UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, Virginia 22313-1450
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ACKNOWLEDGEMENT OF LOSS OF ENTITLEMENT TO ENTITY STATUS DISCOUNT

APPLICATION #	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET #	REQUEST ID
11/976,758	10/26/2007	Kiyofumi Abe	22104.1a.1.2	125106

The entity status change request below filed through Patent Center on 11/09/2023 has been accepted.

Certifications

APPLICANT CHANGING TO REGULAR UNDISCOUNTED FEE STATUS

Signature

I certify, in accordance with 37 CFR 1.4(d)(4), that I am one of the signatories making the entity status change.

Signature	Name	Registration #
/Levi Brown/	Levi Brown	72533

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

ACKNOWLEDGEMENT OF CHANGE TO SMALL ENTITY STATUS

APPLICATION #	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET #	REQUEST ID
11/976,758	10/26/2007	Kiyofumi Abe	22104.1a.1.2	112063

The entity status change request below filed through Patent Center on 09/26/2023 has been accepted.

Certifications

APPLICANT ASSERTING SMALL ENTITY STATUS. See 37CFR 1.27.

Signature

I certify, in accordance with 37 CFR 1.4(d)(4), that I am one of the signatories making the entity status change.

Signature	Name	Registration #
/Levi Brown/	Levi Brown	72533

TERMINAL DISCLAIMER IN A PATENT OR PROCEEDING IN VIEW OF ANOTHER PATENT

Docket Number (Optional)

22104.1a.1.2

Application/Control Number: **11/976,758**

Filing Date: **2007-10-26**

First Named Inventor: **Kiyofumi Abe**

Title: **PICTURE CODING METHOD AND PICTURE DECODING METHOD**

Patent No.: **US 7,769,238**

The patentee, VIDEOLABS, INC. , owner of 100 percent interest in the instant patent hereby disclaims, except as provided below, the terminal part of the statutory term of the instant patent which would extend beyond the latest expiration date of the full statutory terms of the following referenced patents: Patent No. 7,095,896, filed December 8, 2003, and Patent No. 8,867,855, filed July 31, 2013 (the "**reference** patents"), each of which claim priority under 35 U.S.C. §119 to JP2002112665A, filed on April 15, 2002 and under 35 U.S.C. §120 to PCT/JP0303794, filed on March 27, 2003, as the term of said **reference** patents is presently shortened by any terminal disclaimer(s). The patentee hereby agrees that the instant patent shall be enforceable hereafter only for and during such period that the instant patent and the **reference** patents are commonly owned. This agreement runs with the instant patent and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the patentee does not disclaim the terminal part of the instant patent that would extend to the latest expiration date of the full statutory term of the **reference** patents, "as the term of said **reference** patents is presently shortened by any terminal disclaimer(s)," in the event that said **reference** patents later: expire for failure to pay a maintenance fee; are held unenforceable; are found invalid by a court of competent jurisdiction; are statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; have all claims canceled by a reexamination certificate; are reissued; or are in any manner terminated prior to the expiration of their full statutory term as shortened by any terminal disclaimer(s).

If any provision of this Terminal Disclaimer is found to be invalid or unenforceable, then the remainder of this Terminal Disclaimer will have full force and effect, and the invalid provision will be modified, or partially enforced, to the maximum extent permitted to effectuate its original objective.

I. Check either box 1, 2, or 3 below, as appropriate, if there is an assignment:

1. ☐ The current ownership was established by the filing of a statement under 37 CFR 3.73 during prosecution of the application that issued as the instant patent.

2. ☐ The instant patent was issued from an application filed on or after September 16, 2012, and the current patent owner was the applicant under 37 CFR 1.46.

3. ☒ A statement under 37 CFR 3.73 is attached herewith. Form PTO/SB/96 or PTO/AIA/96, as appropriate, may be used.

II. Authorization for Terminal Disclaimer - Check either box 1 or 2 below, if appropriate:

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

☐ 1. For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

☒ 2. The undersigned is an attorney or agent of record. Reg. No. 72,533

/Levi S. Brown/	7/10/2023
Signature	Date
Levi S. Brown	801-321-8823
Typed or printed name	Telephone number

☒ The terminal disclaimer fee under 37 CFR 1.20(d) is included.

☒ *Total of 1 forms are submitted.

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: VIDEOLABS, INC.

Application No./Patent No.: 7769238 Filed/Issue Date: August 3, 2010

Titled: PICTURE CODING METHOD AND PICTURE DECODING METHOD

VideoLabs, Inc., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Kiyofumi Abe et al. To: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 044099, Frame 0072, or for which a copy thereof is attached.

2. From: PANASONIC CORPORATION To: OPTIS WIRELESS TECHNOLOGY, LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 032326, Frame 0707, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: OPTIS WIRELESS TECHNOLOGY, LLC To: VIDEOLABS, INC.

The document was recorded in the United States Patent and Trademark Office at
Reel 054723, Frame 0177, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Levi S. Brown/	July 10, 2023
Signature	Date
Levi S. Brown	72533
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	11976758
Filing Date:	26-Oct-2007
Title of Invention:	PICTURE CODING METHOD AND PICTURE DECODING METHOD
First Named Inventor/Applicant Name:	Kiyofumi Abe
Filer:	Levi S. Brown/Tyler Eller
Attorney Docket Number:	

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Hisense Ex. 1002, p. 7
Hisense v. VideoLabs
IPR2025-01329

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
		Total in USD ($)		**170**

Electronic Acknowledgement Receipt

EFS ID:	48266424
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	PICTURE CODING METHOD AND PICTURE DECODING METHOD
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	22913
Filer:	Levi S. Brown/Tyler Eller
Filer Authorized By:	Levi S. Brown
Attorney Docket Number:	
Receipt Date:	10-JUL-2023
Filing Date:	26-OCT-2007
Time Stamp:	15:33:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$170
RAM confirmation Number	E202370F35146527
Deposit Account	233178
Authorized User	Tyler Eller

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.20 (Post Issuance fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer Filed	22104-1a-1-2_2023-07-10_2nd_Terminal_Disclaimer.pdf	116056 107e82c6bd7afd9d5ef018dca27b5912843fd8b0	no	1
Warnings:					
Information:					
2	Assignee showing of ownership per 37 CFR 3.73	22104-1a-1-2_2023-07-10_3-73c_Statement.pdf	118537 64b91eb74da73d04bc3d7716f6fa7a12582f056a	no	3
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	38130 002ef0a9350864775ac95a06dbaa978292ba0d20	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	272723		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
* 11/976,758 *	11/976,758	Abe et al.	
	Examiner	**Art Unit**	
	PATEL, KANJIBHAI B	2624	

Document Code - DISQ	**Internal Document - DO NOT MAIL**

TERMINAL DISCLAIMER	☑ APPROVED	☐ DISAPPROVED
Date Filed: 06 July 2023	**This patent is subject to a Terminal Disclaimer**	

Approved/Disapproved by:

/TRINA STEPTOE/

Technology Center: OPLC

Telephone: (571)272-2577

7,095,896

Hisense Ex. 1002, p. 11
Hisense v. VideoLabs
IPR2025-01329

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: VIDEOLABS, INC.

Application No./Patent No.: 7769238 Filed/Issue Date: August 3, 2010

Titled: PICTURE CODING METHOD AND PICTURE DECODING METHOD

VideoLabs, Inc., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

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4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Kiyofumi Abe et al. To: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

   The document was recorded in the United States Patent and Trademark Office at
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If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: OPTIS WIRELESS TECHNOLOGY, LLC To: VIDEOLABS, INC.

The document was recorded in the United States Patent and Trademark Office at
Reel 054723, Frame 0177, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Levi S. Brown/	July 6, 2023
Signature	Date
Levi S. Brown	72533
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

TERMINAL DISCLAIMER IN A PATENT OR PROCEEDING IN VIEW OF ANOTHER PATENT

Docket Number (Optional)

22104.1a.1.2

Application/Control Number: **11/976,758**

Filing Date: **2007-10-26**

First Named Inventor: **Kiyofumi Abe**

Title: **PICTURE CODING METHOD AND PICTURE DECODING METHOD**

Patent No.: **US 7,769,238**

The patentee, VIDEOLABS, INC. , owner of 100 percent interest in the instant patent hereby disclaims, except as provided below, the terminal part of the statutory term of the instant patent which would extend beyond the expiration date of the full statutory term of patent No. 7,095,896 (the "**reference** patent"), as the term of said **reference** patent is presently shortened by any terminal disclaimer. The patentee hereby agrees that the instant patent shall be enforceable hereafter only for and during such period that the instant patent and the **reference** patent are commonly owned. This agreement runs with the instant patent and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the patentee does not disclaim the terminal part of the instant patent that would extend to the expiration date of the full statutory term of the **reference** patent, "as the term of said **reference patent** is presently shortened by any terminal disclaimer," in the event that said **reference** patent later: expires for failure to pay a maintenance fee; is held unenforceable; is found invalid by a court of competent jurisdiction; is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; has all claims canceled by a reexamination certificate; is reissued; or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer.

I. Check either box 1, 2, or 3 below, as appropriate, if there is an assignment:

1. ☐ The current ownership was established by the filing of a statement under 37 CFR 3.73 during prosecution of the application that issued as the instant patent.

2. ☐ The instant patent was issued from an application filed on or after September 16, 2012, and the current patent owner was the applicant under 37 CFR 1.46.

3. ☒ A statement under 37 CFR 3.73 is attached herewith. Form PTO/SB/96 or PTO/AIA/96, as appropriate, may be used.

II. Authorization for Terminal Disclaimer - Check either box 1 or 2 below, if appropriate:

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

☐ 1. For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

☒ 2. The undersigned is an attorney or agent of record. Reg. No. 72,533

/Levi S. Brown/	7/6/2023
Signature	Date
Levi S. Brown	801-321-8823
Typed or printed name	Telephone number

☒ The terminal disclaimer fee under 37 CFR 1.20(d) is included.

☒ *Total of 1 forms are submitted.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
11/976,758	**07/06/2023 05:19:13 PM ET**	**-**

Title of Invention

PICTURE CODING METHOD AND PICTURE DECODING METHOD

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	7769238
CONFIRMATION #	3207	FILED BY	Tyler Eller
PATENT CENTER #	62397956	FILING DATE	10/26/2007
CUSTOMER #	22913	FIRST NAMED INVENTOR	Kiyofumi Abe
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Levi Brown

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
22104-1a-1-2 2023-07-06 Terminal Disclaimer.pdf	1	Terminal Disclaimer Filed	111 KB
22104-1a-1-2 2023-07-06 3.73c Statement.pdf	3	Assignee showing of ownership per 37 CFR 3.73	111 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
22104-1a-1-2 2023-07-06 Terminal Disclaimer.pdf	D24EE26D1633BCB81C349029649CAAF1C69C67E514CB41A8 E4EEAC725034879D6681574404077C1A1FA152A36E30C8DC7

E30F1B353A479CB70CF79CD2B8C67EE

22104-1a-1-2 2023-07-06 3.73c Statement.pdf	8FAEE1DF2929DD6831A4EF92466ECEC5E6F5241D25C7822E250B7889BD5718A6A791B62061C6FC1EB8395F25ADC99F0B2A6C61698B5114A4AF5A7B295E74822B

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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PATENT AND TRADEMARK OFFICE

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Alexandria, VA 22313 - 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
11/976,758	**07/06/2023 05:19:13 PM ET**	**-**

Title of Invention

PICTURE CODING METHOD AND PICTURE DECODING METHOD

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	7769238
CONFIRMATION #	3207	FILED BY	Tyler Eller
PATENT CENTER #	62397956	AUTHORIZED BY	Levi Brown
CUSTOMER #	22913	FILING DATE	10/26/2007
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Kiyofumi Abe

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 2008	E202376H25085207	Tyler Eller

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1814	STATUTORY DISCLAIMER, INCLUDING TERMINAL DISCLAIMER	170.00	1	170.00
			TOTAL AMOUNT:	**$170.00**

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/976,758	10/26/2007	Kiyofumi Abe	

CONFIRMATION NO. 3207

22913
Workman Nydegger
60 East South Temple
Suite 1000
Salt Lake City, UT 84111

POA ACCEPTANCE LETTER

OC000000058641752

Date Mailed: 06/27/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/20/2023.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sltorres/

Hisense Ex. 1002, p. 20
Hisense v. VideoLabs
IPR2025-01329

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/976,758	10/26/2007	Kiyofumi Abe	

CONFIRMATION NO. 3207

POWER OF ATTORNEY NOTICE

OC000000058641724

23117
NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

Date Mailed: 06/27/2023

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/20/2023.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sltorres/

Hisense Ex. 1002, p. 21
Hisense v. VideoLabs
IPR2025-01329

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: VIDEOLABS, INC.

Application No./Patent No.: 7769238 Filed/Issue Date: August 3, 2010

Titled: PICTURE CODING METHOD AND PICTURE DECODING METHOD

VideoLabs, Inc., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Kiyofumi Abe et al. To: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 044099, Frame 0072, or for which a copy thereof is attached.

2. From: PANASONIC CORPORATION To: OPTIS WIRELESS TECHNOLOGY, LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 032326, Frame 0707, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: OPTIS WIRELESS TECHNOLOGY, LLC To: VIDEOLABS, INC.

The document was recorded in the United States Patent and Trademark Office at
Reel 054723, Frame 0177, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Levi S. Brown/	June 20, 2023
Signature	Date
Levi S. Brown	72533
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
11/976,758	**06/20/2023 02:22:03 PM ET**	**-**

Title of Invention

PICTURE CODING METHOD AND PICTURE DECODING METHOD

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	7769238
CONFIRMATION #	3207	FILED BY	Tyler Eller
PATENT CENTER #	62301055	FILING DATE	10/26/2007
CUSTOMER #	23117	FIRST NAMED INVENTOR	Kiyofumi Abe
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Levi Brown

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
22104-1a-1-2 2023-06-20 Power of Attorney.pdf	2	Power of Attorney	715 KB
22104-1a-1-2 2023-06-20 3.73c Statement.pdf	3	Assignee showing of ownership per 37 CFR 3.73	111 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
22104-1a-1-2 2023-06-20 Power of Attorney.pdf	27B17E25214C9BA3B75A572CE08E336DC753D0416A66D60F8 72EC4C89B1EA6100F3E7EC210E114943C7C39095A0157C807

B0C0EBEC41DEC9E1433BC50F11FD41

22104-1a-1-2 2023-06-20 3.73c Statement.pdf	9D66C2F5034882867D86FB1D68C26310EC2D0A0F9DD2E69F44F4C4BD8E16AC9697447D421546D52F3168574718A382E2E2D5DF024240302FD39F7AEEE2F00354

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	11/976,758
Filing Date	October 26, 2007
First Named Inventor	Kiyofumi Abe
Title	PICTURE CODING METHOD AND PICTURE DECODING METHOD
Art Unit	2624
Examiner Name	
Attorney Docket Number	22104.1a.1.2

SIGNATURE of Applicant or Patent Practitioner

Signature	/Levi S. Brown/	Date (Optional)	
Name	Levi S. Brown	Registration Number	72533
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA.
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 22913

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

VideoLabs, Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	11/16/21
Name	Bill Goldman		
Title	SVP & Chief IP Officer		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:22-cv-1086	10/18/2022	for the Western District of Texas

PLAINTIFF	DEFENDANT
VideoLabs, Inc.	HP Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	VideoLabs, Inc.
2	8,139,878	3/20/2022	VideoLabs, Inc.
3	8,208,542	6/26/2022	VideoLabs, Inc.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:22-cv-00719	6/30/2022	for the Western District of Texas

PLAINTIFF	DEFENDANT
VideoLabs, Inc.	Acer Inc. and Acer America Corporation

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	VideoLabs, Inc.
2	8,139,878	3/20/2012	VideoLabs, Inc.
3	8,208,542	6/26/2012	VideoLabs, Inc.
4	7,372,452	5/13/2008	VideoLabs, Inc.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
10/10/2022 Doc #7 STIPULATION of Dismissal by Plaintiff VideoLabs, Inc. and Defendants Acer Inc. and Acer America Corporation

CLERK	(BY) DEPUTY CLERK	DATE
PHILIP J. DEVLIN		10/11/2022

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Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Western District of Texas (Waco Division) on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:22-cv-00079	1/21/2022	for the Western District of Texas (Waco Division)

PLAINTIFF	DEFENDANT
VideoLabs, Inc. and VL Collective IP LLC	Amazon.com, Inc. and Amazon Web Services, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	See Attachment A		
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
10/11/2022 Doc #91 Sealed MEMORANDUM OPINION AND ORDER GRANTING 39 Opposed Sealed Motion to Transfer Venue Pursuant to 28 U.S.C. 1404(a).

CLERK	(BY) DEPUTY CLERK	DATE
PHILIP J. DEVLIN		10/11/2022

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

ATTACHMENT A

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1. U.S. 6,880,156	4/12/2005	VL Collective IP LLC
2. U.S. 7,266,682	9/4/2007	VL Collective IP LLC
3. U.S. 7,440,559	10/21/2008	VL Collective IP LLC
4. U.S. 7,769,238	8/3/2010	VideoLabs, Inc.
5. U.S. 7,970,059	6/28/2011	VideoLabs, Inc.
6. U.S. 8,139,878	3/20/2012	VideoLabs, Inc.
7. U.S. 8,605,794	12/10/2013	VL Collective IP LLC

Trials@uspto.gov
571-272-7822

Paper 10
Entered: October 4, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELL TECHNOLOGIES INC. and
DELL INC.
Petitioner,

v.

VIDEOLABS, INC.
Patent Owner.

IPR2022-00628
Patent 7,769,238 B2

Before KARL D. EASTHOM, JEFFERY S. SMITH, and PATRICK M. BOUCHER, *Administrative Patent Judges*.

EASTHOM, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Dell Technologies Inc. and Dell Inc. (collectively "Petitioner") filed a Petition (Paper 1, "Pet.") requesting an *inter partes* review of claim 1 of U.S. Patent No. 7,769,238 B2 (Ex. 1001, the "'238 patent"). Videolabs, Inc. ("Patent Owner") filed a Preliminary Response (Paper 7, "Prelim. Resp."). Petitioner filed a Preliminary Reply to Patent Owner's Preliminary Response (Paper 8, "Pet. Reply") and Patent Owner filed a Sur-reply (Paper 9, "PO Sur-reply") to address discretionary denial and priority (written description) issues. *See* Ex. 1042 (authorizing briefing).

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2020). Institution of an *inter partes* review requires that "the information presented in the petition and . . . any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). The dispositive issue here is whether Patent Owner shows that the effective filing date of the '238 patent extends to the filing date of its foreign application, thereby antedating two of Petitioner's asserted prior art references. For the reasons set forth below, we determine that Petitioner does not show that there is a reasonable likelihood that Petitioner will prevail with respect to the sole challenged claim. Accordingly, we deny *inter partes* review of the '238 patent.

II. BACKGROUND

A. Real Parties in Interest

Patent Owner identifies itself as the real party in interest. Paper 4, 1. Petitioner identifies "Dell Technologies Inc. and Dell Inc. (collectively,

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'Petitioner'), . . . Dell Marketing L.P., Dell Products L.P., and Denali Intermediate Inc." Pet. 72.

B. Related Matters

The parties identify the following proceedings as related district court matters: *VideoLabs, Inc. v. Dell Techs. Inc.*, No. 6:21-cv-00456-ADA (WDTX) (filed May 3, 2021, pending) (Ex. 1018); *VideoLabs, Inc. v. Dell Technologies Inc.*, No. 6:21-cv-00932 (WDTX) (consolidated with No. 6:21-cv-00456 (WDTX)); *VideoLabs, Inc. v. Amazon.com, Inc.*, No. 6:22-cv-00079 (WDTX, filed Jan. 21, 2022, pending); *Optis Wireless Technology, LLC v. Huawei Technologies Co, Ltd.*, No. 2:17-cv-00123 (EDTX, filed Feb. 21, 2017, terminated due to settlement Apr. 2, 2020); *VideoLabs, Inc. v. Dell Technologies Inc.*, No. 6:21-cv-00932 (WDTX) (consolidated with No. 6:21-cv-00456 (WDTX) (listed above)). *See* Pet. 73; Paper 4, 1.

The parties also identify the following related PTAB matter involving the '238 patent or related patents: *Huawei Device Co., Ltd v. Optis Wireless Tech., LLC*, IPR2018-00658, Paper 14 (PTAB Oct. 9, 2018) (denying institution on petitioner's challenge to claim 1 of the '238 patent) (the "'658-IPR"); *Dell Technologies Inc. vs VideoLabs, Inc.*, IPR2022-00629 (filed Mar. 17, 2022, challenging related U.S. Patent No. 8,139,878 B2) (denying institution concurrently); *Dell Technologies Inc. vs VideoLabs, Inc.*, IPR2022-00701 (filed Mar. 17, 2022, challenging related U.S. Patent No. 7,970,059 B2) (denying institution concurrently). *See* Pet. 73; Paper 4, 1–2.

C. The '238 Patent

The '238 patent, entitled "Picture Coding Method and Picture Decoding Method," issued on August 3, 2010, and claims priority to

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Japanese application 2001-112665 ("JP665"), filed on April 15, 2002. Ex. 1001, codes (45, 30, 60).

The '238 patent relates to encoding and decoding video and audio. Ex. 1001, 1:12–14, 38:10–60. The video encoder divides a picture into blocks and performs intra-picture prediction and inter-picture prediction for each block to create predictive residual picture data, a "residual block image." *Id.* at 1:19–21, 8:34–46, 38:24. The coding process then applies orthogonal transformation using, for example, a discrete cosine transform (DCT), and quantization, on the residual block image. *Id.* at 1:19–27, 8:47–50. The '238 patent explains that quantization of the orthogonal transformed data "creates coefficients showing spatial frequency components which is an object for variable length coding." *Id.* at 7:40–43, 8:50–52. After the transformation and quantization processes are performed on each residual image block, the number of coefficients in each block having a value other than 0, *i.e.*, non-zero coefficients, is detected and stored. *Id.* at 8:55–58.

The '238 patent states that the conventional method uses only one variable length code (VLC) table to encode the values of each coefficient in the current block. Ex. 1001, 1:28–44. According to the '238 patent, this technique is inefficient. *Id.* To improve coding efficiency, the '238 patent describes a system that encodes the total number of non-zero coefficients for each block (in addition to the values of the coefficients) using a VLC table that is selected from among several available VLC tables. *Id.* at 1:45–52. The '238 patent teaches selecting the VLC table based on a "predictive value" for the number of non-zero coefficients in a block located on the periphery of the block being encoded. *Id.* at 1:67–2:10. More specifically, the '238 patent describes a "coefficient number encoder" that (1) predicts the total number of non-zero coefficients in the current block based on the

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number of non-zero coefficients in one or more blocks located on the periphery of the current block; (2) selects a VLC table based on that prediction; and (3) encodes the total number of non-zero coefficients in the current block using the selected VLC table. *Id.* at 1:63–2:10; 8:55–62.

The '962 patent's decoding process involves inverse quantization and inverse orthogonal transformation of the coefficients to reconstruct the residual block image. Ex. 1001, 21:54–22:29. The decoder includes a "coefficient number decoder," which predicts the total number of non-zero coefficients in the block being decoded, uses that value to select a VLC table, and employs the selected VLC table to decode the total number of non-zero coefficients in the block. *Id.* at 3:21–42.

D. Illustrative Claim

Independent claim 1, the sole challenged claim, follows:

> 1. A receiving apparatus which receives multiplexed data which is obtained by multiplexing coded audio data and coded picture data, said receiving apparatus comprising:
>
> [1a] a demultiplexing unit configured to separate the multiplexed data into the coded audio data and the coded picture data;
>
> [1b] an audio processing unit configured to decode the separated coded audio data; and
>
> [1c] a picture decoding unit configured to decode the separated coded picture data;
>
> [1d] wherein said picture decoding unit includes a block decoding unit configured to decode coded block data included in the coded picture data, the coded block data being obtained by dividing a picture signal into plural blocks, generating a residual block image from a block image of the respective blocks and a predictive block image obtained by intra-picture prediction or inter-picture prediction, and coding, on a block basis,

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coefficients obtained by performing orthogonal transformation and quantization on the residual block image

[1e] said block decoding unit includes: a coefficient number decoding unit configured to decode the coded block data to obtain the number of non-zero coefficients which are coefficients included in a current block to be decoded and having a value other than "0";

[1f] a unit configured to obtain coefficients corresponding to a residual block image of the current block by decoding the coded block data;

[1g] a unit configured to obtain the residual block image of the current block by performing inverse quantization and inverse orthogonal transformation on the coefficients corresponding to the residual block image of the current block; and

[1h] a reproducing unit configured to reproduce a block image of the current block, from the obtained residual block image and a predictive block image obtained by intra-picture prediction or interpicture prediction,

[1i] said coefficient number decoding unit includes:

a determining unit configured to determine a predictive value for the number of non-zero coefficients included in the current block based on the number of non-zero coefficients included in a decoded block located on a periphery of the current block;

[1j] a selecting unit configured to select a variable length code table based on the determined predictive value; and

[1k] a variable length decoding unit configured to perform variable length decoding on a coded stream which is generated by coding the number of the non-zero coefficients included in the current block, by using the selected variable length code table.

Ex. 1001, 38:10–60 (bracketed information added).

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E. Asserted Prior Art

Exhibit	Reference	Publication or Filing Date
Ex. 1004	H.324 (ITU-T Recommendation H.324)	Feb. 1998
Ex. 1005	H.263 (ITU-T Recommendation H.263)	Feb. 1998
Ex. 1006	Bjontegaard (U.S. Patent No. 7,099,387 B2)	Filed Aug. 30, 2002
Ex. 1007	JVT-C167	May 2002

See Pet. 3–6.

F. Asserted Grounds of Unpatentability

Petitioner contends that claim 1 is unpatentable under Grounds 1 and 2, as follows:[1]

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	103(a)	H.324, H.263, Bjontegaard
1	103(a)	H.324, H.263, JVT-C167

Pet. 3. Petitioner supports its Petition with the Declaration of Dr. Dan Schonfeld (Ex. 1003).

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 103, 112. Because the '238 patent's effective filing date is before the March 16, 2013 effective date of the applicable AIA amendment, the pre-AIA versions of §§ 103, 112 apply.

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III. ANALYSIS OF THE GROUNDS

A. Legal Standards

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

"In order to gain the benefit of the filing date of an earlier application . . . each application in the chain leading back to the earlier application must comply with the written description requirement of 35 U.S.C. §112." *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1571 (Fed. Cir. 1997). Under this standard, the priority application must "reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the [sought-after] filing date." *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). "[I]t is the specification itself that must demonstrate possession," and "a description that merely renders the invention obvious does not satisfy the requirement." *Id.* at 1352.

B. Level of Ordinary Skill in the Art

Determining whether an invention would have been obvious under 35 U.S.C. § 103 requires resolving the level of ordinary skill in the pertinent art at the time of the effective filing date of the claimed invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). The person of ordinary skill in the art is a hypothetical person who knows the relevant art. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors in determining the level of ordinary skill in the art include the types of problems encountered in the art,

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the sophistication of the technology, and educational level of active workers in the field. *Id.* One or more factors may predominate. *Id.*

Relying on its expert, Dr. Schonfeld, Petitioner contends as follows:

> A POSITA at the time would have had at least an undergraduate degree in Electrical Engineering, Computer Science, Computer Engineering, or a related field (or equivalent work experience in the that field), and two or more years of experience with audio, image, or video coding. Ex. 1003, ¶ 24. The relevant experience would include a working understanding of the then-existing audio and video coding standards, including ongoing work on emerging standards. *Id.*

Pet. 16–17 (citing Ex. 1003 ¶ 24). Dr. Schonfeld adds that "a POSITA would have a working understanding of the then existing audio and video encoding standards (e.g., H.263), as well as ongoing work on emerging standards (e.g., H.26L/H.264)." Ex. 1003 ¶ 24. Dr. Richardson, Patent Owner's expert, agrees with, and applies, Dr. Schonfeld's proposed level of ordinary skill. Ex. 2001 ¶ 30 (citing Ex. 1003 ¶ 24).

Based on a review of the preliminary record, for purposes of the Institution Decision, we adopt Petitioner's proposed level of ordinary skill in the art, as agreed upon by Dr. Schonfeld and Dr. Richardson, because it is consistent with the evidence of record, including the asserted prior art and '238 patent specification.

C. Claim Construction

In *inter partes* reviews, the Board interprets claim language using the district-court-type standard, as described in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 37 C.F.R. § 42.100(b) (2020). Under this standard, claim terms have their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the

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specification, and the prosecution history. *See Phillips*, 415 F.3d at 1313–14.

Petitioner "submits that no construction of any claims term is necessary for the Board to resolve." Pet. 7. Patent Owner does not provide a construction. *See generally* Prelim. Resp.

As Petitioner argues, it is not necessary to explicitly construe any claim terms. *See* Pet. 7. Any construction would have no effect in the analysis of the dispositive priority issue here. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (stating that "we need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Asserted Prior Art

Patent Owner contends that "Petitioner's grounds fail to demonstrate a reasonable likelihood that claim 1 would have been obvious," because "Bjontegaard and JVT-C167 are not prior art." Prelim. Resp. 31. As indicated above, to support its obviousness grounds, Petitioner relies on Bjontegaard and JVT-C167 as prior art in Grounds 1 and 2, respectively, the only grounds asserted. *Supra* § I.F.

Patent Owner asserts that "[t]he '238 patent is entitled to the April 15, 2002 filing date of Japanese Patent Application No. 2002-112665 ('JP665')," and that Petitioner recognizes that "both references were published after this date but incorrectly argues that the '238 patent is not entitled to JP665's priority date." Prelim. Resp. 31 (emphasis omitted).

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Petitioner disagrees, arguing that JP665 does not provide written description support for the '283 patent's claim 1 limitations "relating to demultiplexing coded audio and decoding coded audio data." Pet. 1.

Patent Owner asserts that "the Board previously resolved" this priority issue in the '658-IPR." Prelim. Resp. 31. However, as Petitioner argues, "the Board in its Institution Decision [in the '658-IPR] did not make any findings with respect to whether the '238 patent was actually entitled to claim priority to JP 665," because "[p]etitioner Huawei [in the '658-IPR] ***did not challenge*** Patent Owner's assertion that the '238 patent was entitled to claim priority to the April 15, 2002, filing of JP 665." Pet. Reply 1 (citing Ex. 1043, 7, 36–37; Ex. 2002, 24–32) (emphasis omitted). That is, in the '658-IPR, the Board found that "[p]etitioner [Huawei] *does not contest* the April 15, 2002, priority date of the '238 patent." Ex. 2002, 24 (emphasis added). The Board denied institution in the '658-IPR, because it found that Bjontegaard's *provisional* application does not teach certain limitations of the '238 patent's claim 1, and petitioner Huawei relied on the provisional's filing date to antedate the *uncontested* April 15, 2002, effective filing date of the '238 patent (via priority to JP665). *See id.* at 29–31. In contrast, Petitioner does not rely on Bjontegaard's provisional application here for priority; rather, Petitioner contests the alleged April 15, 2002 priority date of the '238 patent based on priority to JP665. *See* Pet. 5 n.2.

E. Priority Based on JP665

As indicated above, whether JP665 provides written descriptive support for challenged claim 1 of the '238 patent is dispositive as to institution, because the filing date of JP665 is April 15, 2002, and the filing dates of Bjontegaard (Ground 1) and JVT-C167 (Ground 2) that Petitioner relies upon are after April 15, 2002. In particular, Petitioner asserts that

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"Bjontegaard was filed on August 30, 2002" and "JVT-C167 was publicly available in May 2002." Pet. 5 & n.2 (conceding that the Petition does not "rely on [Bjontegaard's] provisional application to show that Bjontegaard is prior art to the '238 patent under 35 U.S.C. § 102(e)").

Petitioner asserts that challenged claim 1 of the '238 patent "contains several limitations that are not supported at all in [JP665]." Pet. 24. In particular, Petitioner identifies the following claim 1 limitations as lacking support in JP665:

> 1. A receiving apparatus which receives multiplexed data which is obtained by ***multiplexing coded audio data and coded picture data***, said device, said receiving apparatus comprising:
>
> [1a] a demultiplexing unit configured to ***separate the multiplexed data into coded audio data and the coded picture data***;
>
> [1b] an audio processing unit configured to ***decode the separated coded audio data*** . . . .

Id. (alteration in original) (quoting Ex. 1001, claim 1). Petitioner asserts that JP665 "does not contain ***any*** disclosure whatsoever of coded audio data—let alone demultiplexing coded audio data from coded picture data and then decoding the separated coded audio data." *Id.* (citing Ex. 1020; Ex. 1003 ¶ 196). According to Petitioner, JP665 only discloses "encoding and decoding moving pictures (*e.g.*, videos)," describing "elements such as 'pictures,' 'images,' and 'pixels'—concepts that have nothing to do with audio coding and decoding." *Id.* at 25 (citing Ex. 1020 ¶¶ 2, 4–5, 7, 75, 77, 93).

Patent Owner disagrees. Patent Owner argues that "JP665 discloses improvements to H.26L, an emerging standard at the time of invention." Prelim. Resp. 37. In particular, Patent Owner argues that "JP665 is aimed at

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improving then-present H.26L methods, recommending and disclosing a more efficient method of using the 'variable length code' with VLC tables." *Id.* at 44 (citing Ex. 1020 ¶ 3); *see also id.* at 45–46 (describing improvements to H.26.L). JP665 supports Patent Owner on this point. It discloses "H.26L, a moving picture coding method that is presently under the process of standardization." Ex. 1020 ¶ 2. JP665 also describes improving the H.26L standard. *Id.* ¶¶ 4–5. Petitioner does not dispute this point. *See* Pet. Reply 4–10.

As to audio coding and multiplexing, Patent Owner also argues that "[a] POSITA, already familiar with H.26L, would have immediately recognized that the entire purpose of H.26L (and thus JP665) was to create a new video coding standard to be used in systems that already included audio coding/decoding units and multiplexing/demultiplexing units (see e.g., EX1004, 1)." Prelim. Resp. 44. Petitioner does dispute Patent Owner's factual assertion regarding what a person of ordinary skill recognized as the "entire purpose" of H.26L. *See* Pet. Reply 4–10 (arguing that H.26L is a video coding standard but not disputing Patent Owner's noted factual assertion or Patent Owner's similar assertion that "JP 665 conveys to a POSITA that the inventors recognized that moving pictures could (and would) be coded and transmitted with their associated audio" (quoting Prelim. Resp. 6)).

Patent Owner similarly argues that "[a]s one familiar with the ongoing standards work would readily recognize, H.26L was intended to be used in the framework of devices and systems that multiplexed and demultiplexed coded audio and video data." Prelim. Resp. 40 (citing Ex. 2001 ¶¶ 71, 74–80). To support this contention, Patent Owner states that "the early JVT requirements document of H.26L specified that it should be integrated with

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the H.324 framework." *Id.* at 47 (citing Ex. 2001 ¶¶ 59, 84–90; Ex. 2006, 1, 5; Ex. 2007, 1); *see also* Ex. 2006, 5 ("The JVT codec shall be designed to permit efficient adaptation and integration with a variety of system and delivery layers, including MPEG-4 Systems, MPEG-2 Systems, H.320, H.323, H.324, H.324/M, RTP, as well as others TBD."); Ex. 2001 ¶ 52 (testifying that "the encoding scheme of H.26L was to be used in the context of the systems that support functionality surrounding the encoding scheme, including multiplexing and demultiplexing an H.26L video stream with an audio stream that has been encoded and will subsequently be decoded," including "H.32x (e.g., H.324) and MPEG-4 Systems." (citing Ex. 2011, Ex. 2027, 1)), ¶ 59 (testifying that "the JVT Requirements Document JVT-A004 (EX2006, also published by MPEG as w4508), adopted at the December 2001 Pattaya meetings of MPEG and the JVT, specified that the H.26L codec should integrate with H.324 and other frameworks such as MPEG-2 Systems, MPEG-4 Systems, H.320 and H.323" (citing Ex. 2006, 5)), ¶ 74 (testifying that "H.26L was designed to work within an H.324 multiplexing environment and work was well underway on standardizing this within the JVT" (citing Ex. 2028)); Ex. 2028 (titled "H.26L over IP and H.324 Framework").[2] Petitioner does not dispute that standards groups designed H26L to work in the H.324 multiplexing framework and other similar multiplexing frameworks including MPEG-4 systems or other MPEG systems prior to the priority date at issue. *See* Pet. Reply 4–10.

[2] JVT is the Joint Video Team. *See* Ex. 1007; Ex. 1002 ¶ 53 (testifying that the JVT, formed by the "MPEG and ITU-T VCEG committee," started developing H.26L in December 2001, leading to publication of the H.264 standard in April 2003).

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Further supporting this contention, Patent Owner argues as follows:

> Specifically, the version of H.26L available at the time of JP665 described how H.26L video *is carried in a 'Byte Stream NAL Format' for systems such as ISO/IEC 13818-1 Systems (MPEG-2 Systems), in a packetized form for systems such as H.323, and/or in a media file format such as ISO/IEC 14496-1 (ISO MP4 media file format)*. [Ex. 2001] ¶77. A POSITA would have recognized that all of these (byte stream, packetized or file format in systems or formats such as MPEG-2 Systems, H.323, H.324, and the ISO media file format) included multiplexing of coded video and coded audio. *Id.*, ¶77–78. Hence, *by the time the inventors submitted JP665, H.26L was already incorporated into frameworks that multiplexed coded video with coded audio, such as H.324. Id.*, ¶78.

Prelim. Resp. 48 (emphasis added). Again, Petitioner does not address this argument or evidence showing that H.26L "was already incorporated into frameworks that multiplexed coded video with coded audio." *See id.*; Pet. Reply 4–10.

Dr. Richardson's testimony supports Patent Owner's argument. Dr. Richardson testifies that "[t]he version of H.26L from around the time of JP665[, filed April 15, 2002,] is described in EX2013, 'Working Draft Number 2,' which is the "reference coding method . . . for . . . H.26L." Ex. 2001 ¶ 77 (citing Ex. 2013 ("JVT-B118"), 1) (second two alterations in original). Dr. Richardson notes that "JVT-B118 states on its face that it was 'generated 2002-03-13.' *Id.* (citing Ex 2013, 1).

Then, Dr. Richardson ties the H.26L standard (which JP665 cites) to other well-known standards that evidence multiplexing the video of the H.26L standard according to known coded audio and video standards, by relying on the noted description of the applicable version of H.26L (Ex. 2013):

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> EX2013 describes how H.26L video is carried in a "Byte Stream NAL Format" for systems such as ISO/IEC 13818-1 Systems (MPEG-2 Systems) (EX2013, 84), in a packetized form for systems such as H.323 (EX2013, 84), and/or in a media file format such as ISO/IEC 14496-1 (ISO MP4 media file format) (EX2013, 87), which multiplexes audio and video streams into a file. *See, e.g.*, EX2021, 257 (showing interleaved (multiplexed) coded video and audio tracks).

Ex. 2001 ¶ 77.

Supporting Dr. Richardson's testimony, Exhibit 2013 (which describes H.26L) states that "[t]he intent of JVT is to move toward use of the ISO media file format as the defined method for JVT video content storage. This Appendix defines an interim file format that can be used until encapsulation of JVT video content into ISO media file format has been specified." Ex. 2013, 87. It further states that "[a] file consists of boxes, whose structure is identical to boxes of ISO/IEC 14496-1:2001 (ISO media file format)," and that "[t]he Syntactic Description Language (SDL) of ISO/IEC 14496-1:2001 is used to define the file format." *Id.* Exhibit 2013 also indicates that the H.323 standard for the packetized format (NAL (Network Application Layer) Format) includes H.26L, as Dr. Richardson testifies. *See id.* at 84; Ex. 2001 ¶ 77. As Dr. Richardson's testimony above indicates, Exhibit 2021 documents the ISO/IEC 14496-1 International Standard (i.e., the MP4 media file format).

Dr. Richardson and Patent Owner support the showing as to multiplexing coded audio and video by reproducing the following MP4 file format according to the ISO/IEC 14496-1 International Standard as disclosed in Exhibit 2021 (Prelim. Resp. 49, Ex. 2001 ¶ 77):

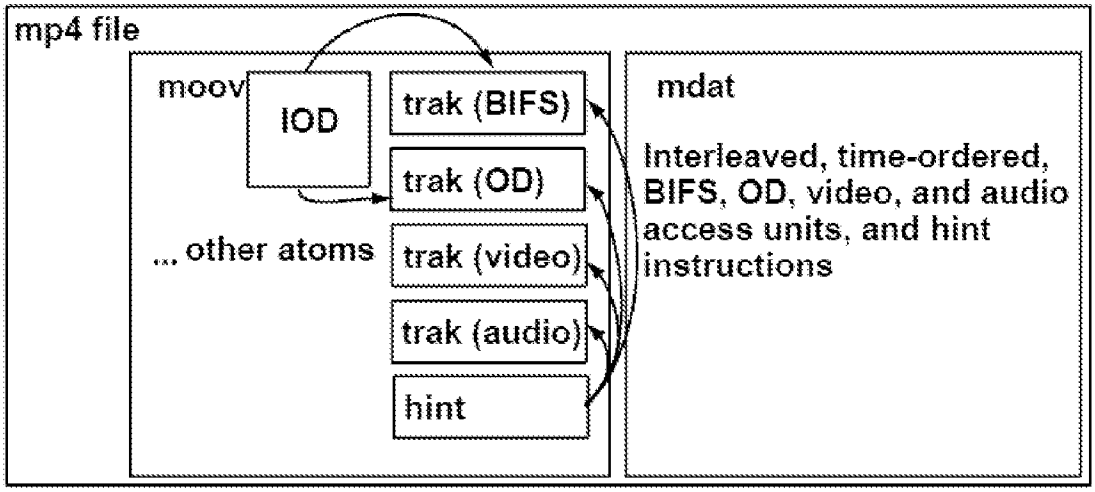


Figure 37 - Hinted Presentation for Streaming

Figure 37 above shows the MP4 multiplexing format (which Exhibit 2013 describes as implemented with H.26L as noted above). *See* Ex. 2021, 257, Fig. 27; Ex. 2013, 87. This MP4 format includes interleaved (multiplexed) coded audio and video. *See* Ex. 2001 ¶ 77 (citing Ex. 2021, 257, Fig. 37). Petitioner does not dispute this. *See* Pet. Reply 4–10.

Therefore, Patent Owner shows that prior to the filing date of JP665, artisans of ordinary skill understood that the intent of well-known standards organizations, including JVT, was to transmit and receive video according to H.26L as disclosed in JP665, using well-known standard file formats that contain multiplexed coded audio and video blocks. *See* Prelim. Resp. 39–40 (citing Ex. 2001 ¶¶ 71, 74–80); PO Sur-reply 8–9.

As noted above, Petitioner does not address this central aspect of Patent Owner's showing. Rather, Petitioner argues that "H.26L is 'a moving picture coding method' (POPR at 43–44), and Patent Owner identifies no disclosure in H.26L of demultiplexing and decoding audio." Pet. Reply 5. Petitioner repeats Patent Owner's contention that "[t]he only legally relevant

inquiry before the Board is whether JP 665 conveys to a POSITA that the inventors recognized that moving pictures could (and would) be coded and transmitted with their associated audio." *Id.* at 6 (quoting Prelim. Resp. 53). Petitioner contends that "[e]ven if Patent Owner is correct that a POSITA could have used the H.26L standard this way, the '238 patent still cannot claim priority to JP 665 as a matter of law." *Id.* Here, however, Petitioner does not dispute Patent Owner's contention that "JP 665 *conveys to a POSITA* that the inventors recognized that moving pictures . . . *would[] be coded and transmitted with their associated audio*." *Id.* (quoting Prelim. Resp. 53 (emphasis added)).

Dr. Richardson also points to admissions in the Petition regarding these standards, testifying that he

> agree[s] with Petitioner that H.26L was intended as "a successor to H.263" (Pet., 15), *that H.263 and/or other video codecs are required in an H.324 implementation* (Pet., 40), and that *H.324 includes audio coding and multiplexing / demultiplexing (Pet., 38–39)*. H.324 was (as Petitioner acknowledges) well known at the time of the invention (Pet., 4) and was even referenced by prior patents by the assignee of the '238 patent (Pet., 4).

Ex. 2001 ¶ 73 (emphasis added).

