Description

The present invention relates to a picture coding apparatus which is intended for high efficiency coding of digital video signals.

Description of the Prior Art

The patent application JP-A-5761387 shows an apparatus to improve the quality of an encoded picture. This apparatus substracts the value of an output picture element of a first frame delay circuit from a digital television signal and calculates an estimated error signal between frames. A quantizing circuit quantizes this estimated error signal and stores it in a buffer memory. A quantizing characteristic setting circuit sets a quantizing characteristic signal according to the degree of buffer occupancy and according to a quantizing characteristic control signal which is the output of a second frame delay circuit and which has been generated one frame earlier by said quantizing characteristic setting circuit. Subsequently the characteristic of the quantizing circuit is determined. If the buffer content is large, the quantizing characteristic is made rough, and if it small, the characteristic is made fine.

FIG. 1 is a block diagram showing constitution of a picture coding apparatus in the prior art operating at a definite transmission rate, such as disclosed in Murakami, Asai et al. "Adaptive Type Vector Quantization System Interframe Coding" in Technical Report IE84-1 of the Institute of Electronic and Communication Engineers in Japan (April 3, 1984). In FIG. 1, the apparatus comprises a frame skip processor 1 for performing a frame skip processing to an input picture data 101 per each frame, a subtractor 11 for performing subtraction between a remained input picture data 102 after the frame skip processing and an interframe prediction signal 107, a quantizer 2 for blocking an interframe differential signal 103 of output from the subtractor 11 and then quantizing the block [hereinafter referred to as "quantization block (QB)"] using predefined quantization characteristics assigned by a quantization characteristics control signal 112 and outputting a quantization index 104, a quantization decoder 3 for decoding the quantization index 104 using the quantization characteristics control signal 112 and outputting a decoded differential signal 105, an adder 12, a frame memory 4 for generating the interframe prediction signal 107, a variable word length coder 5, a transmission buffer 6 for outputting a transmission picture data 113, and a conventional coding controller 7b for controlling the frame skip in the frame skip processor 1 according to a degree of buffer occupancy 108 of the transmission buffer 6 and control of the quantization characteristics in the quantizer 2.

Next, operation will be described. First, in the frame skip processor 1, a frame skip processing is performed to an input picture data 101 per each frame according to a frame skip control signal 111 assigning the number of frame skip. A remained input picture data 102 outputted from the frame skip processor 1 is subjected to subtraction of an interframe prediction signal 107 in the subtractor 11 at the rear stage. As a result, an interframe differential signal 103 reduced the temporal redundancy is generated. In the quantizer 2, the interframe differential signal 103 is divided into quantization blocks QB, and every n x QB (n: natural number) (every prescribed quantization blocks) or every frame, quantization of the quantization blocks QB is performed using predefined quantization characteristics assigned among a plurality of quantization characteristics using a quantization characteristics control signal 112. The conventional coding controller 7b outputs a frame skip control signal 111 and a quantization characteristics (quantization step size) control signal 112 according to a degree of buffer occupancy 108 of the transmission buffer 6. FIG. 2 is a block constitution diagram of the conventional coding controller 7b. Reference numeral 81 indicates a third quantization characteristic control table. Relation of the degree of buffer occupancy 108 and the quantization characteristics (quantization step size) G and the number of the frame skip M is shown as follows.

B : small ⇒ G and M : small (⇒ number of bits created by coding I : increase)

B : large ⇒ G and M : large (⇒ number of bits created by coding I : decrease)

The quantization index 104 and the quantization characteristics control signal 112 are coded and multiplexed in the variable word length coder 5 and transmitted to the transmission buffer 6 and temporarily stored, and then transmitted as a transmission picture data 113. In the quantization decoder 3, the quantization index 104 is decoded using the quantization characteristics control signal 112, and as a result of decoding the quantization index 104 a decoded differential signal 105 is outputted to the adder 12. The interframe prediction signal 107 is added to the decoded differential signal 105 by the adder 12, and a decoded video signal 106 is generated. In the frame memory 4, the decoded video signal 106 is subjected to the frame delay and outputted as the interframe prediction signal 107.

