks with corresponding preceding frame image signals (110) located at the same spatial positions or in the vicinity of said positions, detects the most similar portions of said blocks from among said preceding frame image signals (110), and outputs a spatial amount of displacement between said blocks and the similar portions of said preceding frame image signals as a movement vector (105);
a subtractor (11) which subtracts a frame prediction signal (102) produced in accordance with said movement vector from said digital image input signal and generates a difference signal (103) corresponding to the result of said subtraction;
an orthogonal transformation unit (1) which applies orthogonal transformation to said difference signal (103) and outputs a transformation coefficient (104);
an adaptive quantization unit (2a) which selects one quantization characteristic from among a plurality of predetermined quantization characteristics in accordance with both the magnitude of the movement compensating predicted distortion signal (114) for said block digital image signal series and a sequence of said transformation coefficient (104) and applies quantization to said transformation coefficient (104) according to the selected quantization characteristic to produce a quantization index (106);
an adaptive quantization decoding unit (3a) which selects one quantization characteristic from among a plurality of predetermined quantization characteristics corresponding to both the magnitude of the movement compensating predicted distortion signal and the sequence of said transformation coefficient (104), and applies quantization decoding to the quantization index (106) to produce a quantization transformation coefficient (107);
an inverse orthogonal transformation unit which applies inverse orthogonal transformation to the quantization transformation coefficient (107) to produce a difference signal (108) between decoded frames;
an adder (12) which adds said decoded difference signal (108) and said frame prediction signal to produce a decoded image signal (109);
a frame memory (5) which stores said decoded image signal (109) temporarily to output said frame prediction signal (102) in accordance with said movement vector;
a variable length coding unit (7) which applies variable length coding to said quantization index (106) and said movement vector (105) and said movement compensating predicted distortion signal (114) and outputs the result as coded data (111); and
a transmitting buffer (8) which stores said cod ed data temporarily, outputs them with a fixed bit rate, and at the same time, outputs an amount of buffer data storage as a feedback signal (112) to said adaptive quantization unit (26) in order to prevent buffer overflow.

2. The transformation coding device according to claim 1, wherein, in said adaptive quantization unit (2a), there is further produced a threshold value based on said feedback signal (112) which is output correspondingly to the magnitude of an amount of buffer storage from said buffer for transmission (8), threshold processing is applied to a transformation coefficient (104) from said orthogonal transformation unit (1), and thereafter only a transformation coefficient above said threshold is quantized.

3. The transformation coding device according to claim 1 or claim 2, wherein the movement compensating predicted distortion signal (114) which is output from said movement compensating unit

jected to variable length coding in the variable length coding unit 7, and then sent to the decoding side. The other portions are subjected to the same processing as the conventional one.

Incidentally, in the above-mentioned embodiment, there is shown the case where a quantization characteristic is changed over in accordance with a spatial frequency component corresponding to a sequence of the transformation coefficient 104 and the magnitude of a movement compensating predicted distortion signal 114. But in the case where the movement compensating predicted distortion signal 114 is smaller than an arbitrarily determined threshold value, if control is effected so as to block all sequences of the transformation coefficient, there is an effect that noises in the time direction are reduced.

As described above, according to this invention, since a plurality of quantization characteristics are prepared, and these quantization characteristics are used properly in accordance with the sequence of the transformation coefficient and the magnitude of the distortion at the time of movement compensating prediction, there can be obtained such a transformation coding device that the quantization in accordance with statistical properties of an input signal is implemented, and at the same time, a signal can be compressed efficiently.