> In addition, Dr. Richardson testifies as follows:
>
> Popular protocols for coded media transmission include standards developed by ISO/IEC and ITU-T, including MPEG-2 Systems, MPEG-4 Systems, H.320, H.323, and H.324. Each of these documents specifies methods and systems *for multiplexing coded video and audio into a suitable form for transmission, sending the multiplexed media, and receiving and demultiplexing prior to decoding*. For example, ITU-T H.324 (Terminal for Low Bit Rate Multimedia Communication), first published in 1996, describes a terminal for multimedia coding and communication that includes a video codec, an audio codec and multiplexing / demultiplexing of video and audio.

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Ex. 2001 ¶ 47 (emphasis added) (citing Ex. 1004 (H.324, 1998), Fig. 1, 1–2). In other words, according to the testimony of Dr. Richardson, which the record supports and Petitioner does not dispute, the applicable standards, known to artisans of ordinary skill prior to the filing date of JP665, show demultiplexing (separating) the multiplexed coded audio and video prior to decoding, thereby satisfying the claim 1's preamble and elements 1[a] and 1[b], contrary to Patent Owner's arguments. *See* Pet. 24.

Dr. Richardson supports his testimony by reproducing the following block diagram:

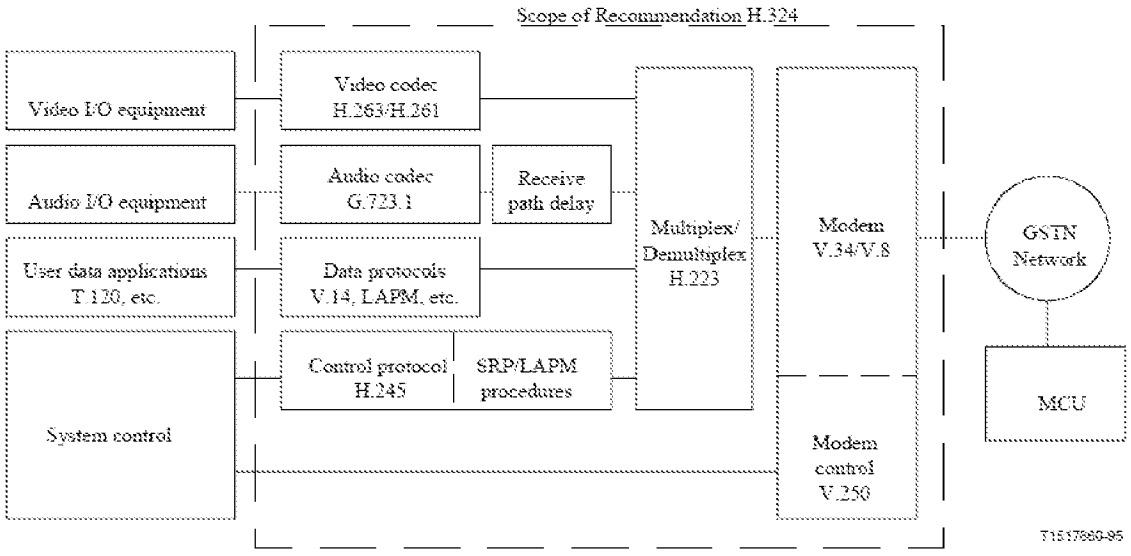


Figure 1/H.324 – Block diagram for H.324 multimedia system

Ex. 2001 ¶ 47 (citing Ex. 1004, Fig. 1, 1–2); Ex. 1004, Fig. 1. Figure 1 above illustrates a generic H.324 multimedia videophone system (intended to be implemented using H.26L video codecs as noted above), including multiplexor and demultiplexor components for coded audio and video, with coded video according to H.263/H.261. Ex. 1004, Fig. 1. As noted above, the parties agree that H.263 was well-known prior to JP665's filing date, and

that H.26L was an intended successor to it. *See* Ex. 2001 ¶ 73; Pet. 4, 15, 40.

Petitioner reproduces the same H.324 block diagram and agrees that "H.324 *implementations that support video communication are required to include a Video Codec (H.263 or H.261), which includes a picture decoding unit that decodes the video stream that has been separated by the demultiplexing unit*." Pet. 40 (emphasis added). Petitioner also contends that H.324 "*discloses*" claim 1's preamble and elements 1a and 1b. *Id.* at 37–40 (emphasis added). And as Patent Owner argues, Petitioner "concedes that the well-known standard H.324 multimedia system at the time included an H.263/H.261 video codec unit (i.e., a video codec conforming to ITU-T Recommendation H.261 or H.263), an audio codec unit, and a unit for multiplexing/demultiplexing video and audio data in accordance with H.223." Prelim. Resp. 38 (citing Pet. 38–40). Therefore, the Petition supports Dr. Richardson's testimony. *See* Ex. 2001 ¶¶ 47, 73. As described above, H.26L, as disclosed in JP665, provides a direct link to these well-known coded audio/video multiplexing/demultiplexing system standards (e.g., H.324), where the parties agree that the system standards require video standards such as H.26L and its predecessor such as H.263.

Under *In re Baxter Travenol Labs*, 952 F.2d 388, 390 (Fed. Cir. 1991), it is proper to rely on extrinsic evidence (including admissions) to explain what a reference discloses. *See id.* ("[S]ince [the prior art reference to] Becker referred to Baxter's commercial system and Baxter's commercial systems utilized a DEHP-plasticized primary bag, it is clear that one skilled in the art would have known that Becker was referring to a DEHP-plasticized primary bag"). In *Baxter Travenol Labs*, the court described all manner of extrinsic evidence as proper to show what a reference teaches:

> Baxter argues that these depositions, declarations, and admissions are *extrinsic evidence, which may not be considered when determining the anticipatory teaching of a reference. This is incorrect.* Baxter acknowledges, as it must, that *extrinsic evidence may be considered when it is used to explain, but not expand, the meaning of a reference. Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565, 1576–77, . . . (Fed. Cir. 1991). Here, the depositions and declarations of skilled workers and Baxter's admissions were used to identify what materials Baxter's commercial bags contained at the time of the Becker document, thereby explaining what the phrase "[Baxter] Travenol's commercial, two blood bag container" would have meant to one skilled in the art. This evidence clearly shows that those skilled in the art, reading the Becker document, would have known that Becker's primary bag was plasticized with DEHP.

Id. (emphasis added, second alteration in original).

Here, Patent Owner employs standards documents (e.g., Ex. 2013) as undisputed evidence that describes the H.26L standard, which JP665 discloses that its system improves upon (Ex. 1020 ¶¶ 3–6), and also employs other standards documents and declaration evidence further describing the use of H.26L, as evidence to show how one of ordinary skill in the art would have known that JP665's improved H.26L video system "would[ ] be" employed in the video portion of coded audio and video multiplexed and demultiplexed systems. *See* Prelim. Resp. 53. And Petitioner does not dispute that "JP665 conveys to a POSITA that the inventors recognized that moving pictures . . . would[] be coded and transmitted with their associated audio." *See* Pet. Reply 6 (quoting Prelim. Resp. 53); *see also In re Alton*, 76 F.3d 1168, 1175–76 (Fed. Cir. 1996) (citing *Ralston Purina Co. v. Far–Mar Co., Inc.*, 772 F.2d 1570, 1576 (Fed. Cir. 1985) and stating that in *Ralston Purina*, "the trial court admitted expert testimony about known industry standards regarding temperature and pressure in 'the art of extrusion of both

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farinaceous and proteinaceous vegetable materials.' The effect of the testimony was to expand the breadth of the actual written description since it was apparent that the inventor possessed such knowledge of industry standards of temperature and pressure at the time the original application was filed.").

In summary, contrary to Petitioner's arguments, an artisan of ordinary skill would not have read JP665's disclosed video improvements to H.26L as limited only to a coded video system (i.e., without audio) in the face of known related audio/video coding standards specifically contemplating video coding standards including H.26L and its predecessor H.263. Moreover, the parties agree that an artisan of ordinary skill would have known of the existing audio and video encoding standards. Ex. 1003 ¶ 24; Ex. 2001 ¶ 30; *supra* § IIIB. Therefore, Patent Owner shows that JP665 conveys possession of a component (video) used in a known system as defined by known standards (coded audio and video in multiplexing and demultiplexing systems) as required by claim 1's preamble, element 1a, and element 1b.

Based on the full record as generally summarized above, Patent Owner establishes priority of the '238 patent to JP665, thereby antedating Bjontegaard and JVT-C167, which the Petition relies upon to allege obviousness in Grounds 1 and 2, respectively. This priority showing is fatal to the Petition's obviousness showing.

IV. CONCLUSION

For the foregoing reasons, we determine Petitioner has not demonstrated a reasonable likelihood of success in proving that claim 1 of the '238 patent is unpatentable on the grounds asserted in the Petition

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V. ORDER

In consideration of the foregoing, it is hereby ORDERED that the Petition is *denied*, and no *inter partes* review is instituted.

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AO 120 (Rev. 08/10)

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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Western District of Texas (Waco Division) on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	1/21/2022	for the Western District of Texas (Waco Division)

PLAINTIFF	DEFENDANT
VideoLabs, Inc. and VL Collective IP LLC	Amazon.com, Inc. and Amazon Web Services, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	See Attachment A		
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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DECISION/JUDGEMENT

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ATTACHMENT A

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1. U.S. 6,880,156	4/12/2005	VL Collective IP LLC
2. U.S. 7,266,682	9/4/2007	VL Collective IP LLC
3. U.S. 7,440,559	10/21/2008	VL Collective IP LLC
4. U.S. 7,769,238	8/3/2010	VideoLabs, Inc.
5. U.S. 7,970,059	6/28/2011	VideoLabs, Inc.
6. U.S. 8,139,878	3/20/2012	VideoLabs, Inc.
7. U.S. 8,605,794	12/10/2013	VL Collective IP LLC

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	6/30/2022	for the Western District of Texas

PLAINTIFF	DEFENDANT
VideoLabs, Inc.	Micro-Star International Co., Ltd. and MSI Computer Corp.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	VideoLabs, Inc.
2	8,139,878	3/20/2012	VideoLabs, Inc.
3	8,208,542	6/26/2012	VideoLabs, Inc.
4	7,372,452	5/13/2008	VideoLabs, Inc.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	6/30/2022	for the Western District of Texas

PLAINTIFF	DEFENDANT
VideoLabs, Inc.	Lenovo Group Limited, Lenover (United States) Inc., and Motorola Mobility LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	VideoLabs, Inc.
2	8,139,878	3/20/2012	VideoLabs, Inc.
3	8,208,542	6/26/2012	VideoLabs, Inc.
4	7,372,452	5/13/2008	VideoLabs, Inc.
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	6/30/2022	for the Western District of Texas

PLAINTIFF	DEFENDANT
VideoLabs, Inc.	ASUSTeK Computer Inc. and ASUS Computer International

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	VideoLabs, Inc.
2	8,139,878	3/20/2012	VideoLabs, Inc.
3	8,208,542	6/26/2012	VideoLabs, Inc.
4	7,372,452	5/13/2008	VideoLabs, Inc.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	6/30/2022	for the Western District of Texas

PLAINTIFF	DEFENDANT
VideoLabs, Inc.	Acer Inc. and Acer America Corporation

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	VideoLabs, Inc.
2	8,139,878	3/20/2012	VideoLabs, Inc.
3	8,208,542	6/26/2012	VideoLabs, Inc.
4	7,372,452	5/13/2008	VideoLabs, Inc.
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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	5/24/2022	District of Delaware

PLAINTIFF	DEFENDANT
VideoLabs, Inc. and VL Collective IP LLC	Meta Platforms, Inc., Instagram, Inc., WhatsApp LLC, Facebook Technologies, LLC, and Giphy, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US 8,139,878 B2	3/20/2012	VideoLabs, Inc.
2	US 7,769,238 B2	8/3/2010	VideoLabs, Inc.
3	US 7,970,059 B2	6/28/2011	VideoLabs, Inc.
4	US 7,266,682 B2	9/4/2007	VL Collective IP LLC
5	US 7,436,980	10/14/2008	VL Collective IP LLC

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-456	5/3/2021	Western District of Texas

PLAINTIFF	DEFENDANT
VIDEOLABS, INC.	DELL TECHNOLOGIES INC. and DELL INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	VIDEOLABS, INC.
2	8,139,878	3/20/2012	VIDEOLABS, INC.
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In the above---entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☑ Other Pleading	
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AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:17-cv-123	2/10/2017	for the Eastern District of Texas

PLAINTIFF	DEFENDANT

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,769,238	8/3/2010	OPTIS WIRELESS TECHNOLOGY, LLC
2	6,604,216	8/5/2003	OPTIS WIRELESS TECHNOLOGY, LLC
3	7,940,851	5/10/2011	OPTIS WIRELESS TECHNOLOGY, LLC
4	8,385,284	2/26/2013	OPTIS WIRELESS TECHNOLOGY, LLC
5	8,208,569	6/26/2012	OPTIS WIRELESS TECHNOLOGY, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
FINAL JUDGMENT

CLERK	(BY) DEPUTY CLERK	DATE
David A. O'Toole	NKL	3/18/19

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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DECISION/JUDGEMENT

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Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

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2:17-cv-123	2/10/2017	for the Eastern District of Texas

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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
11/976,758	7769238	2624	9200

OC000000069321834

Correspondence Address/Fee Address Change

The following fields have been set to Customer Number 23117 on 06/27/2014

- **Correspondence Address**

The address of record for Customer Number 23117 is:

23117
NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

Hisense Ex. 1002, p. 67
Hisense v. VideoLabs
IPR2025-01329

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/976,758	10/26/2007	Kiyofumi Abe	

CONFIRMATION NO. 3207

POA ACCEPTANCE LETTER

23117
NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

OC000000069099828

Date Mailed: 06/19/2014

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/11/2014.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/rmturner myles/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Hisense Ex. 1002, p. 68
Hisense v. VideoLabs
IPR2025-01329

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/976,758	10/26/2007	Kiyofumi Abe	2007_1865

CONFIRMATION NO. 3207

POWER OF ATTORNEY NOTICE

52349
WENDEROTH, LIND & PONACK L.L.P.
1030 15th Street, N.W.
Suite 400 East
Washington, DC 20005-1503

OC00000069099772

Date Mailed: 06/19/2014

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/11/2014.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/rmturner myles/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Hisense Ex. 1002, p. 69
Hisense v. VideoLabs
IPR2025-01329

PTO/SB/96 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Abe , et al.

Application No./Patent No.: 7769238 Filed/Issue Date: 3-Aug-10

Titled: Picture coding method and picture decoding method

OPTIS WIRELESS TECHNOLOGY, LLC , a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy therefore is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: Panasonic Corporation To: OPTIS WIRELESS TECHNOLOGY, LLC

The document was recorded in the United States Patent and Trademark Office at

Reel 032326, Frame 0707, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/John R. Lastova/ June 11, 2014

Signature Date

Printed or Typed Name Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/47 (03-09)
Approved for use through 05/31/2015. OMB 0651-0016
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

"FEE ADDRESS" INDICATION FORM

Address to:
Mail Stop M Correspondence
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

- OR -

Fax to:
571-273-6500

INSTRUCTIONS: The issue fee must have been paid for application(s) listed on this form. In addition, only an address represented by a Customer Number can be established as the fee address for maintenance fee purposes (hereafter, fee address). A fee address should be established when correspondence related to maintenance fees should be mailed to a different address than the correspondence address for the application. **When to check the first box below**: If you have a Customer Number to represent the fee address. **When to check the second box below**: If you have no Customer Number representing the desired fee address, in which case a completed Request for Customer Number (PTO/SB/125) must be attached to this form. For more information on Customer Numbers, see the Manual of Patent Examining Procedure (MPEP) § 403.

For the following listed application(s), please recognize as the "Fee Address" under the provisions of 37 CFR 1.363 the address associated with:

☑ Customer Number: 000204

OR

☐ The attached Request for Customer Number (PTO/SB/125) form.

PATENT NUMBER (if known)	APPLICATION NUMBER
7769238	11/976758

Completed by (check one):

☐ Applicant/Inventor

/John R. Lastova/
Signature

☑ Attorney or Agent of record 33,149 (Reg. No.)

John R. Lastova
Typed or printed name

☐ Assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

703-816-4000
Requester's telephone number

☐ Assignee recorded at Reel _____ Frame_____

June 11, 2014
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more that one signature is required, see below*.

☐ *** Total of _____forms are submitted.**

This collection of information is required by 37 CFR 1.363. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1. 11 and 1.14. This collection is estimated to take 5 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313- 1450. DO NOT SEND COMPLETED FORMS TO THIS ADDRESS.
SEND TO: Mail Stop M Correspondence, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 23117

OR

☐ Practitioner(s) named below (If more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 23117

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:
Optis Wireless Technology, LLC
P.O. Box 250649
Plano, Texas 75025

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record
The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date
Name	James W. Riboman	Telephone
Title	President	

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	19273221
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	PICTURE CODING METHOD AND PICTURE DECODING METHOD
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	John R. Lastova/Margaret Grey
Filer Authorized By:	John R. Lastova
Attorney Docket Number:	2007_1865
Receipt Date:	11-JUN-2014
Filing Date:	26-OCT-2007
Time Stamp:	14:17:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assertion of entitlement to small entity status	238-sb0096.pdf	425391 a32bacdad856ba5bf7d1f2ea27f93d140fbbbe07	no	2

Warnings:	
Information:	

Hisense Ex. 1002, p. 75
Hisense v. VideoLabs
IPR2025-01329

2	Maintenance Fee Address Change	238-sb0047.pdf	203841 8bb3f599ace1795cdf24e605d9ec9bf277cf6bb6	no	2
Warnings:					
Information:					
3	Power of Attorney	OPTISWIRELESSPOA.pdf	218416 13c919e23f444e259c181a13a9137b6425ce92cc	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	847648	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/976,758	08/03/2010	7769238	2007_1865	3207

52349 7590 07/14/2010

WENDEROTH, LIND & PONACK L.L.P.
1030 15th Street, N.W.
Suite 400 East
Washington, DC 20005-1503

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 508 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Kiyofumi Abe, Kadoma-shi, JAPAN;
Shinya Kadono, Nishinomiya-shi, JAPAN;
Satoshi Kondo, Yawata-shi, JAPAN;
Makoto Hagai, Moriguchi-shi, JAPAN;

Hisense Ex. 1002, p. 77
Hisense v. VideoLabs
IPR2025-01329

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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52349 7590 05/18/2010

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Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/976,758	10/26/2007	Kiyofumi Abe	2007_1865	3207

TITLE OF INVENTION: PICTURE CODING METHOD AND PICTURE DECODING METHOD

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	08/18/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
PATEL, KANJIBHAI B	2624	382-232000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 Wenderoth, Lind & Ponack, L.L.P.
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: PANASONIC CORPORATION
(B) RESIDENCE: (CITY and STATE OR COUNTRY): OSAKA, JAPAN

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies .....

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☐ A check is enclosed.
☒ Payment by credit card. ~~Form PTO-2038 is attached.~~
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 23-0975 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Kenneth W. Fields/ 2010.06.21 15:20:48 -04'00' Date June 21, 2010
Typed or printed name Kenneth W. Fields Registration No. 52,430

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Hisense Ex. 1002, p. 78
Hisense v. VideoLabs
IPR2025-01329

Electronic Patent Application Fee Transmittal

Application Number:	11976758
Filing Date:	26-Oct-2007
Title of Invention:	PICTURE CODING METHOD AND PICTURE DECODING METHOD
First Named Inventor/Applicant Name:	Kiyofumi Abe
Filer:	Kenneth Wayne Fields/Karen Gass
Attorney Docket Number:	2007_1865

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	1501	1	1510	1510
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1810**

Electronic Acknowledgement Receipt

EFS ID:	7857747
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	PICTURE CODING METHOD AND PICTURE DECODING METHOD
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	Kenneth Wayne Fields/sarah pedersen
Filer Authorized By:	Kenneth Wayne Fields
Attorney Docket Number:	2007_1865
Receipt Date:	21-JUN-2010
Filing Date:	26-OCT-2007
Time Stamp:	16:48:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1810
RAM confirmation Number	3608
Deposit Account	230975
Authorized User	FIELDS,KENNETH

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	AttachA_FEE_P030145667.pdf	401373 1f02487557290fd6964d6a1bce4cbe66e69bf551	no	1

Warnings:

The PDF file has been signed with a digital signature and the legal effect of the document will be based on the contents of the file not the digital signature.

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	31989 b5fd54aaa1f9e7081243f587690ba075f8f0f9de	no	2

Warnings:

Information:

Total Files Size (in bytes):	433362

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/976,758	10/26/2007	Kiyofumi Abe	2007_1865	3207

52349 7590 06/18/2010

WENDEROTH, LIND & PONACK L.L.P.
1030 15th Street, N.W.
Suite 400 East
Washington, DC 20005-1503

EXAMINER	
PATEL, KANJIBHAI B	

ART UNIT	PAPER NUMBER
2624	

NOTIFICATION DATE	DELIVERY MODE
06/18/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ddalecki@wenderoth.com
eoa@wenderoth.com

Hisense Ex. 1002, p. 83
Hisense v. VideoLabs
IPR2025-01329

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
11976758	10/26/2007	ABE ET AL.	2007_1865

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1030 15th Street, N.W.
Suite 400 East
Washington, DC 20005-1503

EXAMINER	
Kanji Patel	
ART UNIT	**PAPER**
2624	20100614

DATE MAILED:

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Commissioner for Patents

IDS filed 05/03/2010 has been considered by the examiner.

/ Kanji Patel/
Primary Examiner, Art Unit 2624

PTO-90C (Rev.04-03)

Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: May 3, 2010

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA						
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/KBP/	BA	2002-0006250	1/2002	KR			abstract	
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	/KANJIBHAI PATEL/	DATE CONSIDERED	06/15/2010

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2007_1865
Kiyofumi ABE et al.	:	**Confirmation No. 3207**
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel
PICTURE CODING METHOD AND PICTURE DECODING METHOD	:	**Mail Stop: ISSUE FEE**

REQUEST FOR INITIALED FORM PTO/SB/08

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants note that an Information Disclosure Statement was filed on May 3, 2010. Applicants kindly request that the Examiner return to Applicants a signed and initialed copy of the Form PTO/SB/08 submitted therewith in order to confirm that the reference cited therein has been considered on the merits.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
By 2010.06.02 16:34:06 -04'00'
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/ete
Washington, D.C. 20005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
June 2, 2010

The USPTO is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17, and 1.492, which may be required by this paper to Deposit Account No. 23-0975.

Electronic Acknowledgement Receipt

EFS ID:	7731988
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	PICTURE CODING METHOD AND PICTURE DECODING METHOD
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	Kenneth Wayne Fields/pam veazey
Filer Authorized By:	Kenneth Wayne Fields
Attorney Docket Number:	2007_1865
Receipt Date:	02-JUN-2010
Filing Date:	26-OCT-2007
Time Stamp:	17:53:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Post Allowance Communication - Incoming	AttachA_REQ_P03015667.pdf	190141 fd859073f6d6b779c83563056c8b14f8f6ed4f3a	no	1

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New International Application Filed with the USPTO as a Receiving Office

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52349 7590 05/18/2010

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EXAMINER	
PATEL, KANJIBHAI B	
ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 05/18/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/976,758	10/26/2007	Kiyofumi Abe	2007_1865	3207

TITLE OF INVENTION: PICTURE CODING METHOD AND PICTURE DECODING METHOD

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	08/18/2010

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

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B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

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III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

Hisense Ex. 1002, p. 89
Hisense v. VideoLabs
IPR2025-01329

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P.O. Box 1450
Alexandria, Virginia 22313-1450
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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

52349 7590 05/18/2010

WENDEROTH, LIND & PONACK L.L.P.
1030 15th Street, N.W.
Suite 400 East
Washington, DC 20005-1503

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Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/976,758	10/26/2007	Kiyofumi Abe	2007_1865	3207

TITLE OF INVENTION: PICTURE CODING METHOD AND PICTURE DECODING METHOD

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	08/18/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
PATEL, KANJIBHAI B	2624	382-232000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

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❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/976,758	10/26/2007	Kiyofumi Abe	2007_1865	3207

52349 7590 05/18/2010

WENDEROTH, LIND & PONACK L.L.P.
1030 15th Street, N.W.
Suite 400 East
Washington, DC 20005-1503

EXAMINER	
PATEL, KANJIBHAI B	
ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 05/18/2010

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 508 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 508 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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Notice of Allowability	Application No.	Applicant(s)	
	11/976,758	ABE ET AL.	
	Examiner	Art Unit	
	Kanji Patel	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *10/26/2007*.

2. ☒ The allowed claim(s) is/are *34*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☒ Certified copies of the priority documents have been received in Application No. *10/479,831* .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 10/26/07, 8/6/09, 10/1/09, 10/23/09, 11/20/09, 3/9/10
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

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DETAILED ACTION

1. Preliminary Amendment filed 09/29/2008 has been entered and made of record. Claims 1-33 are cancelled. Claim 34 is currently pending in the application.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

3. Drawings filed 10/26/2007 have been approved by the examiner.

Allowable Subject Matter

4. The following is an examiner's statement of reasons for allowance:

Claim 34 is allowed.

The prior art on record fails to teach or fairly suggest singly or in combination, the features of "a de-multiplexing unit configured to separate the multiplexed data into the coded audio data and the coded picture data, an audio processing unit configured to decode the separated coded audio data; and a picture decoding unit configured to decode the separated coded picture data, wherein said picture decoding unit includes a block decoding unit configured to decode coded block data included in the coded picture data, the coded block data being obtained by dividing a picture signal into plural blocks, generating a residual block image from a block image of the respective blocks and a predictive block image obtained by intra-picture prediction or inter-picture prediction, and coding, on a block basis, coefficients obtained by performing orthogonal transformation and quantization on the residual block image, said block decoding unit

includes: a coefficient number decoding unit configured to decode the coded block data to obtain the number of non-zero coefficients which are coefficients included in a current block to be decoded and having a value other than "0", a unit configured to obtain coefficients corresponding to a residual block image of the current block by decoding the coded block data, a unit configured to obtain the residual block image of the current block by performing inverse quantization and inverse orthogonal transformation on the coefficients corresponding to the residual block image of the current block and
a reproducing unit configured to reproduce a block image of the current block, from the obtained residual block image and a predictive block image obtained by intra-picture prediction or inter-picture prediction, said coefficient number decoding unit includes: a determining unit configured to determine a predictive value for the number of non-zero coefficients included in the current block based on the number of non-zero coefficients included in a decoded block located on a periphery of the current block, a selecting unit configured to select a variable length code table based on the determined predictive value; and a variable length decoding unit configured to perform variable length decoding on a coded stream which is generated by coding the number of the non-zero coefficients included in the current block, by using the selected variable length code table" as recited in claim 34.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Other prior art cited

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Eifrig et al. (US 6,748,020 B1) disclose transcoder-multiplexer (transmux) software-architecture.

Wise et al. (US 6,035,126) disclose data pipeline system and data encoding method.

Wise (US 5,784,631) disclose Huffman decoder.

Sotheran (US 5,603,012) discloses a start code detector.

Contact Information

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kanji Patel whose telephone number is (571) 272-7454. The examiner can normally be reached on Monday to Thursday from 8 a.m. to 6:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir Ahmed can be reached on (571) 272-7413 The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you

have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/ Kanji Patel/

Primary Examiner, Art Unit 2624

Notice of References Cited	Application/Control No. 11/976,758	Applicant(s)/Patent Under Reexamination ABE ET AL.	
	Examiner Kanji Patel	Art Unit 2624	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,748,020	06-2004	Eifrig et al.	375/240.26
*	B	US-6,035,126	03-2000	Wise et al.	712/29
*	C	US-5,784,631	07-1998	Wise, Adrian Philip	382/246
*	D	US-5,603,012	02-1997	Sotheran, Martin W.	712/208
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11976758	ABE ET AL.
	Examiner	**Art Unit**
	Kanji Patel	2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/30/2010								
-	1	-								
-	2	-								
-	3	-								
-	4	-								
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-	32	-								
-	33	-								
1	34	=								

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IPR2025-01329

Issue Classification

Application/Control No.	Applicant(s)/Patent Under Reexamination
11976758	ABE ET AL.
Examiner	**Art Unit**
Kanji Patel	2624

ORIGINAL		INTERNATIONAL CLASSIFICATION															
CLASS	SUBCLASS	CLAIMED									NON-CLAIMED						
382	233	G	0	6	K	9 / 36 (2006.0)											
CROSS REFERENCE(S)		H	0	4	N	7 / 12 (2006.01.01)											
		H	0	3	M	7 / 40 (2006.0)											

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
375	240.13				
341	67				

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	-	17	-	33										
-	2	-	18	1	34										
-	3	-	19												
-	4	-	20												
-	5	-	21												
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-	12	-	28												
-	13	-	29												
-	14	-	30												
-	15	-	31												
-	16	-	32												

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	1	
/ Kanji Patel/ Primary Examiner.Art Unit 2624	4/30/10	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

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IPR2025-01329

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11976758	ABE ET AL.
	Examiner	Art Unit
	Kanji Patel	2624

SEARCHED

Class	Subclass	Date	Examiner
382	232-251, 276, 305	4/30/10	KBP
375	240.03, 240.12, 240.16, 240.2, 240.23, 240.24	4/30/10	KBP
348	14.13, 408.1	4/30/10	KBP
341	106	4/30/10	KBP

SEARCH NOTES

Search Notes	Date	Examiner
INVENTOR SEARCH IN PALM	4/30/10	KBP
EAST (US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	4/30/10	KBP
INTERFERENCE SEARCH HISTORY	4/30/10	KBP
NPL-IEEE XPLORE SEARCH	4/30/10	KBP

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner
375	240.12	4/30/10	KBP
341	67	4/30/10	KBP

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www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 3207

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/976,758	10/26/2007	382	2624	2007_1865

APPLICANTS
Kiyofumi Abe, Kadoma-shi, JAPAN;
Shinya Kadono, Nishinomiya-shi, JAPAN;
Satoshi Kondo, Yawata-shi, JAPAN;
Makoto Hagai, Moriguchi-shi, JAPAN;

**** CONTINUING DATA ***************************
This application is a CON of 11/453,078 06/15/2006 PAT 7,308,143 YES /KBP/
which is a DIV of 10/479,831 12/08/2003 PAT 7,095,896
which is a 371 of PCT/JP03/03794 03/27/2003

**** FOREIGN APPLICATIONS ***************************
JAPAN 2002-112665 04/15/2002 YES /KBP/

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
04/16/2008

Foreign Priority claimed ☑ Yes ☐ No 35 USC 119(a-d) conditions met ☑ Yes ☐ No Verified and Acknowledged /KANJIBHAI B PATEL/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		JAPAN	30	2	1

ADDRESS
WENDEROTH, LIND & PONACK L.L.P.
1030 15th Street, N.W.
Suite 400 East
Washington, DC 20005-1503
UNITED STATES

TITLE
Picture coding method and picture decoding method

FILING FEE RECEIVED		
1290	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

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EAST Search History

EAST Search History (Prior Art)

<This search history is empty>

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	(demultiplex$4 and multiplex$4 and audio and picture and coded and decod $4 and block and intra-picture and coefficient$1 and current and variable and length and table). clm.	US-PGPUB; USPAT; UPAD	OR	ON	2010/04/30 10:55
L2	0	(demultiplex$4 and multiplex$4 and audio and picture and coded and decod $4 and block and current and variable and length and table). clm.	US-PGPUB; USPAT; UPAD	OR	ON	2010/04/30 10:56

4/30/10 10:57:58 AM
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	1531	demultiplex$4 and multiplex$4 and audio and picture and coded and decod $4 and block and current and variable and length and table	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 10:58
L4	377	3 and (variable adj length adj decoding ot VLD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 10:59
L5	377	4 and coded	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 11:01
L6	147	5 and coded adj block	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 11:01
L7	75	6 and residual	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 11:03
L8	62	7 and predictive	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 11:03

L9	21	8 and inter adj picture	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 11:03
L10	21	9 and quantiz$6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/30 11:03

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	(demultiplex$4 and multiplex$4 and audio and picture and coded and decod$4 and block and intra-picture and coefficient$1 and current and variable and length and table). clm.	US-PGPUB; USPAT; UPAD	OR	ON	2010/04/30 10:55
L2	0	(demultiplex$4 and multiplex$4 and audio and picture and coded and decod$4 and block and current and variable and length and table). clm.	US-PGPUB; USPAT; UPAD	OR	ON	2010/04/30 10:56

4/30/10 11:10:12 AM
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Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: March 9, 2010

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA						
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/KP/	BA	2002-0006149	1/2002	KR			abstract	
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	/Kanjibhai Patel/	DATE CONSIDERED	04/30/2010

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: August 6, 2009

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/KP/	AA	2002/0037108	3/2002	Matsumoto			
	AB						
	AC						
	AD						
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	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
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	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	/Kanjibhai Patel/	DATE CONSIDERED	04/30/2010

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: October 1, 2009

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/KP/	AA	6,341,144	1/2002	Haskell et al.			
/KP/	AB	6,907,142	6/2005	Kalevo et al.			
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	BA							
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

/KP/	CA	Office Action issued September 3, 2009 in U.S. Application No. 11/976,552.
/KP/	CB	Office Action issued September 9, 2009 in U.S. Application No. 11/976,550.
	CC	
	CD	

EXAMINER	/Kanjibhai Patel/	DATE CONSIDERED	04/30/2010

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: October 23, 2009

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/KP/	AA	5,974,184	10/1999	Eifrig et al.			
	AB						
	AC						
	AD						
	AE						
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	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/KP/	BA	373408	11/1999	TW			corresponds to AA	
/KP/	BB	393856	6/2000	TW			partial & abstract	
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	/Kanjibhai Patel/	DATE CONSIDERED	04/30/2010

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Sheet 1 of 2

INFORMATION DISCLOSURE STATEMENT

FORM PTO 1449 *(modified)*

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(Use several sheets if necessary)

Date Submitted to PTO: October 25, 2007

ATTY DOCKET NO.	SERIAL NO.
2007_1865	NEW

APPLICANT
Kiyofumi ABE et al.

FILING DATE	GROUP
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/KP/	AA	6,292,588	9/2001	Shen et al.			
/KP/	AB	6,473,459	10/2002	Sugano et al.			
/KP/	AC	6,020,923	2/2000	Hosaka et al.			
/KP/	AD	5,500,678	3/1996	Puri			
/KP/	AE	5,563,593	10/1996	Puri			
/KP/	AF	5,512,952	4/1996	Iwamura			
/KP/	AG	6,625,211	9/2003	Etoh et al.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/KP/	AH	5-347710	12/1993	JP				
/KP/	AI	6-232765	8/1994	JP				
/KP/	AJ	7-107492	4/1995	JP				
/KP/	AK	10-191324	7/1998	JP				
/KP/	AL	4-100390	4/1992	JP				
/KP/	AM	4-223773	8/1992	JP				
/KP/	AN	0 876 058	11/1998	EP				

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

/KP/	AO	RICHARDSON, I. E.G., entitled "H.264/MPEG-4 PART 10 WHITE PAPER, VARIABLE-LENGTH CODING", MPEG-4 PART 10 WHITE PAPER, October 17, 2002 (XP002258064).
/KP/	AP	BJONTEGAARD, G., entitled "IMPROVED LOW COMPLEXITY ENTROPY CODING FOR TRANSFORM COEFFICIENTS", Joint Video Team (JVT) of ISO/IEC MPEG & ITU-T VCEG (ISO/IEC JTC1/SC29/WG11 and ITU-T SG16 Q6), XX, XX, January 29, 2002 (XP002257294).
/KP/	AQ	HARTUNG, F., et al., entitled "IMPROVED ENCODING OF DCT COEFFICIENTS FOR LOW BIT-RATE VIDEO CODING USING MULTIPLE VLC TABLES", Image Processing, 1999. ICIP 99. Proceedings. 1999 International Conference of Kobe, Japan 24-28 Oct. 1999, Piscataway, NJ, USA, IEEE, US, October 24, 1999, pages 51-55, (XP010368953).

EXAMINER	/Kanjibhai Patel/	DATE CONSIDERED	04/30/2010

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INFORMATION DISCLOSURE STATEMENT

FORM PTO 1449 (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
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Date Submitted to PTO: October 26, 2007

ATTY DOCKET NO.	SERIAL NO.
2007_1865	NEW

APPLICANT
Kiyofumi ABE et al.

FILING DATE	GROUP
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/KP/	AA	6,658,157	12/2003	Satoh et al.			
/KP/	AB	6,449,395	9/2002	Kobayashi Yoshikazu			
/KP/	AC	6,292,588	9/2001	Shen et al.			
/KP/	AD	5,777,679	7/1998	Cheney et al.			
/KP/	AE	5,740,283	4/1998	Meeker, G. William			
/KP/	AF	5,576,765	11/1996	Cheney et al.			
/KP/	AG	5,510,841	4/1996	Iwamura, Ryuichi			
/KP/	AH	5,821,887	10/1998	Zhu, Chunrong			
/KP/	AI	5,668,599	9/1997	Cheney et al.			

FOREIGN PATENT DOCUMENTS

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	AJ							
	AK							
	AL							
	AM							
	AN							

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	AO	
	AP	
	AQ	

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Date Submitted to PTO: November 20, 2009

ATTY DOCKET NO. 2007_1865	**SERIAL NO.** 11/976,758
APPLICANT Kiyofumi ABE et al.	
FILING DATE October 26, 2007	**GROUP** 2624

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U.S. PATENT DOCUMENTS

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	AA						
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/KP/	BA	2002-0006150	1/2002	KR			X	
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) (*Including Author, Title, Date, Pertinent Pages, Etc.*)

	CA	
	CB	
	CC	
	CD	

EXAMINER	/Kanjibhai Patel/	DATE CONSIDERED	04/30/2010

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Inventor Name Search Result

Your Search was:

Last Name = ABE
First Name = KIYOFUMI

Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Name
10468119	7664180	20040086044	150	08/15/2003	MOVING PICTURE CODING METHOD AND MOVING PICTURE DECODING METHOD FOR PERFORMING INTER PICTURE PREDICTION CODING AND INTER PICTURE PREDECTION DECODING USING PREVIOUSLY PROCESSED PICTURES AS REFERENCE PICTURES	LEE,Y
10468203	7362807	20040086047	150	08/18/2003	MOTION VECTOR CODING METHOD AND MOTION VECTOR DECODING METHOD	RAO,ANAND
10473322	7394853	20040218674	150	09/29/2003	MOTION VECTOR CODING METHOD AND MOTION VECTOR DECODING METHOD	DIEP,NHON
10473350	Not Issued	20040233995	41	09/30/2003	MOVING IMAGE CODING METHOD AND MOVING IMAGE DECODING	CZEKAJ,DAVID

					METHOD	
10475655	7327788	20040233988	150	10/23/2003	MOTION VECTOR DERIVATION METHOD, DYNAMIC IMAGE ENCODING METHOD, AND DYNAMIC IMAGE DECODING METHOD	VO,TUNG
10478010	7505518	20050031030	150	11/17/2003	PICTURE ENCODING METHOD AND IMAGE DECODING METHOD	CZEKAJ,DAVID
10478184	7167591	20040146212	150	11/19/2003	IMAGE ENCODING METHOD AND IMAGE DECODING METHOD	KASSA,YOSEF
10478185	7305035	20050099522	150	11/19/2003	VARIABLE LENGTH ENCODING METHOD AND VARIABLE LENGTH DECODING METHOD	VO,TUNG
10479831	7095896	20040184538	150	12/08/2003	IMAGE ENCODING METHOD AND IMAGE DECODING METHOD	PATEL,KANJIBHA
10480038	6967600	20040174278	150	12/09/2003	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
10480047	Not Issued	20040146109	161	12/09/2003	Method for calculation motion vector	ANYIKIRE,CHIKA
10480928	Not Issued	20040136461	41	12/16/2003	Motion vector calculating method	FINDLEY,CHRIST
10480932	7515635	20040146105	150	12/16/2003	MOVING PICTURE CODING METHOD AND A MOVING PICTURE DECODING METHOD	DIEP,NHON
10481012	7206347	20050058206	150	11/09/2004	IMAGE CODING METHOD AND	DIEP,NHON

					IMAGE DECODING METHOD	
10481277	Not Issued	20040184544	100	12/19/2003	VARIABLE LENGTH ENCODING METHOD AND VARIABLE LENGTH DECODING METHOD	FINDLEY,CHRIST
10483813	Not Issued	20040190615	161	01/15/2004	Moving image encoding method, moving image decoding method, and data recording medium	REKSTAD,ERICK
10487533	Not Issued	20040234143	161	02/23/2004	Picture coding method and picture decoding method	FINDLEY,CHRIST
10489363	Not Issued	20040247190	161	03/12/2004	Image encoding method and image decoding method	NEWMAN,MICHA
10490366	Not Issued	20040264570	41	03/23/2004	Moving picture encoding method, moving picture decoding method, and recording medium	ANYIKIRE,CHIKA
10491153	7308145	20050105809	150	03/26/2004	MOVING PICTURE CODING METHOD AND MOVING PICTURE DECODING METHOD	ROGERS,SCOTT
10491174	Not Issued	20040246373	61	03/30/2004	Picture encoding device, image decoding device and their methods	ANYIKIRE,CHIKA
10494753	Not Issued	20050015248	168	05/05/2004	Variable length coding method and variable length decoding method	KOONTZ,TAMMY
10498088	Not Issued	20050141612	120	06/10/2004	Moving picture encoding method and motion picture decoding method	ROBERTS,JESSIC
10500291	Not Issued	20050117642	161	06/29/2004	Moving picture coding method, decoding method, data stream, data recording medium	ROBERTS,JESSIC

					and program	
10500575	Not Issued	20050062885	30	07/01/2004	Motion compensation method, picture coding method and picture decoding method	ROBERTS,JESSIC
10501001	Not Issued	20050041742	41	07/08/2004	Field/Frame adaptive coding and decoding method with field/frame index and apparatus for performing the same	TORRENTE,RICH
10531004	Not Issued	20060013319	161	04/12/2005	Image decoding device, image encoding device, and method thereof	SENFI,BEHROOZ
10566506	7650032	20060285757	150	01/31/2006	METHOD FOR ENCODING MOVING IMAGE AND METHOD FOR DECODING MOVING IMAGE	DO,ANH
10592788	Not Issued	20080232467	30	09/14/2006	Image Decoding Method	DASTOURI,MEHR
11110916	6954157	20050190085	150	04/21/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11110921	6992605	20050185853	150	04/21/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11110922	7161508	20050185854	150	04/21/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11268667	7109898	20060071831	150	11/08/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM

11453062	7184598	20060269154	150	06/15/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	PATEL,KANJIBHA
11453071	7305134	20060239575	150	06/15/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	PATEL,KANJIBHA
11453078	7308143	20060233449	150	06/15/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	PATEL,KANJIBHA
11453084	7308144	20060233450	150	06/15/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	PATEL,KANJIBHA
11453085	7308149	20060233451	150	06/15/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	PATEL,KANJIBHA
11495598	7283071	20060262987	150	07/31/2006	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11495600	7541948	20060273940	150	07/31/2006	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	LAUTURE,JOSEPH
11495601	7411526	20060261987	150	07/31/2006	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11508934	Not Issued	20060285591	30	08/24/2006	Moving picture coding method and a moving picture decoding method	DASTOURI,MEHR

11531008	Not Issued	20070058725	30	09/12/2006	CODING/DECODING APPARATUS, CODING/DECODING METHOD, CODING/DECODING INTEGRATED CIRCUIT AND CODING/DECODING PROGRAM	DASTOURI,MEHR
11543854	7312730	20070024474	150	10/06/2006	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	NGUYEN,KHAI
11543857	7312731	20070024475	150	10/06/2006	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	NGUYEN,KHAI
11543860	7339506	20070030183	150	10/06/2006	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	NGUYEN,KHAI
11586618	7221803	20070041648	150	10/26/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	KASSA,YOSEF
11586619	7218787	20070041646	150	10/26/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	KASSA,YOSEF
11605958	Not Issued	20070076801	30	11/30/2006	Picture encoding method and picture decoding method	DASTOURI,MEHR
11656957	Not Issued	20070171977	30	01/24/2007	Moving picture coding method and moving picture coding device	DASTOURI,MEHR

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Hisense Ex. 1002, p. 118
Hisense v. VideoLabs
IPR2025-01329

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Inventor Name Search Result

Your Search was:

Last Name = KADONO
First Name = SHINYA

Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Na
07425108	Not Issued		161	10/23/1989	ORTHOGONAL AND INVERSE ORTHOGONAL TRANSFORM APPARATUS	MAI,TAN
07574288	5193010		150	08/28/1990	DIGITAL VIDEO SIGNAL RECORDING AND REPRODUCING APPARATUS HAVING AN ERROR CONCEALMENT CONTROL FUNCTION	HINDI,NABI
07731311	5196930		150	07/17/1991	HIGH EFFICIENCY CODING AND DECODING APPARATUS FOR LOWERING TRANSMISSION OR RECORDING RATE OF TRANSMITTED OR RECORDED VIDEO SIGNAL WITHOUT REDUCING PICTURE QUALITY	KOSTAK,VI
07736056	5218563		250	07/26/1991	DATA ROUND-OFF DEVICE FOR ROUNDING-OFF M-BIT DIGITAL DATA INTO[M-N]- BIT DIGITAL DATA	MAI,TAN
07738140	5323232		150	07/30/1991	FILTER DEVICE FOR DECIMATION AND INTERPOLATION OF CHROMINANCE COMPONENTS OF A VIDEO SIGNAL	HARVEY,MI
07739106	5117381		150	08/01/1991	DISCRETE ORTHOGONAL AND INVERSE	MAI,TAN

					ORTHOGONAL TRANSFORM APPARATUS	
07741049	5140323		150	08/06/1991	DIGITAL SIGNAL ORTHOGONAL TRANSFORMER APPARATUS	LOGAN,SHA
07813765	Not Issued		166	12/27/1991	ENCODING APPARATUS AND DECODING APPARATUS	ANDERSON
07836660	5343501		150	02/18/1992	ORTHOGONAL TRANSFORM APPARATUS FOR VIDEO SIGNAL PROCESSING	GHEBRETIN
07979668	5329475		250	11/20/1992	DATA ROUND-OFF DEVICE FOR ROUNDING-OFF M-BIT DIGITAL DATA INTO (M-N) BIT DIGITAL DATA	MAI,TAN
08113175	5376971		150	08/30/1993	PICTURE ENCODING APPARATUS AND PICTURE DECODING APPARATUS	LE,VU
08215421	5587806		250	03/21/1994	APPARATUS FOR SEPARATELY RECORDING INPUT CODED VIDEO SIGNAL AND IMPORTANT DATA GENERATED THEREFROM	TRAN,THAI
08376651	Not Issued		161	01/20/1995	ENCODING APPARATUS AND DECODING APPARATUS	KELLEY,CH
08401363	5777900		150	03/09/1995	FILTERING PROCESSOR AND FILTER METHOD	COLE,TONY
08552617	5751377		150	11/03/1995	PICTURE CODING APPARATUS AND DECODING APPARATUS	DIN,LUANN
08650185	Not Issued		164	05/20/1996	FILTERING PROCESSOR AND FILTERING METHOD, AND VIDEO SIGNAL CODING APPARATUS AND VIDEO SIGNAL DECODING APPARATUS USING FILTERING PROCESSOR	ASSOUAD,P

08799564	Not Issued		161	02/10/1997	CONTOUR CODING METHOD, CONTOUR DECODING METHOD, CONTOUR CODING APPARATUS AND CONTOUR DECODING APPARATUS EMPLOYING THE SAME METHODS, AND RECORDING MEDIUM RECORDING THE SAME METHODS	COUSO,JOSI
08818662	6067320		250	03/14/1997	METHOD AND APPARATUS FOR ENCODING AND DECODING IMAGES	PHILIPPE,GI
08869862	Not Issued	20010012405	168	06/05/1997	IMAGE CODING METHOD, IMAGE DECODING METHOD, IMAGE CODING APPARATUS, IMAGE DECODING APPARATUS USING THE SAME METHODS, AND RECORDING MEDIUM FOR RECORDING THE SAME METHODS	MILLER,MA
09000077	6188796		150	03/09/1998	PICTURE ENCODER, PICTURE DECODER, PICTURE ENCODING METHOD, PICTURE DECODING METHOD, PICTURE ENCODING PROGRAM RECORDING MEDIUM, AND PICTURE DECODING PROGRAM RECORDING MEDIUM	CHEN,WENI
09011395	Not Issued		168	02/03/1998	IMAGE ENCODER, IMAGE DECODER, IMAGE DECODING METHOD, AND IMAGE TRANSMITTING SYSTEM	LIN,BRYAN
09012191	6088485		250	01/23/1998	METHODS, APPARATUSES AND PROGRAM RECORDING MEDIA FOR IMAGE CODING AND IMAGE DECODING	DANG,DUY

09041840	6043847		250	03/12/1998	PICTURE CODING APPARATUS AND DECODING APPARATUS	DIN,LUANN
09041860	6351562		150	03/12/1998	PICTURE CODING APPARATUS AND DECODING APPARATUS	COUSO,JOSI
09077378	6173078		150	07/20/1998	IMAGE DECODING APPARATUS USING PIXEL VALUES FROM AT LEAST THREE REFERENCE PIXELS	CHEN,WENI
09091678	6275530		150	08/11/1998	IMAGE CODER AND IMAGE CODING METHOD, AND IMAGE DECODER AND IMAGE DECODING METHOD, AND QUANTIZATION CONTROL METHOD AND INVERSE QUANTIZATION CONTROL METHOD, AND DATA RECORDING MEDIUM	BRITTON,H
09095604	6078695		250	06/11/1998	SHAPE CODING METHOD AND SHAPE DECODING METHOD	TADAYON,I
09107457	6334187		150	06/30/1998	INFORMATION EMBEDDING METHOD, INFORMATION EXTRACTING METHOD, INFORMATION EMBEDDING APPARATUS, INFORMATION EXTRACTING APPARATUS, AND RECORDING MEDIA	BARRON JR
09118991	6426975		150	07/20/1998	IMAGE PROCESSING METHOD, IMAGE PROCESSING APPARATUS AND DATA RECORDING MEDIUM	VO,TUNG
09176953	6654541		150	10/22/1998	IMAGE CODING METHOD, AND IMAGE DECODING METHOD	CHIEU,PO L
09176955	Not Issued		161	10/22/1998	IMAGE CODING METHOD AND IMAGE DECODING	JOHNSON,T

					METHOD	
09241886	6483521		150	02/01/1999	IMAGE COMPOSITION METHOD, IMAGE COMPOSITION APPARATUS, AND DATA RECORDING MEDIA	LUU,MATTH
09256308	6229930		250	02/24/1999	IMAGE PROCESSING APPARATUS, IMAGE PROCESSING METHOD, IMAGE DATA STRUCTURE, AND DATA STORAGE MEDIA	COUSO,YON
09263202	6272179		150	03/05/1999	IMAGE CODING APPARATUS, IMAGE DECODING APPARATUS, IMAGE CODING METHOD, IMAGE DECODING METHOD, AND DATA STORAGE MEDIUM	VO,TUNG
09341472	6690724		150	08/17/1999	IMAGE PROCESSING METHOD, IMAGE PROCESSING DEVICE, AND DATA RECORDING MEDIUM	SENFI,BEHR
09531150	6438254		150	03/17/2000	MOTION VECTOR DETECTION METHOD, MOTION VECTOR DETECTION APPARATUS, AND DATA STORAGE MEDIA	MANCUSO,I
09537867	6292513		250	03/29/2000	Method and apparatus for encoding and decoding images	PHILIPPE,GI
09537868	6347151	20020009225	150	03/29/2000	IMAGE SIGNAL CONVERTING/ENCODING METHOD AND APPARATUS	ROGERS,SC
09549380	6590936		150	04/13/2000	CODED DATA TRANSFORM METHOD, TRANSCODING METHOD, TRANSCODING SYTEM, AND DATA STORAGE MEDIA	DIEP,NHON
09561343	6263116		150	04/28/2000	Methods, apparatuses and program recording media for image coding and image	DANG,DUY

					decoding	
09643607	6516095		150	08/24/2000	DECODING APPARATUS FOR SHAPE SIGNAL	CHEN,WENI
09644749	6560372		150	08/24/2000	DECODING APPARATUS BASED ON PIXEL VALUE MOTION VECTORS AND SHAPE SIGNAL MOTION VECTORS	CHEN,WENI
09644845	6445826	20020041715	150	08/24/2000	DECODING APPARATUS FOR SHAPE AND PIXEL VALUE SIGNAL	CHEN,WENI
09651120	6487314		150	08/30/2000	IMAGE DECODING APPARATUS USING PIXEL VALUES FROM AT LEAST THREE REFERENCES PIXELS	CHEN,WENI
09667241	6999673		150	09/22/2000	MOVING PICTURE DECODING METHOD, MOVING PICTURE DECODING APPARATUS AND PROGRAM RECORDING MEDIUM	DUGGINS,A
09695227	6757332		150	10/25/2000	VIDEO DECODING METHOD, VIDEO DECODING APPARATUS, AND PROGRAM STORAGE MEDIA	DIEP,NHON
09709422	6836273		150	11/13/2000	MEMORY MANAGEMENT METHOD, IMAGE CODING METHOD, IMAGE DECODING METHOD, IMAGE DISPLAY METHOD, MEMORY MANAGEMENT APPARATUS, AND MEMORY MANAGEMENT PROGRAM STORAGE MEDIUM	TUNG,KEE
09749911	6597814	20010001019	150	12/29/2000	IMAGE CODING FOR TRANSMITTING INFORMATION OF SHAPE, PIXEL VALUE, AND CODING MODES	CHEN,WENI
09750042	6661928	20010016006	150	12/29/2000	IMAGE APPARATUS FOR ENCODING SHAPE SIGNALS	CHEN,WENI
09777667	6813388	20010014177	150	02/07/2001	IMAGE CODING	DO,ANH

					METHOD, IMAGE CODING APPARATUS AND DATA STORAGE MEDIUM	

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Inventor Name Search Result

Your Search was:

Last Name = KONDO
First Name = SATOSHI

Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner
07134109	Not Issued		161	12/17/1987	MOTOR-DRIVEN FUEL PUMP	CROYLE,
07296963	5007964		150	01/13/1989	CALCIUM CARBONATE, CALCIUM CARBONATE PIGMENT, PROCESS FOR PREPARING SAME, COATING COMPOSITION FOR INFORMATION RECORDING PAPER AND INFORMATION RECORDING PAPER	KLEMAN
07753977	Not Issued		166	09/03/1991	THREE-DIMENSIONAL MODELING APPARATUS AND METHOD	BAYERL,
07921213	Not Issued		166	07/29/1992	MOTOR CONTROL UNIT WITH THERMAL STRUCTURE	STERRET
08181581	5526272		150	01/13/1994	DATA PREPARATION DEVICE AND METHOD FOR PREPARING DATA FOR MACHINING WORK	RUGGIER
08229131	Not Issued		166	04/18/1994	MOTOR CONTROL UNIT WITH THERMAL STRUCTURE	STERRET
08260266	5506948		150	06/14/1994	TOPOLOGY MAINTAINING GEOMETRIC DATA CORRECTING METHOD AND SYSTEM EMPLOYING SAME	JANKUS,
08271642	5569988		150	07/07/1994	A BRUSHLESS MOTOR DRIVE CIRCUIT INCLUDING A LINEAR AMPLIFIER FOR SENDING AN OUTPUT	MARTIN,

					SIGNAL BASED UPON THE DETECTED BACK ELECTROMOTIVE FORCE VOLTAGE	
08336511	Not Issued		166	11/09/1994	ENCODING METHOD, AN ENCODING APPARATUS, A DECODING METHOD AND A DECODING APPARATUS FOR A MOVING PICTURE	AU,AMEI
08354886	5671343		150	12/09/1994	THREE-DIMENSIONAL MODELING APPARATUS AND METHOD UTILIZING THE EXTRACTION OF TOPOLOGICAL DATA, AS FROM TWO-DIMENSIONAL DRAWINGS	BAYERL,
08437380	5508908		150	05/09/1995	MOTOR CONTROL UNIT WITH THERMAL STRUCTURE	STERRET
08493150	5737481		150	06/21/1995	INFORMATION RECORDING METHOD, INFORMATION RECORDING APPARATUS AND INFORMATION RECORDING MEDIUM	CHEVALI
08630777	5621465		150	04/10/1996	COLOR IMAGE ENCODER	AU,AMEI
08685857	5818179		150	07/24/1996	BRUSHLESS MOTOR DRIVE CIRCUIT INCLUDING A LINEAR AMPLIFIER FOR SENDING AN OUTPUT SIGNAL BASED UPON THE DETECTED BACK ELECTROMOTIVE FORCE VOLTAGE	MARTIN,
08753501	5927071		150	11/26/1996	HYDRAULIC PRESSURE SOURCE APPARATUS AND VEHICLE HEIGHT CONTROL APPARATUS	LOPEZ,FI
08777671	5786070		250	12/20/1996	CROSS-LINKED POLYURETHANE RESIN SHEET AND LAMINATED PRODUCT EMPLOYING IT	NAKARA
08809074	Not Issued		164	03/14/1997	CALCIUM-BASE FILLER AND PROCESS FOR PRODUCING THE SAME	BRUNSM
08841619	6303669		150	04/30/1997	FLEXIBLE POLYURETHANE FOAM	SERGENT

08854758	5815209		250	05/12/1997	ENCODING METHOD, AN ENCODING APPARATUS, A DECODING METHOD AND A DECODING APPARATUS FOR A MOVING PICTURE	AU,AMEI
08874341	5789330		150	06/13/1997	VAPOR DEPOSITION MATERIAL	MARCAN
08877403	5996978		150	06/17/1997	HYDRAULIC DAMPER FOR VEHICLE	SCHWAR
08976449	6259739		150	11/25/1997	MOVING PICTURE VARIABLE BIT RATE CODING APPARATUS, MOVING PICTURE VARIABLE BIT RATE CODING METHOD, AND RECORDING MEDIUM FOR MOVING PICTURE VARIABLE BIT RATE CODING PROGRAM	VO,TUNC
09121110	6556546		150	07/23/1998	MULTIPLEX DATA TRANSMITTING AND RECEIVING EQUIPMENT	PEZZLO,J
09122899	6618396		150	07/28/1998	DATA TRANSMITTING DEVICE, DATA RECEIVING DEVICE, AND DATA RECORDING DEVICE	TSEGAYI
09269519	6180347		250	04/02/1999	METHOD FOR MONITORING TRANSCRIPTIONAL SYNTHESIS OF RNA	HORLICK
09270002	6519656	20020152337	150	03/16/1999	DATA TRANSMISSION SYSTEM FOR APPENDING A CORRESPONDING ID CODE TO RESPECTIVE ITEMS OF AUXILIARY INFORMATION AND GENERATING A LIST OF THE AUXILIARY INFORMATION	CAO,CHU
09288825	6442621		150	04/09/1999	SYSTEM FOR PROCESSING COMMAND SENT FROM EXTERNAL CONTROLLER BY EXECUTING INFORMATION STORED JUST BEFORE AND AFTER THE PROCESSING AND INFORMING BACK TO CONTROLLER THE CONTENTS OF COMMAND	DU,THUA

09310572	Not Issued		161	05/12/1999	DATA TRANSMISSION APPARATUS AND METHOD THEREFOR	PAULA,C
09357887	6532262		150	07/21/1999	CODING METHOD AND APPARATUS AND RECORDER	BUGG,GE
09413326	6678227		150	10/06/1999	SIMULTANEOUS RECORDING AND REPRODUCTION APPARATUS AND SIMULTANEOUS MULTI-CHANNEL REPRODUCTION APPARATUS	HUBER,P
09515499	Not Issued		161	02/29/2000	Data transmission and reception system	PHAN,TR
09573203	6395381		150	05/19/2000	VAPOR DEPOSITION MATERIAL	VO,HAI
09581222	6429364		150	06/23/2000	DATA TRANSMITTING/RECEIVING DEVICE AND METHOD	DONELS,
09588186	6625322		150	06/07/2000	IMAGE CODING APPARATUS	COUSO,J
09599606	6308123		150	06/23/2000	Vehicle steering control system	CHIN,GA
09622406	6934464		150	08/17/2000	VIDEO/AUDIO DATA RECORDING APPARATUS, VIDEO/AUDIO DATA REPRODUCING APPARATUS, VIDEO/AUDIO DATA RECORDING/REPRODUCING APPARATUS, VIDEO/AUDIO DATA RECORDING METHOD, VIDEO/AUDIO DATA REPRODUCING METHOD, AND PROGRAM RECORDING PROGRAM RECORDING MEDIUM	DUGGINS
09623273	6792762		150	10/01/2001	GAS TURBINE EQUIPMENT AND GAS TURBINE COOLING METHOD	KIM,TAE
09645579	6748113		250	08/25/2000	NOISE DETECTING METHOD, NOISE DETECTOR AND IMAGE DECODING APPARATUS	WU,JING
09654783	6856759		150	09/01/2000	RECORDING APPARATUS	CHEVALI

					AND CODING APPARATUS	
09700845	6697886		150	11/21/2000	DATA RECEIVER AND DATA TRANSMITTER	HUYNH,K
09719051	Not Issued		161	12/07/2000	Image processing method and image processing apparatus	HALLENI HUBER,JI
09764381	6885775	20010022857	150	01/19/2001	IMAGE PROCESSING METHOD AND IMAGE PROCESSING APPARATUS	AZARIAN
09775272	6895172	20010016107	150	02/07/2001	VIDEO SIGNAL REPRODUCING APPARATUS	TRAN,TH
09830920	7653289		150	07/31/2001	STREAM CONVERTING METHOD AND APPARATUS THEREOF, AND STREAM RECORDING METHOD AND APPARATUS THEREOF	JONES,HI
09834928	6968122	20010055358	150	04/16/2001	RECORDER AND TRANSMITTER	ONUAKU
09913287	6755888	20020174745	150	11/02/2001	FACILITY FOR REDUCING METAL OXIDE, METHOD FOR OPERATING THE FACILITIES AND MOLDINGS AS RAW MATERIAL TO BE CHARGED TO REDUCTION FURNACE	ANDREW
09930443	Not Issued	20020015851	161	08/16/2001	Polysilazane composition and coated molded product having its cured material	ROBERTS
09931066	Not Issued	20020025990	161	08/17/2001	Flexible polyurethane foam	SERGENT
09981794	7116372	20020047919	150	10/19/2001	METHOD AND APPARATUS FOR DEINTERLACING	NATNAE
09982788	7031393	20020067432	150	10/22/2001	BLOCK DISTORTION DETECTION METHOD, BLOCK DISTORTION DETECTION APPARATUS, BLOCK DISTORTION REMOVAL METHOD, AND BLOCK DISTORTION REMOVAL APPARATUS	LEE,RICH

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Hisense v. VideoLabs
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Date: 4/30/2010

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Time: 11:17:36

Inventor Name Search Result

Your Search was:

Last Name = HAGAI
First Name = MAKOTO

Application#	Patent#	PG Pub#	Status	Date Filed	Title	Examiner Nam
08600584	5844618		250	02/13/1996	METHOD AND APPARATUS FOR TELECINE IMAGE CONVERSION	LEE,MICHAEI
08869862	Not Issued	20010012405	168	06/05/1997	IMAGE CODING METHOD, IMAGE DECODING METHOD, IMAGE CODING APPARATUS, IMAGE DECODING APPARATUS USING THE SAME METHODS, AND RECORDING MEDIUM FOR RECORDING THE SAME METHODS	MILLER,MAR
09025816	6414972	20020057705	150	02/19/1998	SIGNAL DECODING METHOD, SIGNAL DECODING APPARATUS, SIGNAL MULTIPLEXING METHOD, SIGNAL MULTIPLEXING APPARATUS, AND RECORDING MEDIUM	PHAM,BREND
09176955	Not Issued		161	10/22/1998	IMAGE CODING METHOD AND IMAGE DECODING METHOD	JOHNSON,TIM
09261351	6621932	20020048406	150	03/03/1999	VIDEO IMAGE DECODING AND COMPOSING METHOD AND VIDEO IMAGE DECODING AND COMPOSING	MARIAM,DAN

					APPARATUS	
09397924	6539054		150	09/17/1999	IMAGE OUTPUT APPARATUS,IMAGE REPRODUCTION METHOD, OBJECT COMPOSITION APPARATUS, OBJECT COMPOSITION METHOD, AND DATA STORAGE MEDIUM	VO,TUNG
09450590	6587985		150	11/30/1999	DATA TRANSMISSION METHOD, DATA TRANSMISSION APPARATUS, DATA RECEIVING APPARATUS, AND PACKET DATA STRUCTURE	BRITT,CYNTH
09450670	6891799		150	11/30/1999	DATA TRANSMISSION METHOD AND DEVICE	HO,DUC
09458009	6580756		150	12/10/1999	DATA TRANSMISSION METHOD, DATA TRANSMISSION SYSTEM, DATA RECEIVING METHOD, AND DATA RECEIVING APPARATUS	RAO,ANAND
09739648	7051110	20010013128	150	12/20/2000	DATA RECEPTION/PLAYBACK METHOD & APPARATUS AND DATA TRANSMISSION METHOD & APPARATUS FOR PROVIDING PLAYBACK CONTROL FUNCTIONS	PRIETO,BEAT
09820311	6925097	20010038649	150	03/29/2001	DECODER, DECODING METHOD, MULTIPLEXER, AND MULTIPLEXING METHOD	HAN,CLEMEN
10227456	6684354	20030009717	150	08/26/2002	DATA TRANSMISSION METHOD, DATA TRANSMISSION APPARATUS, DATA RECEIVING APPARATUS, AND PACKET DATA	BRITT,CYNTH

					STRUCTURE	
10250456	Not Issued	20040052507	93	07/02/2003	MOVING PICTURE CODING METHOD AND MOVING PICTURE DECODING METHOD	CZEKAJ,DAVI
10341350	7437009	20030133169	150	01/14/2003	IMAGE CODING APPARATUS, IMAGE CODING METHOD, AND IMAGE CODING PROGRAM FOR CODING AT LEAST ONE STILL FRAME WITH STILL FRAME CODING HAVING A HIGHER QUALITY THAN NORMAL FRAME CODING OF OTHER FRAMES	CHEN,WENPE
10415329	7664182	20040081241	150	04/29/2003	PICTURE CODING AND DECODING APPARATUSES AND METHODS PERFORMING VARIABLE LENGTH CODING AND DECODING ON A SLICE HEADER STREAM AND ARITHMETIC CODING AND DECODING ON A SLICE DATA STREAM	LEE,Y
10416002	7126989	20040032908	150	05/06/2003	IMAGE CODING METHOD AND IMAGE DECODING METHOD	PHILIPPE,GIM
10432872	7209520	20040028132	150	05/28/2003	MIVING PICTURE ENCODING METHOD AND MOVING PICTURE DECODING METHOD	PHILIPPE,GIM
10456842	6732313	20030226094	150	06/09/2003	DATA TRANSMISSION METHOD	BRITT,CYNTH
10468119	7664180	20040086044	150	08/15/2003	MOVING PICTURE CODING METHOD AND MOVING PICTURE DECODING METHOD FOR PERFORMING INTER PICTURE PREDICTION CODING AND INTER PICTURE PREDECTION	LEE,Y

					DECODING USING PREVIOUSLY PROCESSED PICTURES AS REFERENCE PICTURES	
10468203	7362807	20040086047	150	08/18/2003	MOTION VECTOR CODING METHOD AND MOTION VECTOR DECODING METHOD	RAO,ANAND
10473322	7394853	20040218674	150	09/29/2003	MOTION VECTOR CODING METHOD AND MOTION VECTOR DECODING METHOD	DIEP,NHON
10473350	Not Issued	20040233995	41	09/30/2003	MOVING IMAGE CODING METHOD AND MOVING IMAGE DECODING METHOD	CZEKAJ,DAVI
10475655	7327788	20040233988	150	10/23/2003	MOTION VECTOR DERIVATION METHOD, DYNAMIC IMAGE ENCODING METHOD, AND DYNAMIC IMAGE DECODING METHOD	VO,TUNG
10478010	7505518	20050031030	150	11/17/2003	PICTURE ENCODING METHOD AND IMAGE DECODING METHOD	CZEKAJ,DAVI
10478184	7167591	20040146212	150	11/19/2003	IMAGE ENCODING METHOD AND IMAGE DECODING METHOD	KASSA,YOSEI
10478185	7305035	20050099522	150	11/19/2003	VARIABLE LENGTH ENCODING METHOD AND VARIABLE LENGTH DECODING METHOD	VO,TUNG
10478484	7310373	20040151248	150	11/21/2003	MOVING PICTURE CODING METHOD, AND MOVING PICTURE DECODING METHOD	SENFI,BEHRO
10479831	7095896	20040184538	150	12/08/2003	IMAGE ENCODING METHOD AND IMAGE DECODING METHOD	PATEL,KANJI
10480038	6967600	20040174278	150	12/09/2003	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
10480047	Not	20040146109	161	12/09/2003	Method for calculation	ANYIKIRE,CH

	Issued				motion vector	
10480928	Not Issued	20040136461	41	12/16/2003	Motion vector calculating method	FINDLEY,CHF
10480932	7515635	20040146105	150	12/16/2003	MOVING PICTURE CODING METHOD AND A MOVING PICTURE DECODING METHOD	DIEP,NHON
10481012	7206347	20050058206	150	11/09/2004	IMAGE CODING METHOD AND IMAGE DECODING METHOD	DIEP,NHON
10481277	Not Issued	20040184544	100	12/19/2003	VARIABLE LENGTH ENCODING METHOD AND VARIABLE LENGTH DECODING METHOD	FINDLEY,CHF
10483813	Not Issued	20040190615	161	01/15/2004	Moving image encoding method, moving image decoding method, and data recording medium	REKSTAD,ERI
10487533	Not Issued	20040234143	161	02/23/2004	Picture coding method and picture decoding method	FINDLEY,CHF
10489363	Not Issued	20040247190	161	03/12/2004	Image encoding method and image decoding method	NEWMAN,MIC
10490366	Not Issued	20040264570	41	03/23/2004	Moving picture encoding method, moving picture decoding method, and recording medium	ANYIKIRE,CH
10491153	7308145	20050105809	150	03/26/2004	MOVING PICTURE CODING METHOD AND MOVING PICTURE DECODING METHOD	ROGERS,SCO
10492975	Not Issued	20040247031	161	04/16/2004	Motion vector detection method	ANYIKIRE,CH
10494753	Not Issued	20050015248	168	05/05/2004	Variable length coding method and variable length decoding method	KOONTZ,TAM
10500291	Not Issued	20050117642	161	06/29/2004	Moving picture coding method, decoding method, data stream, data recording medium and program	ROBERTS,JES
10601706	6918077	20040102932	150	06/24/2003	DATA TRANSMISSION METHOD AND DATA TRANSMISSION APPARATUS	BRITT,CYNTH

10945881	7124333	20050053093	150	09/22/2004	RETRANSMISSION PACKET STRUCTURE HAVING MULTIPLE SEQUENCE NUMBERS	BRITT,CYNTH
11110916	6954157	20050190085	150	04/21/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11110921	6992605	20050185853	150	04/21/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11110922	7161508	20050185854	150	04/21/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11268667	7109898	20060071831	150	11/08/2005	VARIABLE LENGTH CODING METHOD AND VARIABLE LENGTH DECODING METHOD	MAI,LAM
11392734	7583731	20060188017	150	03/30/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	PHILIPPE,GIM
11453062	7184598	20060269154	150	06/15/2006	PICTURE CODING METHOD AND PICTURE DECODING METHOD	PATEL,KANJI

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2007_1865
Kiyofumi ABE et al.	:	**Confirmation No. 3207**
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel
PICTURE CODING METHOD AND PICTURE DECODING METHOD	:	**Mail Stop: AMENDMENT**

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the provisions of 37 CFR 1.56, 1.97 and 1.98, Applicants request consideration of the reference listed on attached Form PTO/SB/08 and any additional information identified below in paragraph 3. A legible copy of each reference listed on the Form PTO/SB/08 is enclosed, except a copy is not provided for:

[] each U.S. Patent and U.S. Patent application publication;

[] each reference previously cited in prior parent application Serial No._____.

1a. [X] This Information Disclosure Statement is submitted:

within three months of the filing date (or of entry into the National Stage) of the above-entitled application, **or**

before the mailing of a first Office Action on the merits or the mailing of a first Office Action after the filing of an RCE,

and thus no certification and/or fee is required.

The USPTO is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17, and 1.492, which may be required by this paper to Deposit Account No. 23-0975.

1b. [] This Information Disclosure Statement is submitted

after the events of above paragraph 1a and prior to the mailing date of a final Office Action or a Notice of Allowance or an action which otherwise closes prosecution in the application, and thus:

(1) [] the certification of paragraph 2 below is provided, or

(2) [] the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

1c. [] This Information Disclosure Statement is submitted:

after the mailing date of a final Office Action or Notice of Allowance or action which otherwise closes prosecution in the application, and prior to payment of the issue fee, and thus:

the certification of paragraph 2 below is provided, and

the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

2. It is hereby certified

a. [X] that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Statement, or

b. [] that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the Statement.

3. [] Consideration of the following list of additional information (including any copending or abandoned U.S. application, prior uses and/or sales, etc.) is requested.

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4. For each non-English language reference listed on the attached Form PTO/SB/08, reference is made to:

a. [] a full or partial English language translation submitted herewith,

b. [] a foreign patent office search report (in the English language) submitted herewith,

c. [] the concise explanation contained in the specification of the present application at page ,

d. [X] the concise explanation set forth in the attached English language abstract,

e. [] the concise explanation set forth below or on a separate sheet attached to the reference:

5. [X] A Notice of Allowance in the corresponding Korean application is enclosed citing the reference listed on the attached Form PTO/SB/08.

6. [X] Statement Under 37 CFR 1.704(d)

Each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign Patent Office in a counterpart application, and this communication was not received by any individual designated in §1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
2010.05.03 14:13:43 -04'00'
By _____
Kenneth W. Fields
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May 3, 2010

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Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: May 3, 2010

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA						
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	BA	2002-0006250	1/2002	KR			abstract	
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	DATE CONSIDERED

*Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

(19) KOREAN INTELLECTUAL PROPERTY OFFICE

KOREAN PATENT ABSTRACTS

(11)Publication number: 1020020006250 A
(43)Date of publication of application: 19.01.2002

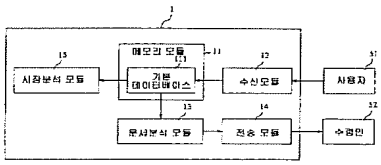
(21)Application number: 1020000039809
(22)Date of filing: 12.07.2000
(30)Priority:

(51)Int. Cl G06F 19/00

(71)Applicant: PCYI NETWORK CORPORATION
(72)Inventor: CHI-MIN CHENG

(54) SYSTEM AND METHOD FOR NETWORK MARKETING WITH DIVINATION

(57) Abstract:



PURPOSE: A system and a method for the network marketing based on the divination are provided to raise the sale in proportion to the member number by increasing the desire of the user wishing to access to the network marketing system. CONSTITUTION: The system has a memory module (11), a receiving module(12), a luck analysis module (13), a transmitting module(14) and a market analysis module(15). The memory module stores the basic information. The receiving module receives the basic information of the receiver(52) inputted by the user(51) and stores the basic data in a basic database(111). The luck analysis module finds out a luck analysis result by carrying out the luck analysis relating to the basic data of the receiver. The transmitting module transmits the luck analysis result to the receiver in order to increase the desire of the receiver wishing to access to the network marketing system. The market analysis module decides the condition requested by the receiver according to the contents including to the basic database.

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Legal Status
Date of request for an examination (00000000)
Notification date of refusal decision ( )
Final disposal of an application (withrawal)
Date of final disposal of an application (20050713)
Patent registration number ( )
Date of registration ( )
Number of opposition against the grant of a patent ( )
Date of opposition against the grant of a patent ( )
Number of trial against decision to refuse ( )
Date of requesting trial against decision to refuse ( )
Date of extinction of right ( )

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(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(51) 。Int. Cl. [7]
G06F 19/00

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(21) 출원번호 10-2000-0039809
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(71) 출원인 피씨와이아이 네트워크 코포레이션
린 와이- 푸
대만, 타이페이, 룬- 후아 사우스 로드, 섹션 2, 레인 200, 18번, 1층

(72) 발명자 치- 민첸
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(74) 대리인 김윤배
이범일

심사청구 : 없음

(54) 점술을 중심으로 하는 네트워크 마케팅 시스템 및 그 방법

요약

메모리 모듈, 수신모듈, 운세분석모듈 및 전송모듈을 구비하는 점술을 중심으로 하는 네트워크 마케팅 시스템을 개시한다. 메모리 모듈은 기본 데이터베이스를 저장한다. 수신모듈은 사용자가 입력한 수령인의 기본 데이터를 수신하고 이 기본 데이터를 기본 데이터베이스에 저장한다. 운세분석모듈은 기본 데이터에 따라 수령인에 관한 운세분석을 수행하여 운세분석결과를 구한다. 전송모듈은 수령인에게 운세분석결과를 전송하여 점술을 중심으로 하는 마케팅 시스템에 접속하고자 하는 수령인의 소망을 증가시킨다. 본 발명은 점술을 중심으로 하는 네트워크 마케팅 방법도 제공한다.

대표도
도 1

명세서

도면의 간단한 설명

도 1은 본 발명의 바람직한 일실시예에 따른 점술을 중심으로 하는 네트워크 마케팅 시스템의 구조를 도시한 도면이다.

도 2는 본 발명의 바람직한 일실시예에 따른 점술을 중심으로 하는 네트워크 마케팅 방법을 나타내는 흐름도이다.

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발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 네트워크 시스템에 관한 것으로서, 특히 접속을 중심으로 하는 네트워크 마케팅 시스템 및 그 방법에 관한 것이다.

네트워크 기술이 빠르게 발전함에 따라, 상행위를 용이하게 하기 위하여 네트워크를 사용하는 것이 상업상의 새로운 모델이 되었다. 그러나, 극심한 경쟁으로 인하여, 사람들에게 회사를 알리고 고객으로 하여금 소비를 유도하는 것이 네트워크 상에서 상행위를 수행하는 상인에게는 중요한 과제가 되었다. 종래 기술에 있어서, 다양한 형태의 매체를 사용하여 광고지를 우송하거나 대량의 광고서신을 발송하여 회사 및 상품을 소개하는 것이 관례적이다. 이 방법에 의하면 비용이 많이 들뿐만 아니라 관심을 가지고 있는 고객들에게 효과적으로 상품을 소개할 수 없다. 또한, 어떤 고객들은 광고서신을 수신하는 것을 좋아하지 않을 수도 있어서, 이러한 형태의 광고가 부정적인 효과를 초래할 수도 있다.

현재 개량된 마케팅 방법들 중에서, 새로운 방법은 새로운 회원들을 추천하도록 회원들을 격려하여 사용자의 수를 늘리는 것이다. 예를 들면, 회사가 웹사이트 상에서 계속적으로 복권을 발행하고 회원이 이 복권에 당첨되면, 당첨된 회원을 추천한 회원도 보너스를 받도록 하는 것이다. 따라서, 기존의 회원들은 웹사이트의 회원에 가입하도록 자기 친구들을 더욱 적극적으로 소개할 것이다.

이러한 형태의 개량된 마케팅이 많은 사용자를 끌어들일 수는 있지만, 회원가입을 하고자 하는 사용자들의 실제 이유는 회사가 제공하는 상품에 있는 것이 아니라 상품과는 직접적으로 관련이 없는 이벤트들에 있다. 따라서, 그 수혜의 폭이 회원수의 증가와 동일한 속도로 성장하지는 않게 된다.

다른 개량 마케팅 방법은 자기 친구들을 추천하도록 회원들을 위한 간단하면서 무료인 이벤트들을 제공하여 더 많은 사용자를 끌어들이는 것이다. 예를 들면, 웹사이트는 자기 친구들에게 보내도록 회원들을 위한 무료 전자 생일카드를 제공할 수 있다. 다른 예로는, 네트워크 잡지 제공자가 독자들로 하여금 몇 개의 주요기사를 다른 사람들에게 무료로 발송하도록 허용함으로써, 그 잡지를 광고한다는 목적을 달성하는 것이다.

그러나 이 개량된 마케팅 방법들은 몇 가지 단점을 가지고 있다. 먼저, 전자카드의 내용이 상품과 직접 관련이 없는 경우, 판매량이 회원들의 수와 비례하여 증가하지 않는다. 또한, 이 방법들은 회원들의 친구로 하여금 회원에 가입하도록 직접적으로 권유하는 것은 아니므로, 잠재적인 사용자들의 기본 데이터를 얻을 수 없어서, 회원들이 필요로 하는 상품이나 서비스를 분석하고 제공하기 위하여 현존하는 회원들의 데이터만을 남기게 된다. 그리고, 현존하는 회원들 이외의 잠재적인 사용자들의 기본 데이터를 구한 경우에도, 회원들이 전자카드를 발송할 때 네트워크 접속이 보장되는 것은 아니기 때문에 이 데이터가 실제적인 것이 아닐 수 있고 따라서 구해진 데이터가 대개 쓸모없게 된다.

이에 따라, 더 효율적으로 광고를 할 수 있는 마케팅 방법을 제공하게 되면 회원수의 증가와 함께 판매량이 늘어나게 되며, 현재의 네트워크 산업에서 중요한 과제인 잠재적 사용자들의 요구사항을 더 높은 신뢰성으로 분석하기 위하여 잠재적인 사용자들의 기본 데이터를 얻을 수 있다.

발명이 이루고자 하는 기술적 과제

본 발명의 목적은 접속을 중심으로 하는 네트워크 마케팅 시스템에 접속하고자 하는 사용자의 소망을 증가시킴으로써 회사의 판매고가 회원수에 비례하여 성장할 수 있는 접속을 중심으로 하는 네트워크 마케팅 방법 및 그 시스템을 제공하는 것이다.

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본 발명의 다른 목적은 높은 신뢰성을 가지고 사용자의 기본 데이터를 얻을 수 있어서 고객이 정말로 원하는 것을 분석할 수 있는 접속을 중심으로 하는 네트워크 마케팅 방법 및 그 시스템을 제공하는 것이다.

상기 목적을 달성하기 위하여, 본 발명에 따른 접속을 중심으로 하는 네트워크 마케팅 시스템은 메모리 모듈, 수신모듈, 운세분석모듈 및 전송모듈을 구비한다. 메모리 모듈은 기본 데이터베이스를 저장한다. 수신모듈은 사용자가 입력한 수령인의 기본 데이터를 수신하고 이 기본 데이터를 기본 데이터베이스에 저장한다. 운세분석모듈은 기본 데이터에 따라 수령인에 관한 운세분석을 수행하여 운세분석결과를 구한다. 전송모듈은 수령인에게 운세분석결과를 전송하여 접속을 중심으로 하는 마케팅 시스템에 접속하고자 하는 수령인의 소망을 증가시킨다. 본 발명은 접속을 중심으로 하는 네트워크 마케팅 방법도 제공한다.

본 발명의 다른 실시예는 수신단계, 데이터 저장단계, 운세분석단계, 전송단계 및 시장분석단계를 구비하는 접속을 중심으로 하는 네트워크 마케팅 방법을 제공한다. 수신단계는 사용자가 입력한 수령인의 기본 데이터를 수신한다. 데이터 저장단계는 기본 데이터를 저장한다. 운세분석단계는 수령인의 기본 데이터에 따라 운세분석을 수행한다. 전송단계는 수령인에게 운세분석결과를 전송한다. 시장분석단계는 사용자의 기본 데이터에 따라 사용자의 요구를 파악하여 시장의 경향을 판단하는 기초자료로 활용한다.

발명의 구성 및 작용

본 발명의 특징과 장점 및 실시예들이 본 발명을 제한하고자 하는 것은 아닌 첨부도면과 함께 이하의 설명으로부터 명확해 질 것이다.

도면들에서 동일한 부재에는 동일한 참조번호를 부여한다.

도 1에 도시된 바와 같이, 본 발명에 따른 접속을 중심으로 하는 네트워크 마케팅 시스템(1)은 메모리 모듈(11)과 수신모듈(12)과 운세분석 모듈(13)과 전송모듈(14) 및 시장분석모듈(15)을 구비하는데, 메모리 모듈(11)은 모든 사용자의 기본 데이터를 기록한 기본 데이터베이스(111)를 저장하고 있다.

사용자가 접속을 중심으로 하는 네트워크 마케팅 시스템(1)에 로그온한 경우, 수령인(52)의 기본 데이터를 입력할 수 있다. 수신모듈(12)이 사용자(51)에 의해 입력된 수령인(52)의 기본 데이터를 수신한 후, 이 기본 데이터는 메모리 모듈(11)의 기본 데이터베이스(111)에 저장된다. 예를 들면, 사용자(51)는 자기 친구의 성명, 생일 및 혈액형을 접속을 중심으로 하는 네트워크 마케팅 시스템(1)에 입력할 수 있다. 수신모듈(12)이 기본 데이터를 얻은 경우, 사용자의 친구, 즉 수령인(52)의 기본 데이터는 기본 데이터베이스(111)에 저장된다. 메모리 모듈(11)은 메모리 기능을 가지는 어떠한 장치라도 포함할 수 있는데, 예를 들면 하드디스크 드라이브, 플래시 메모리 또는 DRAM일 수 있다.

수령인(52)의 기본 데이터를 입력할 때, 기본 데이터베이스(111)에 이 수령인에 관한 이전 데이터가 없다면, 사용자(51)는 수령인을 위한 적어도 하나의 기본 데이터를 입력하여야 한다. 그러나, 수령인의 기본 데이터가 이미 입력되어 있다면, 사용자(51)는 새로운 기본 데이터를 입력하거나, 기존의 기본 데이터를 수정하거나 또는 기본의 기본 데이터로부터 사용하고자 하는 기본 데이터를 단순히 선택할 수 있다. 따라서, 사용자(51)는 본 발명의 접속을 중심으로 하는 네트워크 마케팅 시스템(1)을 더 편리하게 사용할 수 있다. 예컨대, 사용자(51)가 주소록에 수령인(52)의 기본 데이터를 설정하게 되면, 사용자(51)가 수령인(52)의 기본 데이터를 입력하고자 할 때, 주소록으로부터 간단히 그 데이터를 선택할 수 있다. 이렇게 하면 서비스가 더욱 편리해지고 사용자(51)가 점점 더 기꺼이 사용하게 될 것이다.

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한편, DRAM만이 메모리 모듈(11)로 사용되는 경우, 사용자(51)가 점술을 중심으로 하는 네트워크 마케팅 시스템(1)에서 로그아웃한 후에 입력된 기본데이터를 계속하여 저장할 수 없다는 것에 주목하여야 한다. 사용자(51)가 다음 번에 네트워트에 로그온하는 경우, 수령인(51)의 기본 데이터를 다시 입력하여야 하며 이전에 입력된 기본 데이터를 선택할 수 없어서, 매우 불편하게 된다. 그러므로, 메모리 모듈(11)로 DRAM만을 사용하는 경우에도 하드디스크 드라이브와 같이 장시간 동안 데이터를 저장할 수 있는 메모리 장치를 메모리 모듈(11)에 추가할 수 있다.

운세분석 모듈(13)은 기본 데이터에 따라 수령인(52)의 운세를 분석한다. 예를 들면, 수령인(52)의 혈액형이나 성명이 수령인의 성격의 장단점을 분석하는데 사용될 수 있으며, 생일은 점성술을 사용하여 그 주의 운세를 예측하는데 사용될 수 있다. 운세분석 타입은 사용자(51)가 입력한 기본 데이터에 의해 결정된다는 것을 이해하여야 한다. 예컨대, 사용자(51)가 수령인(52)의 생일을 입력하지 않았다면, 그 수령인(52)에 대하여 점성술을 수행할 수 없다. 따라서, 본 시스템은 사용자가 기본 데이터를 입력할 때 어떤 타입의 운세분석이 수행될지를 사용자에게 상기시킬 수 있다.

전송모듈(14)은 수령인(52)의 기본 데이터에 따라 운세분석 모듈(13)에 의해 수령인(52)에 대한 운세분석에서 얻어진 운세분석결과를 소정의 형태로 전송한다. 예를 들면, 사용자(51)가 수령인(52)에게 운세분석 결과를 전송할 때 수령인의 생일에 근접한 경우, 운세분석결과는 전자카드의 형태로 수령인(52)에게 보내질 수 있다. 이렇게 하면 수령인(52)에게 강렬한 인상을 줄 수 있어서, 광고효과가 증가된다.

시장분석 모듈(15)은 메모리 모듈(11)에 포함되어 있는 기본 데이터베이스(111)의 내용에 따라 수령인(52)의 요구를 판단한다. 예컨대, 어떤 회사가 운세분석결과를 구비하는 전자카드를 제공하며 이 전자카드를 웹사이트 상에서 친구에게 발송하는 서비스를 하는 경우에, 남성 사용자는 다른 남성 친구들보다는 여성 친구들에게 전자카드를 더 많이 발송한다는 것을 발견할 수도 있다. 그러면, 서비스 제공자는 이러한 사용자들을 위하여 더 낭만적인 전자카드를 디자인할 수 있다.