Since the picture coding apparatus in the prior art is constituted as above described, the interframe differential signal is divided into the quantization blocks QB, and the decoding control every n x QB or every frame is performed according to the degree of buffer occupancy. Consequently, problems exist in that when the control is performed every n x QB, the picture quality may become ununiform locally resulting in deterioration of the subjective quality, and that when the control is performed every frame, since the

coding control is delayed, a larger step size may be selected or the frame skip may occur frequently.

In other words, the coding control every frame is advantageous in that relatively uniform quality is obtained in the coded picture and the control is performed to the fluctuation for a long period of the number of bits created by coding the picture depending on the content of the scene, but is disadvantageous in that as the number of bits created by coding increases, the jerky picture frame is liable to occur accompanying with the increase and the significant fluctuation of the number of frame skip. On the other hand, in the coding control every blocks (n x QB) where one picture frame is blocked (for example, 4 pixels by 4 lines), advantages exist in that the number of frame skip is relatively constant and the control is performed to the fluctuation for a short period of the number of bits created by coding the picture in each portion of the scene, but disadvantages exist in that the coding distortion is concentrated to a specific portion on the picture frame and the unnatural picture quality is liable to occur.

SUMMARY OF THE INVENTION

In order to solve the above-mentioned problems in the prior art, an object of the present invention is to provide a picture coding apparatus wherein the local deterioration of the picture quality is prevented and the delay of the coding control is decreased.

In order to attain the foregoing object, it is foreseen a picture coding apparatus according to the invention as set out in claim 1.

Particular embodiments of the invention are set out in the dependent claims. The invention will be more fully apparent from the following detailed description when the same is read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating constitution of a picture coding apparatus in the prior art;

FIG. 2 is a block diagram illustrating constitution of a coding controller in the prior art;

FIG. 3 is a block diagram illustrating constitution of a picture coding apparatus as an embodiment of the invention;

FIG. 4 is a block diagram illustrating constitution of a coding controller as an embodiment of the invention; and

FIG. 5 is an explanation diagram illustrating relation of the quantization characteristics and the normalized number of bits created by coding.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of the invention will now be described in detail referring to the accompanying drawings. In FIG. 3 where similar parts to those in FIG. 1 are designated by the same reference numerals, a coding controller 7a determines the number of frame skip and the quantization characteristic according to a degree of buffer occupancy 108, a video rate 109 and a frame rate 110. FIG. 4 is a block diagram showing constitution of the coding controller 7a in the picture coding apparatus according to an embodiment of the invention. In FIG. 4, a frame skip controller 71 for determining the number of frame skip outputs a frame skip control signal 111. The coding controller 7a comprises a first number of bits calculation section 72 for calculating the number of bits created by coding 701 n x QB, a second number of bits calculation section 73 for calculating the number of bits created by coding 702 one frame and outputting it, a first delay circuit 74 for providing delay corresponding to n x QB, a second delay circuit 75 for providing delay corresponding to one frame, a first normalization section 76 for evaluating a normalized value for the number of bits 701 per n x QB which is independent of the video rate 109 and the frame rate 110, a second normalization section 77 for evaluating a normalized value for the number of bits 702 per one frame, a first quantization characteristics control table 78 for determining predefined quantization characteristics among a plurality of quantization characteristics using the first normalized value 705 estimated by the first normalization section 76, a second quantization characteristics control table 79 for determining predefined quantization characteristics among a plurality of quantization characteristics using the second normalized value 706 estimated by the second normalization section 77, and a selector 80 for selecting either the first quantization characteristics control signal 707 outputted from the first quantization characteristics control table 78 or the second quantization characteristics control signal 708 outputted from the second quantization characteristics control table 79 according to the first normalized value 705. Also the apparatus comprises interframe differential signal generating means 1, 11, transmission picture data output means 2, 5, 6, decoded video signal generating means 3, 12, first normalized value evaluating means 72, 74, 76, and second normalized value evaluating means 73, 75, 77.