Claims

1. A transformation coding device comprising:
a movement compensating unit (6) which divides a digital image input signal series (101) into a plurality of blocks, and thereafter compares respective blocks with corresponding preceding frame image signals (110) located at the same spatial positions or in the vicinity of said positions, detects the most similar portions of said blocks from among said preceding frame image signals (110), and outputs a spatial amount of displacement between said blocks and the similar portions of said preceding frame image signals as a movement vector (105);
a subtractor (11) which subtracts a frame prediction signal (102) produced in accordance with said movement vector from said digital image input signal and generates a difference signal (103) corresponding to the result of said subtraction;
an orthogonal transformation unit (1) which applies orthogonal transformation to said difference signal (103) and outputs a transformation coefficient (104);
an adaptive quantization unit (2a) which selects one quantization characteristic from among a plurality of predetermined quantization characteristics in accordance with both the magnitude of the movement compensating predicted distortion signal (114) for said block digital image signal series and a sequence of said transformation coefficient (104) and applies quantization to said transformation coefficient (104) according to the selected quantization characteristic to produce a quantization index (106);
an adaptive quantization decoding unit (3a) which selects one quantization characteristic from among a plurality of predetermined quantization characteristics corresponding to both the magnitude of the movement compensating predicted distortion signal and the sequence of said transformation coefficient (104), and applies quantization decoding to the quantization index (106) to produce a quantization transformation coefficient (107);
an inverse orthogonal transformation unit which applies inverse orthogonal transformation to the quantization transformation coefficient (107) to produce a difference signal (108) between decoded frames;
an adder (12) which adds said decoded difference signal (108) and said frame prediction signal to produce a decoded image signal (109);
a frame memory (5) which stores said decoded image signal (109) temporarily to output said frame prediction signal (102) in accordance with said movement vector;
a variable length coding unit (7) which applies variable length coding to said quantization index (106) and said movement vector (105) and said movement compensating predicted distortion signal (114) and outputs the result as coded data (111); and
a transmitting buffer (8) which stores said cod ed data temporarily, outputs them with a fixed bit rate, and at the same time, outputs an amount of buffer data storage as a feedback signal (112) to said adaptive quantization unit (26) in order to prevent buffer overflow.

2. The transformation coding device according to claim 1, wherein, in said adaptive quantization unit (2a), there is further produced a threshold value based on said feedback signal (112) which is output correspondingly to the magnitude of an amount of buffer storage from said buffer for transmission (8), threshold processing is applied to a transformation coefficient (104) from said orthogonal transformation unit (1), and thereafter only a transformation coefficient above said threshold is quantized.

3. The transformation coding device according to claim 1 or claim 2, wherein the movement compensating predicted distortion signal (114) which is output from said movement compensating unit

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(6) is input into said variable length coding unit (7) and applied with variable length coding, and thereafter inputted into said adaptive quantization decoding unit (3a) to make the quantization characteristic on the coding side coincide with that on the decoding side.

4. The transformation coding device according to claim 3, wherein, in said adaptive quantization unit (2a), all of sequences of said transformation coefficients (104) are blocked in the case where the degree of similarity of said movement compensating predicted distortion signal (114) is smaller than an arbitrarily fixed threshold value.