도 2를 참조하면, 본 발명에 따른 점술을 중심으로 하는 네트워크 마케팅 방법(2)의 바람직한 실시예는 수신단계(21), 데이터 저장단계(22), 운세분석 단계(23), 전송단계(24) 및 시장분석단계(25)를 구비한다. 수신단계는 사용자(51)가 입력한 수령인(52)의 기본 데이터, 예컨대 성명이나 생일 등을 수신한다. 데이터 저장단계(22)는 수령인(52)의 기본 데이터를 저장한다. 운세분석단계(23)는 기본 데이터에 따라 수령인(52)에 대한 운세분석을 수행한다. 운세분석결과는 전송단계(24)에서 수령인(52)에게 전송된다. 시장분석단계(25)는 시장의 경향을 참조하기 위하여 기본 데이터에 따라 수령인(52)의 요구를 분석한다.

수령인의 기본 데이터가 메모리 모듈에 저장되므로, 본 시스템의 제공자는 사용자들의 요구를 알 수 있어서 상품이나 서비스를 개선할 수 있다. 예컨대, 어떤 회사가 운세분석결과를 구비하는 전자카드를 제공하며 이 전자카드를 웹사이트 상에서 친구에게 발송하는 서비스를 하는 경우에, 남성 사용자는 다른 남성 친구들보다는 여성 친구들에게 전자카드를 더 많이 발송한다는 것을 발견할 수도 있다. 그러면, 서비스 제공자는 이러한 사용자들을 위하여 더 낭만적인 전자카드를 디자인할 수 있다.

본 발명의 점술을 중심으로 하는 네트워크 마케팅 방법 및 시스템에 따르면, 수령인에게 운세분석결과를 전송하는 것은 통상적인 광고가 아니며, 운세분석은 특히 각 개인에 대하여 행해져 각 개인이 개성화된 운세분석을 받게 된다. 그러므로, 수령인에게는 매우 매력적인 것이 된다. 따라서, 수령인은 서비스 제공자에 대하여 나쁜 인상을 받지 않는다. 이렇

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게 하면, 점술을 중심으로 하는 네트워크 마케팅 시스템과 관련하여 수령인의 관심을 크게 높일 수 있어서, 광고 효과를 상당히 증가시킨다.

본 발명의 점술을 중심으로 하는 네트워크 마케팅 방법 및 시스템에 따르면, 구해진 기본 데이터는 운세분석용으로 사용되므로 더 신뢰할 수 있다. 서비스 제공자는 이렇게 더 신뢰할 수 있는 기본 데이터를 사용하여 더 정확한 시장분석을 할 수 있어서 잠재 고객들의 요구를 판단할 수 있고 상품 및 서비스의 내용을 개선할 수 있다. 예컨대, 수령인이 대부분 청소년들이라면 이들을 주요 잠재고객으로 간주하여 그에 맞도록 서비스를 바꿀 수 있다. 대부분의 사용자가 자기 친구에게 재물과 관련된 운세분석을 보내는 경우에는, 사용자와 수령인이 재정적인 정보에 더 관심이 있다는 것을 서비스 제공자가 알게 된다. 따라서, 서비스 제공자는 투자나 재테크 및 재정적인 뉴스에 대한 서비스를 더 많이 제공할 수 있다.

본 발명의 점술을 중심으로 하는 네트워크 마케팅 방법 및 시스템은 다양한 타입 및 내용의 네트워크 서비스 제공자와 결합할 수 있다. 예를 들면, 본 발명은 운세분석 서비스를 제공하여 친구를 사귀는 것이 목적인 웹사이트와 결합할 수 있다. 사용자가 입력한 수령인의 기본 데이터가 친구를 사귀는 웹사이트에 의해 수신되는 경우, 그 기본 데이터는 본 발명의 점술을 중심으로 하는 네트워크 마케팅 시스템으로 전송되어 운세분석을 수행한다. 분석이 완료되면, 그 결과가 수령인에게 전송된다. 따라서, 친구를 사귀는 웹사이트는 점술을 중심으로 하는 네트워크 마케팅 시스템 자체를 구비할 필요가 없이 운세분석결과를 제공할 수 있다. 본 발명의 점술을 중심으로 하는 네트워크 마케팅 시스템은 개인 데이터에 따라 잠재 고객들의 성향을 친구를 사귀는 웹사이트 제공자에게 제공할 수 있어서, 서비스 제공자가 그 서비스를 개선하거나 서비스를 증가시킬 수 있다. 따라서, 이렇게 하면, 친구를 사귀는 웹사이트에 접속하려는 수령인을 더 많이 끌어들일 수 있을 뿐만 아니라 서비스 제공자에게 정확한 관심사와 사용자 및 수령인의 요구사항을 제공할 수 있다.

본 발명이 상기 실시예를 참조하면서 설명되었으나, 당업자라면 첨부된 본 발명의 청구범위 및 정신으로부터 벗어나지 않으면서 다양한 변경이 가능하다는 것을 이해할 수 있을 것이다.

발명의 효과

상술한 바와 같이, 본 발명은 점술을 중심으로 하는 네트워크 마케팅 시스템에 접속하고자 하는 사용자의 소망을 증가시킴으로써 회사의 판매고가 회원수에 비례하여 성장할 수 있으며, 또한 높은 신뢰성을 가지고 사용자의 기본 데이터를 얻을 수 있어서 고객이 정말로 원하는 것을 분석할 수 있다.

(57) 청구의 범위

청구항 1.

점술을 중심으로 하는 네트워크 마케팅 시스템으로서,

기본 데이터베이스를 저장하는 메모리 모듈;

사용자가 입력한 수령인의 기본 데이터를 수신하고 이 기본 데이터를 기본 데이터베이스에 저장하는 수신모듈;

기본 데이터에 따라 수령인에 관한 운세분석을 수행하여 운세분석결과를 구하는 운세분석 모듈;

점술을 중심으로 하는 네트워크 마케팅 시스템에 접속하고자 하는 수령인의 소망을 증가시키기 위하여 수령인에게 운세분석결과를 전송하는 전송모듈을 구비하는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 시스템.

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청구항 2.

제1항에 있어서, 기본 데이터베이스에 포함되어 있는 내용에 따라 수령인의 요구사항을 판단하는 시장분석 모듈을 더 구비하는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 시스템.

청구항 3.

제1항에 있어서, 상기 메모리 모듈은 하드디스크 드라이브를 구비하는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 시스템.

청구항 4.

제1항에 있어서, 상기 메모리 모듈은 플래시 메모리를 구비하는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 시스템.

청구항 5.

제1항에 있어서, 상기 메모리 모듈은 DRAM을 구비하는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 시스템.

청구항 6.

제1항에 있어서, 상기 운세분석결과는 전자카드의 형태로 수령인에게 보내지는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 시스템.

청구항 7.

점술을 중심으로 하는 네트워크 마케팅 방법으로서,

사용자가 입력한 수령인의 기본 데이터를 수신하는 수신단계;

기본 데이터를 저장하는 데이터 저장단계;

기본 데이터에 따라 수령인에 관한 운세분석을 수행하여 운세분석결과를 구하는 운세분석단계;

점술을 중심으로 하는 네트워크 마케팅 시스템에 접속하고자 하는 수령인의 소망을 증가시키기 위하여 수령인에게 운세분석결과를 전송하는 전송단계를 구비하는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 방법.

청구항 8.

제7항에 있어서, 기본 데이터베이스에 포함되어 있는 내용에 따라 수령인의 요구사항을 판단하는 시장분석단계를 더 구비하는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 방법.

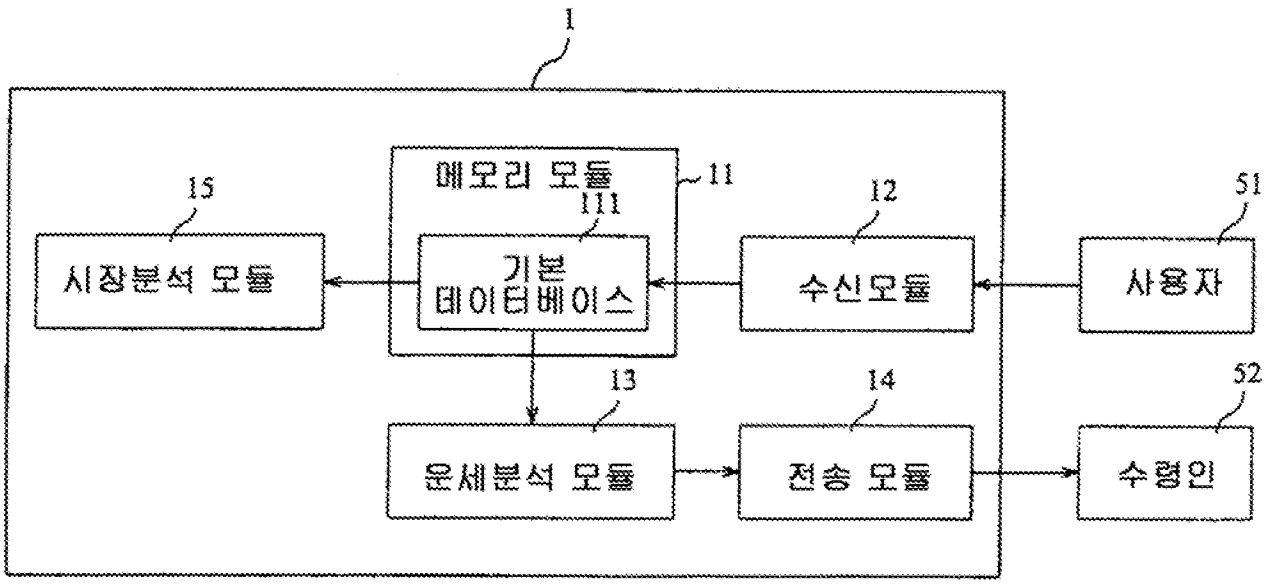
청구항 9.

제7항에 있어서, 상기 운세분석결과는 전자카드의 형태로 수령인에게 보내지는 것을 특징으로 하는 점술을 중심으로 하는 네트워크 마케팅 방법.

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도면

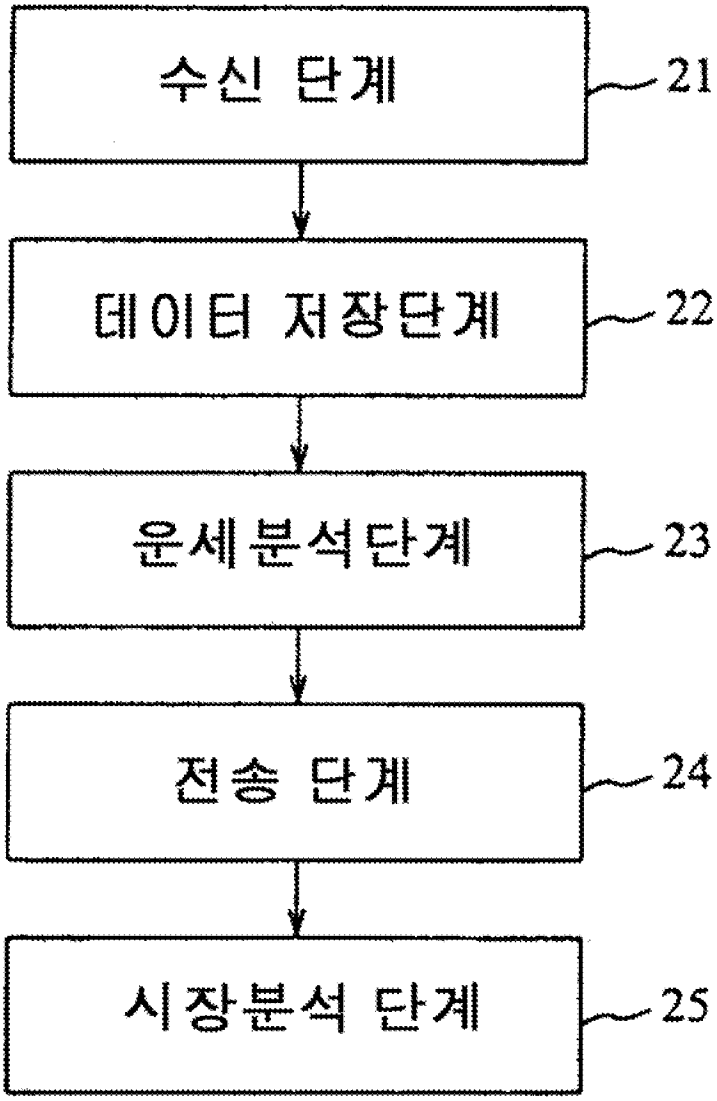
도면 1



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도면 2

2



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Electronic Acknowledgement Receipt

EFS ID:	7537113
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	Picture coding method and picture decoding method
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	Kenneth Wayne Fields/sarah pedersen
Filer Authorized By:	Kenneth Wayne Fields
Attorney Docket Number:	2007_1865
Receipt Date:	03-MAY-2010
Filing Date:	26-OCT-2007
Time Stamp:	16:26:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed (SB/08)	AttachZ1_IDS_P03015667.pdf	283482 3c0608bb64086521927afd0c43691e8155fdec86	no	4

Warnings:	
Information:	

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The PDF file has been signed with a digital signature and the legal effect of the document will be based on the contents of the file not the digital signature.

2	NPL Documents	AttachZ2.pdf	77317 2cda8376b279475130eb9146f82153fdc267089a	no	2

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:

3	Foreign Reference	AttachZBA.pdf	1812520 b6ca5ed7347d25ce35d907d28d272929f9bc4d0e	no	9

Warnings:

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Information:

Total Files Size (in bytes):	2173319

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2007_1865
Kiyofumi ABE et al.	:	**Confirmation No. 3207**
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel
PICTURE CODING METHOD AND PICTURE DECODING METHOD	:	**Mail Stop: AMENDMENT**

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the provisions of 37 CFR 1.56, 1.97 and 1.98, Applicants request consideration of the reference listed on attached Form PTO/SB/08 and any additional information identified below in paragraph 3. A legible copy of each reference listed on the Form PTO/SB/08 is enclosed, except a copy is not provided for:

[] each U.S. Patent and U.S. Patent application publication;

[] each reference previously cited in prior parent application Serial No._____.

1a. [X] This Information Disclosure Statement is submitted:

within three months of the filing date (or of entry into the National Stage) of the above-entitled application, **or**

before the mailing of a first Office Action on the merits or the mailing of a first Office Action after the filing of an RCE,

and thus no certification and/or fee is required.

The USPTO is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17, and 1.492, which may be required by this paper to Deposit Account No. 23-0975.

1b. [] This Information Disclosure Statement is submitted

after the events of above paragraph 1a and prior to the mailing date of a final Office Action or a Notice of Allowance or an action which otherwise closes prosecution in the application, and thus:

(1) [] the certification of paragraph 2 below is provided, or

(2) [] the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

1c. [] This Information Disclosure Statement is submitted:

after the mailing date of a final Office Action or Notice of Allowance or action which otherwise closes prosecution in the application, and prior to payment of the issue fee, and thus:

the certification of paragraph 2 below is provided, and

the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

2. It is hereby certified

a. [X] that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Statement, or

b. [] that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the Statement.

3. [] Consideration of the following list of additional information (including any copending or abandoned U.S. application, prior uses and/or sales, etc.) is requested.

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4. For each non-English language reference listed on the attached Form PTO/SB/08, reference is made to:

a. [] a full or partial English language translation submitted herewith,

b. [] a foreign patent office search report (in the English language) submitted herewith,

c. [] the concise explanation contained in the specification of the present application at page ,

d. [X] the concise explanation set forth in the attached English language abstract,

e. [] the concise explanation set forth below or on a separate sheet attached to the reference:

5. [X] A Korean Notice of Allowance is enclosed citing the reference listed on the attached Form PTO/SB/08.

6. [] Statement Under 37 CFR 1.704(d)

Each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign Patent Office in a counterpart application, and this communication was not received by any individual designated in §1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
By 2010.03.09 14:15:46 -05'00'
Kenneth W. Fields
Registration No. 52,430
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Facsimile (202) 721-8250
March 9, 2010

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Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: March 9, 2010

ATTY DOCKET NO. 2007_1865	**SERIAL NO.** 11/976,758
APPLICANT Kiyofumi ABE et al.	
FILING DATE October 26, 2007	**GROUP** 2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA						
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	BA	2002-0006149	1/2002	KR			abstract	
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	DATE CONSIDERED

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Simple Abstract (1 - 1 of 1)

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1. VARIABLE LENGTH CODER OF MOTION PICTURE COMPRESSION CODING APPARATUS

Abstract :

PURPOSE: A variable length coder of a motion picture compression coding apparatus, which variable-length-encodes image information passing through a low transmission line allowed by a transmission channel, is provided to recover loss due to error generated during variable length encoding.

CONSTITUTION: A variable length coder of a motion picture compression coding apparatus includes a luminance block pattern processor(100) for processing a coded block pattern for luminance with a VLC code, an MCBPC(110) for defining a macro block type and coded block pattern for chrominance with the VLC code, and a motion vector difference processor (120). The variable length coder further has a luminance DCT DC size processor(130), a chrominance DCT DC size processor(140), and an input buffer(201) for buffering a DCT coefficient subjected to zigzag scan and outputting it to a run length coder(202) that outputs control information required for VLC coding. The variable length coder also has the first, second, third and fourth switches(203,204,205,206) for selectively various control signals to switch paths from the run length coder.

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요약

본 발명은 동영상압축 부호화장치의 가변 길이 부호화기를 제공하기 위한 것으로, 이러한 본 발명은 동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화하고, 가변 길이 부호화시 에러 손실을 복구할 수 있으며 역방향 가변 길이 부호화(Reverse Variable Length Coding)와 호환성을 가지도록 한다.

대표도
도 2

색인어
동영상압축부호화, 가변길이부호화, intra프레임, inter프레임, DCT계수, RLC, escape모드, TCOEF테이블, RVLC, MPEG4, H.263

명세서

도면의 간단한 설명

도1은 국제 표준 MPEG4의 부호화기 블럭 구성도,

도2는 본 발명에 의한 동영상압축 부호화장치의 가변 길이 부호화기 블럭 구성도,

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도3은 MPEG4 인코드시 escape 모드 처리 작용을 보인 도면,

도4는 본 발명에 의한 다른 실시예 동영상압축 부호화장치의 가변 길이 부호화의 출력을 위한 장치 블럭 구성도,

도5는 도4의 TCOEF VLC/RVLC ESC. 수행부의 내부 블럭 구성도,

도6은 도5의 intra/inter TCOEF VLC & VLC ESC. 수행부의 내부 블럭 구성도,

도7은 도5의 intra/inter TCOEF RVLC & RVLC ESC. 수행부의 내부 블럭 구성도.

< 도면의 주요 부분에 대한 부호의 설명>

100: CBPY 110: MCBPC

120: MVD 130: 휘도 DCT DC 크기 처리부

140: 색차 DCT DC 크기처리부 201: 입력버퍼

202: RLC 203- 206: 제1 내지 제4 스위치

207: intra TCOEF/MPEG4 intra ESC. 수행부

208: inter TCOEF/MPEG4 inter ESC. 수행부

209: TCOEF/H.263 ESC. 수행부

210: intra RVLC TCOEF/ESC. FLC 수행부

211: inter RVLC/TCOEF ESC. FLC 수행부

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 화상전화, 화상회의, PCS(개인휴대통신)용 PDA(Personal Digital Assistant; 휴대용개인단말기), mobile용 전화 및 멀티미디어 장치, IMT- 2000(3세대 이동통신 시스템) 영상 서비스를 위한 장치 등에서 동영상 압축 부호화 장치에 관한 것으로, 특히 동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화하고, 가변 길이 부호화시 에러 손실을 복구할 수 있으며 역방향 가변 길이 부호화(Reverse Variable Length Coding)와 호환성을 가질 수 있도록 한 동영상압축 부호화장치의 가변 길이 부호화기에 관한 것이다.

영상을 부호화하는 가변 길이 부호화 장치에는 기존의 MPEG1,MPEG2, H.261, H.263 등 여러가지 가변 길이 부호화 방법이 제안되어 왔다. 특히 HDTV(High Density TeleVision)의 표준 방식인 MPEG2의 가변 길이 부호화 장치의 특징은, 대용량의 영상 정보를 빠른 시간 안에 처리하기 위해, 헤더 정보와 영상 데이터를 구분하여 헤더 정보는 그대로 부호화하고 영상데이터는 여러 가지 병렬 구조로 구성되는데, 동시에 여러 개의 영상 데이터를 처리하는 것이다.

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도1은 국제 표준 MPEG4의 부호화기 블럭 구성을 보인다. 기존의 MPEG2와는 달리 모양 정보 부호화를 추가로 수행하는 것이 가장 큰 차이점이다.

입력된 영상 데이터를 블럭 단위로 움직임 추정(Motion Estimation)을 수행하여 움직임 벡터를 생성하는 움직임 추정부(1)와; 상기 생성된 움직임 벡터를 이용하여 움직임 보상(Motion Compensation)을 수행하는 움직임 보상부(2)와; 상기 움직임보상부(2)에서 움직임 보상이 되지 않은 부분을 영상 정보 부호화(Texture coding)를 수행하는 영상정보 부호화부(4)와; 상기 움직임 보상부(2)에서 움직임 보상된 VOP(Video Object Plane; MEPG4에서 임의의 모양을 가지는 부호화 단위)와, 상기 영상정보 부호화부(4)에서 부호화된 대상물의 내부 정보가 가산되어 현재 영상 바로 이전 영상의 VOP인 이전 VOP를 재구성하는 이전VOP 재구성부(6)와; 입력된 영상의 모양 정보에 대해 모양 정보 부호화(Shape coding)를 수행하는 모양정보부호화부(9)와; 상기 움직임추정부(1)에서 추정된 움직임 정보와, 상기 영상 정보 부호화부(4)에서 부호화된 내부 영상 정보 및 상기 모양 정보 부호화부(9)에서 부호화된 모양 정보를 다중화하는 다중화부(11)와; 상기 다중화부(11)에서 다중화된 비트스트림을 버퍼링한 후 출력하는 출력 버퍼(12)로 구성된다.

상기와 같은 국제 표준 MPEG4의 부호화기의 작용을 설명하면 다음과 같다.

먼저, 영상 화면이 입력되면, 블럭 단위로 움직임 추정(Motion Estimation)을 하고, 여기에서 생성된 움직임 벡터를 전송한다. 그런 후 움직임 벡터로 움직임 보상(Motion Compensation)을 한 후 움직임 보상이 되지 않은 부분을 영상 정보 부호화(Texture coding)를 수행한다.

그리고 영상의 모양 정보에 대해 모양 정보 부호화(Shape coding)를 수행한다. 모양정보 부호화부(9)의 출력 신호는 VOP 부호화기가 적용되는 분야에 따라 사용 여부가 가변되는 것으로, 점선으로 표시된 바와 같이, 모양 정보 부호화부(9)의 출력신호를 움직임 추정부(1), 움직임 보상부(2) 및 영상 정보 부호화부(4)에 입력시켜 움직임 추정, 움직임 보상 및 영상 정보 부호화(texture coding)하는 데 사용할 수 있다.

움직임추정부(1)에서 추정된 움직임 정보와, 영상 정보 부호화부(4)에서 부호화된 내부 영상 정보 및 모양 정보 부호화부(9)에서 부호화된 모양 정보는 다중화부(11)에서 다중화된 후, 출력 버퍼(12)를 통해 비트스트림으로 송신된다.

이렇게 다중화부(11)로 입력되어 송신될 데이터는, 움직임 추정부(1)로부터의 움직임 벡터 정보, 영상정보 부호화부(4)로부터의 매크로블럭 헤더 정보, 영상 데이터 정보 등으로서, 이러한 정보의 대다수가 가변 길이 부호화 코드를 사용하고 있다.

그런데 HDTV의 대용량의 영상 정보를 실시간에 처리해야 하는 경우가 아니라, 전송 채널이 허용하는 저 전송 선로에 대해서도 처리할 수 있는 비교적 적은 영상 정보(CIF: 352*288, QCIF: 176*144)를 효과적으로 가변 길이 부호화해야 하는 경우, 국제 표준 MPEG4의 부호화에서 영상 정보 부호화(texture coding)된 영상 정보를 가변 길이로 부호화하는 장치는 저 전송선로에 대한 비교적 적은 양의 영상 정보를 처리할 수 있도록 구현되어야 한다.

발명이 이루고자 하는 기술적 과제

이에 본 발명은 상기와 같은 종래 기술의 필요에 의해 제안된 것으로, 본 발명의 목적은

동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화하고, 가변 길이 부호화시 에러 손실을 복구할 수 있으며 역방향 가변 길이 부호화(Reverse Variable Length Coding)와 호환성을 가지도록 한 동영상압축 부호화장치의 가변 길이 부호화기를 제공하는 데 있다.

상기와 같은 목적을 달성하기 위하여 본 발명에 의한 동영상압축 부호화장치의 가변 길이 부호화기는,

영상정보 부호화(texture coding)에서 나오는 매크로블럭 헤더 정보 중 휘도 블럭 패턴(Coded Block Pattern for Luminance; CBPY)을 intra_inter 플래그(intra 프레임 부호화와 inter 프레임 부호화를 선택하기 위한 제어 신호)에 따라 VLC 코드로 처리하는 휘도 블럭 패턴 처리부와;

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매크로블럭 헤더 정보 중 매크로블럭 타입(MB type)과 CBPC(Coded Block Pattern for Chrominance)의 정보를 VLC 코드로 정의하는 MCBPC와;

매크로블럭 헤더 정보 중의 하나인 이전의 움직임 벡터와 현재의 움직임 벡터 간의 차이값을 VLC 코드로 처리하는 움직임 벡터 차이값 처리부(Motion Vector Difference; MVD)와;

매크로블럭 헤더 정보 중의 하나인 휘도 DCT DC 크기(dct_dc_size_lum.)를 위한 VLC 코드를 처리하는 휘도 DCT DC 크기 처리부와;

매크로블럭 헤더 정보 중의 하나인 색차 DCT DC 크기(dct_dc_size_chro.)를 위한 VLC 코드를 처리하는 색차 DCT DC 크기 처리부와;

영상정보 부호화(texture coding) 과정에서 zigzag scan을 거친 DCT 계수(TCOEF)를 입력받아 버퍼링하고, escape 모드를 고려한 VLC를 하기 위해 필요한 클럭 레이트(clock rate)에 맞추어 RLC로 출력하는 입력 버퍼와;

상기 입력버퍼에서 출력되는 DCT AC 계수를 RLC(Run Length Coding)를 수행하여, VLC 부호화하기 위해 필요한 제어 정보를 출력하는 RLC와;

역방향 가변 길이 부호화(RVLC)와 가변 길이 부호화(VLC)를 선택하기 위한 제어 신호(RVLC 플래그), H.263 TCOEF VLC를 선택하기 위한 제어 신호(H.263 플래그), intra 프레임 부호화와 inter 프레임 부호화를 선택하기 위한 제어 신호(intra_inter 플래그)를 선택적으로 입력받아, 역방향 가변 길이 부호화(RVLC), intra TCOEF 가변 길이 부호화(VLC), inter TCOEF VLC, H.263 TCOEF VLC가 선택적으로 수행되도록 상기 RLC로부터의 경로를 각각 스위칭하는 제1 내지 제4 스위치와;

상기 제1 내지 제3 스위치에 의해 선택되면 MPEG4 intra TCOEF를 intra escape 모드로 VLC를 수행하는 intra TCOEF/MPEG4 intra ESC. 수행부와;

상기 제1 내지 제3 스위치에 의해 선택되면 MPEG4 inter TCOEF를 inter escape 모드로 VLC를 수행하는 inter TCOEF/MPEG4 inter ESC. 수행부와;

상기 제1 및 제2 스위치에 의해 선택되면 H.263 TCOEF를 inter 프레임 부호화를 사용하여 escape 모드를 수행하는 TCOEF/H.263 ESC. 수행부와;

상기 제1, 제2, 제4 스위치에 의해 선택되면 intra TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 intra RVLC TCOEF / ESC. FLC 수행부와;

상기 제1, 제2, 제4 스위치에 의해 선택되면 inter TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 inter RVLC TCOEF / ESC. FLC 수행부로 이루어짐을 그 기술적 구성상의 특징으로 한다.

상기와 같은 목적을 달성하기 위하여 본 발명에 의한 동영상압축 부호화장치의 가변 길이 부호화기는,

RVLC 플래그에 따라 normal VLC 기능과 RVLC 기능을 수행하고, VLC escape 모드시 FLC를 수행하는 TCOEF VLC/RVLC ESC. 수행부와;

상기 TCOEF VLC/RVLC ESC. 수행부에서 출력되는 가변 길이 부호화 코드와 고정 길이 부호화(FLC) 코드를 블럭(block) 단위로 하나의 비트열로 램(TCOEF VLC/RVLC 버퍼)에 쓰기 위해 재구성하는 TCOEF 비트 스트림 생성기와
;

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상기 TCOEF 비트 스트림 생성기에서 출력되는 TCOEF 비트열을 저장하는 TCOEF VLC/RVLC 버퍼(램)으로 이루어짐을 그 기술적 구성상의 특징으로 한다.

발명의 구성 및 작용

이하, 상기와 같은 본 발명에 의한 동영상압축 부호화장치의 가변 길이 부호화기를 첨부된 도면에 의거 상세히 설명하면 다음과 같다.

본 발명은 MPEG4 simple profile에 맞는 가변 길이 부호화(Variable Length Coding; VLC)와 H.263의 가변 길이 부호화, 그리고 에러 전송에 효과적인 역방향 가변 길이 부호화(Reversible Variable Length Coding; RVLC)의 복합 구조를 이루고 있고, simple profile에서는 모양 정보 부호화는 고려하지 않고 있다.

MPEG4 simple profile 부호화기의 가변 길이 부호화시 사용되는 가변길이 부호화 테이블(VLC 테이블)이 [표 1]에 구성된다.

[표 1]

	VLC Table Name	Index 개수	비트수	비고
1	mcbpc for I- VOPs	9	1- 9	
2	mcbpc for P- VOPs	21	1- 9	
3	cbpy for four non- transparent blocks	16	2- 6	
4	MVD	65	1- 13	
5	dct_dc_size_luminance	9	2- 7	Not N- bit
6	dct_dc_size_chrominance	9	2- 7	Not N- bit
7	Intra Lum. And Chr. TCOEF	113	3- 13	
8	Inter Lum. And Chr. TCOEF	113	3- 13	
9	RVLC for intra TCOEF	169	4- 16	
10	RVLC for inter TCOEF	169	4- 16	

그리고 H.263 VLC 테이블 구성이 [표 2]에 보인다.

[표 2]

	VLC Table Name	Index 개수	비트수	MPEG4와 비교
1	mcbpc for I- VOPs	9	1- 9	동일
2	mcbpc for P- VOPs	21	1- 9	동일
3	cbpy for four blocks	16	2- 6	동일
4	MVD	65	1- 13	구성이 다름
5	Inter TCOEF	113	3- 13	동일(escape 다름)

도2는 본 발명에 의한 동영상압축 부호화장치의 가변 길이 부호화기 일 실시예 블럭 구성을 보인다.

MPEG4 simple profile에 맞는 가변 길이 부호화와 H.263의 가변 길이 부호화, 그리고 에러 전송에 효과적인 역방향 가변 길이 부호화(Reversible Variable Length Coding; RVLC)의 복합적인 구조를 가진다.

즉, 영상정보 부호화(texture coding)에서 나오는 매크로블럭 헤더 정보와 영상 데이터를 구분하여 처리하게 되는데, 매크로블럭 헤더 정보 중 휘도 블럭 패턴(Coded Block Pattern for Luminance; CBPY)을 intra_inter 플래그(intra 프레임 부호화와 inter 프레임 부호화를 선택하기 위한 제어 신호)에 따라 VLC 코드로 처리하는 휘도 블럭 패턴 처리부(100)와; 매크로블럭 헤더 정보 중 매크로블럭 타입(MB type)과 CBPC(Coded Block Pattern for Chrominance)의 정보를 VLC 코드로 정의하는 MCBPC(110)와; 매크로블럭 헤더 정보 중의 하나인 이전의 움직임 벡터와 현재의 움직임 벡터 간의 차이값을 VLC 코드로 처리하는 움직임 벡터 차이값 처리부(Motion Vector Difference; MVD)(120)

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와; 매크로블럭 헤더 정보 중의 하나인 휘도 DCT DC 크기(dct_dc_size_lum.)를 위한 VLC 코드를 처리하는 휘도 DC T DC 크기 처리부(130)와; 매크로블럭 헤더 정보 중의 하나인 색차 DCT DC 크기(dct_dc_size_chro.)를 위한 VLC 코드를 처리하는 색차 DCT DC 크기 처리부(140)와; 영상정보 부호화(texture coding) 과정에서 zigzag scan을 거친 DCT 계수(TCOEF)를 입력받아 버퍼링하고, escape 모드를 고려한 VLC를 하기 위해 필요한 클럭 레이트(clock rate)에 맞추어 RLC(203)로 출력하는 입력 버퍼(201)와; 상기 입력버퍼(201)에서 출력되는 DCT AC 계수를 RLC(Run Length Coding)를 수행하여, VLC 부호화하기 위해 필요한 제어 정보를 출력하는 RLC(202)와; 역방향 가변 길이 부호화(RVLC)와 가변 길이 부호화(VLC)를 선택하기 위한 제어 신호(RVLC 플래그), H.263 TCOEF VLC를 선택하기 위한 제어 신호(H.263 플래그), intra 프레임 부호화와 inter 프레임 부호화를 선택하기 위한 제어 신호(intra_inter 플래그)를 선택적으로 입력받아, 역방향 가변 길이 부호화(RVLC), intra TCOEF 가변 길이 부호화(VLC), inter TCOEF VLC, H.263 TCOEF VLC가 선택적으로 수행되도록 상기 RLC(202)로부터의 경로를 각각 스위칭하는 제1 내지 제4 스위치(203- 206)와; 상기 제1 내지 제3 스위치(203- 205)에 의해 선택되면 MPEG4 intra TCOEF를 intra escape 모드로 VLC를 수행하는 intra TCOEF/MPEG4 intra ESC. 수행부(207)와; 상기 제1 내지 제3 스위치(203- 205)에 의해 선택되면 MPEG4 inter TCOEF를 inter escape 모드로 VLC를 수행하는 inter TCOEF/MPEG4 inter ESC. 수행부(208)와; 상기 제1 및 제2 스위치(203)(204)에 의해 선택되면 H.263 TCOEF를 inter 프레임 부호화를 사용하여 escape 모드를 수행하는 TCOEF/H.263 ESC. 수행부(209)와; 상기 제1, 제2, 제4 스위치(203,204,206)에 의해 선택되면 intra TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 intra RVLC TCOEF / ESC. FLC 수행부(210)와; 상기 제1, 제2, 제4 스위치(203,204,206)에 의해 선택되면 inter TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 inter RVLC TCOEF / ESC. FLC 수행부(211)로 구성된다.

상기 RLC(202)에서 출력되는 VLC 부호화하기 위해 필요한 제어 정보는, 현재 부호화되는 0이 아닌 DCT 계수가 블럭 내의 마지막 0이 아닌 DCT 계수인 지를 나타내는 LAST, 0이 아닌 계수의 값을 나타내는 LEVEL, 부호화되는 계수 앞의 연속적인 0의 개수를 나타내는 RUN이다.

상기 제1 스위치(203)는 상기 RLC(202)에서 출력되는 제어정보(LAST, LEVEL, RUN)를 RVLC 플래그에 따라 제2 스위치(204)와 제4스위치(206) 중 하나로 스위칭하고, 상기 제2 스위치(203)는 상기 제1 스위치(203)에서 출력되는 정보를 H.263플래그에 따라 제3 스위치(205)와 상기 TCOEF/H.263 ESC. 수행부(209) 중 하나로 스위칭하며, 상기 제3 스위치(205)는 상기 제2 스위치(204)에서 출력되는 정보를 intra_inter 플래그에 따라 상기 intra TCOEF/MPEG4 intra ESC. 수행부(207)와 inter TCOEF/MPEG4 inter ESC. 수행부(208) 중 하나로 스위칭하고, 상기 제4 스위치(206)는 상기 제1 스위치(203)에서 출력되는 정보를 상기 intra_inter 플래그에 따라 상기 intra RVLC TCOEF / ESC. FLC 수행부(210)와 inter RVLC TCOEF / ESC. FLC 수행부(211) 중 하나로 스위칭한다.

상기와 같은 본 발명에 의한 동영상압축 부호화장치의 가변 길이 부호화기 일 실시예의 작용을 설명하면 다음과 같다.

입력 버퍼(201)에 입력되는 정보는 영상정보(texture) 부호화에서 나오는 계수(coefficient)로 지그재그 스캔(zigzag scan)을 거친 정보이다. 입력 버퍼(201)에서는 escape mode를 고려한 VLC를 하기 위해 필요한 클럭 레이트(clock rate)에 맞추어 계수를 RLC(202)로 읽어내고 RLC(202)는 RUN,LEVEL,LAST를 구하기 위한 RLC(Run Length Coding)를 한다.

각각의 모듈(207,208,209,210,211)을 선택하기 위해 RVLC 플래그, H.263 플래그, Intra_Inter 플래그가 이용된다.

MPEG4 Inter TCOEF VLC 테이블은 H.263 TCOEF VLC 테이블과 동일하다. 그러나 escape mode는 다르게 구성된다.

영상정보 부호화(texture coding)에서 나오는 매크로블럭 헤더 정보와 영상 데이터를 구분하여 처리하게 되는데, 매크로블럭 헤더 정보 처리 작용에 대해 설명하면, CBPY(100)는 휘도 블럭 패턴을 VLC하고, MCBPC(110)는 MB 타입과

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CBPC(Coded Block Pattern for Chrominance)의 정보를 VLC 코드로 정의한다. 그리고 MVD(120)는 이전의 움직임 벡터와 현재의 움직임 벡터의 차이값을 VLC하고, 휘도 DCT DC 크기 처리부(130)는 휘도 DCT DC 크기를 VLC하며, 색차 DCT DC 크기 처리부(140)는 색차 DCT DC 크기를 VLC한다.

이제, 영상 데이터 처리인 입력 버퍼(201)에 이어, RLC의 동작을 설명하면, 입력 버퍼(201)에서 출력되는 AC 계수값을 RLC를 수행하여, LAST, RUN, LEVEL로 이루어진 일련의 EVENT들을 출력해서, VLC 부호화될 수 있도록 한다.

이때 LAST가 '0'인 경우 0이 아닌 계수가 블럭 내에 더 존재한다는 것을 의미하고, '1'인 경우 0이 아닌 계수가 블럭 내에 더 이상 존재하지 않음을 나타낸다.

이렇게 RLC를 수행하여 LAST, RUN, LEVEL을 출력하는 방법을 코드(code)로 나타내면 다음과 같다.

```
count < = count + 1 ;

if(!AC_Coefficient) begin

run_cnt < = run_cnt + 1 ;

RLC_E < = 1'b0 ;

end

else begin

run_cnt < = 0;

LEVEL_tmp < = AC_Coefficient;

RUN_tmp < = run_cnt;

if(LEVEL_tmp != 12'd0)

RLC_E < = 1'b1;

end

LEVEL < = LEVEL_tmp;

RUN < = RUN_tmp;

if(count == 65) begin - - - - - - - - (1)

LAST < = 1'b1;

LEVEL < = LEVEL_tmp;

RUN < = RUN_tmp;

RLC_E < = 1'b1;
```


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end

상기에서 input은 AC_Coefficient, count flag(64 or 65) 이고, output은 RUN, LEVEL, LAST, RLC_E(RLC_Enable) 이다. intra mode일 때, (1) 의 count == 65는 DC 값을 빼고 LAST를 결정해야 하므로 64로 바뀐다. 그러나 Intra_dc_thr에 의해 DC값을 AC값과 동일한 방법으로 하여 처리하게 되면 Intra mode이더라도 65로 처리한다. 실제 RUN, LEVEL, LAST의 정보는 RLC_Enable로써 나타낸다.

도3은 MPEG4 인코딩(encoding) 시 escape 모드 처리 작용을 보인다.

기존의 MPEG1, MPEG2, H.261, H.263에서의 escape 모드 처리 방법은 고정 길이 부호화(Fixed Length Coding; FLC)를 수행했다. 그러나 본 발명에 적용되는 MPEG4 escape mode는 도3에서 보여지는 바와 같이, 영상 압축률을 향상시키기 위해 3단계로 구분하여 처리한다. 즉, Intra TCOEF와 Inter TCOEF로 나누어져 각각 다른 테이블을 이용하며 escape mode에서도 LEVEL과 RUN값을 변화시키는 table이 각각 다르다.

그러나 신호 흐름의 내용은 유사하다. 먼저 RLC(202)에서 나오는 RUN, LEVEL, LAST값을 가지고 TCOEF VLC 테이블을 참조하여 TCOEF VLC 코드를 결정한다. 그래서 TCOEF VLC 테이블의 해당 인덱스 안에 값이 존재하면 일반적인(normal) VLC를 수행한다(ST11,ST12).

그러나 TCOEF VLC 테이블의 해당 인덱스 안에 값이 존재하지 않으면 escape mode로 선택된다. 그래서 LEVEL 값을 변화시킨다. 변화된 LEVEL값은 LEVEL+ 로, sign(LEVEL)*[abs(LEVEL)- LMAX] 이다(ST13)(제1단계). 여기서 LMAX는 주어진 쌍 (LAST,RUN)의 LEVEL의 최대값이다.

이렇게 LEVEL값을 변화시킨 후, 동일한 TCOEF VLC 테이블을 참조하여 해당 인덱스 안에 값이 존재하면 TCOEF VLC 코드를 정한다(ST14,ST15).

그러나 ST14에서 상기 TCOEF VLC 테이블에 값이 존재하지 않아, 다시 escape mode가 선택되면, RUN값을 변화시킨다. 변화된 RUN값은 RUN+ 로, RUN- (RMAX + 1) 이다(ST16)(제2단계). 여기서 RMAX는 주어진 쌍 (LAST, LEVEL)의 RUN의 최대값이다.

이렇게 RUN 값을 변화시킨 후, 다시 동일한 TCOEF VLC 테이블을 참조하여 TCOEF VLC 코드를 정한다(ST17,ST18). 그러나 상기 TCOEF VLC 테이블에 VLC 코드가 존재하지 않아 escape 모드가 선택되면, FLC(Fixed Length Coding)를 수행한다(ST19)(제3단계).

위와 같은 동작 수행은 Intra일 때와 Inter일 때 동일한 방법으로 수행되고 적용되는 테이블의 구성이 다르다.

도4는 본 발명에 의한 다른 실시예 동영상압축 부호화장치의 가변 길이 부호화의 출력을 위한 장치 블럭 구성을 보인다.

RVLC 플래그에 따라 normal VLC 기능과 RVLC 기능을 수행하고, VLC escape 모드시 FLC를 수행하는 TCOEF VLC/RVLC ESC. 수행부(300)와; 상기 TCOEF VLC/RVLC ESC. 수행부(300)에서 출력되는 가변 길이 부호화(VLC) 코드와 고정 길이 부호화(FLC) 코드를 블럭(block) 단위로 하나의 비트열로 램(500)에 쓰기 위해 재구성하는 TCOEF 비트 스트림 생성기(400)와; 상기 TCOEF 비트 스트림 생성기(400)에서 출력되는 TCOEF 비트열을 저장하는 TCOEF VLC/RVLC 버퍼(램)(500)으로 구성된다.

상기 TCOEF VLC/RVLC ESC. 수행부(300)는 도5에 도시된 바와 같이, RVLC 플래그가 VLC 수행을 나타내면 normal VLC 기능을 수행하고 VLC escape 모드시 FLC를 수행하는 intra/inter TCOEF VLC & VLC ESC. 수행부(310)와; 상기 RVLC 플래그가 RVLC 수행을 나타내면 RVLC 기능을 수행하고 RVLC escape 모드시 FLC를 수행하는 intra/inter TCOEF RVLC & RVLC ESC. 수행부(320)와; 상기 RVLC 플래그에 따라, 상기 intra/inter TCOEF VLC & V

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LC ESC. 수행부(310)에서 출력되는 intra/inter TCOEF VLC/FLC 코드와 상기 intra/inter TCOEF RVLC & RVLC ESC. 수행부(320)에서 출력되는 intra/inter TCOEF RVLC/FLC 코드를 다중화하여 VLC 코드와 FLC 코드를 상기 TCOEF 비트 스트림 생성기(400)로 출력하는 TCOEF VLC/FLC 다중화부(330)로 구성된다.