In general, the quantization characteristics and the number of bits created by coding have relation as shown in FIG. 5. In the picture including the large motion and complicated patterns much, the characteristic curve moves to the right upward side. On the contrary, in the picture including the small motion and simple patterns, the characteristic curve moves to

the left downward side. In this embodiment, several characteristic curves are previously set by a preparatory experiment, and among these curves, the characteristics corresponded to the coding results of the preceding frame (or n x QB) are selected, and this shall be made the characteristic curve in the existing frame (or n x QB).

For arbitrarily determined threshold value TH, if it follows that

$$N_1 > N_2 + TH$$

the coding control is changed from every frame to every blocks.

After m x n x QB (m: natural number), if it is satisfied that

$$N_1 \leqq N_2 + TH$$

the coding control is changed into every frame.

In this embodiment, for arbitrarily determined threshold value TH', if it follows that

$$N_1 < N_2 + TH'$$

the control of every frame may be changed into the control of every blocks, thereby similar effect can be obtained.

Next, operation will be described. First, in FIG. 4, in the first number of bits calculation section 72, the number of bits I_1 701 per n x QB is calculated using a degree of buffer occupancy 703 before n x QB outputted from the first delay circuit 74 providing delay by n x QB with respect to the existing degree of buffer occupancy 108. On the contrary, in the second number of bits calculation section 73, the number of bits I_2 702 per frame is calculated using a degree of buffer occupancy 704 before one frame outputted from the second delay circuit 75 providing delay by one frame with respect to the existing degree of buffer occupancy 108. In the first normalization section 76, a normalized value being independent of a video rate R_v 109 and a frame rate R_f 110 is calculated for the number of bits I_1 701 per n x QB and is outputted as a first normalized value N_1 705. If the number of the quantization blocks per one frame is made ℓ, relation of the first normalized value N_1 705 to the number of bits I_1 701 per n x QB, the video rate R_v 109 and the frame rate R_f 110 is expressed by following formula.

$$N_1 = (\ell \times I_1 \times R_f)/(n \times R_v)$$

Also in the second normalization section 77, a normalized value is calculated for the number of bits I_2 702 per one frame, and is outputted as a second normalized value N_2 706.

$$N_2 = (I_2 \times R_f)/R_v$$

In the first quantization characteristic control table 78 and the second quantization characteristic control table 79, predefined quantization characteristics are determined among a plurality of quantization characteristics using the first normalized value N_1 705 and the second normalized value N_2 706 respectively. The determining procedure of the quantization characteristics as shown in FIG. 5, is in that ① a suitable characteristic curve is selected among a plurality of characteristic curves indicating the relation of the quantization characteristics and the normalized value according to the previous relation of the quantization characteristics and the normalized value, and ② the quantization characteristics corresponding to the aimed normalized value N_t (= 1) is determined using the selected characteristic curve. In the selector 80, either first quantization characteristics control signal CS_1 707 or second quantization characteristics control signal CS_2 708 which were determined in the first quantization characteristics control table 78 and the second quantization characteristics control table 79 respectively is selected using the first normalized value N_1 705, and is outputted as a quantization control signal 112.

N_1 : large ⇒ select CS_1

N_1 : small ⇒ select CS_2

Other parts are processed in similar manner to the prior art.

In this embodiment, although the control every n x QB and the control every frame are changed according to the normalized value of number of bits created by coding, in the selection of the control units of n x QB/frame, the variance of number of bits created by coding may be used as the criterion together with the number of bits created by coding, thereby the more suitable coding control becomes possible.

According to the invention as above described, as units of the coding control, the first quantization characteristics control signal performing the control every n x QB is generated by the first normalized value evaluating means and the first quantization characteristics control table, and the second quantization characteristics control signal performing the control every frame is generated by the second normalized value evaluating means and the second quantization characteristics control table, and either quantization characteristics control signal is selected to change the control unit by the selector according to number of bits created by coding; thereby the local deterioration of the picture quality is prevented, the delay of the coding control is decreased and the high efficiency coding of the digital video signal can be intended.