Patentansprüche

1. Transformationskodiervorrichtung mit:
einer bewegungskompensierenden Einheit (6), welche eine digitale Bildeingangssignalfolge (101) in eine Vielzahl von Blöcken unterteilt, und anschließend entsprechende Blöcke mit hierzu korrespondierenden Bildsignalen (110) eines vorhergehenden Einzelbildes vergleicht, die an derselben räumlichen Position oder in der Nähe dieser Positionen angeordnet sind, die einander am meisten entsprechenden Teile dieser Blöcke aus den Bildsignalen (110) des vorhergehenden Einzelbildes erfaßt, und eine räumliche Versatzmenge zwischen diesen Blöcken und entsprechenden Teilen des vorhergehenden Einzelbildsignals als einen Bewegungsvektor (105) ausgibt;
einer Subtraktionseinheit (11), welche ein Einzelbildprediktionssignal (102), das in Übereinstimmung mit dem Bewegungsvektor erzeugt wurde, von dem digitalen Bildeingangssignal subtrahiert und ein Differenzsignal (103) erzeugt, das dem Ergebnis dieser Subtraktion entspricht;
einer orthogonalen Transformationseinheit (1), die eine orthogonale Transformation auf das Differenzsignal (103) anwendet und einen Transformationskoeffizienten (104) ausgibt;
einer adaptiven Quantisierungseinheit (2a), welche eine Quantisierungschrakteristik aus einer Vielzahl von vorbestimmten Quantisierungscharakteristiken in Übereinstimmung mit der Größe des vorhergesagten Bewegungskompensationsverzerrungssignals (114) für die digitale Bildsignalblockfolge, und einer Sequenz des Transformationskoeffizienten (104) auswählt und eine Quantisierung auf den Transformationskoeffizienten (104) gemäß der ausgewählten Quantisierungscharakteristik anwendet, um einen Quantisierungsindex (106) zu erzeugen;
einer adaptiven Quantisierungsdekodierungseinheit (3a), welche eine Quantisierungscharakteristik aus einer Vielzahl von vorbestimmten Quantisierungscharakteristiken auswählt, welche sowohl der Größe des vorhergesagten Bewegungskompensationsverzerrungssignals als auch der Sequenz des Transformationskoeffizienten (104) entspricht, und eine Quantisierungsdekodierung auf den Quantisierungsindex (106) anwendet, um einen Quantisierungstransformationskoeffizienten (107) zu erzeugen;
einer inversen orthogonalen Transformationseinheit, welche eine inverse orthogonale Transformation auf den Quantisierungstransformationskoeffizienten (107) anwendet, um ein Differenzsignal (108) zwischen dekodierten Einzelbildern zu erzeugen;
einer Addiereinheit (12), welche das dekodierte Differenzsignal (108) und das Einzelbildprediktionssignal addiert, um ein dekodiertes Bildsignal (109) zu erzeugen;
einem Bildspeicher (5), der das dekodierte Bildsignal (109) vorübergehend speichert, um das Einzelbildprädiktionssignal (102) in Übereinstimmung mit dem Bewegungsvektor auszugeben;
einer variablen Längenkodiereinheit (7), welche eine variable LängenKodierung auf den Quantisierungsindex (106) und den Bewegungsvektor (105) und das vorhergesagte Bewegungskompensationsverzerrungssignal (114) anwendet und das Ergebnis als kodierte Daten (111) ausgibt; und
einem Übertragungspufferspeicher (8), welcher die kodierten Daten vorübergehend speichert, sie mit einer festen Bitrate ausgibt, und zugleich eine Pufferspeicherbelegung als ein Feedback-Signal (112) zu der adaptiven Quantisierungseinheit (26) ausgibt, um ein Pufferspeicherüberlaufen zu verhindern.

2. Transformationskodiervorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß in der adaptiven Quantisierungseinheit (2a) weiterhin basierend auf dem Feedback-Signal (112) ein Schwellwert erzeugt wird, welcher entsprechend der Pufferspeicherbelegung von dem Pufferspeicher zur Übertragung (8) ausgegeben wird, eine Schwellwertverarbeitung auf einen Transformationskoeffizienten (104) von der orthogonalen Transformationseinheit (1) angewendet wird, und anschließend nur ein Transformationskoeffizient über dem Schwellwert quantisiert wird.

3. Transformationskodiervorrichtung nach einem der Ansprüche 1 oder 2,
dadurch gekennzeichnet, daß das vorhergesagte Bewegungskompensationsverzerrungssignal (114), welches von der Bewegungskompensationsein-

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heit (6) ausgegeben wird, in die variable-Längen-Kodiereinheit (7) eingegeben wird, einer variablen-Längen-Kodierung unterzogen wird und anschließend in die adaptive Quantisierungsdekodiereinheit (3a) eingegeben wird, um die Quantisierungscharakteristik auf der Kodierungsseite koinzident mit der auf der Dekodierungsseite zu machen.

4. Transformationskodiervorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß in der adaptiven Quantisierungseinheit (2a) alle Sequenzen der Transformationskoeffizienten (104) für den Fall in Blöcken zusammengefaßt werden, daß der Grad der Übereinstimmung des vorhergesagten Bewegungskompensationsverzerrungssignals (114) kleiner ist, als ein beliebig aber fest vorgewählter Schwellwert.