상기 intra/inter TCOEF VLC & VLC ESC. 수행부(310)는 도6에 도시된 바와 같이, TCOEF VLC 테이블에서 원하는 VLC 모드를 검색하여 그 결과에 따라 escape 모드인 지를 판단하고, escape 모드이면 타이밍 컨트롤러(313)로 escape 모드 신호를 전송하며, 판단된 모드에 따라 가변 길이 부호화를 수행하는 intra/inter TCOEF VLC 수행부(315)와; RMAX, RUN+ 를 계산하는 intra/inter RMAX, RUN+ 계산부(311)와; LMAX, LEVEL+ 를 계산하는 intra/inter LMAX, LEVEL+ 계산부(312)와; 상기 intra/inter RMAX, RUN+ 계산부(311)에서 계산된 RMAX, RUN+ 를 제공받고, 상기 intra/inter LMAX, LEVEL+ 계산부(312)에서 계산된 LMAX, LEVEL+ 를 제공받으며, 상기 intra/inter TCOEF VLC 수행부(315)로부터 전송받는 escape 모드 신호에 따라, LEVEL과 LEVEL+ 선택 기능과 RUN과 RUN+ 선택 기능을 수행하고 각 해당 블럭의 동작 제어 기능을 수행하는 타이밍 컨트롤러(313)와; 상기 타이밍 컨트롤러(313)의 제어에 따라, TCOEF 부호화를 위해 LEVEL의 절대치를 계산하는 LEVEL 절대값 계산부(314)와; 상기 intra/inter TCOEF VLC 수행부(315)에서 RUN, LEVEL, LAST를 이용한 가변 길이 부호화가 끝난 시점에, 상기 LEVEL 절대값 계산부(314)에서 출력되는 데이터를 이용하여 상기 intra/inter TCOEF VLC 수행부(315)로부터의 데이터에 사인비트(sign bit)를 첨가하는 부호비트 에더(sign bit adder)(317)와; 상기 타이밍 컨트롤러(313)의 동작 제어 신호에 따라 동작하여, MPEG4와 H.263의 DCT 계수에 대해 각각 FLC 부호화를 수행하는 MPEG4/H.263 TCOEF FLC 수행부(316)와; 상기 타이밍 컨트롤러(313)의 제어에 따라, 상기 부호 비트 에더(317)의 출력과 상기 MPEG4/H.263 TCOEF FLC 수행부(316)의 출력을 다중화하는 intra/inter TCOEF VLC/FLC 다중화부(318)로 구성된다.

상기 intra/inter TCOEF RVLC & RVLC ESC. 수행부(320)는 도7에 도시된 바와 같이, TCOEF 부호화를 위해 LEVEL의 절대치를 계산하는 LEVEL 절대값 계산부(321)와; 상기 LEVEL 절대값 계산부(321)에서 출력되는 신호, RLC 인에이블 신호, RVLC 플래그, intra_inter 플래그를 입력받아 RVLC를 수행하는 intra/inter TCOEF RVLC 수행부(322)와; 상기 intra/inter TCOEF RVLC 수행부(322)에서 출력되는 RVLC 부호화 코드에 상기 LEVEL 절대값 계산부(321)로부터의 LEVEL sign bit를 첨가하는 sign bit adder(323)와; escape 모드일 때 FLC를 수행하는 TCOEF RVLC FLC 수행부(324)와; 상기 TCOEF RVLC FLC 수행부(324)의 출력과 상기 sign bit adder(323)의 출력을, 상기 intra/inter TCOEF RVLC 수행부(322)로부터의 escape 모드 신호에 따라 다중화하여 상기 TCOEF VLC/FLC 다중화부(330)로 출력하는 intra/inter TCOEF RVLC/FLC 다중화부(325)로 구성된다.

상기와 같은 본 발명에 의한 다른 실시예 동영상압축 부호화장치의 가변 길이 부호화의 출력을 위한 장치의 작용을 설명하면 다음과 같다.

TCOEF VLC/RVLC ESC. 수행부(300)는 RVLC 플래그에 따라 normal VLC 기능과 RVLC 기능을 수행하고, VLC escape 모드시 FLC를 수행한다. TCOEF 비트 스트림 생성기(400)는 TCOEF VLC/RVLC ESC. 수행부(300)에서 출력되는 가변 길이 부호화(VLC) 코드와 고정 길이 부호화(FLC) 코드를 블럭(block) 단위로 하나의 비트열로 램(500)에 쓰기 위해 재구성한다. TCOEF VLC/RVLC 버퍼(램)(500)은 TCOEF 비트 스트림 생성기(400)에서 출력되는 TCOEF 비트열을 저장하고 원하는 곳에 출력한다.

상기 TCOEF VLC/RVLC ESC. 수행부(300)의 작용을 좀더 상세히 설명하면, 도5에 도시된 바와 같이, RVLC 플래그로 2개의 module(310)(320)을 선택한다.

즉, RVLC 플래그가 VLC 수행을 나타내면, intra/inter TCOEF VLC & VLC ESC. 수행부(310)는 normal VLC 기능을 수행하고 VLC escape 모드시 FLC를 수행한다. 그리고 상기 RVLC 플래그가 RVLC 수행을 나타내면 intra/inter TCOEF RVLC & RVLC ESC. 수행부(320)는 RVLC 기능을 수행하고 RVLC escape 모드시 FLC를 수행한다.

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intra/inter TCOEF VLC & VLC ESC. 수행부(310)는 MPEG4와 H.263에 대해 같은 TCOEF VLC 테이블을 사용하여 부호화하고, intra/inter TCOEF RVLC & RVLC ESC. 수행부(320)는 MPEG4와 H.263에 대해 다른 VLC 테이블을 사용하여 부호화한다.

TCOEF VLC/FLC 다중화부(330)는 상기 RVLC 플래그에 따라, 상기 intra/inter TCOEF VLC & VLC ESC. 수행부(310)에서 출력되는 intra/inter TCOEF VLC/FLC 코드와 상기 intra/inter TCOEF RVLC & RVLC ESC. 수행부(320)에서 출력되는 intra/inter TCOEF RVLC/FLC 코드를 다중화하여 VLC 코드와 FLC 코드를 상기 TCOEF 비트 스트림 생성기(400)로 출력한다.

그리고 상기 intra/inter TCOEF VLC & VLC ESC. 수행부(310)의 작용을 좀더 상세히 설명하면 도6에 도시된 바와 같이, intra/inter TCOEF VLC 수행부(315)는, RUN, LEVEL, LAST를 가지고 TCOEF VLC 테이블에서 먼저 인덱스를 찾고, 이 때 escape mode이면 타이밍 컨트롤러(313)로 escape 모드 신호를 전송한다. 그러면 타이밍 컨트롤러(313)는 intra/inter LMAX, LEVEL+ 계산부(312)에서 이미 찾아진 LEVEL+ 값을 선택하여 intra/inter TCOEF VLC 수행부(315)로 전송하고, 다시 TCOEF VLC 테이블을 찾도록 한다. 그 결과 escape mode가 다시 선택되면 미리 선택된 RUN+ 를 가지고 다시 TCOEF VLC 테이블을 참조한다. 그 결과 escape mode가 다시 선택되면 FLC를 수행하도록 타이밍 컨트롤러(313)에서 MPEG4/H.263 TCOEF FLC 수행부(316)를 제어하여 FLC를 수행하도록 한다.

이러한 방법은 Intra TCOEF일 때와 Inter TCOEF일 때 동일하게 적용되고, 실제 구성 테이블과 LEVEL+ 와 RUN+ 참고 표는 다르다. 그리고 Inter TCOEF VLC는 H.263 VLC와 동일하게 적용된다.

그리고 escape mode일 때 FLC 방법이 다르므로 H.263 플래그에 의해 FLC 방법을 스위칭한다.

한편 LEVEL 절대값 계산부(314)는 LEVEL 값의 절대치를 계산한다. 그리고 signbit adder(부호비트 가산기)는 intra/inter TCOEF VLC 수행부(315)의 출력 신호인 unsigned VLC code에 sign_bit를 붙인다.

intra/inter TCOEF VLC/FLC 다중화부(318)는 타이밍 컨트롤러(313)의 제어에 따라 상기 부호 비트 에더(317)의 출력과 상기 MPEG4/H.263 TCOEF FLC 수행부(316)의 출력을 다중화하여 상기 TCOEF VLC/FLC 다중화부(330)로 출력한다.

또한 intra/inter TCOEF RVLC & RVLC ESC. 수행부(320)의 작용을 상세히 설명하면, 도7에 도시된 바와 같이, RVLC는 Intra RVLC와 Inter RVLC의 테이블 구성이 다르다. RVLC가 escape mode일 때, FLC 방법은 Intra 프레임 부호화와 Inter 프레임 부호화가 모두 같다.

RVLC 부호화를 위해 선택되는 모드 정보를 이용하여 LEVEL의 sign bit를 처리하고, escape 모드일 때 FLC를 수행하며, 이들의 정보를 intra/inter TCOEF RVLC/FLC 다중호부(325)에서 상기 escape 모드임을 나타내는 신호에 따라 다중화하여 상기 TCOEF VLC/FLC 다중화부(330)로 출력한다.

발명의 효과

이상에서 살펴본 바와 같이, 본 발명 동영상압축 부호화장치의 가변 길이 부호화기는, 동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화하고, 가변 길이 부호화시 에러 손실을 복구할 수 있으며 역방향 가변 길이 부호화(Reverse Variable Length Coding)와 호환성을 가지도록 한 효과가 있다.

(57) 청구의 범위

청구항 1.

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동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화를 수행하기 위한 장치에 있어서,

영상정보 부호화(texture coding)에서 나오는 매크로블럭 헤더 정보 중 휘도 블럭 패턴(Coded Block Pattern for Luminance; CBPY)을 intra_inter 플래그(intra 프레임 부호화와 inter 프레임 부호화를 선택하기 위한 제어 신호)에 따라 VLC 코드로 처리하는 휘도 블럭 패턴 처리부와;

매크로블럭 헤더 정보 중 매크로블럭 타입(MB type)과 CBPC(Coded Block Pattern for Chrominance)의 정보를 VLC 코드로 정의하는 MCBPC와;

매크로블럭 헤더 정보 중의 하나인 이전의 움직임 벡터와 현재의 움직임 벡터 간의 차이값을 VLC 코드로 처리하는 움직임 벡터 차이값 처리부(Motion Vector Difference; MVD)와;

매크로블럭 헤더 정보 중의 하나인 휘도 DCT DC 크기(dct_dc_size_lum.)를 위한 VLC 코드를 처리하는 휘도 DCT DC 크기 처리부와;

매크로블럭 헤더 정보 중의 하나인 색차 DCT DC 크기(dct_dc_size_chro.)를 위한 VLC 코드를 처리하는 색차 DCT DC 크기 처리부와;

영상정보 부호화(texture coding) 과정에서 zigzag scan을 거친 DCT 계수(TCOEF)를 입력받아 버퍼링하고, escape 모드를 고려한 VLC를 하기 위해 필요한 클럭 레이트(clock rate)에 맞추어 RLC로 출력하는 입력 버퍼와;

상기 입력버퍼에서 출력되는 DCT AC 계수를 RLC(Run Length Coding)를 수행하여, VLC 부호화하기 위해 필요한 제어 정보를 출력하는 RLC와;

역방향 가변 길이 부호화(RVLC)와 가변 길이 부호화(VLC)를 선택하기 위한 제어 신호(RVLC 플래그), H.263 TCOEF VLC를 선택하기 위한 제어 신호(H.263 플래그), intra 프레임 부호화와 inter 프레임 부호화를 선택하기 위한 제어 신호(intra_inter 플래그)를 선택적으로 입력받아, 역방향 가변 길이 부호화(RVLC), intra TCOEF 가변 길이 부호화(VLC), inter TCOEF VLC, H.263 TCOEF VLC가 선택적으로 수행되도록 상기 RLC로부터의 경로를 각각 스위칭하는 제1 내지 제4 스위치와;

상기 제1 내지 제3 스위치에 의해 선택되면 MPEG4 intra TCOEF를 intra escape 모드로 VLC를 수행하는 intra TCOEF/MPEG4 intra ESC. 수행부와;

상기 제1 내지 제3 스위치에 의해 선택되면 MPEG4 inter TCOEF를 inter escape 모드로 VLC를 수행하는 inter TCOEF/MPEG4 inter ESC. 수행부와;

상기 제1 및 제2 스위치에 의해 선택되면 H.263 TCOEF를 inter 프레임 부호화를 사용하여 escape 모드를 수행하는 TCOEF/H.263 ESC. 수행부와;

상기 제1, 제2, 제4 스위치에 의해 선택되면 intra TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 intra RVLC TCOEF / ESC. FLC 수행부와;

상기 제1, 제2, 제4 스위치에 의해 선택되면 inter TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 inter RVLC TCOEF / ESC. FLC 수행부로 구성된 것을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

청구항 2.

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제 1 항에 있어서, 상기 RLC에서 출력되는 VLC 부호화하기 위해 필요한 제어 정보는,

현재 부호화되는 0이 아닌 DCT 계수가 블럭 내의 마지막 0이 아닌 DCT 계수인 지를 나타내는 LAST, 0이 아닌 계수의 값을 나타내는 LEVEL, 부호화되는 계수 앞의 연속적인 0의 개수를 나타내는 RUN임을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

청구항 3.

제 1 항에 있어서,

상기 제1 스위치는 상기 RLC에서 출력되는 제어정보(LAST, LEVEL, RUN)를 RVLC 플래그에 따라 상기 제2 스위치와 상기 제4스위치 중 하나로 스위칭하고, 상기 제2 스위치는 상기 제1 스위치에서 출력되는 정보를 H.263플래그에 따라 상기 제3 스위치와 상기 TCOEF/H.263 ESC. 수행부 중 하나로 스위칭하며, 상기 제3 스위치는 상기 제2 스위치에서 출력되는 정보를 intra_inter 플래그에 따라 상기 intra TCOEF/MPEG4 intra ESC. 수행부와 상기 inter TCOEF /MPEG4 inter ESC. 수행부 중 하나로 스위칭하고, 상기 제4 스위치는 상기 제1 스위치에서 출력되는 정보를 상기 intra_inter 플래그에 따라 상기 intra RVLC TCOEF / ESC. FLC 수행부와 상기 inter RVLC TCOEF / ESC. FLC 수행부 중 하나로 스위칭하는 것을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

청구항 4.

동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화 장치에 있어서,

RVLC 플래그에 따라 normal VLC 기능과 RVLC 기능을 수행하고, VLC escape 모드시 FLC를 수행하는 TCOEF VLC/RVLC ESC. 수행부와;

상기 TCOEF VLC/RVLC ESC. 수행부에서 출력되는 가변 길이 부호화 코드와 고정 길이 부호화(FLC) 코드를 블럭(block) 단위로 하나의 비트열로 램(TCOEF VLC/RVLC 버퍼)에 쓰기 위해 재구성하는 TCOEF 비트 스트림 생성기와;

상기 TCOEF 비트 스트림 생성기에서 출력되는 TCOEF 비트열을 저장하는 TCOEF VLC/RVLC 버퍼(램)으로 구성된 것을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

청구항 5.

제 4 항에 있어서, 상기 TCOEF VLC/RVLC ESC. 수행부는,

RVLC 플래그가 VLC 수행을 나타내면 normal VLC 기능을 수행하고 VLC escape 모드시 FLC를 수행하는 intra/inter TCOEF VLC & VLC ESC. 수행부와; 상기 RVLC 플래그가 RVLC 수행을 나타내면 RVLC 기능을 수행하고 RVLC escape 모드시 FLC를 수행하는 intra/inter TCOEF RVLC & RVLC ESC. 수행부와; 상기 RVLC 플래그에 따라, 상기 intra/inter TCOEF VLC & VLC ESC. 수행부에서 출력되는 intra/inter TCOEF VLC/FLC 코드와 상기 intra/inter TCOEF RVLC & RVLC ESC. 수행부에서 출력되는 intra/inter TCOEF RVLC/FLC 코드를 다중화하여 VLC 코드와 FLC 코드를 상기 TCOEF 비트 스트림 생성기로 출력하는 TCOEF VLC/FLC 다중화부로 구성된 것을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

청구항 6.

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제 5 항에 있어서,

상기 intra/inter TCOEF VLC & VLC ESC. 수행부는, MPEG4와 H.263에 대해 같은 TCOEF VLC 테이블을 사용하여 부호화하고, 상기 intra/inter TCOEF RVLC & RVLC ESC. 수행부는 MPEG4와 H.263에 대해 다른 VLC 테이블을 사용하여 부호화하는 것을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

청구항 7.

제 5 항에 있어서, 상기 intra/inter TCOEF VLC & VLC ESC. 수행부는,

TCOEF VLC 테이블에서 원하는 VLC 모드를 검색하여 그 결과에 따라 escape 모드인 지를 판단하고, escape 모드이면 타이밍 컨트롤러로 escape 모드 신호를 전송하며, 판단된 모드에 따라 가변 길이 부호화를 수행하는 intra/inter TCOEF VLC 수행부와; RMAX, RUN+ 를 계산하는 intra/inter RMAX, RUN+ 계산부와; LMAX, LEVEL+ 를 계산하는 intra/inter LMAX, LEVEL+ 계산부와; 상기 intra/inter RMAX, RUN+ 계산부에서 계산된 RMAX, RUN+ 를 제공받고, 상기 intra/inter LMAX, LEVEL+ 계산부에서 계산된 LMAX, LEVEL+ 를 제공받으며, 상기 intra/inter TCOEF VLC 수행부로부터 전송받는 escape 모드 신호에 따라, LEVEL과 LEVEL+ 선택 기능과 RUN과 RUN+ 선택 기능을 수행하고 각 해당 블럭의 동작 제어 기능을 수행하는 타이밍 컨트롤러와; 상기 타이밍 컨트롤러의 제어에 따라, TCOEF 부호화를 위해 LEVEL의 절대치를 계산하는 LEVEL 절대값 계산부와; 상기 intra/inter TCOEF VLC 수행부에서 RUN, LEVEL, LAST를 이용한 가변 길이 부호화가 끝난 시점에, 상기 LEVEL 절대값 계산부에서 출력되는 데이터를 이용하여 상기 intra/inter TCOEF VLC 수행부로부터의 데이터에 사인비트(sign bit)를 첨가하는 부호비트 에더(sign bit adder)와; 상기 타이밍 컨트롤러의 동작 제어 신호에 따라 동작하여, MPEG4와 H.263의 DCT 계수에 대해 각각 FLC 부호화를 수행하는 MPEG4/H.263 TCOEF FLC 수행부와; 상기 타이밍 컨트롤러의 제어에 따라, 상기 부호비트 에더의 출력과 상기 MPEG4/H.263 TCOEF FLC 수행부의 출력을 다중화하는 intra/inter TCOEF VLC/FLC 다중화부로 구성된 것을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

청구항 8.

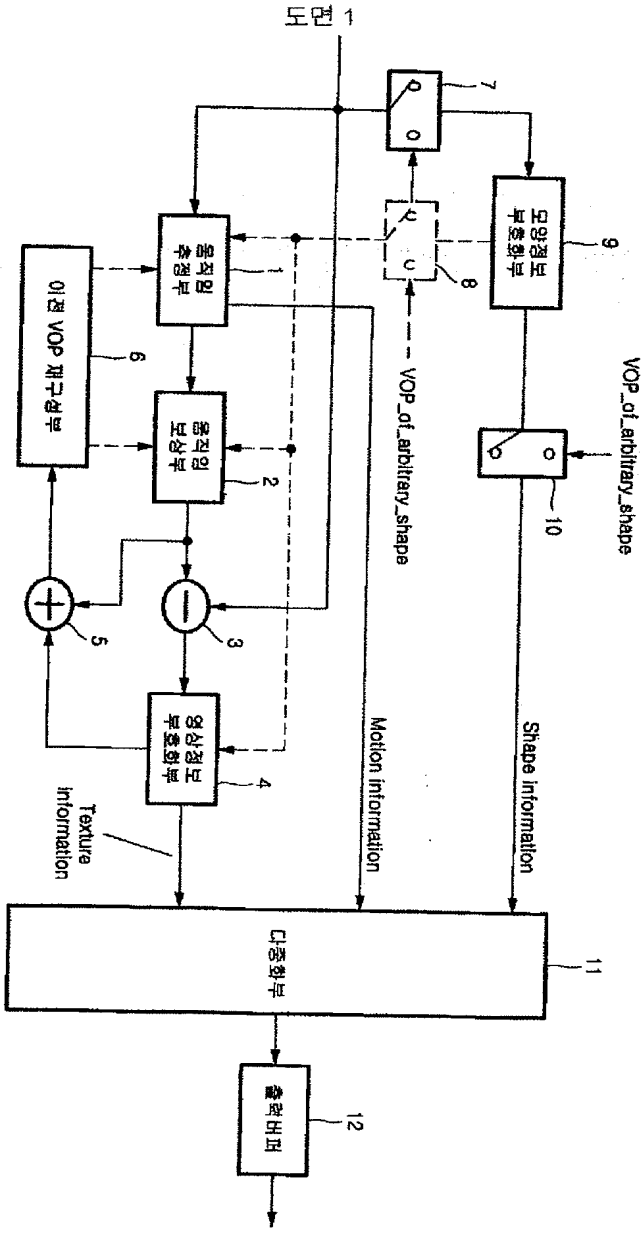
제 5 항에 있어서, 상기 intra/inter TCOEF RVLC & RVLC ESC. 수행부는,

TCOEF 부호화를 위해 LEVEL의 절대치를 계산하는 LEVEL 절대값 계산부와; 상기 LEVEL 절대값 계산부에서 출력되는 신호, RLC 인에이블 신호, RVLC 플래그, intra_inter 플래그를 입력받아 RVLC를 수행하는 intra/inter TCOEF RVLC 수행부와; 상기 intra/inter TCOEF RVLC 수행부에서 출력되는 RVLC 부호화 코드에 상기 LEVEL 절대값 계산부로부터의 LEVEL sign bit를 첨가하는 sign bit adder와; escape 모드일 때 FLC를 수행하는 TCOEF RVLC FLC 수행부와; 상기 TCOEF RVLC FLC 수행부의 출력과 상기 sign bit adder의 출력을, 상기 intra/inter TCOEF RVLC 수행부로부터의 escape 모드 신호에 따라 다중화하여 상기 TCOEF VLC/FLC 다중화부로 출력하는 intra/inter TCOEF RVLC/FLC 다중화부로 구성된 것을 특징으로 하는 동영상압축 부호화장치의 가변 길이 부호화기.

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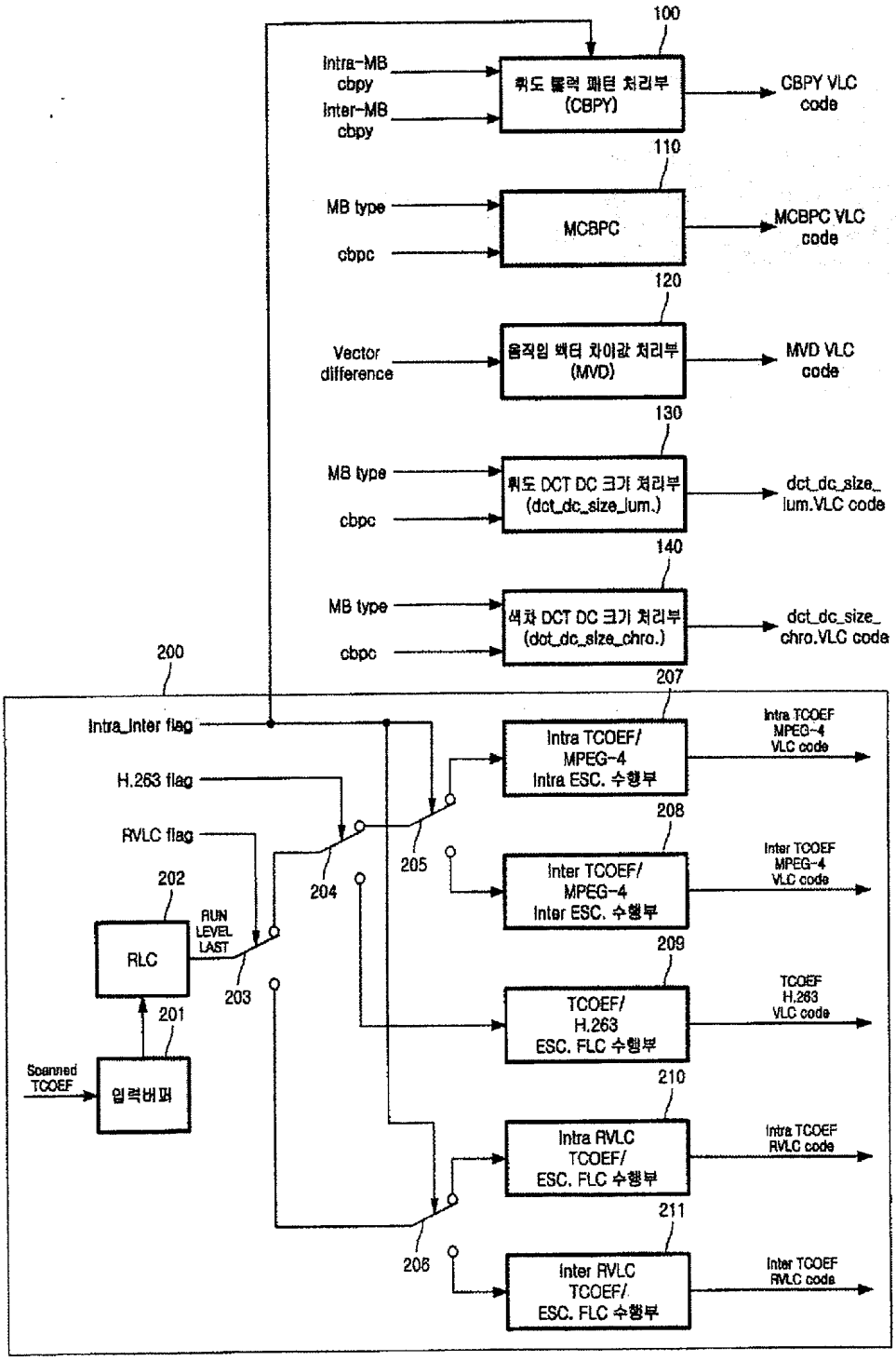
도면

도면 1



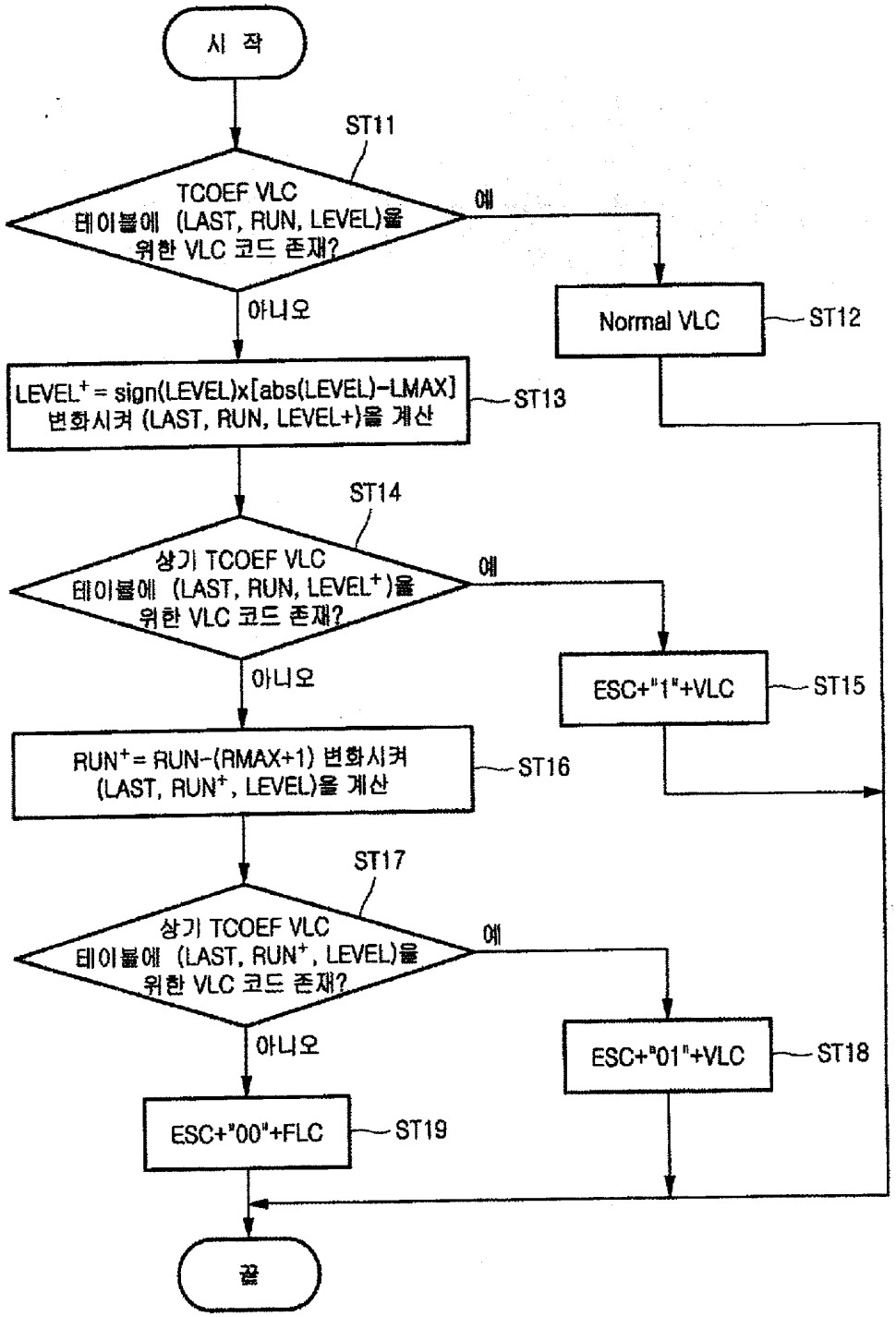
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도면 2



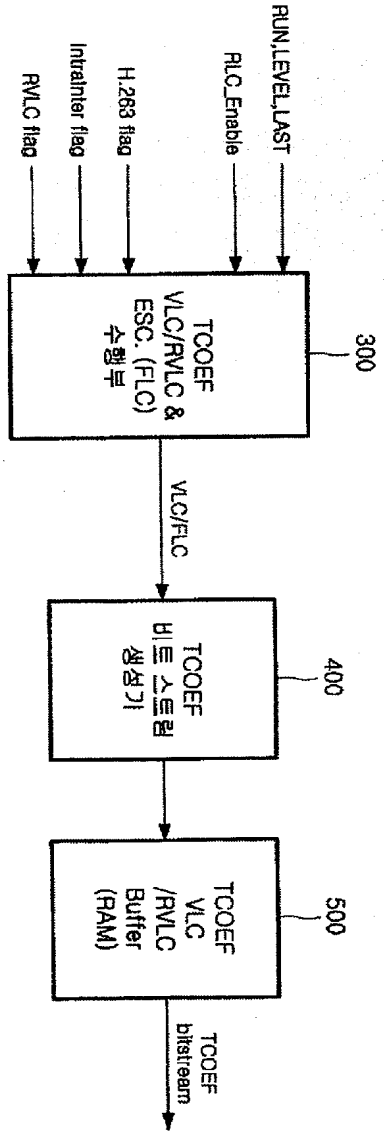
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도면 3



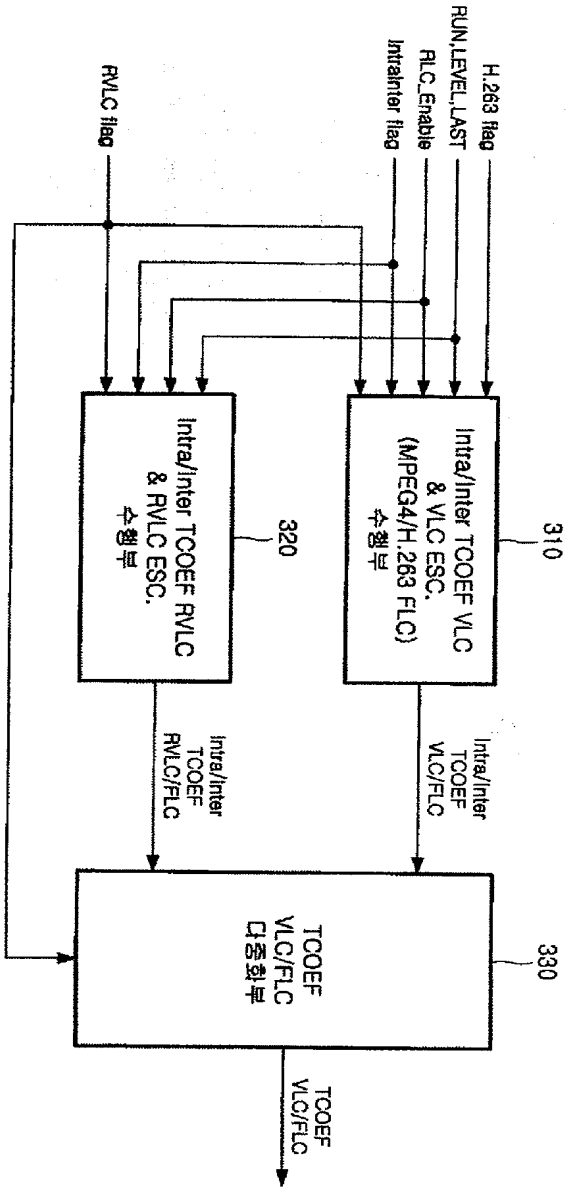
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도면 4



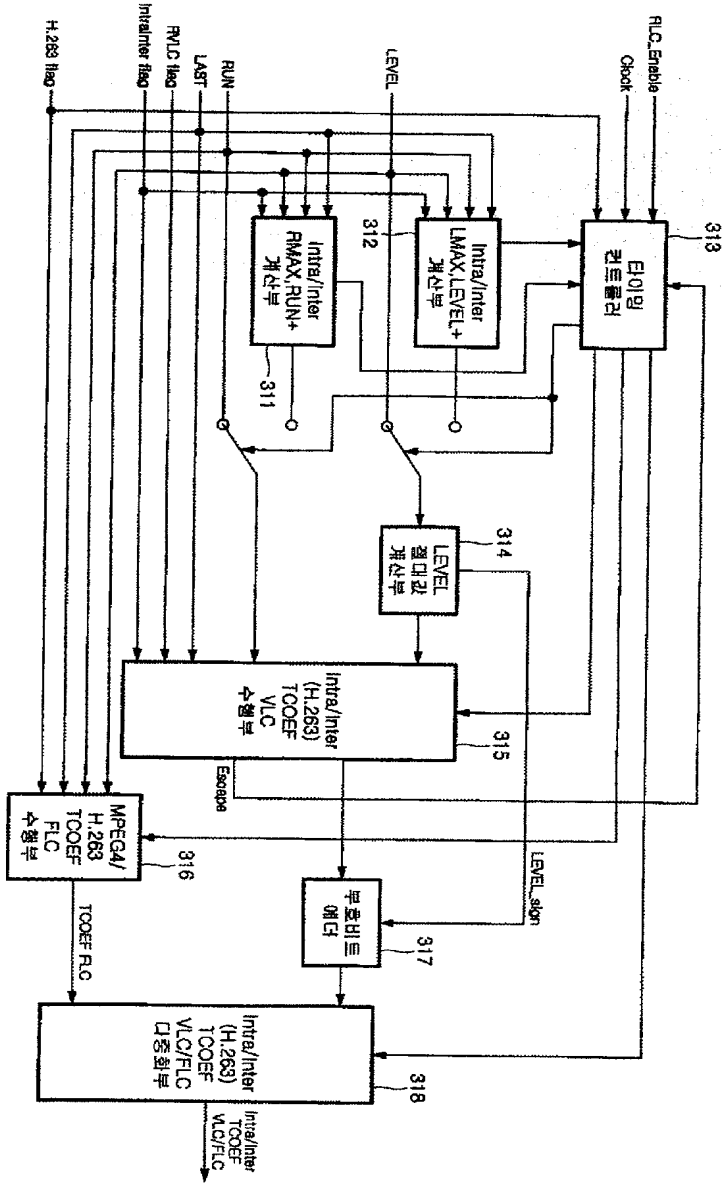
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도면 5



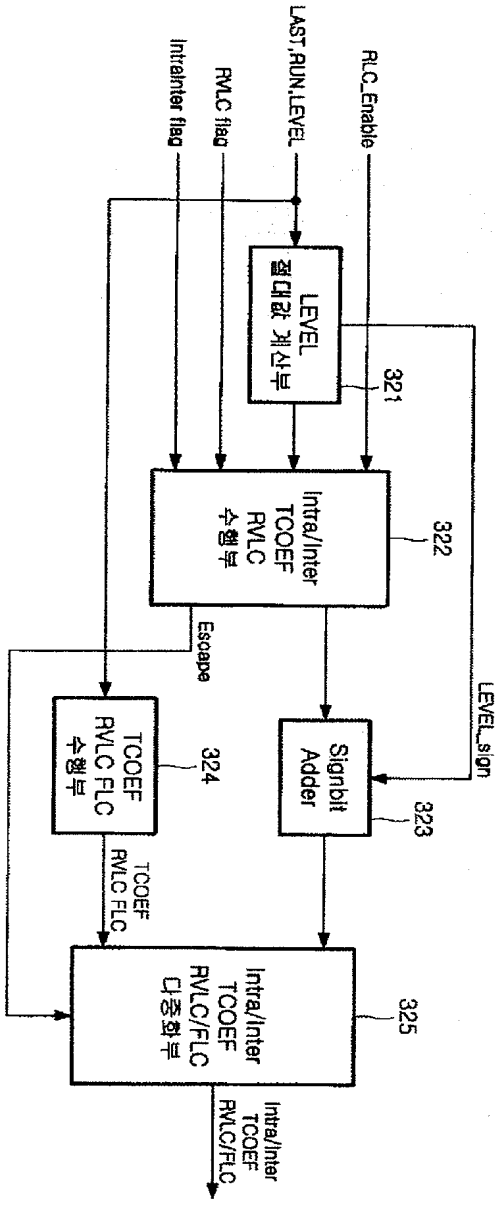
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도면 6



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도면 7



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Electronic Acknowledgement Receipt

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Customer Number:	52349
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1	Information Disclosure Statement (IDS) Filed (SB/08)	AttachZ1_IDS_P03015667.pdf	282314 ec53dbf51df3b7730f45831744faf600a9109d3f	no	4

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Information:	

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Warnings:					
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Warnings:					
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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: November 20, 2009

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APPLICANT Kiyofumi ABE et al.	
FILING DATE October 26, 2007	**GROUP** 2624

OIPE IAP56
NOV 20 2009
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U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA						
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	BA	2002-0006150	1/2002	KR			X	
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	DATE CONSIDERED

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

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Request for examination: Yes

(54) APPARATUS AND METHOD FOR VARIABLE LENGTH CODING WITH GROUPED VARIABLE LENGTH CODING TABLE IN MOVING PICTURE COMPRESSION ENCODER

ABSTRACT

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The present invention relates to an apparatus and method for variable length coding with a grouped variable length coding table in a moving picture compression encoder. The present invention divides the variable length coding table into plural based on regularity and similarity of a variable length code and multiplexes variable length coded information by referring to each variable length coding table when the variable length coding is performed on a relatively small capacity of texture information via a low transmission line that is permitted by a transmission channel in the moving picture compression encoder. Therefore, it possible to decrease errors in individual processing time during an entire table configuration processing. And, the variable length coding table is grouped into a plurality of variable length coding tables and then composed and output to reduce a whole size of a composed logic, thereby making it possible to simplify the configuration of the apparatus.

Representative Drawing

FIG. 8

Index Terms

Variable length coding table division, Variable length code regularity, Variable length code similarity,

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Escape code, Intra MPEG4 variable length code, H.2 63 variable code, Inter RVLC, Intra RVLC

SPECIFICATION

Brief Description of the Drawings

FIG. 1 is a block configuration diagram of an encoder of International Standard MPEG 4;

FIG. 2 is a block configuration diagram of an apparatus for variable length coding in a moving picture compression encoder to which the present invention is applied;

FIG. 3 is a diagram showing an escape mode processing operation in MPEG4 encoding;

FIG. 4 is a block configuration diagram of an apparatus for outputting the variable length coding in a moving picture compression encoder to which the present invention is applied;

FIG. 5 is an internal block configuration diagram of TCOEF VLC/RVLC ESC. executing unit of FIG. 4;

FIG. 6 is an internal block configuration diagram of intra/inter TCOEF VLC & VLC ESC. executing unit of FIG. 5;

FIG. 7 is an internal block configuration diagram of intra/inter TCOEF RVLC & RVLC ESC. executing unit of FIG. 5;

FIG. 8 is a block configuration diagram of an intra

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TCOEF VLC executing unit according to the present invention among intra/inter TCOEF VLC executing units of FIG. 6;

FIG. 9 is a block configuration diagram of an inter (H.263) TCOEF VLC executing unit according to the present invention among intra/inter TCOEF VLC executing units of FIG. 6;

FIG. 10 is a block configuration diagram of an intra TCOEF RVLC executing unit according to the present invention among intra/inter TCOEF VLC executing units of FIG. 7; and

FIG. 11 is a block configuration diagram of an inter TCOEF RVLC executing unit according to the present invention among intra/inter TCOEF RVLC executing units of FIG. 7.

<Description of Reference Numerals and Signs>

400: Intra TCOEF MODULE SELECTING UNIT

410 to 413: FIRST to FOURTH Intra TCOEF VLC table module

420: Intra TCOEF & Escape MULTIPLEXING UNIT

Detailed Description of the Invention

Objects of the Invention

Technical Field to which the Invention Belongs and Related Art

The present invention relates to an apparatus for

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variable length coding in a moving picture compression encoder in a video phone, video conference, a PDA (Personal Digital Assistant) for PCS (Personal Communication Services), a mobile phone and multimedia apparatus, an apparatus for IMT-2000 (third generation mobile communication system) image services, etc. In particular, the present invention relates to an apparatus and method for variable length coding with a grouped variable length coding table in a moving picture compression encoder, which can decrease errors in individual processing time during an entire table configuration processing. In the present invention, the variable length coding table is grouped into plural based on similarity of a variable length code when the variable length coding is performed on a relatively small capacity of texture information on a low transmission line that is permitted by a transmission channel in the moving picture compression encoder. The configuration of the apparatus is simplified by grouping the variable length coding table into a plurality of variable length coding tables and then composing and outputting them to generally reduce a size of a composed logic. Various methods for variable length coding, such as existing MPEG1, MPEG2, H.261, H.263, etc., have been used for the apparatus for variable length coding for image coding. In particular, an apparatus for variable length coding of MPEG2, which is a

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standard scheme of HDTV (High Density Television) is characterized in that it divides header information and image data and then, codes the header information as it is and forms the image data in several parallel structures, and simultaneously processes several image data in order to a large capacity of image information within a short time.

FIG. 1 is a block diagram of an encoder of International Standard MPEG 4. The largest difference with the existing MPEG 2 is that the MPEG 4 further performs shape information coding.

The MPEG 4 encoder is configured to include: a motion estimating unit that generates a motion vector by performing motion estimation on input image data block by block; a motion compensating unit 2 that performs motion compensation using the generated motion vector; a texture information coding unit 4 that performs texture information coding on a part of which motion is not compensated in the motion compensating unit 2; a VOP reconfiguring unit 6 that reconfigures a previous VOP, which is a VOP of an image just before the current image, by adding a VOP (Video Object Plane; a coding unit having any shape information in MPEG4) motion-compensated in the motion compensating unit 2 to the internal information of objects coded in the texture information coding unit 4; a shape information coding unit 9 that performs shape information coding on the shape

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information of the input image; a multiplexing unit 11 that multiplexes the motion information estimated in the motion estimating unit 1, the internal image information coded in the texture information coding unit 4, and the shape information coded in the shape information coding unit 9; and an output buffer 12 that buffers bit streams multiplexed in the multiplexing unit 11 and outputs them.

The operation of the above-mentioned international standard MPEG4 encoder will be described below.

First, when image pictures are input, the MPEG4 encoder performs the motion estimation block by block and transmits the corresponding generated motion vectors. Thereafter, the MPEG4 encoder performs the motion compensation by the motion vector and then, performs the texture information coding on a part of which motion is not compensated.

The MPEG4 encoder performs the shape information coding on the shape information of the image. The use or nonuse of the output signal of the shape information coding unit 9 is changed according to a field to which the VOP encoder is applied. As shown in a dotted line, the output signal of the shape information coding unit 9 is input to the motion estimating unit 1, the motion compensating unit 2, and the texture information coding unit 4 such that it can be used to performe the motion estimation, the motion

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compensation, and the texture information coding.