Claims

1. A picture coding apparatus comprising differential signal generating means (1,11) for outputting a differential signal (103) using a digitized input picture data (101) and a prediction signal (107), transmission picture data output means (2,5,6) for quantizing and coding the differential signal (103) using a quantization characteristics control signal (112) and for storing it in a transmission buffer (6) and outputting a transmission picture data (113), decoded picture signal generating means (3,12 for decoding a quantization index

the left downward side. In this embodiment, several characteristic curves are previously set by a preparatory experiment, and among these curves, the characteristics corresponded to the coding results of the preceding frame (or n x QB) are selected, and this shall be made the characteristic curve in the existing frame (or n x QB).

For arbitrarily determined threshold value TH, if it follows that

$$N_1 > N_2 + TH$$

the coding control is changed from every frame to every blocks.

After m x n x QB (m: natural number), if it is satisfied that

$$N_1 \leqq N_2 + TH$$

the coding control is changed into every frame.

In this embodiment, for arbitrarily determined threshold value TH', if it follows that

$$N_1 < N_2 + TH'$$

the control of every frame may be changed into the control of every blocks, thereby similar effect can be obtained.

Next, operation will be described. First, in FIG. 4, in the first number of bits calculation section 72, the number of bits I_1 701 per n x QB is calculated using a degree of buffer occupancy 703 before n x QB outputted from the first delay circuit 74 providing delay by n x QB with respect to the existing degree of buffer occupancy 108. On the contrary, in the second number of bits calculation section 73, the number of bits I_2 702 per frame is calculated using a degree of buffer occupancy 704 before one frame outputted from the second delay circuit 75 providing delay by one frame with respect to the existing degree of buffer occupancy 108. In the first normalization section 76, a normalized value being independent of a video rate R_v 109 and a frame rate R_f 110 is calculated for the number of bits I_1 701 per n x QB and is outputted as a first normalized value N_1 705. If the number of the quantization blocks per one frame is made ℓ, relation of the first normalized value N_1 705 to the number of bits I_1 701 per n x QB, the video rate R_v 109 and the frame rate R_f 110 is expressed by following formula.

$$N_1 = (\ell \times I_1 \times R_f)/(n \times R_v)$$

Also in the second normalization section 77, a normalized value is calculated for the number of bits I_2 702 per one frame, and is outputted as a second normalized value N_2 706.

$$N_2 = (I_2 \times R_f)/R_v$$

In the first quantization characteristic control table 78 and the second quantization characteristic control table 79, predefined quantization characteristics are determined among a plurality of quantization characteristics using the first normalized value N_1 705 and the second normalized value N_2 706 respectively. The determining procedure of the quantization characteristics as shown in FIG. 5, is in that ① a suitable characteristic curve is selected among a plurality of characteristic curves indicating the relation of the quantization characteristics and the normalized value according to the previous relation of the quantization characteristics and the normalized value, and ② the quantization characteristics corresponding to the aimed normalized value N_t (= 1) is determined using the selected characteristic curve. In the selector 80, either first quantization characteristics control signal CS_1 707 or second quantization characteristics control signal CS_2 708 which were determined in the first quantization characteristics control table 78 and the second quantization characteristics control table 79 respectively is selected using the first normalized value N_1 705, and is outputted as a quantization control signal 112.

N_1 : large ⇒ select CS_1

N_1 : small ⇒ select CS_2

Other parts are processed in similar manner to the prior art.

In this embodiment, although the control every n x QB and the control every frame are changed according to the normalized value of number of bits created by coding, in the selection of the control units of n x QB/frame, the variance of number of bits created by coding may be used as the criterion together with the number of bits created by coding, thereby the more suitable coding control becomes possible.