Revendications

1. Dispositif de codage de transformation, comprenant :

une unité de compensation de mouvement (6) qui divise une série de signaux d'entrée d'images numériques (101) en une pluralité de blocs et qui, ensuite, compare des blocs respectifs à des signaux d'images correspondants de l'image précédente (110), situés dans les mêmes positions spatiales ou à proximité desdites positions, qui détecte les parties les plus identiques desdits blocs parmi lesdits signaux d'image de l'image précédente (110) et qui produit une quantité spatiale de déplacement entre lesdits blocs et les parties similaires desdits signaux d'image de l'image précédente, sous la forme d'un vecteur de mouvement (105) ;

un soustracteur (11) qui soustrait un signal de prédiction d'image (102) produit en fonction dudit vecteur de mouvement à partir dudit signal d'entrée d'image numérique et qui produit un signal différence (103) correspondant au résultat de ladite soustraction ;

une unité de transformation orthogonale (1) qui applique une transformation orthogonale audit signal différence (103) et qui produit un coefficient de transformation (104) ;

une unité de quantification adaptative (2a), qui sélectionne une caractéristique de quantification, parmi une pluralité de caractéristiques de quantification prédéterminées, en fonction à la fois de l'amplitude du signal de distorsion prédite de compensation de mouvement (114) pour ladite série de signaux d'images numériques d'un bloc et d'une suite dudit coefficient de transformation (104) et qui applique une quantification audit coefficient de transformation (104) en fonction de la caractéristique de quantification sélectionnée, pour produire un indice de quantification (106) ;

une unité de décodage de quantification adaptative (3a), qui sélectionne une caractéristique de quantification parmi une pluralité de caractéristiques de quantification prédéterminées, correspondant à la fois à l'amplitude du signal de distorsion prédite de compensation de mouvement et à la suite dudit coefficient de transformation (104), et qui applique un décodage de quantification à l'indice de quantification (106) pour produire un coefficient de transformation de quantification (107) ;

une unité transformation orthogonale inverse, qui applique une transformation orthogonale inverse au coefficient de transformation de quantification (107) pour produire un signal différence (108) entre images décodées ;

un additionneur (12) qui additionne ledit signal différence décodé (108) et ledit signal de prédiction d'image pour produire un signal d'image décodé (109) ;

une mémoire d'image (5) qui conserve temporairement ledit signal d'image décodé (109) pour produire ledit signal de prédiction d'image (102) en fonction dudit vecteur de mouvement ;

une unité de codage de longueur variable (7) qui applique un codage de longueur variable audit indice de quantification (106) et audit vecteur de mouvement (105) et audit signal de distorsion prédite de compensation de mouvement (114) et qui produit le résultat sous la forme de données codées (111) ; et

une mémoire tampon de transmission (8) qui conserve temporairement lesdites données codées, les émet à un débit binaire fixe et, en même temps, produit une quantité de données en mémoire tampon sous la forme d'un signal (112) réinjecté à l'entrée de ladite unité de quantification adaptative (26) afin d'empêcher un dépassement de capacité de la mémoire tampon.

2. Dispositif de codage par transformation selon la revendication 1, dans lequel, dans ladite unité de quantification adaptative (2a), il est en outre produit une valeur de seuil, basée sur ledit signal réinjecté (112) qui est produit en fonction de la quantité de données en mémoire tampon, à partir de ladite mémoire tampon de transmission (8), le traitement de seuil est appliqué à un coefficient de transformation (104) venant de ladite unité de transformation orthogonale (1), et ensuite seul est quantifié un coefficient de transmission supérieur audit seuil.

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3. Dispositif de codage par transformation selon la revendication 1 ou la revendication 2, dans lequel le signal de distorsion prédite de compensation de mouvement (114), qui est produit par ladite unité de compensation de mouvement (6), est fourni à ladite unité de codage de longueur variable (7) et reçoit un codage de longueur variable, après quoi il est fourni à ladite unité de décodage de quantification adaptative (3a) pour faire coïncider la caractéristique de quantification du côté codage avec celle du côté décodage.

4. Dispositif de codage par transformation selon la revendication 3, dans lequel, dans ladite unité de quantification adaptative (2a), toutes les suites desdits coefficients de transformation (104) sont bloquées si le degré de similitude dudit signal de distorsion prédite de compensation de mouvement (114) est inférieur à une valeur de seuil arbitrairement fixée.

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