The motion information estimated in the motion estimating unit 1, the internal texture information coded in the texture information coding unit 4, and the shape information coded in the shape information coding unit 9 are multiplexed in the multiplexing unit 11, which are in turn transmitted as bit streams through the output buffer 12.

The data, which are input to the multiplexing unit 11 and transmitted, are the motion vection information from the motion estimating unit 1, the macro block header information from the texture information coding unit 4, the image data information, etc., most of which would use the variable length code.

However, when effectively performing the variable length coding on the relative small capacity of texture information (CIF: 352*288, QCIF: 176*144), which can be processed on the low transmission line permitted by the transmission channel, rather than processing a large capacity of texture information, such as HDTV, in real time, the apparatus for performing the variable length coding on the texture information that is subjected to the texture information coding in the international standard MPEG4 encoder was implemented to be able to process a relatively small capacity of texture information on the low

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transmission line.

When implementing the apparatus for variable length coding to process the relatively small amount of texture information on the low transmission line, the entire variable length coding table is implemented as one logic and thus, is composed without being affected by the regularity or correlation of the variable length code in the actual composing process, thereby making the size of the logic very large.

Problems of the Invention to Solve

It is an object of the present invention to provide an apparatus and method for variable length coding with a grouped variable length coding table in a moving picture compression encoder, which can decrease errors in individual processing time during an entire table configuration processing by grouping the variable length coding table into plural based on similarity of a variable length code and referring to each variable length coding table when the variable length coding is performed on a relatively small capacity of texture information on a low transmission line that is permitted by a transmission channel in the moving picture compression encoder and can simplify the configuration of the apparatus by grouping the variable length coding table into a plurality of variable

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length coding tables based on the similarity of the variable length code and then composing and outputting them to generally reduce a size of a composed logic.

In order to achieve the above object, there is provided an apparatus for variable length coding with grouped variable length coding table in a moving picture compression encoder according to the present invention, wherein

an apparatus for performing intra TCOEF(DCT coefficient) VLC is configured to include:

an intra TCOEF module selecting unit for selecting the corresponding intra TCOEF VLC table module according to a value of RUN, LEVEL, LAST;

first to fourth modules that are configured of four modules to be grouped into a bundle of VLC codes having a high similarity of the intra TCOEF VLC code according to the value of the RUN, LEVEL, LAST; and

an intra TCOEF & escape multiplexing unit for multiplexing maximum variable length codes, a code length to be coded, and an escape code that are output from each of the first to fourth modules, according to a signal selected in the intra TCOEF module selecting unit, and

an apparatus for performing inter(H.263) TCOEF VLC is configured to include:

an inter TCOEF module selecting unit for selecting

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the corresponding VLC table module for the intra TCOEF VLC and the H.263 VLC according to the value of the RUN, LEVEL, LAST;

first to seventh modules that are configured of seven modules to be grouped into a bundle of VLC codes having a high similarity of the inter TCOEF VLC code according to the value of the RUN, LEVEL, LAST; and

an inter TCOEF & escape multiplexing unit for multiplexing maximum variable length codes, a code length to be coded, and an escape code that are output from each of the first to seventh modules, according to a signal selected in the inter TCOEF module selecting unit.

In order to achieve the above object, a method for variable length coding with grouped variable length coding table in a moving picture compression encoder according to the present invention includes:

a first step that determines regularity and similarity of a variable length code for configuring MPEG standard variable length coding;

a second step that configures a plurality of variable length coding tables by grouping similar variable length codes based on the determined results; and

a third step that performs the variable length coding by referring to the corresponding variable length coding table among the plurality of variable length coding tables

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and multiplexes it.

Mode for Carrying Out the Invention

Hereinafter, an apparatus and method for variable length coding with a grouped variable length coding VLC table in a moving picture compression encoder according to the present invention will be described in detail with reference to the accompanying drawings.

An moving picture compression coding apparatus to which the present invention is applied has a complex structure of variable length coding (VLC) and variable length coding of H.263 meeting an MPEG4 simple profile and a reversible variable length coding (RVLC) that is effective for error transmission but does not consider shape information coding in a simple profile.

The variable length coding table (VLC table) to be used at the time of the variable length coding of an MPEG4 simple profile encoder is configured in [Table 1].

[Table 1]

	VLC Table Name	Number of Index	Bit Number	Remark
1	mcbpc for I-VOPs	9	1-9	
2	mcbpc for P-VOPs	21	1-9	
3	cbpy for four non-transparent blocks	16	2-6	
4	MVD	65	1-13	
5	dct_dc_size_luminance	9	2-7	Not N-bit
6	dct_dc_size_chrominance	9	2-7	Not N-bit

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7	Intra Lum. And Chr. TCOEF	113	3-13	
8	Inter Lum. And Chr. TCOEF	113	3-13	
9	RVLC for intra TCOEF	169	4-16	
10	RVLC for inter TCOEF	169	4-16	

And, the H.263 VLC table configuration is shown in [Table 2].

[Table 2]

	VLC Table Name	Number of Index	Bit Number	Comparison with MPEG4
1	mcbpc for I-VOPs	9	1-9	Same
2	mcbpc for P-VOPs	21	1-9	Same
3	cbpy for four blocks	16	2-6	Same
4	MVD	65	1-13	Different Configuration
5	Inter TCOEF	113	3-13	Same (different in escape)

FIG. 2 shows a block configuration of the apparatus for variable length coding in the apparatus for the moving picture compression coding to which the present invention is applied.

It has a complex structure of variable length coding (VLC) and variable length coding of H.263 meeting an MPEG4 simple profile and a reversible variable length coding (RVLC) that is effective for error transmission.

In other words, it separately processes macro block header information and image data from texture information coding. It is configured to include: a coded block pattern processing unit for luminance 100 that processes a coded block pattern for luminance (CBPY) among the macro block

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header information with a VLC code according to an intra_inter flag (control signal for selecting intra frame coding and inter frame coding); an MCBPC 110 that defines information of a macro block type (MB type) and a CBPC (Coded Block Pattern for Chrominance) among the macro block header information; a motion vector difference (MVD) processing unit 120 that processes the difference between a previous motion vector, which is one of the macro block header information, and a current motion vector with the VLC code; a DCT DC size processing unit for luminance 130 that processes the VLC code for a DCT DC size (dct_dc_size_lum.) for luminance which is one of the macro block header information; a DCT DC size processing unit for chrominance 140 that processes the VLC code for a DCT DC size (dct_dc_size_chro.) for chrominance which is one of the macro block header information; an input buffer 201 that receives and buffers a DCT coefficient (TCOEF) subjected to a zigzag scan during the texture information coding process and outputs it as an RLC 203 meeting a clock rate necessary for the VLC in consideration of an escape mode; an RLC 202 that performs an RLC (Run Length Coding) on the DCT AC coefficient output from the input buffer 201 to output control information necessary for the VLC coding; first to fourth switches 203 to 206 each of which switches a path from the RLC 202 to perform the reversible variable

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length coding (RVLC), the intra TCOEF variable length coding (VLC), the inter TCOEF VLC, the H.263 TCOEF VLC by selectively receiving a control signal (RVLC flag) for selecting the reversible variable length coding (RVLC) and the variable length coding (VLC), a control signal (H.263 flag) for selecting H. 263 TCOEF VLC, and a control signal (intra_inter flag) for selecting intra frame coding and inter frame coding; an intra TCOEF/MPEG4 intra ESC. executing unit 207 that performs the VLC on an MPEG4 intra TCOEF by an intra escape mode when being selected by the first to third switches 203 to 205; an inter TCOEF/MPEG4 intra ESC. executing unit 208 that performs the VLC on an MPEG4 inter TCOEF by an inter escape mode when being selected by the first to third switches 203 to 205; an TCOEF/H. 263 ESC. executing unit 209 that performs the escape mode on the H.263 TCOEF using the inter frame coding when being selected by the first and second switches 203 and 204; an intra RVLC TCOEF / ESC. FLC executing unit 210 that performs the RLVC on the intra TCOEF when being selected by the first, second, and fourth switches 203,204, and 206 and performs fixed length coding (FLC) in the escape mode; and an inter RVLC TCOEF / ESC. FLC executing unit 211 that performs the RLVC on the inter TCOEF when being selected by the first, second, and fourth switches 203,204, and 206 and performs fixed length coding (FLC) in

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the escape mode.

The control information necessary for the VLC coding output from the RLC 202 is the LAST that indicates whether the currently coded DCT coefficient that is not 0 is the DCT coefficient that is not 0 at the tail of the block, the LEVEL that indicates the value of coefficient that is not 0, and the RUN that indicates the consecutive number of 0 before the coded coefficient.

The first switch 203 switches the control information (LAST, LEVEL, RUN) output from the RLC 202 to one of the second switch 204 and the fourth switch 206 according to the RVLC flag, the second switch 203 switches the information output from the first switch 203 to one of the third switch 205 and the TCOEF/H.263 ESC. executing unit 209 according to the H.263 flag, the third switch 205 switches the information output from the second switch 204 to one of the intra TCOEF /MPEG4 intra ESC. executing unit 207 and the inter TCOEF/MPEG4 inter ESC. executing unit 208 according to the intra_inter flag, and the fourth switch 206 switches the information output from the first switch 203 to one of the intra RVLC TC OEF / ESC. FLC executing unit 210 and the inter RVLC TCOEF / ESC. FLC executing unit 211 according to the intra_inter flag.

The operation of the apparatus for variable length coding in a moving picture compression encoder to which the

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present invention is applied as described above will be described below.

The information input to the input buffer 201 is information that is subjected to the zigzag scan with the coefficient from the texture information coding. The input buffer 201 reads the coefficient with the RLC 202, meeting the clock rate necessary for performing the VLC in consideration of the escape mode and the RLC 202 performs the RLC (Run Length Coding) to obtain the RUN, LEVEL, and LAST.

In order to select each module 207, 208, 209, 210, and 211, the RVLC flag, the H.263 flag, and the Intra_Inter flag are used.

The MPEG Inter TCOEF VLC table is the same as the H.263 TCOEF VLC table. However, the escape mode is configured differently.

It separately processes the macro block header information and the image data from the texture information coding. Describing the operation of processing the macro block header information, the CBPY 100 performs the VLC on the coded block pattern for luminance and the MCBPC 110 defines the information of the MB type and the CBPC (Coded Block Pattern for Chrominance) by the VLC code. The MVD 120 performs the VLC on the difference of the previous motion vector and the current motion vector and the DCT DC

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size processing unit for luminance 130 performs the VLC on the DCT DC size for luminance and the DCT DC size processing unit for chrominance 140 performs the VLC on the DCT DC size for chrominance.

Hereinafter, describing the operation of the RLC subsequent to describing the input buffer 201 that processes the image data, it performs the RLC on the AC coefficient value output from the input buffer 201 to output a series of EVENTs configured of the LAST, RUN, and LEVEL to be VLC-coded.

At this time, when the LAST is '0', it means that the coefficients, which are not 0, further exist in the block and when the LAST is '1', it means that the coefficients, which are not 0, do not exist in the block any more.

The method for outputting the LAST, RUN, and LEVEL by performing the RLC will be represented by code as described below.

```
count < = count +1;
if(!AC_Coefficient) begin
run_cnt < = run_cnt + 1;
RLC_E < = 1'b0;
end
else begin
run_cnt < = 0;
LEVEL_tmp < = AC_Coefficient;
```


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```
RUN_tmp < = run_cnt;
if(LEVEL_tmp != 12'd0)
RLC_E < = 1'b1;
end
LEVEL < = LEVEL_tmp;
RUN < = RUN_tmp;
if(count == 65) begin --------(1)
LAST < = 1'b1;
LEVEL < = LEVEL_tmp;
RUN < = RUN_tmp;
RLC_E < = 1'b1;
end
```

In the above description, the input is AC_Coefficient, count flag (64 or 65) and the output is RUN, LEVEL, LAST, RLC_E(RLC_Enab le). In the intra mode, since the count == 65 of (1) determines the LAST except for the DC value, it is changed to 64. However, when the DC value is processed by the same method as the AC value, the count == 65 of (1) is processed as 65 even in the intra mode. The information of the actual RUN, LEVEL, and LAST is represented by RLC_Enable.

FIG. 3 is a diagram showing an escape mode processing operation in MPEG4 encoding.

The method for processing the escape mode in the existing MPEG1, MPEG2, H.261, and H.263 performed the fixed

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length coding (FLC). However, the MPEG4 escape mode to which the present invention is applied performs the process by being grouped into 3 steps in order to improve the image compression rate as shown in FIG. 3. In other words, it is grouped into the Intra TCOEF and the Inter TCOEF each of which uses different tables and even in the escape mode, the table changing the value of the LEVEL and the RUN is different.

However, the contents of the signal flow is similar to each other. First, the TOCEF VLC code is determined by referring to the TCOEF VLC table with the value of the RUN, LEVEL, and LAST coming from RLC 202. Therefore, when there is the value in the corresponding index of the TCOEF VLC table, a normal VLC is performed (ST11,ST12).

However, when ther is no value in the corresponding index of the TCOEF VLC table, it is selected as the escape mode. Therefore, the LEVEL value is changed. The changed LEVEL value is sign(LEVEL)*[abs(LEVEL)-LMAX] as LEVEL+ (ST13) (first step). Herein, the LMAX is a maximum value of the LEVEL of the given pair (LAST, RUN).

After the LEVEL value is changed by the above-mentioned step, when there is a value in the corresponding index by referring to the same TCOEF VLC table, the TCOEF VLC code is defined (ST14,ST15).

However, at ST14, since the value does not exist in

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the TCOEF VLC table, the escape mode is selected again to change the RUN value. The changed RUN value is , RUN-(RMAX + 1) as RUN+ (ST16) (second step). Herein, the RMAX is a maximum value of the RUN of the given pair (LAST, LEVEL).

After he RUN value is changed by the above-mentioned step, the TCOEF VLC code is defined by referring to the same TCOEF VLC table again (ST17,ST18). However, since there is no VLC code in the TCOEF VLC table, the escape mode is selected again to perform the FLC (Fixed Length C oding) (ST19) (third step).

The above-mentioned operation is performed by the same method in both the Intra and the Inter but the configuration of the applied table is different.

FIG. 4 shows a block configuration of an apparatus for outputting the variable length coding in the moving picture compression encoder to which the present invention is applied.

It is configured to include: a TCOEF VLC/RVLC ESC. executing unit 300 that performs the normal VLC function and the RVLC function according to the RVLC flag and performs the FLC in the VLC escape mode; a TCOEF bit stream generator 400 that is reconfigured to write the variable length coding (VLC) code and the fixed length coding (FLC) code, which are output from the TCOEF VL C/RVLC ESC. executing unit 300, in a RAM 500 at one bit stream block by

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block; and a TCOEF VLC/RVLC buffer (RAM) 500 that stores the TCOEF bit stream output from the TCOEF bit stream generator 400.

As shown in FIG. 5, the TCOEF VL C/RVLC ESC. executing unit 300 is configured to include: an intra/inter TCOEF VLC & VLC ESC. executing unit 310 that performs the normal VLC function when the RVLC flag represents the VLC performance and performs the FLC in the VLC escape mode; an intra/ inter TCOEF RVLC & RVLC ESC. executing unit 320 that performs the RVLC function when the RVLC flag represents the RVLC performance and performs the FLC in the RVLC escape mode; and a TCOEF VLC/FLC multiplexing unit 330 that multiplexes the intra/inter TCOEF VLC/FLC code output from the intra/inter TCOEF VLC & V LC ESC. executing unit 310 and the intra/inter TCOEF RVLC/FLC code from the intra/inter TCOEF RVLC & RVLC ESC. executing unit 320 according to the RVLC flag to output the VLC code and the FLC code to the TCOEF bit stream generator 400.

As shown in FIG. 6, the intra/inter TCOEF VLC & VLC ESC. executing unit 310 is configured to include: an intra/inter TCOEF VLC executing unit 315 that searches the desired VLC mode in the TCOEF VLC table to determine whether the VLC mode is the escape mode based on the search result and if so, transmits the escape mode signal to a timing controller 313 and performs the variable length

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coding according to the determined mode; an intra/inter RMAX, RUN+ calculating unit 311 that calculates the RMAX and RUN+; an intra/inter LMAX, LEVEL+ calculating unit 312 that calculates the LMAX and the LEVEL+; a timing controller that receives the RMAX and the RUN+ calculated in the intra/inter RMAX, RUN+ calculating unit 313 and receives the LMAX and LEVEL+ calculated in the intra/inter LMAX, LEVEL+ calculating unit 312 and performs the LEVEL and LEVEL+ selection function and the RUN and RUN+ selection function according to the escape mode signal transmitted from the intra/inter TCOEF VLC executing unit 315 and performs the operational control function of each of the corresponding blocks; a LEVEL absolute value calculating unit 314 that calculates the absolute value of the LEVEL for the TCOEF coding in response to the control of the timing controller 313; a sign bit adder 317 that adds a sign bit to the data from the intra/inter TCOEF VLC executing unit 315 using the data output from the LEVEL absolute value calculating unit 314 when the variable length coding using the RUN, LEVEL, and LAST in the intra/inter TCOEF VLC executing unit 315 ends; an MPEG4/H.263 TCOE F FLC executing unit 316 that is operated according to the operation of the timing controller 313 to perform the FLC coding on each of the DCT coefficients of the MPEG4 and H.263; and an intra/inter TCOEF VLC/FLC

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multiplexing unit 318 that multiplexes the output of the sign bit adder 317 and the output of the MPEG 4/H.263 TCOEF FLC executing unit 316 in response to the control of the timing controller 313.

As shown in FIG. 7, the intra/inter TCOEF RVLC & RVLC ESC. executing unit 320 is configured to include a LEVEL absolute value calculating unit 321 that calculates the absolute value of the LEVEL for the TCOEF coding; an intra/inter TCOEF RVLC executing unit 322 that receives the signal, the RLC enable signal, the RVLC flag, and the intra_inter flag, which are output from the LEVEL absolute value calculating unit 321, to perform the RVLC; a sign bit adder 323 that adds a LEVEL sign bit from the LEVEL absolute value calculating unit 321 to the RVLC coding code output from the intra/inter TCOEF RVLC executing unit 322; a TCOEF RVLC FLC executing unit 322 that performs the FLC in the escape mode; a TCOEF RVLC FLC executing unit 324 that performs the FLC in the escape mode; and an intra/inter TCOEF RVLC/FLC multiplexing unit 325 that multiples the output of the TCOEF RVLC FLC executing unit 324 and the output of the sign bit adder 323 according to the escape mode signal from the intra/inter TCOEF RVLC executing unit 322 and outputs them to the TCOEF VLC/FLC multiplexing unit 330.

The operation of the above-mentioned apparatus for

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outputing the variable length coding in the moving picture compression encoder to which the present invention is applied will be described below.

The TCOEF VLC/RVLC ESC. executing unit 300 performs the normal VLC function and the RVLC function according to the RVLC flag and performs the FLC in the VLC escape mode. The TCOEF bit stream generator 400 is reconfigured to write the variable length coding (VLC) code and the fixed length coding (FLC) code, which are output from the TCOEF VL C/RVLC ESC. executing unit 300, in the RAM 500 at one bit stream block by block. The TCOEF VLC/RVLC buffer (RAM) 500 stores the TCOEF bit stream output from the TCOEF bit stream generator 400 and outputs it in a desired place.

Describing in more detail the operation TCOEF VLC/RVLC ESC. executing unit 300, as shwon in FIG. 5, two modules 310 and 320 are selected as the RVLC flag.

In other words, when the RVLC flag represents the VLC performance, the intra/inter TCOEF VLC & VLC ESC. executing unit 310 performs the normal VLC function and performs the FLC in the VLC escape mode. Further, when the RVLC flag represents the RVLC performance, the intra/inter TCOEF RVLC & RVLC ESC. executing unit 320 performs the RVLC function and performs the FLC in the RVLC escape mode.

The intra/inter TCOEF VLC & VLC ESC. executing unit 310 codes the MPEG4 and the H.263 by using the same TCOEF

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VLC table and the intra/inter TCOEF RVLC & RVLC ESC. executing unit 320 codes the MPEG4 and the H.263 by using the different VLC table.

The TCOEF VLC/FLC multiplexing unit 330 multiplexes the intra/inter TCOEF VLC/FLC code output from the intra/inter TCOEF VLC & VLC ESC. executing unit 310 and the intra/inter TCOEF RVLC/FLC code output from the intra/inter TCOEF RVLC & RVLC ESC. executing unit 320 according to the RVLC flag and outputs the VLC code and the FLC code to the TCOEF bit stream generator 400.

Describing in more detail the operation of the intra/inter TCOEF VLC & VLC ESC. executing unit 310, as shown in FIG. 6, the intra/inter TCOEF VLC executing unit 315 first searches the index in the TCOEF VLC table by the RUN, LEVEL, and LAST. At this time, in the case of the escape mode, the escape mode signal is transmitted to the timing controller 313. Thereby, the timing controller 313 selects the value of the LEVEL+ previoulsy searched in the intra/inter LMAX, LEVEL+ calculating unit 312 and transmits it to the intra/inter TCOEF VL C executing unit 315 and searches the TCOEF VLC table again. As a result, when the escape mode is selected again, the TCOEF VLC table is referred again by the perviously selected RUN+. As a result, when the escape mode is selected again, in order to perform the FLC, the MPEG4/H.263 TCOEF FLC executing unit

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316 is controlled in the timing controler 313. The same method is applied in both the Intra TCOEF and the Inter TCOEF but the actual configuration table and the LEVEL+ and RUN+ reference table is different. The Inter TCOEF VLC is applied like the H.263 VLC.

In the escape mode, the FLC method is different, such that the FLC method is switched by the H.263 flag.

Meanwhile, the LEVEL absolute value calculating unit 314 calculates the absolute value of the LEVEL value. The sign bit adder adds sign_bit to an unsigned VLC code that is an output signal of the intra/inter TCOEF VLC executing unit 315.

The intra/inter TCOEF VLC/FLC multiplexing unit 318 multiplxes the output of the sign bit adder 317 and the output of the MPEG4/H.263 TCOEF FLC executing unit 316 in response to the control of the timing controller 313 and outputs them to the TCOEF VLC/FLC multiplexing unit 330.

Further, describing in detail the intra/inter TCOEF RVLC & RVLC ESC. executing unit 320, as shown in FIG. 7, the RVLC has the different table configuration of the Intra RVLC and the Inter RVLC. When the RVLC is the escape mode, the FLC method has the same Intra frame coding and Inter frame coding.

It processes the sign bit of the LEVEL using the mode information selected for the RVLC coding and performs the

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FLC in the escape mode and multiplexes the information in the intra/inter TCOEF RVLC/FLC multiplexing unit 325 according to the signal that indicates the escape mode and outputs it to the TCOEF VLC/FLC multiplexing unit 330.

The configuration of the apparatus for variable length coding with the grouped variable length coding table in the moving picture compression encoder will now be described.

FIG. 8 shows a block configuration of the intra TCOEF VLC executing unit, not inter (H.263) in the intra/inter TCOEF VLC executing unit 315 of FIG. 6.

As shown, it is confiured to include: an intra TCOEF module selecting unit 400 that selects the corresponding intra TCOEF VLC table module according to the value of the RUN, LEVEL, and LAST; and first to fourth modules 410 to 413 that are configured of four modules to be grouped into a bundle of VLC codes having a high similarity of the intra TCOEF VLC code according to the value of the RUN, LEVEL, LAST; and an intra TCOEF & escape multiplexing unit 420 that multiplexes maximum variable length codes, a code length to be coded, and an escape code that are output from each of the first to fourth modules 410 to 413, according to a signal selected in the intra TCOEF module selecting unit 400.

FIG. 9 shows the configuration of the inter(H.263)

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TCOEF VLC executing unit 315 of FIG. 6.

As shown, it is configured to include: is configured to include: an inter TCOEF module selecting unit 500 that selects the corresponding VLC table module for the intra TCOEF VLC and the H.263 VLC according to the value of the RUN, LEVEL, LAST; and first to seventh modules 510 to 516 that are configured of seven modules to be grouped into a bundle of VLC codes having a high similarity of the inter TCOEF VLC code according to the value of the RUN, LEVEL, LAST are configured of four modules; and an inter TCOEF & escape multiplexing unit 520 that multiplexes maximum variable length codes, a code length to be coded, and an escape code that are output from each of the first to seventh modules 510 to 516, according to a signal selected in the inter TCOEF module selecting unit 500.

FIG. 10 shows a block configuration of the intra TCOEF RVLC executing unit in the intra/inter TCOEF RVLC executing unit 322 of FIG. 7.

As shown, it is confiured to include: an intra TCOEF RVLC module selecting unit 600 that selects the corresponding intra TCOEF RVLC table module according to the value of the RUN, LEVEL, and LAST; and first to thirteenth modules 610 to 622 that are configured of thirteen modules to be grouped into a bundle of RVLC codes having a high similarity of the intra TCOEF RVLC code

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according to the value of the RUN, LEVEL, LAST; and an intra TCOEF RVLC & escape multiplexing unit 630 that multiplexes maximum reversible variable length codes, a code length to be coded, and an escape code that are output from each of the first to thirteenth modules 610 to 622, according to a signal selected in the intra TCOEF RVLC module selecting unit 600.

FIG. 11 shows a block configuration of the inter TCOEF RVLC executing unit in the intra/inter TCOEF RVLC executing unit 322 of FIG. 7.

As shown, it is confiured to include: an inter TCOEF RVLC module selecting unit 700 that selects the corresponding inter TCOEF RVLC table module according to the value of the RUN, LEVEL, and LAST; and first to twelfth modules 710 to 721 that are configured of twelve modules to be grouped into a bundle of RVLC codes having a high similarity of the inter TCOEF RVLC code according to the value of the RUN, LEVEL, LAST; and an inter TCOEF RVLC & escape multiplexing unit 730 that multiplexes maximum reversible variable length codes, a code length to be coded, and an escape code that are output from each of the first to twelfth modules 710 to 721, according to a signal selected in the inter TCOEF RVLC module selecting unit 700.

The operation of the above-mentioned apparatus for variable length coding with the grouped variable length

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coding table in the moving picture compression encoder will be described.

First, it performs a first step that determines the regularity and similarity of the variable length code for configuring the MPEG4 standard variable length coding in the configuration for the texture information variable length coding; a second step that configures the plurality of variable length coding tables by grouping the similar variable length codes based on the determined result; and a thrid step that performs the variable length coding by referring to the corresponding variable length coding table in the plurality of variable length coding table and then, multiplexes it.

In the second step, the VLC codes having a high similarity of the intra TCOEF VLC codes are grouped and form the four intra MPEG4 VLC tables in the case of the intra TCOEF VLC, the VLC codes having a high silimiarity of the inter TCOEF VLC codes are grouped and form the table for the inter TCOEF VLC and the H.263 VLC as seven modules in the case of the inter(H.263) TCOEF VLC, RVLC codes having a high similarity of the intra TCOEF RVLC code are grouped and form thirteen intra TCOEF RVLC tables in the case of the intra TCOEF RVLC, and RVLC codes haivng a high similarity of the inter TCOEF RVLC code are grouped and form twelve inter TCOEF RVLC tables in the case of the

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inter TCOEF RVLC.

Describing in detail the case of each of the variable length coding, in the cae of the intra TCOEF VLC, it divides the type of the coding code to be configured as four modules and performs the multiplexing on the maximum variable length code,the code length to be coded, the escape code of each of four table modules by the signal selected in the intra TCOEF module selecting unit 400.

In addition, in the inter(H.263) TCOEF VLC in the Intra/Inter TCOEF VLC executing unit 315, the inter TCOEF VLD module is constituted by seven modules for a reason such as the intra mode. Further, a maximum variable length code of each of seven tables and the effective number to bits to be coded, and an escape code are multiplexed by a signal selected in the module selector.

In the Intra/Inter TCOEF RVLC executing unit 322 of FIG. 7, the intra TCOEF RVLC executing unit groups RVLC codes having a high similarity of the intra TCOEF RVLC code to form thirteen intra TCOEF RVLC tables as shown in FIG. 10. Further, it performs the multiplexing by the signal selected in the intra TCOEF RVLC module selecting unit 600.

In the Intra/Inter TCOEF RVLC executing unit 322 of FIG. 7, the Inter TCOEF RVLC executing unit groups the RVLC codes having a high similarity of the inter TCOEF RVLC code to form twelve inter TCOEF RVLC tables as shown in FIG. 11.

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Therefore, it performs the multiplexing on the maximum reversible variable length code, the code length to be coded, and the escape code of each of the twelve tables by the signal selected in the inter TCOEF RVLC module selecting unit 700.

The range of the value of the RUN, LEVEL, and LAST is defined to be able to process the variable length code having a high similarity by a bundle, thereby making the logic implementation the most smooth.

The process minimizes the number of cases of grouping the variable length coding table, thereby minimizing the error in temporal delay. Thereby, the error in the processing time between the respective variable length coding executing units and the error in the processing time in the respective variable length coding exeucitng unit are controlled, thereby making it possible to decrease the error in the individual processing time during the entire table configuration processing.

Effect of the Invention

As described above, the apparatus and method for variable length coding with the grouped variable length coding table in the moving picture compression encoder performs the variable length coding table into plural based on regularity and similarity of a variable length code when

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the variable length coding is performed on a relatively small capacity of texture information via a low transmission line that is permitted by a transmission channel in the moving picture compression encoder to decrease the errors in the processing time between the respective variable length coding executing units and the errors in the processing time in the respective variable length coding executing units, thereby making it possible to decrease the errors in the individual processing time during an entire table configuration processing.

Further, when the entire VLC table is implemented as one logic like the related art, it is composed without being affected by the regularity or correlation of the variable length code in the actual composition process, thereby making the size of the logic large, but according to the present invention, it is grouped into several modules based on the similarity of the variable length code and is then composed, such that the whole size of the composed logic is decreased, thereby making it possible to simplify the configuration of the apparatus.

(57) Claims

Claim 1

A method for variable length coding with a grouped variable length coding table in a moving picture

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compression encoder comprising:

a first step for determining the regularity and similarity of the variable length code to configure the MPEG4 standard variable length coding;

a second step for configuring the plurality of variable length coding tables by grouping the similar variable length codes based on the determined result; and

a thrid step for performing and multiplexing the variable length coding by referring to the corresponding variable length coding table in the plurality of variable length coding tables.

Claim 2

The method for variable length coding with a grouped variable length coding table in a moving picture compression encoder according to claim 1, in the second step,

the VLC codes having a high similarity of the intra TCOEF VLC codes are grouped and form the four intra MPEG4 VLC tables in the case of the intra TCOEF VLC,

the VLC codes having a high silimiarity of the inter TCOEF VLC codes are grouped and form the table for the inter TCOEF VLC and the H.263 VLC as seven modules in the case of the inter(H.263) TCOEF VLC,

the RVLC codes having a high similarity of the intra

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the TCOEF RVLC code are grouped and form thirteen intra TCOEF RVLC tables in the case of the intra TCOEF RVLC, and

the RVLC codes haivng a high similarity of the inter TCOEF RVLC code are grouped and form twelve inter TCOEF RVLC tables in the case of the inter TCOEF RVLC.

Claim 3

An apparatus for variable length coding with grouped variable length coding table in a moving picture compression encoder,

wherein an apparatus for performing intra TCOEF(DCT coefficient) VLC includes:

an intra TCOEF module selecting unit for selecting the corresponding intra TCOEF VLC table module according to a value of RUN, LEVEL, LAST;

first to fourth modules formed by each grouping VLC codes having a high similarity of the intra TCOEF VLC code according to the value of the RUN, LEVEL, LAST; and

an intra TCOEF & escape multiplexing unit for multiplexing the maximum variable length codes, a code length to be coded, and an escape code that are output from each of the first to fourth modules, according to a signal selected in the intra TCOEF module selecting unit,

wherein an apparatus for performing inter(H.263)

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TCOEF VLC includes:

an inter TCOEF module selecting unit for selecting the corresponding VLC table module for the intra TCOEF VLC and the H.263 VLC according to the value of the RUN, LEVEL, LAST;

first to seventh modules formed by each grouping VLC codes having a high similarity of the inter TCOEF VLC code according to the value of the RUN, LEVEL, LAST; and

an inter TCOEF & escape multiplexing unit for multiplexing maximum variable length codes, a code length to be coded, and an escape code that are output from each of the first to seventh modules, according to a signal selected in the inter TCOEF module selecting unit.

Claim 4

An apparatus for variable length coding with grouped variable length coding table in a moving picture compression encoder, wherein in an apparatus for performing intra/inter TCOEF (DCT coefficient) reversible variable length coding (RVLC) in the moving picture compression encoder,

wherein an apparatus for performing intra TCOEF RVLC includes:

an intra TCOEF RVLC module selecting unit for selecting the corresponding intra TCOEF RVLC table module

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according to a value of RUN, LEVEL, LAST;

first to thirteenth modules formed by each grouping RVLC codes having a high similarity of the intra TCOEF RVLC code according to the value of the RUN, LEVEL, LAST;

an intra TCOEF RVLC & escape multiplexing unit for multiplexing maximum reversible variable length codes, a code length to be coded, and an escape code that are output from each of the first to thirteenth modules, according to a signal selected in the intra TCOEF RVLC module selecting unit, and

wherein an apparatus for performing inter TCOEF RVLC includes:

an inter TCOEF RVLC module selecting unit for selecting the corresponding inter TCOEF VLC table module according to a value of RUN, LEVEL, LAST;

first to twelfth modules formed by each grouping RVLC codes having a high similarity of the inter TCOEF RVLC code according to the value of the RUN, LEVEL, LAST; and

an inter TCOEF RVLC & escape multiplexing unit for multiplexing maximum reversible variable length codes, a code length to be coded, and an escape code that are output from each of the first to twelfth modules, according to a signal selected in the inter TCOEF RVLC module selecting unit.

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[DRAWINGS]

[FIG. 1]

9: SHAPE INFORMATION CODING UNIT

1: MOTION ESTIMATING UNIT

2: MOTION COMPENSATING UNIT

4: TEXTURE INFORMATION CODING UNIT

6: PREVIOUS VOP RECONFIGURING UNIT

11: MULTIPLEXING UNIT

12: OUTPUT BUFFER

[FIG. 2]

100: BLOCK PATTERN PROCESSING UNIT FOR LUMINANCE

120: MOTION VECTOR DIFFERENCE PROCESSING UNIT

130: DCT DC SIZE PROCESSING UNIT FOR LUMINANCE

140: DCT DC SIZE PROCESSING UNIT FOR CHROMINANCE

207: Intra TCOEF/MPEG-4 Intra ESC. EXECUTING UNIT

208: Inter TCOEF/MPEG-4 Intra ESC. EXECUTING UNIT

209: TCOEF/H.263 ESC. FLC EXECUTING UNIT

210: Intra RVLC TCOEF/ESC. FLC EXECUTING UNIT

211: Inter RVLC TCOEF/ESC. FLC EXECUTING UNIT

201: INPUT BUFFER

[FIG. 3]

START

ST11: IS THERE VLC CODE FOR (LAST, RUN, LEVEL) IN

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TCOEF VLC TABLE

YES

NO

ST13: CALCULATE (LAST, RUN, LEVEL) BY CHANGING LEVEL^{+} = sign (LEVEL) × [abs (LEVEL)-LMAX]

ST14: IS THERE VLC CODE FOR (LAST, RUN, LEVEL^{+}) IN TCOEF VLC TABLE

YES

NO

ST16: CALCULATE (LAST, RUN^{+}, LEVEL) BY CHANGING RUN^{+} = RUN − (RMAX + 1)

ST17: IS THERE VLC CODE FOR (LAST, RUN^{+}, LEVEL) IN TCOEF VLC TABLE

YES

NO

[FIG. 4]

300: TCOEF VLC/RVLC & ESC. (FLC) EXECUTING UNIT

400: TCOEF BIT STREAM GENERATOR

500: TCOEF VLC/RVLE BUFFER (RAM)

[FIG. 5]

310: Intra/Inter TCOEF VLC & VLC ESC. (MPEG4/H.263 FLC) EXECUTING UNIT

320: Intra/Inter TCOEF RVLC & RVLC ESC. EXECUTING

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UNIT

330: TCOEF VLC/FLC MULTIPLEXING UNIT

[FIG. 6]

313: TIMING CONTROLLER

312: Intra/Inter LMAX. $LEVEL^+$ CALCULATING UNIT

311: Intra/Inter RMAX. RUN^+ CALCULATING UNIT

314: LEVEL ABSOLUTE CALCULATING UNIT

315: Intra/Inter (H.263) TCOEF VLC EXECUTING UNIT

316: MPEG4/H.263 TCOEF FLC EXECUTING UNIT

317: SIGN BIT ADDER

318: Intra/Inter (H.263) TCOEF VLC/FLC MULTIPLEXING UNIT

[FIG. 7]

321: LEVEL ABSOLUTE VALUE CALCULATING UNIT

322: Intra/Inter TCOEF RVLC EXECUTING UNIT

324: TCOEF RVLC FLC EXECUTING UNIT

325: Intra/Inter TCOEF RVLC/FLC MULTIPLEXING UNIT

[FIG. 8]

400: Intra TCOEF MODULE SELECTING UNIT

420: Intra TCOEF & Escape MULTIPLEXING UNIT

[FIG. 9]

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500: Inter TCOEF MODULE SELECTING UNIT

520: Inter TCOEF & Escape MULTIPLEXING UNIT

[FIG. 10]

600: Intra TCOEF RVLC MODULE SELECTING UNIT

630: Intra TCOEF RVLC & Escape MULTIPLEXING UNIT

[FIG. 11]

700: Inter TCOEF RVLC MODULE SELECTING UNIT

730: Inter TCOEF RVLC & Escape MULTIPLEXING UNIT

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(54) 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치 및 그 방법

요약

본 발명은, 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치 및 그 방법을 제공하기 위한 것으로, 이러한 본 발명은 동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해, 가변 길이 부호화를 수행할 때, 가변 길이 부호화 테이블을 가변 길이 코드의 규칙성과 유사성을 기준으로 복수개로 분할하고, 각 가변 길이 부호화 테이블을 참조하여 가변 길이 부호화된 정보를 다중화함으로써, 전체 테이블 구성 처리 과정에 대한 개별적인 처리 시간의 오차를 줄일 수 있고, 가변 길이 코드의 유사성을 기준으로 복수개의 가변 길이 부호화 테이블로 구분한 후 합성하여 출력하면 전체적으로 합성된 로직의 크기가 감소되어 장치 구성을 간략화시킬 수 있게 된다.

대표도

도8

색인어

가변길이부호화테이블분할, 가변길이코드규칙성, 가변길이코드유사성, escape코드, intra MPEG4 가변길이코드, H.263 가변길이코드, Inter RVLC, Intra RVLC

명세서

도면의 간단한 설명

도1은 국제 표준 MPEG4의 부호화기 블럭 구성도,

도2는 본 발명이 적용되는 동영상압축 부호화장치 내 가변 길이 부호화기 블럭 구성도,

도3은 MPEG4 인코드시 escape 모드 처리 작용을 보인 도면,

도4는 본 발명이 적용되는 동영상압축 부호화장치 내 가변 길이 부호화의 출력을 위한 장치 블럭 구성도,

도5는 도4의 TCOEF VLC/RVLC ESC, 수행부의 내부 블럭 구성도,

도6은 도5의 Intra/Inter TCOEF VLC & VLC ESC, 수행부의 내부 블럭 구성도,

도7은 도5의 Intra/Inter TCOEF RVLC & RVLC ESC, 수행부의 내부 블럭 구성도,

도8은 도6의 Intra/Inter TCOEF VLC 수행부 중에서 본 발명에 의한 Intra TCOEF VLC 수행부의 블럭 구성도,

도9는 도6의 Intra/Inter TCOEF VLC 수행부 중에서 본 발명에 의한 Inter(H.263) TCOEF VLC 수행부의 블럭 구성도,

도10은 도7의 Intra/Inter TCOEF RVLC 수행부 중에서 본 발명에 의한 Intra TCOEF RVLC 수행부 블럭 구성도,

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도11은 도7의 Intra/Inter TCOEF RVLC 수행부 중에서 본 발명에 의한 Inter TCOEF RVLC 수행부 블럭 구성도.

<도면의 주요 부분에 대한 부호의 설명>

400: Intra TCOEF 모듈선택부

410-413: 제1 내지 제4 Intra TCOEF VLC 테이블 모듈

420: Intra TCOEF & escape 다중화부

발명의 상세한 설명

발명의 목적

발명이 속하는 기술분야 및 그 분야의 종래기술

본 발명은 화상전화, 화상회의, PCS(개인휴대통신)용 PDA(Personal Digital Assistant; 휴대용개인단말기), mobile용 전화 및 멀티미디어 장치, IMT-2000(3세대 이동통신 시스템) 영상 서비스를 위한 장치 등에서 동영상 압축 부호화 장치 내 가변 길이 부호화 장치에 관한 것으로, 특히 동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화를 수행할 경우, 가변 길이 부호화 테이블을 가변 길이 코드의 유사성을 기준으로 복수개로 구분함으로써, 전체 데이블 구성 처리 과정에 대해 개별적인 처리 시간의 오차를 줄일 수 있고, 가변 길이 코드의 유사성을 기준으로 복수개의 가변 길이 부호화 테이블로 구분한 후 합성하여 출력하면 전체적으로 합성된 로직의 크기가 감소되어 장치 구성을 간략화시킬 수 있게 되는 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치 및 그 방법에 관한 것이다.

영상을 부호화하는 가변 길이 부호화 장치에는 기존의 MPEG1,MPEG2, H.261, H.263 등 여러가지 가변 길이 부호화 방법이 제안되어 왔다. 특히 HDTV(High Density Television)의 표준 방식인 MPEG2의 가변 길이 부호화 장치의 특징은, 대용량의 영상 정보를 빠른 시간 안에 처리하기 위해, 헤더 정보와 영상 데이터를 구분하여 헤더 정보는 그대로 부호화하고 영상데이터는 여러 가지 병렬 구조로 구성되는데, 동시에 여러 개의 영상 데이터를 처리하는 것이다.

도1은 국제 표준 MPEG4의 부호화기 블럭 구성을 보인다. 기존의 MPEG2와는 달리 모양 정보 부호화를 추가로 수행하는 것이 가장 큰 차이점이다.

입력된 영상 데이터를 블럭 단위로 움직임 추정(Motion Estimation)을 수행하여 움직임 벡터를 생성하는 움직임 추정부(1)와; 상기 생성된 움직임 벡터를 이용하여 움직임 보상(Motion Compensation)을 수행하는 움직임 보상부(2)와; 상기 움직임보상부(2)에서 움직임 보상이 되지 않은 부분을 영상 정보 부호화(Texture coding)를 수행하는 영상정보 부호화부(4)와; 상기 움직임 보상부(2)에서 움직임 보상된 VOP(Video Object Plane; MEPG4에서 임의의 모양을 가지는 부호화 단위)와, 상기 영상정보 부호화부(4)에서 부호화된 데이블의 내부 정보가 가산되어 현재 영상 바로 이전 영상의 VOP인 이전 VOP를 재구성하는 이전VOP 재구성부(6)와; 입력된 영상의 모양 정보에 대해 모양 정보 부호화(Shape coding)를 수행하는 모양 정보부호화부(9)와; 상기 움직임추정부(1)에서 추정된 움직임 정보와, 상기 영상 정보 부호화부(4)에서 부호화된 내부 영상 정보 및 상기 모양 정보 부호화부(9)에서 부호화된 모양 정보를 다중화하는 다중화부(11)와, 상기 다중화부(11)에서 다중화된 비트스트림을 버퍼링한 후 출력하는 출력 버퍼(12)로 구성된다.

상기와 같은 국제 표준 MPEG4의 부호화기의 작동을 설명하면 다음과 같다.

먼저, 영상 화면이 입력되면, 블럭 단위로 움직임 추정(Motion Estimation)을 하고, 여기에서 생성된 움직임 벡터를 전송한다. 그런 후 움직임 벡터로 움직임 보상(Motion Compensation)을 한 후 움직임 보상이 되지 않은 부분을 영상 정보 부호화(Texture coding)를 수행한다.

그리고 영상의 모양 정보에 대해 모양 정보 부호화(Shape coding)를 수행한다. 모양정보 부호화부(9)의 출력 신호는 VOP 부호화기가 적용되는 분야에 따라 사용 여부가 가변되는 것으로, 점선으로 표시된 바와 같이, 모양 정보 부호화부(9)의 출력신호를 움직임 추정부(1), 움직임 보상부(2) 및 영상 정보 부호화부(4)에 입력시켜 움직임 추정, 움직임 보상 및 영상 정보 부호화(texture coding)하는 데 사용할 수 있다.

움직임추정부(1)에서 추정된 움직임 정보와, 영상 정보 부호화부(4)에서 부호화된 내부 영상 정보 및 모양 정보 부호화부(9)에서 부호화된 모양 정보는 다중화부(11)에서 다중화된 후, 출력 버퍼(12)를 통해 비트스트림으로 송신된다.

이렇게 다중화부(11)로 입력되어 송신될 데이터는, 움직임 추정부(1)로부터의 움직임 벡터 정보, 영상정보 부호화부(4)로부터의 매크로블럭 헤더 정보, 영상 데이터 정보 등으로서, 이러한 정보의 대다수가 가변 길이 부호화 코드를 사용하고 있다.

그런데 HDTV의 대용량의 영상 정보를 실시간에 처리해야 하는 경우가 아니라, 전송 채널이 허용하는 저전송 선로에 대해서도 처리할 수 있는 비교적 적은 영상 정보(QCIF: 352*288, QCIF: 176*144)를 효과적으로 가변 길이 부호화해야 하는 경우, 국제 표준 MPEG4의 부호화에서 영상 정보 부호화(texture coding)된 영상 정보를 가변 길이로 부호화하는 장치는 저전송선로에 대한 비교적 적은 양의 영상 정보를 처리할 수 있도록 구현되어야 한다.

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이렇게 저 전송 선로에 대한 비교적 적은 양의 영상 정보를 처리할 수 있도록 가변 길이 부호화 장치를 구현할 경우, 전체 가변 길이 부호화 테이블을 하나의 로직(logic)으로 구현하게 되면, 실제로 합성 과정에서 가변 길이 코드의 규칙성이나 상관성에 영향을 받지 않고 합성하므로, 로직의 크기가 매우 커지는 문제점이 있었다.

발명이 이루고자 하는 기술적 과제

이에 본 발명은 상기와 같은 종래 기술의 문제점을 해결하기 위해 제안된 것으로, 본 발명의 목적은

동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화를 수행할 경우, 가변 길이 부호화 테이블을 가변 길이 코드의 규칙성과 유사성을 기준으로 복수개로 분할하고, 각 가변 길이 부호화 테이블을 참조하여 가변 길이 부호화된 정보를 다중화함으로써, 전체 테이블 구성 처리 과정에 따른 패널적인 처리 시간의 오차를 줄일 수 있고, 가변 길이 코드의 유사성을 기준으로 복수개의 가변 길이 부호화 테이블로 구분한 후 합성하여 압축하면 전체적으로 합성된 로직의 크기가 감소되어 장치 구성을 간략화시킬 수 있게 되는 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치 및 그 방법을 제공하는 데 있다.

상기와 같은 목적을 달성하기 위하여 본 발명에 의한 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치는,

Intra TCOEF(DCT 계수) VLC를 수행하는 장치로,

RUN, LEVEL, LAST값에 따라 해당 Intra TCOEF VLC 테이블 모듈을 선택하는 Intra TCOEF 모듈 선택부와;

상기 RUN, LEVEL, LAST값에 따른 Intra TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 4개의 모듈(module)로 구성된 제1 내지 제4 모듈과;

상기 제1 내지 제4 모듈에서 각각 출력되는 최대 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Intra TCOEF 모듈 선택부에서 선택되는 신호에 따라 다중화하는 Intra TCOEF & escape 다중화부로 구성하고,

Inter(H.263) TCOEF VLC를 수행하는 장치로,

RUN, LEVEL, LAST값에 따라, Inter TCOEF VLC와 H.263 VLC를 위한 해당 VLC 테이블 모듈을 선택하는 Inter TCOEF 모듈 선택부와;

상기 RUN, LEVEL, LAST값에 따라 Inter TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 7개의 모듈(module)로 구성된 제1 내지 제7 모듈과;

상기 제1 내지 제7 모듈에서 각각 출력되는 최대 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Inter TCOEF 모듈 선택부에서 선택되는 신호에 따라 다중화하는 Inter TCOEF & escape 다중화부로 구성함을 그 기술적 구성상의 특징으로 한다.

상기와 같은 목적을 달성하기 위하여 본 발명에 의한 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 방법은,

MPEG4 표준 가변 길이 부호화를 구성하기 위해 가변 길이 코드의 규칙성과 유사성을 판단하는 제1단계와;

상기 판단된 결과에 따라 유사 가변 길이 코드끼리 묶어 복수개의 가변 길이 코드화 테이블을 구성하는 제2단계와;

상기 복수개의 가변 길이 코드화 테이블 중 해당 가변 길이 코드화 테이블을 참조하여 가변 길이 코드화를 수행한 후 다중화하는 제3단계로 이루어짐을 그 방법적 구성상의 특징으로 한다.

발명의 구성 및 작용

이하, 상기와 같은 본 발명에 의한 동영상 압축 부호화장치의 VLC 테이블 분할 가변길이 부호화 장치 및 그 방법을 첨부된 도면에 의거 상세히 설명하면 다음과 같다.

본 발명이 적용되는 동영상 압축 부호화 장치는, MPEG4 simple profile에 맞는 가변 길이 부호화(Variable Length Coding; VLC)와 H.263의 가변 길이 부호화, 그리고 에러 전송에 효과적인 역방향 가변 길이 부호화(Reversible Variable Length Coding; RVLC)의 복합 구조를 이루고 있고, simple profile에서는 모양 정보 부호화는 고려하지 않고 있다.

MPEG4 simple profile 부호화기의 가변 길이 부호화시 사용되는 가변길이 부호화 테이블(VLC 테이블)이 [표 1]에 구성된다.

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[표 1]

	VLC Table Name	Index 개수	비트수	비고
1	mcbpc for I-VOPs	9	1-9	
2	mcbpc for P-VOPs	21	1-9	
3	cbpy for four non-transparent blocks	16	2-6	
4	MVD	65	1-13	
5	dct_dc_size_luminance	9	2-7	Not N-bit
6	dct_dc_size_chrominance	9	2-7	Not N-bit
7	Intra Lum. And Chr. TCOEF	113	3-13	
8	Inter Lum. And Chr. TCOEF	113	3-13	
9	RVLC for Intra TCOEF	169	4-15	
10	RVLC for Inter TCOEF	169	4-16	

그리고 H.263 VLC 테이블 구성이 [표 2]에 보인다.

[표 2]

	VLC Table Name	Index 개수	비트수	MPEG4와 비교
1	mcbpc for I-VOPs	9	1-9	동일
2	mcbpc for P-VOPs	21	1-9	동일
3	cbpy for four blocks	16	2-6	동일
4	MVD	65	1-13	구성이 다름
5	Inter TCOEF	113	3-13	동일(escape 다름)

도2는 본 발명이 적용되는 동영상압축 부호화장치의 가변 길이 부호화기 블럭 구성을 보인다.

MPEG4 simple profile에 맞는 가변 길이 부호화와 H.263의 가변 길이 부호화, 그리고 에러 전송에 효과적인 역방향 가변 길이 부호화(Reversible Variable Length Coding; RVLC)의 복합적인 구조를 가진다.

즉, 영상정보 부호화(texture coding)에서 나오는 매크로블럭 헤더 정보와 영상 데이터를 구분하여 처리하게 되는데, 매크로블럭 헤더 정보 중 휘도 블럭 패턴(Coded Block Pattern for Luminance; CBPY)를 Intra/Inter 플래그(Intra 프레임 부호화와 Inter 프레임 부호화를 선택하기 위한 제어 신호)에 따라 VLC 코드로 처리하는 휘도 블럭 패턴 처리부(100)와; 매크로블럭 헤더 정보 중 매크로블럭 타입(MB type)과 CBPC(Coded Block Pattern for Chrominance)의 정보를 VLC 코드로 정의하는 MCBPC(110)와; 매크로블럭 헤더 정보 중의 하나인 이전의 움직임 벡터와 현재의 움직임 벡터 간의 차이값을 VLC 코드로 처리하는 움직임 벡터 차이값 처리부(Motion Vector Difference; MVD)(120)와; 매크로블럭 헤더 정보 중의 하나인 휘도 DCT DC 크기(dct_dc_size_luminance)를 위한 VLC 코드를 처리하는 휘도 DCT DC 크기 처리부(130)와; 매크로블럭 헤더 정보 중의 하나인 색차 DCT DC 크기(dct_dc_size_chrominance)를 위한 VLC 코드를 처리하는 색차 DCT DC 크기 처리부(140)와; 영상정보 부호화(texture coding) 과정에서 zigzag scan을 거친 DCT 계수(TCOEF)를 입력받아 버퍼링하고, escape 모드를 고려한 VLC를 하기 위해 필요한 클럭 레이트(clock rate)에 맞추어 RLC(203)로 출력하는 입력 버퍼(201)와; 상기 입력버퍼(201)에서 출력되는 DCT AC 계수를 RLC(Run Length Coding)를 수행하며, VLC 부호화하기 위해 필요한 제어 정보를 출력하는 RLC(202)와; 역방향 가변 길이 부호화(RVLC)와 가변 길이 부호화(VLC)를 선택하기 위한 제어 신호(RVLC 플래그), H.263 TCOEF VLC를 선택하기 위한 제어 신호(H.263 플래그), Intra 프레임 부호화와 Inter 프레임 부호화를 선택하기 위한 제어 신호(Intra/Inter 플래그)를 선택적으로 입력받아, 역방향 가변 길이 부호화(RVLC), Intra TCOEF, 가변 길이 부호화(VLC), Inter TCOEF VLC, H.263 TCOEF VLC가 선택적으로 수행되도록 상기 RLC(202)로부터의 경로를 각각 스위칭하는 제1 내지 제4 스위치(203-206)와; 상기 제1 내지 제3 스위치(203-205)에 의해 선택되면 MPEG4 Intra TCOEF를 Intra escape 모드로 VLC를 수행하는 Intra TCOEF/MPEG4 Intra ESC 수행부(207)와; 상기 제1 내지 제3 스위치(203-205)에 의해 선택되면 MPEG4 Inter TCOEF를 Inter escape 모드로 VLC를 수행하는 Inter TCOEF/MPEG4 Inter ESC 수행부(208)와; 상기 제1 및 제2 스위치(203)(204)에 의해 선택되면 H.263 TCOEF를 Inter 프레임 부호화를 사용하여 escape 모드를 수행하는 TCOEF/H.263 ESC 수행부(209)와; 상기 제1, 제2, 제4 스위치(203,204,206)에 의해 선택되면 Intra TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 Intra RVLC TCOEF / ESC, FLC 수행부(210)와; 상기 제1, 제2, 제4 스위치(203,204,206)에 의해 선택되면 Inter TCOEF를 RVLC 수행하고 escape 모드시 고정길이 부호화(Fixed Length Coding; FLC)를 수행하는 Inter RVLC TCOEF / ESC, FLC 수행부(211)로 구성된다.

상기 RLC(202)에서 출력되는 VLC 부호화하기 위해 필요한 제어 정보는, 현재 부호화되는 0이 아닌 DCT 계수가 블럭 내의 마지막 0이 아닌 DCT 계수인지를 나타내는 LAST, 0이 아닌 계수의 값을 나타내는 LEVEL, 부호화되는 계수 앞의 연속적인 0의 개수를 나타내는 RUN이다.

상기 제1 스위치(203)는 상기 RLC(202)에서 출력되는 제어정보(LAST, LEVEL, RUN)를 RVLC 플래그에 따라

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제2 스위치(204)와 제4스위치(206) 중 하나로 스위칭하고, 상기 제2 스위치(203)는 상기 제1 스위치(203)에서 출력되는 정보를 H.263플래그에 따라 제3 스위치(205)와 상기 TCOEF/H.263 ESC, 수행부(209) 중 하나로 스위칭하며, 상기 제3 스위치(205)는 상기 제2 스위치(204)에서 출력되는 정보를 Intra_Inter 플래그에 따라 상기 Intra TCOEF/MPEG4 Intra ESC, 수행부(207)와 Inter TCOEF/MPEG4 Inter ESC, 수행부(208) 중 하나로 스위칭하고, 상기 제4 스위치(206)는 상기 제1 스위치(203)에서 출력되는 정보를 상기 Intra_Inter 플래그에 따라 상기 Intra RVLC TCOEF / ESC, FLC 수행부(210)와 Inter RVLC TCOEF / ESC, FLC 수행부(211) 중 하나로 스위칭한다.

상기와 같은 본 발명이 적용되는 동영상압축 부호화장치의 가변 길이 부호화기의 작용을 설명하면 다음과 같다.

입력 버퍼(201)에 입력되는 정보는 영상정보(texture) 부호화에서 나오는 계수(coefficient)로 지그재그 스캔(zigzag scan)을 거친 정보이다. 입력 버퍼(201)에서는 escape mode를 고려한 VLC를 하기 위해 필요한 클럭 레이트(clock rate)에 맞추어 계수를 RLC(202)로 읽어내고 RLC(202)는 RUN,LEVEL,LAST를 구하기 위한 RLC(Run Length Coding)를 한다.

각각의 모듈(207,208,209,210,211)을 선택하기 위해 RVLC 플래그, H.263 플래그, Intra_Inter 플래그가 이용된다.

MPEG4 Inter TCOEF VLC 테이블은 H.263 TCOEF VLC 테이블과 동일하다. 그러나 escape mode는 다르게 구성된다.

영상정보 부호화(texture coding)에서 나오는 매크로블럭 헤더 정보와 영상 데이터를 구분하여 처리하게 되는데, 매크로블럭 헤더 정보 처리 작용에 대해 설명하면, CBPY(100)는 휘도 블럭 패턴을 VLC하고, MCBPC(110)는 MB 타입과 CBPC(Coded Block Pattern for Chrominance)의 정보를 VLC 코드로 정의한다. 그리고 MVD(120)는 이전의 움직임 벡터와 현재의 움직임 벡터의 차이값을 VLC하고, 휘도 DCT DC 크기 처리부(130)는 휘도 DCT DC 크기를 VLC하며, 색차 DCT DC 크기 처리부(140)는 색차 DCT DC 크기를 VLC한다.

이제, 영상 데이터 처리인 입력 버퍼(201)에 이어, RLC의 동작을 설명하면, 입력 버퍼(201)에서 출력되는 AC 계수값을 RLC를 수행하여, LAST, RUN, LEVEL로 이루어진 일련의 EVENT들을 출력해서, VLC 부호화될 수 있도록 한다.

이때 LAST가 '0'인 경우 0이 아닌 계수가 블럭 내에 더 존재한다는 것을 의미하고, '1'인 경우 0이 아닌 계수가 블럭 내에 더 이상 존재하지 않음을 나타낸다.

이렇게 RLC를 수행하여 LAST, RUN, LEVEL을 출력하는 방법을 코드(code)로 나타내면 다음과 같다.