According to the invention as above described, as units of the coding control, the first quantization characteristics control signal performing the control every n x QB is generated by the first normalized value evaluating means and the first quantization characteristics control table, and the second quantization characteristics control signal performing the control every frame is generated by the second normalized value evaluating means and the second quantization characteristics control table, and either quantization characteristics control signal is selected to change the control unit by the selector according to number of bits created by coding; thereby the local deterioration of the picture quality is prevented, the delay of the coding control is decreased and the high efficiency coding of the digital video signal can be intended.

Claims

1. A picture coding apparatus comprising differential signal generating means (1,11) for outputting a differential signal (103) using a digitized input picture data (101) and a prediction signal (107), transmission picture data output means (2,5,6) for quantizing and coding the differential signal (103) using a quantization characteristics control signal (112) and for storing it in a transmission buffer (6) and outputting a transmission picture data (113), decoded picture signal generating means (3,12 for decoding a quantization index

(104) according to the quantization characteristics control signal (112) and providing a decoded differential signal (105) and for outputting a decoded picture signal (106) by adding said decoded differential signal (105) and the prediction signal (107), a memory (4) for storing the decoded picture signal (106) and for outputting the prediction signal (107) with time delay, and a coding controller (7) for receiving the degree of buffer occupancy (108) from said transmission picture data output means (2,5,6) and for outputting said quantization characteristics control signal (112),

characterized in that said coding controller (7) comprises:

first calculation means (72,74) for calculating and outputting the number of bits created by coding a first predefined portion of the digitized input picture data (101) using the variation of the degree of buffer occupancy;

second calculation means (73,75) for calculating and outputting the number of bits created by coding a second predefined portion of the digitized input picture data (101) using the variation of the degree of buffer occupancy; and

determination means (78,79,80 for determining quantization characteristics among a plurality of quantization characteristics using the outputs (701,702) from said first and second calculation means (72,74;73,75) and for outputting the quantization characteristics control signal (112).

2. A picture coding apparatus according to claim 1, characterized in that said coding controller (7) further comprises a frame skip control means (71) for outputting a frame skip control signal (111) according to the degree of buffer occupancy (108), first quantization characteristics control means (78) for selecting and outputting one among a plurality of quantization characteristics according to the output (701) of said first calculation means (72,74), and second quantization characteristics control means (79) for selecting and outputting one among a plurality of quantization characteristics according to the output (702) of said second calculation means (73,75),

said first calculation means (72,74) calculating the variation of the degree of buffer occupancy (108) for a predefined number n of quantization blocks (QB),

said second calculation means (73,75) calculating the variation of the degree of buffer occupancy (108) for one frame,

said determination means (78,79,80) selecting either said first or second quantization characteristics control means (78;79) and outputting the quantization characteristics control signal (112) according to the outputs (701,702) from said first or second calculation means (72,74; 73,75).

3. A picture coding apparatus according to claim 2, characterised in that said coding controller (7) further comprises first and second information amount normalization means (76; 77) for normalizing the outputs (701; 702) from said first and second calculation means (72,74; 73,75) into amounts N_1 and N_2 being independent of the video rate (109), the frame rate (110) and size of the first predefined portion of the digitized input picture data (101);

said determination means (78,79,80) determining predefined quantization characteristics among a plurality of quantization characteristics using the outputs N_1 (705) and N_2 (706) from said first and second information amount normalization means (76;77) respectively, and outputting the quantization characteristics control signal (112).

4. A picture coding apparatus according to claim 3, characterised in that said determination means (78,79,80) outputs the quantization characteristics control signal (112) for every set of n quantization blocks if $N_1 > N_2 + TH$ for arbitrarily determined threshold value TH, and if $N_1 \leqq N_2 + TH$ after coding m sets of n quantization blocks, then said determination means (78,79,80) outputs the quantization characteristics control signal (708) for every frame.

5. A picture coding apparatus according to claim 3, characterized in that said determination means (78,79,80) outputs the quantization characteristics control signal (112) for every frame if $N_1 < N_2 + TH'$ for arbitrarily determined threshold value TH', and if $N_1 \geqq N_2 + TH'$ after coding m sets of n quantization blocks, then said determining means (78,79,80) outputs the quantization characteristics control signal (707) for every set of n quantization blocks.