```
count <= count + 1 ;
If(!AC_Coefficient) begin
          run_cnt <= run_cnt + 1 ;
          RLC_E <= 1'b0 ;
       end
       else begin
  run_cnt <= 0;

  LEVEL_tmp <= AC_Coefficient;
  RUN_tmp <= run_cnt;
         If(LEVEL_tmp != 12'd0)
           RLC_E <= 1'b1;
         end

         LEVEL <= LEVEL_tmp;
         RUN <= RUN_tmp;

         If(count == 65) begin          ------(1)
           LAST <= 1'b1;
           LEVEL <= LEVEL_tmp;
           RUN <= RUN_tmp;
           RLC_E <= 1'b1;
       end
```


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상기에서 Input은 AC_Coefficient, count, flag(64 or 65)이고, output은 RUN, LEVEL, LAST, RLC_E(RLC_Enable)이다. Intra mode일 때, (1)의 count == 65는 DC 값을 빼고 LAST를 결정해야 하므로 64로 바뀐다. 그러나, Intra_dc_thr에 의해 DC값을 AC값과 동일한 방법으로 하여 처리하게 되면 Intra mode이더라도 65로 처리한다. 실제 RUN, LEVEL, LAST의 정보는 RLC_Enable로써 나타낸다.

도3은 MPEG4 인코딩(encoding)시 escape 모드 처리 작용을 보인다.

기존의 MPEG1, MPEG2, H.261, H.263에서의 escape 모드 처리 방법은 고정 길이 부호화(Fixed Length Coding; FLC)를 수행했다. 그러나 본 발명에 적용되는 MPEG4 escape mode는 도3에서 보여지는 바와 같이, 영상 압축률을 향상시키기 위해 3단계로 구분하여 처리한다. 즉, Intra TCOEF와 Inter TCOEF로 나누어져 각각 다른 테이블을 이용하며 escape mode에서도 LEVEL과 RUN값을 변화시키는 table이 각각 다르다.

그러나 신호 흐름의 내용은 유사하다. 먼저 RLC(202)에서 나오는 RUN, LEVEL, LAST값을 가지고 TCOEF VLC 테이블을 참조하여 TCOEF VLC 코드를 결정한다. 그래서 TCOEF VLC 테이블의 해당 인덱스 안에 값이 존재하면 일반적인(normal) VLC를 수행한다(ST11,ST12).

그러나 TCOEF VLC 테이블의 해당 인덱스 안에 값이 존재하지 않으면 escape mode로 선택된다. 그래서 LEVEL 값을 변화시킨다. 변화된 LEVEL값은 LEVEL+로, sign(LEVEL)*[abs(LEVEL)-LMAX]이다(ST13)(제1단계). 여기서 LMAX는 주어진 쌍 (LAST,RUN)의 LEVEL의 최대값이다.

이렇게 LEVEL값을 변화시킨 후, 동일한 TCOEF VLC 테이블을 참조하여 해당 인덱스 안에 값이 존재하면 TCOEF VLC 코드를 정한다(ST14,ST15).

그러나 ST14에서 상기 TCOEF VLC 테이블에 값이 존재하지 않아, 다시 escape mode가 선택되면, RUN값을 변화시킨다. 변화된 RUN값은 RUN+로, RUN+(RMAX + 1)이다(ST16)(제2단계), 여기서 RMAX는 주어진 쌍 (LAST, LEVEL)의 RUN의 최대값이다.

이렇게 RUN 값을 변화시킨 후, 다시 동일한 TCOEF VLC 테이블을 참조하여 TCOEF VLC 코드를 정한다(ST17,ST18). 그러나 상기 TCOEF VLC 테이블에 VLC 코드가 존재하지 않아 escape 모드가 선택되면, FLC(Fixed Length Coding)를 수행한다(ST19)(제3단계).

위와 같은 동작 수행은 Intra일 때와 Inter일 때 동일한 방법으로 수행되고 적용되는 테이블의 구성이 다르다.

도4는 본 발명이 적용되는 동영상압축 복호화장치의 가변 길이 부호화와 출력을 위한 장치 블럭 구성을 보인다.

RVLC 플래그에 따라 normal VLC 기능과 RVLC 기능을 수행하고, VLC escape 모드시 FLC를 수행하는 TCOEF VLC/RVLC ESC. 수행부(300)와; 상기 TCOEF VLC/RVLC ESC. 수행부(300)에서 출력되는 가변 길이 부호화(VLC) 코드와 고정 길이 부호화(FLC) 코드를 블럭(block) 단위로 하나의 비트열로 램(500)에 쓰기 위해 재구성하는 TCOEF 비트 스트림 생성기(400)와; 상기 TCOEF 비트 스트림 생성기(400)에서 출력되는 TCOEF 비트열을 저장하는 TCOEF VLC/RVLC 버퍼(램)(500)으로 구성된다.

상기 TCOEF VLC/RVLC ESC. 수행부(300)는 도5에 도시된 바와 같이, RVLC 플래그가 VLC 수행을 나타내면 normal VLC 기능을 수행하고 VLC escape 모드시 FLC를 수행하는 Intra/Inter TCOEF VLC & VLC ESC. 수행부(310)와; 상기 RVLC 플래그가 RVLC 수행을 나타내면 RVLC 기능을 수행하고 RVLC escape 모드시 FLC를 수행하는 Intra/Inter TCOEF RVLC & RVLC ESC. 수행부(320)와; 상기 RVLC 플래그에 따라, 상기 Intra/Inter TCOEF VLC & VLC ESC. 수행부(310)에서 출력되는 Intra/Inter TCOEF VLC/FLC 코드와 상기 Intra/Inter TCOEF RVLC & RVLC ESC. 수행부(320)에서 출력되는 Intra/Inter TCOEF RVLC/FLC 코드를 다중화하여 VLC 코드와 FLC 코드를 상기 TCOEF 비트 스트림 생성기(400)로 출력하는 TCOEF VLC/FLC 다중화부(330)로 구성된다.

상기 Intra/Inter TCOEF VLC & VLC ESC. 수행부(310)는 도6에 도시된 바와 같이, TCOEF VLC 테이블에서 원하는 VLC 모드를 검색하여 그 결과에 따라 escape 모드인 지를 판단하고, escape 모드이면 타이밍 컨트롤러(313)로 escape 모드 신호를 전송하며, 판단된 모드에 따라 가변 길이 부호화를 수행하는 Intra/Inter TCOEF VLC 수행부(315)와; RMAX, RUN+를 계산하는 Intra/Inter RMAX, RUN+ 계산부(311)와; LMAX, LEVEL+를 계산하는 Intra/Inter LMAX, LEVEL+ 계산부(312)와; 상기 Intra/Inter RMAX, RUN+ 계산부(311)에서 계산된 RMAX, RUN+를 제공받고, 상기 Intra/Inter LMAX, LEVEL+ 계산부(312)에서 계산된 LMAX, LEVEL+를 제공받으며, 상기 Intra/Inter TCOEF VLC 수행부(315)로부터 전송받는 escape 모드 신호에 따라, LEVEL과 LEVEL+, 선택 기능과 RUN과 RUN+ 선택 기능을 수행하고 각 해당 블럭의 동작 제어 기능을 수행하는 타이밍 컨트롤러(313)와; 상기 타이밍 컨트롤러(313)의 제어에 따라, TCOEF 부호화를 위해 LEVEL의 절대치를 계산하는 LEVEL 절대값 계산부(314)와; 상기 Intra/Inter TCOEF VLC 수행부(315)에서 RUN, LEVEL, LAST를 이용한 가변 길이 부호화가 끝난 시점에, 상기 LEVEL 절대값 계산부(314)에서 출력되는 데이터를 이용하여 상기 Intra/Inter TCOEF VLC 수행부(315)로부터의 데이터에 사인비트(sign bit)를 첨가하는 부호비트 애더(sign bit adder)(317)와; 상기 타이밍 컨트롤러(313)의 동작 제어 신호에 따라 동작하며, MPEG4와 H.263의 DCT 계수에 대해 각각 FLC 부호화를 수행하는 MPEG4/H.263 TCOEF FLC 수행부(316)와; 상기 타이밍 컨트롤러(313)의 제어에 따라, 상기 부호 비트 애더(317)의 출력과 상기 MPEG4/H.263 TCOEF FLC 수행부(316)의 출력을 다중화하는 Intra/Inter TCOEF VLC/FLC 다중화부(318)로 구성된다.

상기 Intra/Inter TCOEF RVLC & RVLC ESC. 수행부(320)는 도7에 도시된 바와 같이, TCOEF 부호화를 위해 LEVEL의 절대치를 계산하는 LEVEL 절대값 계산부(321)와; 상기 LEVEL 절대값 계산부(321)에서 출력되는 신호; RLC 인에이블 신호, RVLC 플래그, Intra_Inter 플래그를 입력받아 RVLC를 수행하는 Intra/Inter TCOEF RVLC 수행부(322)와; 상기 Intra/Inter TCOEF RVLC 수행부(322)에서 출력되는 RVLC 부호화 코드에 상기 LEVEL 절대값 계산부(321)로부터의 LEVEL sign bit를 첨가하는 sign bit adder(323)와; escape 모드일 때 FLC를 수행하는 TCOEF RVLC FLC 수행부(324)와; 상기 TCOEF RVLC FLC 수행부(324)의 출력과 상기

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sign bit adder(323)의 출력을, 상기 Intra/Inter TCOEF RVLC 수행부(322)로부터의 escape 모드 신호에 따라 다중화하여 상기 TCOEF VLC/FLC 다중화부(330)로 출력하는 Intra/Inter TCOEF RVLC/FLC 다중화부(325)로 구성된다.

상기와 같은 본 발명이 적용되는 동영상압축 부호화장치의 가변 길이 부호화의 출력을 위한 장치의 작용을 설명하면 다음과 같다.

TCOEF VLC/RVLC ESC. 수행부(300)는 RVLC 플래그에 따라 normal VLC 기능과 RVLC 기능을 수행하고, VLC escape 모드시 FLC를 수행한다. TCOEF 비트 스트림 생성기(400)는 TCOEF VLC/RVLC ESC. 수행부(300)에서 출력되는 가변 길이 부호화(VLC) 코드와 고정 길이 부호화(FLC) 코드를 블럭(block) 단위로 하나의 비트열로 팹(500)에 쓰기 위해 재구성한다. TCOEF VLC/RVLC 버퍼(팹)(500)은 TCOEF 비트 스트림 생성기(400)에서 출력되는 TCOEF 비트열을 저장하고 원하는 곳에 출력한다.

상기 TCOEF VLC/RVLC ESC. 수행부(300)의 작용을 좀더 상세히 설명하면, 도5에 도시된 바와 같이, RVLC 플래그로 2개의 module(310)(320)을 선택한다.

즉, RVLC 플래그가 VLC 수행을 나타내면, Intra/Inter TCOEF VLC & VLC ESC. 수행부(310)는 normal VLC 기능을 수행하고 VLC escape 모드시 FLC를 수행한다. 그리고 상기 RVLC 플래그가 RVLC 수행을 나타내면 Intra/Inter TCOEF RVLC & RVLC ESC. 수행부(320)는 RVLC 기능을 수행하고 RVLC escape 모드시 FLC를 수행한다.

Intra/Inter TCOEF VLC & VLC ESC. 수행부(310)는 MPEG4와 H.263에 대해 같은 TCOEF VLC 테이블을 사용하여 부호화하고, Intra/Inter TCOEF RVLC & RVLC ESC. 수행부(320)는 MPEG4와 H.263에 대해 다른 VLC 테이블을 사용하여 부호화한다.

TCOEF VLC/FLC 다중화부(330)는 상기 RVLC 플래그에 따라, 상기 Intra/Inter TCOEF VLC & VLC ESC. 수행부(310)에서 출력되는 Intra/Inter TCOEF VLC/FLC 코드와 상기 Intra/Inter TCOEF RVLC & RVLC ESC. 수행부(320)에서 출력되는 Intra/Inter TCOEF RVLC/FLC 코드를 다중화하여 VLC 코드와 FLC 코드를 상기 TCOEF 비트 스트림 생성기(400)로 출력한다.

그리고 상기 Intra/Inter TCOEF VLC & VLC ESC. 수행부(310)의 작용을 좀더 상세히 설명하면 도6에 도시된 바와 같이, Intra/Inter TCOEF VLC 수행부(315)는, RUN, LEVEL, LAST를 가지고 TCOEF VLC 테이블에서 먼저 인덱스를 찾고, 이 때 escape mode이면 타이밍 컨트롤러(313)로 escape 모드 신호를 전송한다. 그러면 타이밍 컨트롤러(313)는 Intra/Inter LMAX, LEVEL+ 계산부(312)에서 이미 찾아진 LEVEL+ 값을 선택하여 Intra/Inter TCOEF VLC 수행부(315)로 전송하고, 다시 TCOEF VLC 테이블을 찾도록 한다. 그 결과 escape mode가 다시 선택되면 미리 선택된 RUN+를 가지고 다시 TCOEF VLC 테이블을 참조한다. 그 결과 escape mode가 다시 선택되면 FLC를 수행하도록 타이밍 컨트롤러(313)에서 MPEG4/H.263 TCOEF FLC 수행부(316)를 제어하여 FLC를 수행하도록 한다.

이러한 방법은 Intra TCOEF일 때와 Inter TCOEF일 때 동일하게 적용되고, 실제 구현 테이블과 LEVEL+와 RUN+ 참고 표는 다르다. 그리고 Inter TCOEF VLC는 H.263 VLC와 동일하게 적용된다.

그리고 escape mode일 때 FLC 방법이 다르므로 H.263/플래그에 의해 FLC 방법을 스위칭한다.

한편 LEVEL 절대값 계산부(314)는 LEVEL 값의 절대값을 계산한다. 그리고 signbit adder(부호비트 가산기)는 Intra/Inter TCOEF VLC 수행부(315)의 출력 신호인 unsigned VLC code에 sign bit를 붙인다.

Intra/Inter TCOEF VLC/FLC 다중화부(318)는 타이밍 컨트롤러(313)의 제어에 따라 상기 부호 비트 에더(317)의 출력과 상기 MPEG4/H.263 TCOEF FLC 수행부(316)의 출력을 다중화하여 상기 TCOEF VLC/FLC 다중화부(330)로 출력한다.

또한 Intra/Inter TCOEF RVLC & RVLC ESC. 수행부(320)의 작용을 상세히 설명하면, 도7에 도시된 바와 같이, RVLC는 Intra RVLC와 Inter RVLC의 테이블 구성이 다르다. RVLC가 escape mode일 때, FLC 방법은 Intra 프레임 부호화와 Inter 프레임 부호화가 모두 같다.

RVLC 부호화를 위해 선택되는 모드 정보를 이용하여 LEVEL의 sign bit를 처리하고, escape 모드일 때 FLC를 수행하며, 이들의 정보를 Intra/Inter TCOEF RVLC/FLC 다중화부(325)에서 상기 escape 모드임을 나타내는 신호에 따라 다중화하여 상기 TCOEF VLC/FLC 다중화부(330)로 출력한다.

이제, 본 발명에 의한 동영상 압축 부호화장치의 VLC 테이블 분할 가변길이 부호화 장치의 구성을 설명한다.

도8은 도6의 Intra/Inter TCOEF VLC 수행부(315) 중 Inter(H.263)가 아닌 Intra TCOEF VLC 수행부의 블럭 구성을 보인다.

도시된 바와 같이, RUN, LEVEL, LAST값에 따라 해당 Intra TCOEF VLC 테이블 모듈을 선택하는 Intra TCOEF 모듈 선택부(400)와; 상기 RUN, LEVEL, LAST값에 따라 Intra TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 4개의 모듈(module)로 구성된 제1 내지 제4 모듈(410-413)과; 상기 제1 내지 제4 모듈(410-413)에서 각각 출력되는 최대 가변 길이 코드와 부호화된 유효 비트수(code length), escape 코드를 상기 Intra TCOEF 모듈 선택부(400)에서 선택되는 신호에 따라 다중화하는 Intra TCOEF & escape 다중화부(420)로 구성된다.

도9는 도6의 Intra/Inter TCOEF VLC 수행부(315) 내부의 Inter(H.263) TCOEF VLC 수행부의 구성을 보인다.

도시된 바와 같이, RUN, LEVEL, LAST값에 따라, Inter TCOEF VLC와 H.263 VLC를 위한 해당 VLC 테이블 모

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블록 선택하는 Inter TCOEF 모듈 선택부(500)와; 상기 RUN, LEVEL, LAST값에 따라 Inter TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 7개의 모듈(module)로 구성된 제1 내지 제7 모듈(510-516)과; 상기 제1 내지 제7 모듈(510-516)에서 각각 출력되는 최대 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Inter TCOEF 모듈 선택부(500)에서 선택되는 신호에 따라 다중화하는 Inter TCOEF & escape 다중화부(520)로 구성된다.

도10은 도7의 Intra/Inter TCOEF RVLC 수행부(322) 중에서 Intra TCOEF RVLC 수행부 블럭 구성을 보인다.

도시된 바와 같이, RUN, LEVEL, LAST값에 따라 해당 Intra TCOEF RVLC 테이블 모듈을 선택하는 Intra TCOEF RVLC 모듈 선택부(600)와; 상기 RUN, LEVEL, LAST값에 따라 Intra TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 13개의 모듈(module)로 구성된 제1 내지 제13 모듈(610-622)과; 상기 제1 내지 제13 모듈(610-622)에서 각각 출력되는 최대 역방향 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Intra TCOEF RVLC 모듈 선택부(600)에서 선택되는 신호에 따라 다중화하는 Intra TCOEF RVLC & escape 다중화부(630)로 구성된다.

도11은 도7의 Intra/Inter TCOEF RVLC 수행부(322) 중에서 Inter TCOEF RVLC 수행부 블럭 구성을 보인다.

도시된 바와 같이, RUN, LEVEL, LAST값에 따라 해당 Inter TCOEF RVLC 테이블 모듈을 선택하는 Inter TCOEF RVLC 모듈 선택부(700)와; 상기 RUN, LEVEL, LAST값에 따라 Inter TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 12개의 모듈(module)로 구성된 제1 내지 제12 모듈(710-721)과; 상기 제1 내지 제12 모듈(710-721)에서 각각 출력되는 최대 역방향 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Inter TCOEF RVLC 모듈 선택부(700)에서 선택되는 신호에 따라 다중화하는 Inter TCOEF RVLC & escape 다중화부(730)로 구성된다.

상기와 같은 본 발명에 의한 동영상 압축 부호화 장치의 VLC 테이블 분할 가변길이 부호화 장치의 작용에 대해 설명하면 다음과 같다.

먼저, 영상 정보 가변 길이 부호화를 위한 구성에서 MPEG4 표준 가변 길이 부호화를 구성하기 위해 가변 길이 코드의 규칙성과 유사성을 판단하는 제1단계와; 상기 판단된 결과에 따라 유사 가변 길이 코드끼리 묶어 복수개의 가변 길이 코드화 테이블을 구성하는 제2단계와; 상기 복수개의 가변 길이 코드화 테이블 중 해당 가변 길이 코드화 테이블을 참조하여 가변 길이 코드화를 수행한 후 다중화하는 제3단계를 수행한다.

상기 제2단계는, Intra TCOEF VLC의 경우, Intra TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 4개의 Intra MPEG4 VLC 테이블로 구성하고, Inter(H.263) TCOEF VLC의 경우, Inter TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 Inter TCOEF VLC와 H.263 VLC를 위한 테이블을 7개의 모듈(module)로 구성하며, Intra TCOEF RVLC의 경우, Intra TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 13개의 Intra TCOEF RVLC 테이블로 구성하고, Inter TCOEF RVLC의 경우, Inter TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 12개의 Inter TCOEF RVLC 테이블을 구성한다.

각 가변 길이 부호화의 경우에 대해 상세히 설명하면, Intra TCOEF VLC의 경우, 부호화 코드의 종류를 구분하여 4개의 모듈로 구성하고, 4개 테이블 모듈의 각각의 최대 가변 길이 코드와 부호화할 유효 비트수(code length), escape코드를 Intra TCOEF 모듈 선택부(400)에서 선택되는 신호에 의해 다중화를 수행한다.

그리고 도6의 Intra/Inter TCOEF VLC 수행부(315)에서 Inter(H.263) TCOEF VLC의 경우, Intra mode와 같은 이유로 Inter TCOEF VLC 모듈을 7개의 모듈로 구성한다. 그리고 7개 테이블의 각각의 최대 가변 길이 코드와 부호화할 유효 비트수, escape 코드를 모듈 선택기에서 선택되는 신호에 의해 다중화를 수행한다.

도7의 Intra/Inter TCOEF RVLC 수행부(322)에서 Intra TCOEF RVLC 수행부는, 도10에 도시된 바와 같이, Intra TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 13개의 Intra TCOEF RVLC 테이블로 구성한다. 그리고 역시 Intra TCOEF RVLC 모듈 선택부(600)에서 선택되는 신호에 의해 다중화를 수행하게 된다.

그리고 도7의 Intra/Inter TCOEF RVLC 수행부(322)에서 Inter TCOEF RVLC 수행부는, 도11에 도시된 바와 같이, Inter TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 12개의 Inter TCOEF RVLC 테이블로 구성한다. 그리고 12개 테이블의 각각의 최대 역방향 가변 길이 코드와 부호화할 유효 비트 수, escape 코드를 Inter TCOEF RVLC 모듈 선택부(700)에서 선택되는 신호에 의해 다중화를 수행한다.

이렇게 RUN과 LEVEL, LAST의 값의 범위를 가변 길이 코드의 유사성이 높은 것끼리 한 묶음으로 처리할 수 있도록 정의시, logic 구현이 가장 원활하도록 한다.

이러한 과정은 가변 길이 부호화 테이블을 구분하는 경우의 수를 최소화하여, 시간적인 지연의 오차가 최소화된다. 이렇게 하면 각 가변 길이 부호화 수행부 간의 처리 시간에 대한 오차를 조정하고 또한 각 가변 길이 부호화 수행부 안에서 처리 시간의 오차를 조정함으로써 전체 테이블 구성 처리 과정에 대해 계별적인 처리 시간의 오차를 줄일 수 있다.

발명의 효과

이상에서 살펴본 바와 같이, 본 발명 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치 및 그 방법은, 동영상 압축 부호화 장치에서 전송 채널이 허용하는 저전송선로를 통하는 비교적 적은 영상정보에 대해 가변 길이 부호화를 수행할 경우, 가변 길이 부호화 테이블을 가변 길이 코드의 규칙성과 유사성을 기준으로 복수개로 분할함으로써, 각 가변 길이 부호화 수행부 간의 처리 시간에 대한 오차를 조정하고 또한 각 가변 길이 부호화 수행부 안에서 처리 시간의 오차를 조정하여, 전체 테이블 구성 처리 과정에 대해 계별적인 처리 시간의 오차를 줄일 수 있는 효과가 있다.

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그리고 전체 VLC 테이블을 종래와 같이 하나의 로직으로 구현하면, 실제로 합성 과정에서 가변 길이 코드의 규칙성이나 상관성에 영향을 받지 않고 합성하므로 로직의 크기가 매우 커졌으나, 본 발명에 의해 가변 길이 코드의 유사성을 기준으로 여러 모듈로 구분한 후 합성하면 전체적으로 합성되는 로직의 크기가 크게 줄어들게 되어 장치 구성을 간략화시킬 수 있는 효과가 있다.

(57) 청구의 범위

청구항 1

영상 정보 가변 길이 부호화 방법에 있어서,

MPEG4 표준 가변 길이 부호화를 구성하기 위해 가변 길이 코드의 규칙성과 유사성을 판단하는 제1단계와;

상기 판단된 결과에 따라 유사 가변 길이 코드끼리 묶여 복수개의 가변 길이 코드화 테이블을 구성하는 제2단계와;

상기 복수개의 가변 길이 코드화 테이블 중 해당 가변 길이 코드화 테이블을 참조하여 가변 길이 코드화를 수행한 후 다중화하는 제3단계를 수행함을 특징으로 하는 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 방법.

청구항 2

제 1 항에 있어서, 상기 제2단계는,

Intra TCOEF VLC의 경우, Intra TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 4개의 Intra MPEG4 VLC 테이블로 구성하고, Inter(H.263) TCOEF VLC의 경우, Inter TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 Inter TCOEF VLC와 H.263 VLC를 위한 테이블을 7개의 모듈(module)로 구성하며, Intra TCOEF RVLC의 경우, Intra TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 13개의 Intra TCOEF RVLC 테이블로 구성하고, Inter TCOEF RVLC의 경우, Inter TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 12개의 Inter TCOEF RVLC 테이블로 구성하는 것을 특징으로 하는 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 방법.

청구항 3

동영상 압축 부호화장치에서 Intra/Inter TCOEF(DCT 계수) 가변 길이 부호화를 수행하는 장치에 있어서,

Intra TCOEF(DCT 계수) VLC를 수행하는 장치는,

RUN, LEVEL, LAST값에 따라 해당 Intra TCOEF VLC 테이블 모듈을 선택하는 Intra TCOEF 모듈 선택부와;

상기 RUN, LEVEL, LAST값에 따라 Intra TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 4개의 모듈(module)로 구성된 제1 내지 제4 모듈과;

상기 제1 내지 제4 모듈에서 각각 출력되는 최대 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Intra TCOEF 모듈 선택부에서 선택되는 신호에 따라 다중화하는 Intra TCOEF & escape 다중화부로 구성되고,

Inter(H.263) TCOEF VLC를 수행하는 장치는,

RUN, LEVEL, LAST값에 따라, Inter TCOEF VLC와 H.263 VLC를 위한 해당 VLC 테이블 모듈을 선택하는 Inter TCOEF 모듈 선택부와,

상기 RUN, LEVEL, LAST값에 따라 Inter TCOEF VLC 코드의 유사도가 높은 VLC 코드끼리 구분하여 7개의 모듈(module)로 구성된 제1 내지 제7 모듈과;

상기 제1 내지 제7 모듈에서 각각 출력되는 최대 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Inter TCOEF 모듈 선택부에서 선택되는 신호에 따라 다중화하는 Inter TCOEF & escape 다중화부로 구성된 것을 특징으로 하는 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치.

청구항 4

동영상 압축 부호화장치에서 Intra/Inter TCOEF(DCT 계수) 역방향 가변 길이 부호화(RVLC)를 수행하는 장치에 있어서,

Intra TCOEF RVLC를 수행하는 장치는,

RUN, LEVEL, LAST값에 따라 해당 Intra TCOEF RVLC 테이블 모듈을 선택하는 Intra TCOEF RVLC 모듈 선택부와;

상기 RUN, LEVEL, LAST값에 따라 Intra TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 13개의 모듈(module)로 구성된 제1 내지 제13 모듈과;

상기 제1 내지 제13 모듈에서 각각 출력되는 최대 역방향 가변 길이 코드와 부호화할 유효 비트수(code length), escape 코드를 상기 Intra TCOEF RVLC 모듈 선택부에서 선택되는 신호에 따라 다중화하는 Intra

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TCOEF RVLC & escape 다중화부로 구성되고,

Inter TCOEF RVLC를 수행하는 장치는,

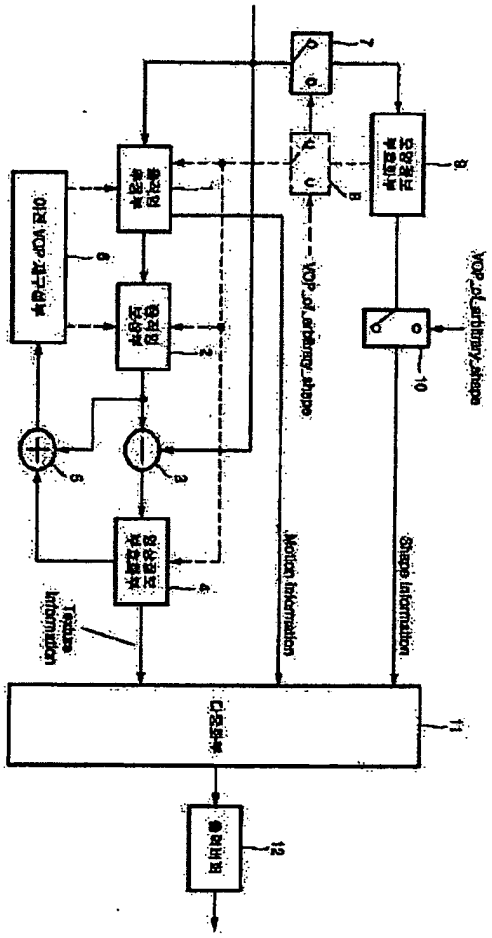
RUN, LEVEL, LAST값에 따라 해당 Inter TCOEF RVLC 테이블 모듈을 선택하는 Inter TCOEF RVLC 모듈 선택부와;

상기 RUN, LEVEL, LAST값에 따라 Inter TCOEF RVLC 코드의 유사도가 높은 RVLC 코드끼리 구분하여 12개의 모듈(module)로 구성된 제1 내지 제12 모듈과;

상기 제1 내지 제12 모듈에서 각각 출력되는 최대 역방향 가변 길이 코드와 부호화될 유효 비트수(code length), escape 코드를 상기 inter TCOEF RVLC 모듈 선택부에서 선택되는 신호에 따라 다중화하는 Inter TCOEF RVLC & escape 다중화부로 구성된 것을 특징으로 하는 동영상 압축 부호화장치의 가변길이부호화 테이블 분할 가변길이 부호화 장치.

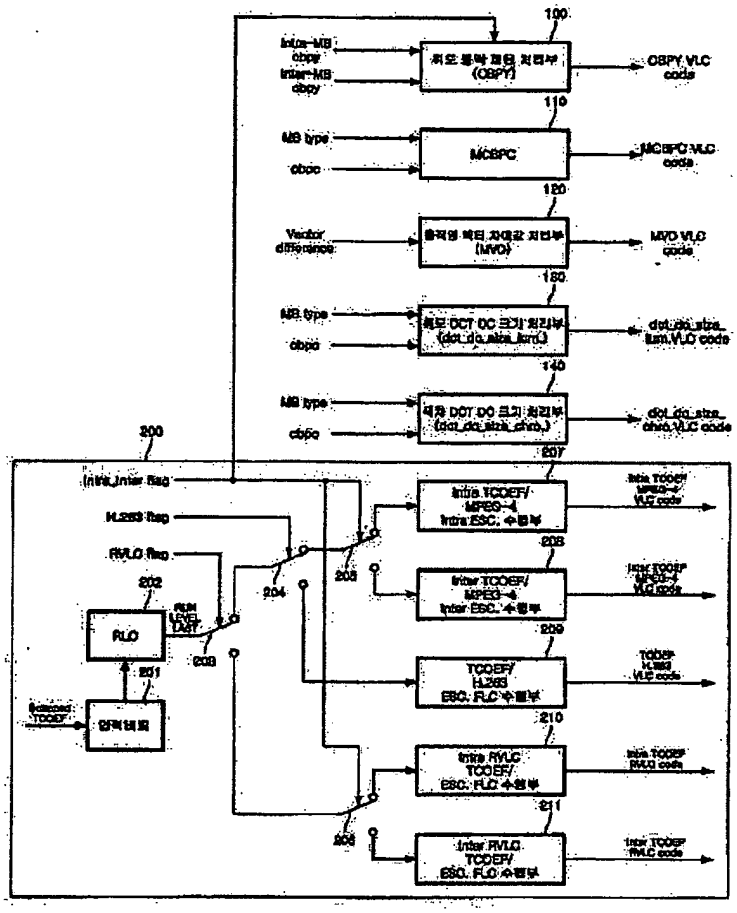
도면

도면1



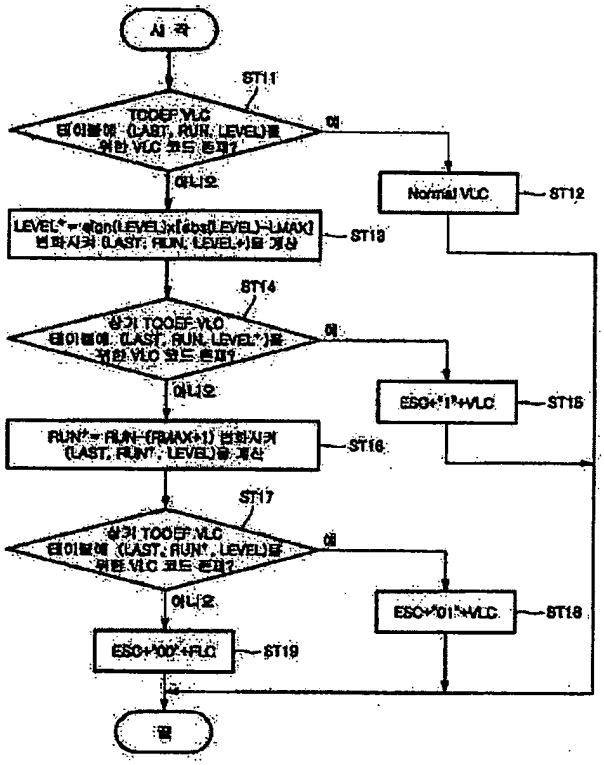
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도면2



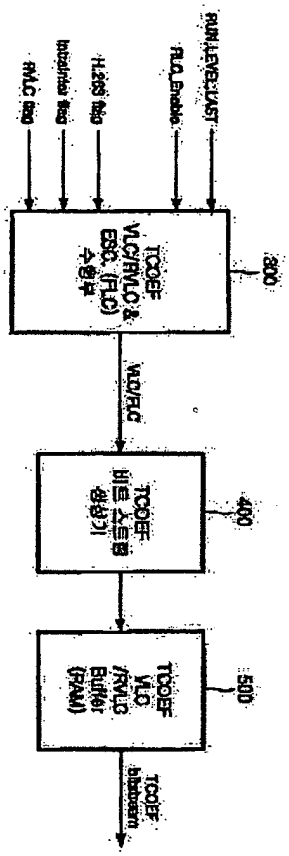
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도면3



Hisense Ex. 1002, p. 234
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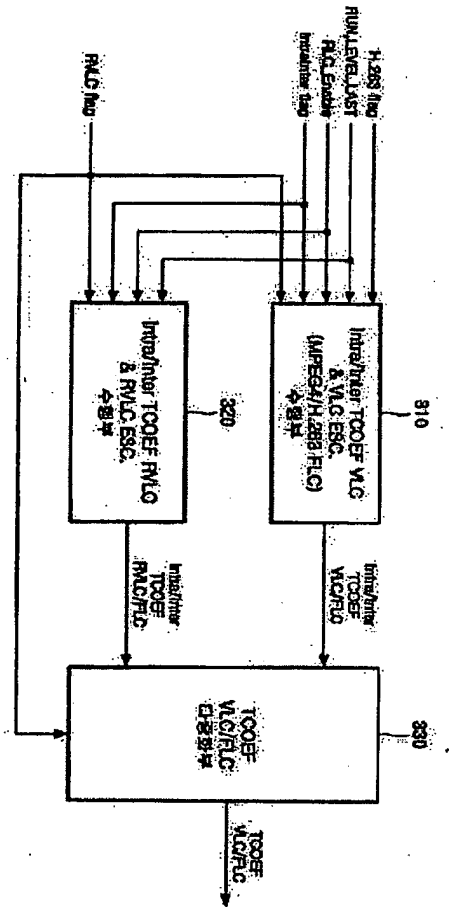