Patentansprüche

1. Bildkodierapparat mit einem Differenzsignalerzeugungsmittel (1, 11) zum Ausgeben eines Differenzsignals (103) unter Benutzung eines digitalisierten Bildeingangsdatensatzes (101) und eines Prediktionssignals (107), einem Übertragungsbilddatenausgabemittel (2, 5, 6) zur Quantisierung und Kodierung des Differenzsignals (103) unter Benutzung eines Quantisierungscharakteristiksteuersignals (112) und zu seiner Speicherung in einem Übertragungspufferspeicher (6) und der Ausgabe eines Übertragungsbilddatensatzes (113), einem dekodierten-Bildsignal-

Erzeugungsmittel (3, 12) zur Dekodierung eines Quantisierungsindizes (104) gemäß dem Quantisierungscharakteristiksteuersignal (112) und zur Bereitstellung eines dekodierten Differenzsignals (105) und zum Ausgeben eines dekodierten Bildsignals (106) durch Addieren des dekodierten Differenzsignals (105) und des Prediktionssignals (107), einem Speicher (7) zum Speichern des dekodierten Bildsignals (106) und zum Ausgeben des Prediktionssignals (107) mit Zeitverzögerung, und einer Kodiersteuereinrichtung (7) zum Empfangen des Grades der Pufferspeicherbelegung (108) von dem Übertragungsbilddatenausgabemittel (2, 5, 6) und zum Ausgeben des Quantisierungscharakteristiksteuersignals (112),
dadurch gekennzeichnet, daß die Kodiersteuereinrichtung (7) enthält: erste Berechnungsmittel (72, 74) zum Berechnen und Ausgeben der Anzahl der Bits, die durch Kodierung eines ersten vorbestimmten Teils der digitalisierten Eingangsbilddaten (101) unter Benutzung der Abweichung des Grades der Pufferspeicherbelegung erzeugt wurden; zweite Berechnungsmittel (73, 75) zum Berechnen und Ausgeben der Anzahl der Bits, die durch Kodierung eines zweiten Teils der digitalisierten Bildeingangsdaten (101) unter Benutzung der Abweichung des Grades der Pufferspeicherbelegung erzeugt wurde; und Bestimmungsmittel (78, 79, 80) zur Bestimmung von Quantisierungscharakteristiken unter einer Vielzahl von Quantisierungscharakteristiken unter Benutzung des Ausgangssignals (701, 702) des ersten und zweiten Berechnungsmittel (72, 74; 73, 75) und zum Ausgeben des Quantisierungscharakteristiksteuersignals (112).

2. Bildkodierapparat nach Anspruch 1,
dadurch gekennzeichnet, daß die zweite Kodiersteuereinrichtung (7) weiterhin enthält:
ein Einzelbildübergehungssteuermittel (71) zum Ausgeben eines Einzelbildübergehungssteuersignals (111) gemäß dem Grad der Pufferspeicherbelegung (108), erste Quantisierungscharakteristiksteuermittel (78) zur Auswahl und Ausgabe eines von einer Vielzahl von Quantisierungscharakteristiken gemäß dem Ausgangssignal (701) des ersten Berechnungsmittels (72, 74), und zweite Quantisierungscharakteristiksteuermittel (79) zum Auswählen und Ausgeben eines unter einer Vielzahl von Quantisierungscharakteristiken gemäß dem Ausgangssignal (702) des zweiten Berechnungsmittels (73, 75), wobei das erste Berechnungsmittel (72, 74) die Abweichung des Grades der Pufferspeicherbelegung (108) für eine vorbestimmte Anzahl n von Quantisierungsblöcken (QB) berechnet, das zweite Berechnungsmittel (73, 75) die Abweichung des Grades der Pufferspeicherbelegung (108) für ein Einzelbild berechnet, und das Bestimmungsmittel (78, 79, 80) entweder das erste oder das zweite Quantisierungscharakteristiksteuermittel (78; 79) auswählt und das Quantisierungscharakteristiksteuersignal (112) gemäß den Ausgangssignalen (701, 702) der ersten oder zweiten Berechnungsmittel (72, 74; 73, 75) ausgibt.

3. Bildkodierapparat nach Anspruch 2,
dadurch gekennzeichnet, daß die Kodiersteuereinrichtung (7) weiterhin erste und zweite Informationsmengennormalisierungsmittel (76; 77) zur Normalisierung der Ausgangssignale (701; 702) der ersten und zweiten Berechnungsmittel (72, 74; 73, 75) in Mengen N_1 und N_2 enthält, die unabhängig von der Videorate (109), der Einzelbildrate (110) und der Größe des ersten vorbestimmten Teils der digitalisierten Bildeingangsdaten (101) ist; wobei das Bestimmungsmittel (78, 79, 80) vorbestimmte Quantisierungscharakteristiken unter einer Vielzahl von Quantisierungscharakteristiken unter Benutzung der Ausgangssignale N_1 (705) und N_2 (706) der ersten oder zweiten Informationsmengennormalisierungsmittel (76; 77) bestimmt und das Quantisierungscharakteristiksteuersignal (112) ausgibt.

4. Bildkodierapparat nach Anspruch 3,
dadurch gekennzeichnet, daß das Bestimmungsmittel (78, 79, 80) das Quantisierungscharakteristiksteuersignal (112) für jede Menge von n Quantisierungsblöcken ausgibt, falls $N_1 > N_2 +$ TH für einen beliebig gewählten Schwellwert TH ist, und, falls $N_1 \leq N_2 +$ TH nach Kodierung von m Mengen von n Quantisierungsblöcken beträgt, das Quantisierungscharakteristiksteuersignal (708) für jedes Einzelbild ausgibt.

5. Bildkodierapparat nach Anspruch 3,
dadurch gekennzeichnet, daß das Bestimmungsmittel (78, 79,80) das Quantisierungscharakteristiksteuersignal (112) für jedes Einzelbild ausgibt, falls $N_1 < N_2 +$ TH' für einen beliebig gewählten Schwellwert TH' ist, und, falls $N_1 \geqq N_2 +$ TH' nach Kodierung von m Mengen von n Quantisierungsblöcken beträgt, das Quantisierungscharakteristiksteuersignal (707) für jede Menge von n Quantisierungsblöcken ausgibt.

Revendications

1. Dispositif de codage d'images comprenant des moyens de génération de signal différentiel (1, 11) pour délivrer un signal différentiel (103) utilisant des données d'image numérisée d'entrée (101) et un signal de prédiction (107), des

moyens de sortie de données d'image et de transmission (2, 5, 6) pour quantifier et coder le signal différentiel (103) en utilisant un signal de commande de caractéristique de quantification (112) et pour le mémoriser dans une mémoire-tampon de transmission (6) et délivrer des données d'image de transmission (113), des moyens de génération de signal d'image décodé (3, 12) pour décoder un index de quantification (104) conformément au signal de commande de caractéristique de quantification (112) et fournir un signal différentiel décodé (105) et pour délivrer un signal d'image décodé (106) par l'addition dudit signal différentiel décodé (105) et dudit signal de prédiction (107), une mémoire (4) pour mémoriser le signal d'image décodé (106) et pour délivrer le signal de prédiction (107) avec un retard, et un circuit de commande de codage (7) pour recevoir le degré de l'occupation (108) de la mémoire-tampon en provenance desdits moyens de sortie de données d'image et de transmission (2, 5, 6) et pour délivrer ledit signal de commande de caractéristique de quantification (112),

caractérisé en ce que ledit circuit de commande de codage (7) comprend:

des premiers moyens de calcul (72, 74) pour calculer et délivrer la quantité de bits engendrés par le codage d'une première portion prédéfinie des données d'image numérisée d'entrée (101) en utilisant la variation du degré d'occupation de mémoire-tampon;

des seconds moyens de calcul (73, 75) pour calculer et délivrer la quantité de bits engendrés par le codage d'une seconde portion prédéfinie des données d'image numérisée d'entrée (101) en utilisant la variation du degré d'occupation de mémoire-tampon; et

des moyens de détermination (78, 79, 80) pour déterminer une caractéristique de quantification parmi une pluralité de caractéristiques de quantification en utilisant les sorties (701, 702) provenant desdits premiers et seconds moyens de calcul (72, 74; 73, 75) et pour délivrer le signal de commande de caractéristique de quantification (112).

2. Dispositif de codage d'images selon la revendication 1, caractérisé en ce que ledit circuit de commande de codage (7) comprend également des moyens de commande de saut de trame (71) pour délivrer un signal de commande de saut de trame (111) conformément au degré d'occupation de mémoire-tampon (108), des premiers moyens de commande de caractéristique de quantification (78) pour sélectionner et délivrer une caractéristique parmi une pluralité de caractéristiques de quantification conformément à la sortie (701) desdits premiers moyens de calcul (72, 74), et des seconds moyens de commande de caractéristique de quantification (79) pour sélectionner et délivrer une caractéristique de quantification parmi une pluralité de caractéristiques de quantification conformément à la sortie (702) desdits seconds moyens de calcul (73, 75),

lesdits premiers moyens de calcul (72, 74) calculant la variation du degré d'occupation de mémoire-tampon (108) pour un nombre prédéfini n de blocs de quantification (QB),

lesdits seconds moyens de calcul (73, 75) calculant la variation du degré d'occupation de mémoire-tampon (108) pour une trame,

lesdits moyens de détermination (78, 79, 80) sélectionnant soit lesdits premiers soit lesdits seconds moyens de commande de caractéristique de quantification (78; 79) et délivrant le signal de commande de caractéristique de quantification (112) conformément aux sorties (701, 702) provenant desdits premiers ou seconds moyens de calcul (72, 74; 73, 75).

3. Dispositif de codage d'images selon la revendication 2, caractérisé en ce que ledit circuit de commande de codage (7) comprend également des premiers et seconds moyens de normalisation de quantité d'information (76; 77) pour normaliser les sorties (701; 702) provenant desdits premiers et seconds moyens de calcul (72, 74; 73, 75) en des quantités N_1 et N_2 qui sont indépendantes de la fréquence vidéo (109), la fréquence de trame (110) et la taille de la première portion prédéfinie des données d'image numérisée d'entrée (101);

lesdits moyens de détermination (78, 79, 80) déterminant une caractéristique de quantification prédéfinie parmi une pluralité de caractéristiques de quantification en utilisant les sorties N_1 (705) et N_2 (706) provenant desdits premiers et seconds moyens de normalisation de quantité d'information (76; 77), respectivement, et délivrant le signal de commande de caractéristique de quantification (112).

4. Dispositif de codage d'images selon la revendication 3, caractérisé en ce que lesdits moyens de détermination (78, 79, 80) délivrent le signal de commande de caractéristique de quantification (112) pour chaque ensemble de n blocs de quantification si $N_1 > N_2 + TH$, pour une valeur de seuil TH déterminée de manière arbitraire, et si $N_1 \leqq N_2 + TH$ après le codage de m ensembles de n blocs de quantification, alors lesdits moyens de détermination (78, 79, 80) délivrent le signal de commande de caractéristique de quantification (708) pour chaque trame.

5. Dispositif de codage d'images selon la revendi-

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cation 3, caractérisé en ce que lesdits moyens de détermination (78, 79, 80) délivrent le signal de commande de caractéristique de quantification (112) pour chaque trame si $N_1 < N_2 + TH'$, pour une valeur de seuil TH' déterminée de manière arbitraire, et si $N_1 \geqq N_2 + TH'$ après le codage de m ensembles de n blocs de quantification, alors lesdits moyens de détermination (78, 79, 80) délivrent le signal de commande de caractéristique de quantification (707) pour chaque ensemble de n blocs de quantification.