도면4



20-13

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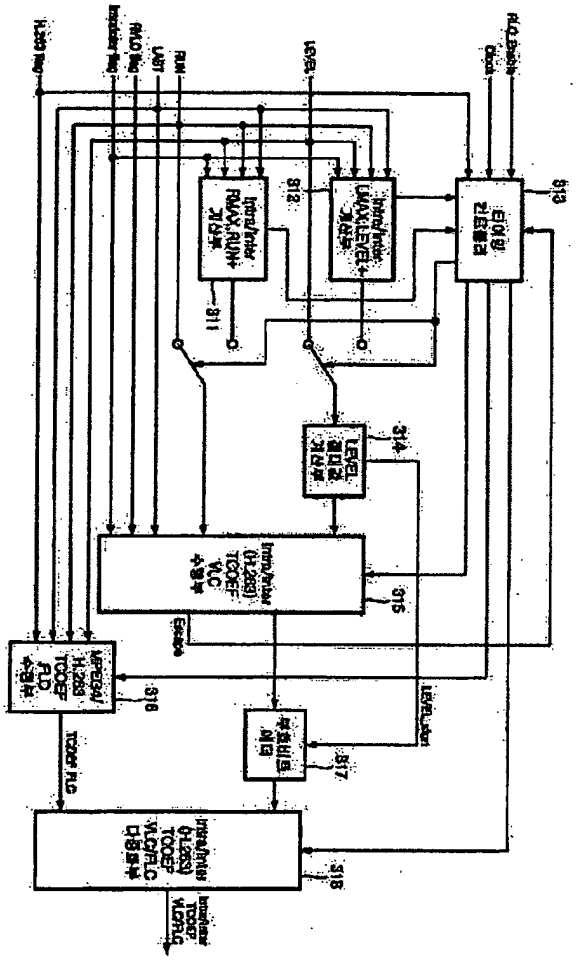
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20-14

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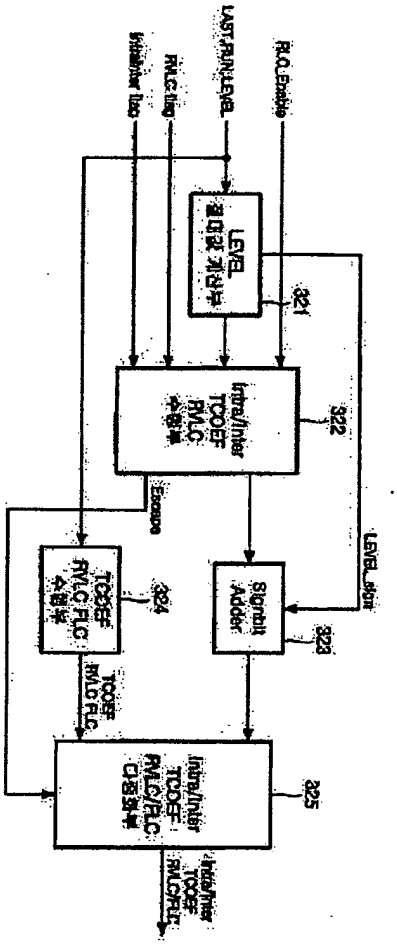
도면6



20-15

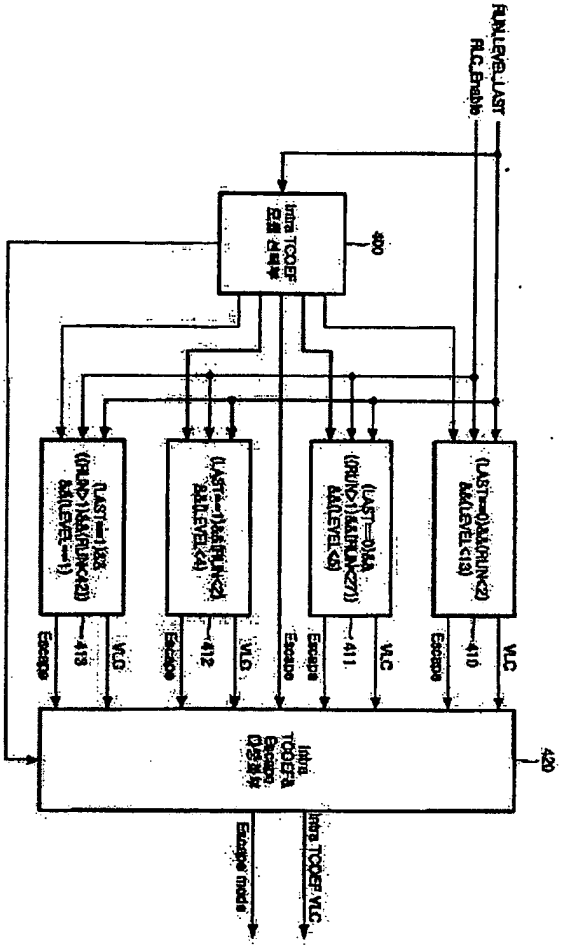
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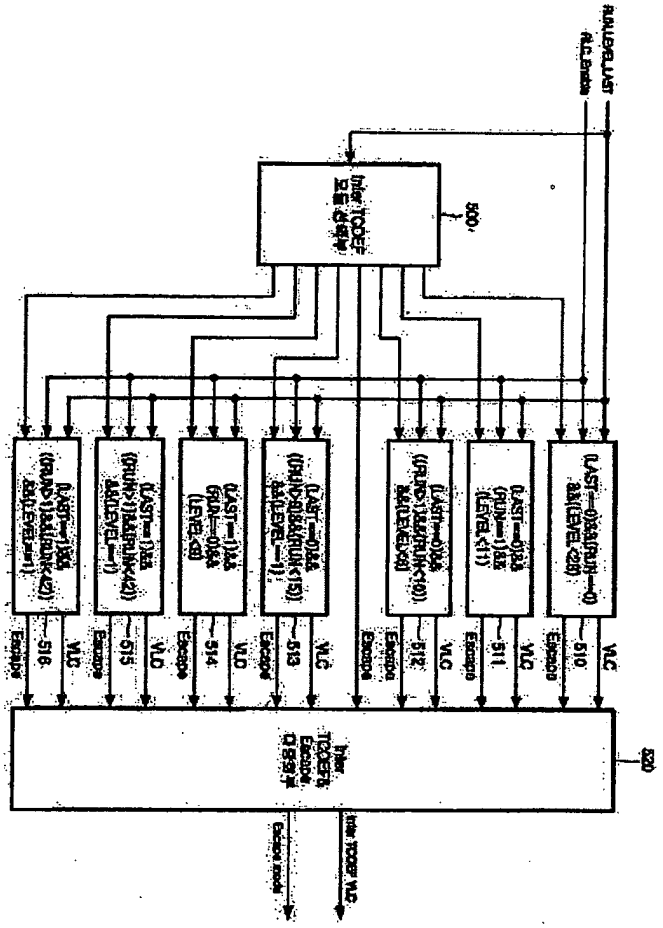
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20-17

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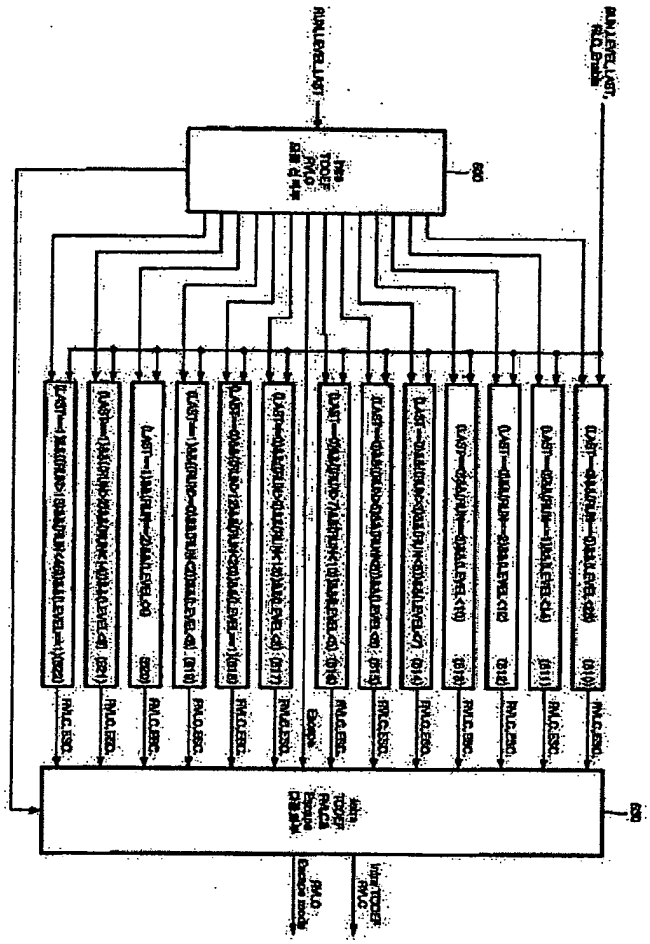
도면9



20-18

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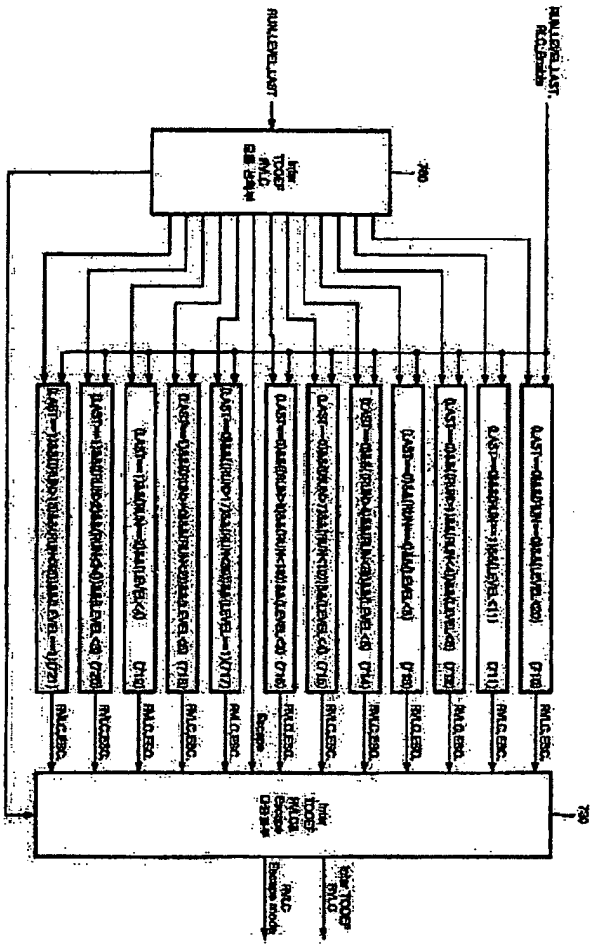
도면10



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도면11



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2007_1865
Kiyofumi ABE et al.	:	**Confirmation No. 3207**
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel
PICTURE CODING METHOD AND PICTURE DECODING METHOD	:	**Mail Stop: AMENDMENT**

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the provisions of 37 CFR 1.56, 1.97 and 1.98, Applicants request consideration of the reference listed on attached Form PTO/SB/08 and any additional information identified below in paragraph 3. A legible copy of each reference listed on the Form PTO/SB/08 is enclosed, except a copy is not provided for:

[] each U.S. Patent and U.S. Patent application publication;

[] each reference previously cited in prior parent application Serial No._____.

1a. [X] This Information Disclosure Statement is submitted:

within three months of the filing date (or of entry into the National Stage) of the above-entitled application, **or**

before the mailing of a first Office Action on the merits or the mailing of a first Office Action after the filing of an RCE,

and thus no certification and/or fee is required.

The USPTO is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17, and 1.492, which may be required by this paper to Deposit Account No. 23-0975.

1b. [] This Information Disclosure Statement is submitted

after the events of above paragraph 1a and prior to the mailing date of a final Office Action or a Notice of Allowance or an action which otherwise closes prosecution in the application, and thus:

(1) [] the certification of paragraph 2 below is provided, or

(2) [] the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

1c. [] This Information Disclosure Statement is submitted:

after the mailing date of a final Office Action or Notice of Allowance or action which otherwise closes prosecution in the application, and prior to payment of the issue fee, and thus:

the certification of paragraph 2 below is provided, and

the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

2. It is hereby certified

a. [X] that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Statement, or

b. [] that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the Statement.

3. [] Consideration of the following list of additional information (including any copending or abandoned U.S. application, prior uses and/or sales, etc.) is requested.

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4. For each non-English language reference listed on the attached Form PTO/SB/08, reference is made to:

a. [X] a full or partial English language translation submitted herewith,

b. [] a foreign patent office search report (in the English language) submitted herewith,

c. [] the concise explanation contained in the specification of the present application at page ,

d. [] the concise explanation set forth in the attached English language abstract,

e. [] the concise explanation set forth below or on a separate sheet attached to the reference:

5. [X] A Korean Office Action is enclosed citing the reference listed on the attached Form PTO/SB/08.

6. [] Statement Under 37 CFR 1.704(d)

Each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign Patent Office in a counterpart application, and this communication was not received by any individual designated in §1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
By 2009.11.20 12:54:47 -05'00'
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

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Telephone (202) 721-8200
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November 20, 2009

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2007_1865
Kiyofumi ABE et al.	:	**Confirmation No. 3207**
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel
PICTURE CODING METHOD AND PICTURE DECODING METHOD	:	**Mail Stop: AMENDMENT**

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the provisions of 37 CFR 1.56, 1.97 and 1.98, Applicants request consideration of the references listed on attached Form PTO/SB/08 and any additional information identified below in paragraph 3. A legible copy of each reference listed on the Form PTO/SB/08 is enclosed, except a copy is not provided for:

[X] each U.S. Patent and U.S. Patent application publication;

[] each reference previously cited in prior parent application Serial No._____.

1a. [X] This Information Disclosure Statement is submitted:

within three months of the filing date (or of entry into the National Stage) of the above-entitled application, **or**

before the mailing of a first Office Action on the merits or the mailing of a first Office Action after the filing of an RCE,

and thus no certification and/or fee is required.

The Commissioner is authorized to charge any deficiency or to credit any overpayment associated with this communication to Deposit Account No. 23-0975.

1b. [] This Information Disclosure Statement is submitted

after the events of above paragraph 1a and prior to the mailing date of a final Office Action or a Notice of Allowance or an action which otherwise closes prosecution in the application, and thus:

(1) [] the certification of paragraph 2 below is provided, or

(2) [] the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

1c. [] This Information Disclosure Statement is submitted:

after the mailing date of a final Office Action or Notice of Allowance or action which otherwise closes prosecution in the application, and prior to payment of the issue fee, and thus:

the certification of paragraph 2 below is provided, and

the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

2. It is hereby certified

a. [X] that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Statement, or

b. [] that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the Statement.

3. [] Consideration of the following list of additional information (including any copending or abandoned U.S. application, prior uses and/or sales, etc.) is requested.

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4. For each non-English language reference listed on the attached Form PTO/SB/08, reference is made to:

a. [X] a full or partial English language translation submitted herewith,

b. [] a foreign patent office search report (in the English language) submitted herewith,

c. [] the concise explanation contained in the specification of the present application at page ,

d. [X] the concise explanation set forth in the attached English language abstract,

e. [X] the concise explanation set forth below or on a separate sheet attached to the reference:

TW 373408 corresponds to US 5,974,184

5. [X] A Taiwanese Office Action is enclosed citing the references listed on the attached Form PTO/SB/08.

6. [] Statement Under 37 CFR 1.704(d)

Each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign Patent Office in a counterpart application, and this communication was not received by any individual designated in §1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
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By _____
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October 23, 2009

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Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: October 23, 2009

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA	5,974,184	10/1999	Eifrig et al.			
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	BA	373408	11/1999	TW			corresponds to AA	
	BB	393856	6/2000	TW			partial & abstract	
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	DATE CONSIDERED

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

中 華 民 國 專 利 公 報 〔19〕〔12〕

〔11〕公告編號：373408

〔44〕中華民國88年（1999）11月01日

發 明 全 9 頁

〔51〕Int.Cl.[6]：H04N7/32

〔54〕名 稱：交錯數位視訊之巨集區塊間之直流及交流係數預測

〔21〕申 請 案 號：87103125 〔22〕申請日期：中華民國87年（1998）03月04日

〔30〕優 先 權：〔31〕60/040,120 〔32〕1997/03/07 〔33〕美國
60/042,245 1997/03/31 美國
08/957,511 1997/10/24 美國

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愛潔盧沙 美國
程素明 美國

〔71〕申 請 人：
通用先進系統股份有限公司 美國

〔74〕代 理 人：陳長文 先生

1 2

[57]申請專利範圍：

1.一種用以在數位視訊的影像中編碼一目前INTRA碼區塊的空間轉換係數之方法，包括以下步驟：

識別一毗連左區塊、一毗連頂端區塊、和及一左上方區塊，其係鄰近於該左區塊及該頂端區塊；

該左區塊、頂端區塊、及左上方區塊，每個具有DC空間轉換係數及許多的AC空間轉換係數；

該等區塊中的每一個係根據一影像框模式、重新排列圖場模式、及非重新排列圖場域模式中的任一模式予以編碼；及

從該左區塊及該頂端區塊中的一個來選取AC空間轉換係數，用以不同地編碼該目前區塊的各別AC空間轉換係數；

該選取步驟要回覆該目前區塊及該頂端區塊的寫碼模式。

2.如申請專利範圍第1項之方法，還包括以下步驟：

當該頂端區塊係根據該影像框模式及該非重新排列圖場模式而編碼時，從該左區塊選取該AC空間轉換係數，而且該目前區塊係根據重新排列圖場模式而被編碼。

3.如申請專利範圍第1項之方法，還包括以下步驟：

當該頂端區塊係根據該影像框模式及該非重新排列圖場模式而編碼時，從該左區塊選取該AC空間轉換係數，而且該頂端區塊係根據重新排列圖場模式而編碼。

4.如申請專利範圍第1項之方法，還包括以下步驟：

選取一DC空間轉換係數，用以不同地編碼來自該左區塊及頂端區塊中的一該目前區塊的該DC空間轉換係數，其係根據(a)在該左區塊及該左上方區塊之間的DC空間轉換係數之間的一梯度，及(b)在該頂端區塊及該左上方區塊的DC空間轉換係數之間的一梯度。

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5.如申請專利範圍第4項之方法，還包括以下步驟：

選取AC空間轉換係數，用以根據所選取的DC空間轉換係數而做不同地編碼來自該左區塊及該頂端區塊中的一個。

6.如申請專利範圍第4項之方法，還包括以下步驟：

當DC空間轉換是從該頂端區塊時，選取AC空間轉換係數用以來自該頂端區塊的不同編碼，而且該目前的區塊係根據影像框模式或非重新排列圖場模式而被編碼，而且該等端區塊係根據影像框模式或非重新排列圖場模式而編碼。

7.如申請專利範圍第4項之方法，還包括以下步驟：

當該DC空間轉換係數是從該頂端區塊而選取，而且該目前區塊及該頂端區塊皆根據該重新排列圖場模式而寫碼時，選取AC為空間轉換係數用以不同地編碼來自該頂端的區塊。

8.如申請專利範圍第1項之方法，還包括以下步驟：

當該所選取的區塊並非是INTRA時，使用零AC空間轉換係數取代來自所選取區塊的AC空間轉換係數。

9.如申請專利範圍第1項之方法，其中在一目前影像物體平面(VOP)中存在的該目前區塊還包括以下步驟：

當所選取的區塊並未出現在該目前的VOP時，使用零AC空間轉換係數取代來自所選取區塊的AC空間變換係數。

10.如申請專利範圍第4項之方法，還包括以下步驟：

非線性地量化目前區塊的該DC空間轉換係數。

11.一種用以在一數位視訊影像中解碼經由不同地編碼一目前INTRA碼區塊的空間轉換係數之方法，而此數位視訊影像是以一數位位元流傳送，以恢復符合該目前區塊的整個AC空間轉換係數，

包括以下步驟如下：

恢復該數位位元流；

該數位位元流是由來自一毗連左區塊、一毗連頂端區塊、及一左上方區塊的資料所組成，而此左上方區塊是毗連該左區塊及該頂端區塊；

該左區塊、頂端區塊、及左上方區塊中的每一個具有一DC空間轉換係數及許多的AC空間變換係數；

該等所要編碼區塊中的每一個係根據一影像框模式、一重新排列圖場模式、及一非重新排列圖場模式中的一模式處理編碼；

選取來自該左區塊及該頂端區塊中的一個的AC空間轉換係數；

加總該所選取的AC空間轉換係數與該對應於該的不同所編碼的AC空間轉換係數，以該目前區塊的該整個AC空間轉換係數；

該選取步驟要能回覆該目前區塊及該頂端區塊的編碼模式。

12.如申請專利範圍第11項之方法，還包括以下步驟：

當該頂端區塊根據該影像框模式及該非重新排列圖場模式中的一模式編碼時，選取來自該左區塊的該加總步驟的AC空間轉換係數，而該目前區塊係根據重新排列圖場模式而編碼。

13.如申請專利範圍第11項之方法，還包括以下步驟：

當該目前區塊根據該影像框模式及該非重新排列圖場模式中的一模式編碼時，選取來自該左區塊的該加總步驟的AC空間轉換係數，而該頂端區塊係根據該重新排列圖場模式而編碼。

14.如申請專利範圍第11項之方法，其中該目前區塊的DC空間轉換係數係使用來自該左區塊及該頂端區塊中的一DC空間轉換係數，而在使用數位位元流傳輸之前經過不同地編碼，其係根據(a)在

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該左區塊及該左上方區塊的DC空間轉換係數之間的第一梯度，及(b)在該左區塊及該左上方區塊的DC空間轉換係數之間的第二梯度，還包括以下步驟：

決定該第一及第二的梯度；及

選取該DC空間轉換係數，其係根據所決定的梯度而不同地編碼來自該左區塊及該頂端區塊中的一該目前區塊的DC空間轉換係數。

15.如申請專利範圍第14項之方法，還包括以下步驟：

根據該所選取的DC空間轉換係數選取來自該左區塊及該頂端區塊中的一該加總步驟的AC空間轉換係數。

16.如申請專利範圍第14項之方法，還包括以下步驟：

當該DC空間轉換係數是從該頂端區塊選取時，選取來自該頂端區塊的該加總步驟的AC空間轉換係數，而且該目前區塊係根據該影像框模式或非重新排列圖場模式而編碼，並且該頂端區塊是根據該影像框模式或該非重新排列圖場模式而編碼。

17.如申請專利範圍第14項之方法，還包括以下步驟：

當該DC空間轉換係數是從該頂端區塊選取，而該目前區塊及該頂端區塊皆根據該重新排列圖場模式編碼時，選取來自該頂端區塊的該加總步驟的AC空間轉換係數。

18.如申請專利範圍第11項之方法，還包括以下步驟：

當該所選取的區塊並非是INTRA碼時，使用零AC空間轉換係數編碼取代來自所選取區塊的AC空間轉換係數。

19.如申請專利範圍第11項之方法，其中該目前區塊是存一目前影像物體平面(VOP)中，還包括以下步驟：

當該所選取的區塊並非在該目前的VOP內時，使用零AC空間轉換係數取

代來自該所選取區塊的AC空間轉換係數。

20.如申請專利範圍第11項之方法，其中：

該選取步驟會回覆在該數位位元流中所提供的一碼字，其是來自該左區塊及該頂端區塊中的一AC空間轉換係數。

21.如申請專利範圍第14項之方法，其中該目前區塊的DC空間轉換係數是非線性非量化，還包括以下步驟：

恢復來自該所選取區塊及該目前區塊的各別量子化位準的該數位位元流的資料；及

根據該所選取區塊及該目前區塊的各別量子化位準，依比例決定該目前區塊的DC空間轉換係數，以恢復一依比例決定的DC空間轉換係數。

22.一種用以在一數位視訊影像中編碼一目前INTRA碼區塊的空間轉換係數之裝置，包括：

裝置，用以識別一毗連左區塊、一毗連頂端區塊、及毗連該左區塊及該頂端區塊的一左上方區塊；

該左區塊、頂端區塊、及左上方區塊中的每個具有一DC空間轉換係數及許多的AC空間轉換係數；

該等所要編碼中的每一個係根據一影像框模式、一重新排列圖場模式、及一非重新排列圖場模式中的一模式而編碼；及

裝置，用以選取來自該左區塊及該頂端區塊中的一AC空間轉換係數，用以不同地編碼該目前區塊的各別AC空間轉換係數；

該選取裝置係回覆至該目前區塊及該頂端區塊的編碼模式。

23.如申請專利範圍第22項之裝置，其中：

當該頂端區塊根據該影像框模式及該非重新排列圖場模式中的一模式來編碼

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時，該裝置用以選取來自該左區塊的AC空間轉換係數，而且該目前區塊係根據該重新排列圖場模式而編碼。

24.如申請專利範圍第22項之裝置，其中：

當該目前區塊係根據該影像框模式及該非重新排列圖場模式中的一模式來編碼時，該裝置用以許取來自該左區塊的該AC空間轉換係數，而且該頂端區塊係根據該重新排列圖場模式而編碼。

25.如申請專利範圍第22項之裝置，其中：

其中該目前區塊的DC空間轉換係數係使用來自該左區塊及該頂端區塊中的一DC空間轉換係數，而在使用數位位元流傳輸之前經過不同地編碼，其係根據(a)在該左區塊及該左上方區塊的DC空間轉換係數之間的第一梯度，及(b)在該左區塊及該左上方區塊的DC空間轉換係數之間的第二梯度；

該選取裝置係選取一DC空間轉換係數，使用在來自該左區塊及該頂端區塊中的一該目前區塊的不同編碼DC空間轉換係數，其係根據(a)在該左區塊及該左上方區塊的DC空間轉換係數之間的一梯度，及(b)在該頂端區塊及該左上方區塊的DC空間轉換係數之間的一梯度。

26.如申請專利範圍第25項之裝置，其中：

該選取裝置選取AC空間轉換係數，其係根據所選取的DC空間轉換係數而使用在來自該左區塊及該頂端區塊中的一不同編碼。

27.如申請專利範圍第25項之裝置，其中：

該選取裝置係用以當DC空間轉換係數是從該頂端區塊選取時，選取使用在來自該頂端區塊不同編碼的AC空間轉換係數，而該目前區塊是根據該影像框模

式或該非重新排列圖場模式而編碼，而且該頂端區塊係根據該影像框模式或該非重新排列圖場模式而編碼。

28.如申請專利範圍第25項之裝置，其中：

該選取裝置係用以當DC空間轉換係數從該頂端區塊選取時，選取來自該頂端區塊不同編碼的AC空間轉換係數，而且該目前區塊及該頂端區塊皆根據該所重新排列的圖場模式而編碼。

29.如申請專利範圍第22項之裝置，還包括：

裝置，用以當所選取的區塊並非是INTRA碼時，使用零AC空間轉換係數取代來自該所選取區塊的AC空間轉換係數。

30.如申請專利範圍第22項之裝置，其中該目前區塊係存在一目前的影像物體平面(VOP)中，還包括：

裝置用以當所選取的區塊並非存在該目前的VOP時，使用零AC空間轉換係數取代來自該所選取區塊的AC空間轉換係數。

31.如申請專利範圍第25項之裝置，還包括：

裝置，用於該目前區塊的非線性量化DC空間轉換係數。

32.一種用以解碼在一數位視訊影像中所不編碼的一目前INTRA碼區塊的空間轉換係數之裝置，其是以數位位元流而傳輸，以恢復符合該目前區塊的整個AC空間轉換係數，包括：

裝置，用以恢復該數位位元流；

該數位位元流係由來自一毗連的左區塊、一毗連的頂端區塊、及毗連該左區塊及該頂端區塊的一左上方區塊的資料所組成；

該左區塊、頂端區塊、及左上方區塊中的每個具有一DC空間轉換係數及許多的AC空間轉換係數；

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該等所要編碼區塊的每一個係根據一影像框模式、一重新排列圖場模式、及一非重新排列圖場模式中的一模式來編碼；

第一裝置，用以選取來自該左區塊及該頂端區塊中的一AC空間轉換係數；及

裝置，用以加總該所選取AC空間轉換係數及該目前區塊的對應不同編碼AC空間轉換係數，以恢復該目前區塊的整個AC空間轉換係數；

該第一選取裝置係回覆至該目前區塊及該頂端區塊的編碼模式。

33.如申請專利範圍第32項之裝置，其中：

該第一選取裝置係當該頂端區塊根據該影像框模式及該非重新排列圖場模式中的一模式而編碼，且該目前區塊係根據該重新排列過的圖場模式編碼時，藉由來自該左區塊的加總處理裝置來選取AC空間轉換係數。

34.如申請專利範圍第32項之裝置，其中：

該第一選取裝置係當該目前區塊根據該影像框模式及該非重新排列圖場模式中的一模式而編碼，且該頂端區塊係根據該重新排列過的圖場模式編碼時，藉由來自該左區塊的加總處理裝置來選取AC空間轉換係數。

35.如申請專利範圍第32項之裝置，其中該目前區塊的DC空間轉換係在傳輸之前，以數位位元流而做不同地編碼，其使用來自該左區塊及該頂端區塊中的一DC空間轉換係數，其係根據(a)該左區塊及該左上方區塊的DC空間轉換係數之間的第一梯度，及(b)在該頂端區塊及該左上方區塊的DC空間轉換係數之間的第二梯度，還包括：

裝置，用以決定該第一和第二梯度；及

第二裝置，用以選取該DC空間轉換係數，其係使用在來自該左區塊及該頂端

區塊中的一該目前區塊的DC空間轉換係數，而且該頂端區塊係根據所決定的梯度。

36.如申請專利範圍第35項之裝置，其中：

該第一選取裝置係根據所選取的DC空間轉換係數，而藉由該左區塊及該頂端區塊中的加總處理裝置來選取AC空間轉換係數。

37.如申請專利範圍第35項之裝置，其中：

該第一選取裝置選取AC空間轉換係數，係加總來自該頂端區塊的平均值，這是當DC空間轉換係數係選自於該頂端區塊，而該目前區塊係根據影像框模式或非重新排列圖場模式而編碼，且該頂端區塊係根據影像框模式或非重新排列圖場模式進行編碼而加總。

38.如申請專利範圍第35項之裝置，其中：

該第一選取裝置選取AC空間轉換係數，係加總來自該頂端區塊的平均值，這是當DC空間轉換係數係選自於該頂端區塊，而該目前區塊及該頂端區塊係根據重新排列圖場模式進行編碼而加總。

39.如申請專利範圍第32項之裝置，還包括：

裝置，當所選取的區塊並非是INTRA編碼時，用於零AC空間轉換係數，以取代來自所選取區塊的AC空間轉換係數。

40.如申請專利範圍第32項之裝置，其中該目前區塊存在於一目前影像物體平面(VOP)，還包括：

裝置，當所選取的區塊並非存在於該目前VOPNTRA時，用於零AC空間轉換係數，以取代來自所選取區塊的AC空間轉換係數。

41.如申請專利範圍第32項之裝置，其

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中：

該第一選取裝置係回應於在該數位位元流中所提供的一碼字，其指定來自該左區塊及該頂端區塊其中之一的AC空間轉換係數。

42.如申請專利範圍第35項之裝置，其中該目前區塊的DC空間轉換係數是非線性量化，還包括：

裝置，用以恢復來自該數位位元流的資料，而此位元流係指出該所選定區塊及該目前區塊的量子化位準；及

裝置，係根據該所選取區塊及該目前區塊之相對量子化位準，而依比例決定該目前區塊的DC空間轉換係數，以恢復一依比例決定的DC空間轉換係數。

圖式簡單說明：

第一圖係根據本發明的一編碼器的方塊圖。

第二圖係根據本發明而描述在一適合影像框／圖場DCT方法中的圖素線條重新排列。

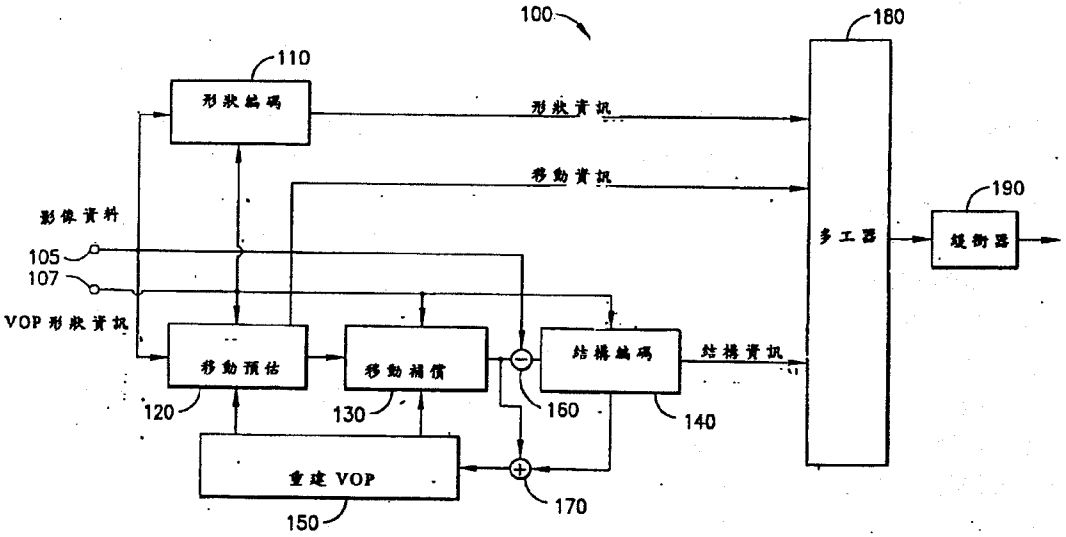
第三圖係根據本發明而描述一INTRA碼區塊的DC係數預測。

第四圖(a)-(d)係根據本發明而描述一目前區塊及有可能成為預測器區塊的四個可能的配置。

第五圖係根據本發明而描述一INTRA碼區塊的AC係數預測。

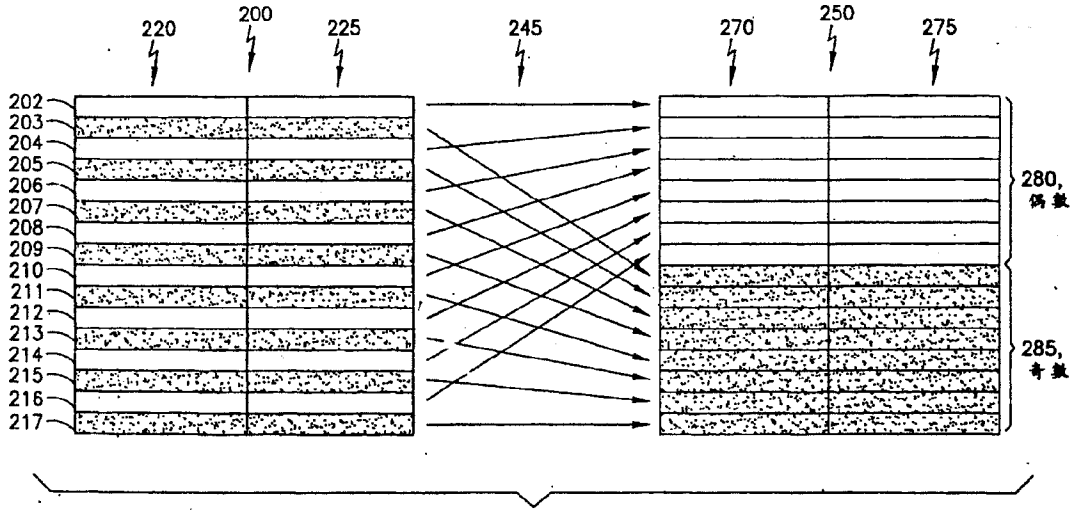
第六圖係根據本發明的一解碼器的方塊圖。

第七圖係根據本發明而描述一巨區塊封包結構。

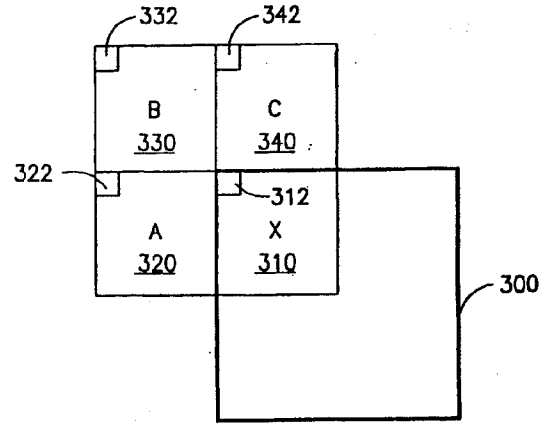


第一圖

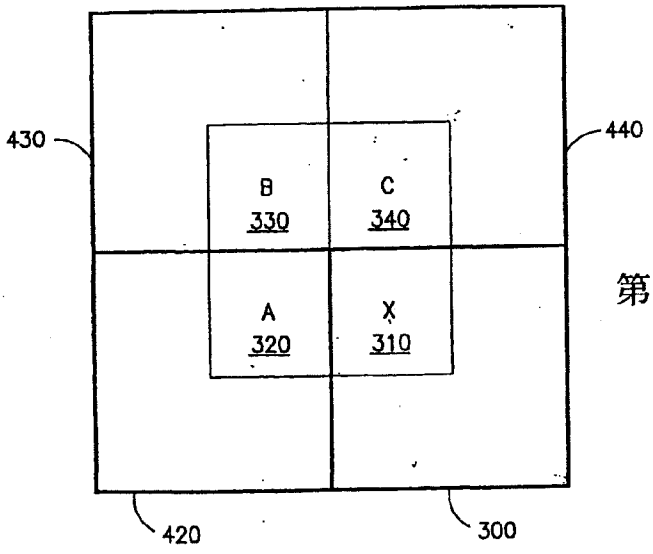
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第二圖

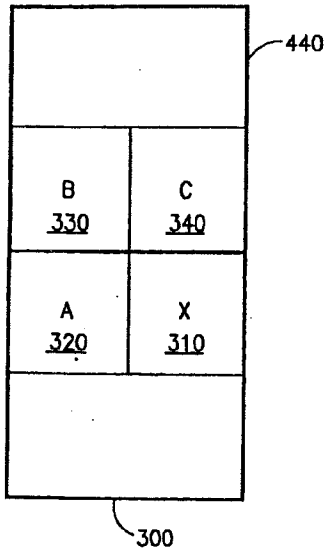


第三圖

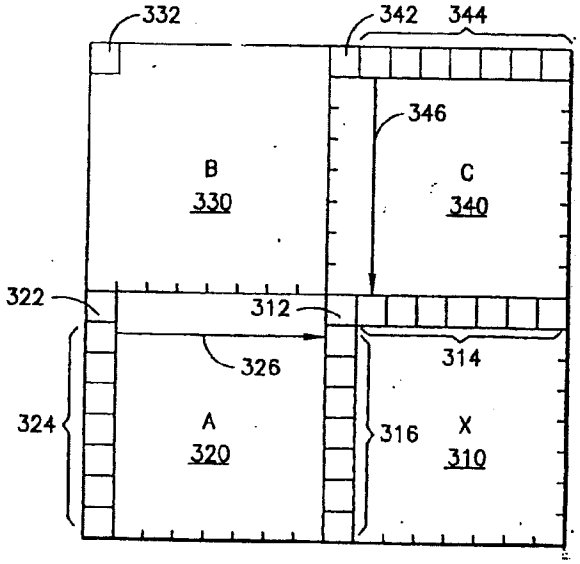


第四圖 A

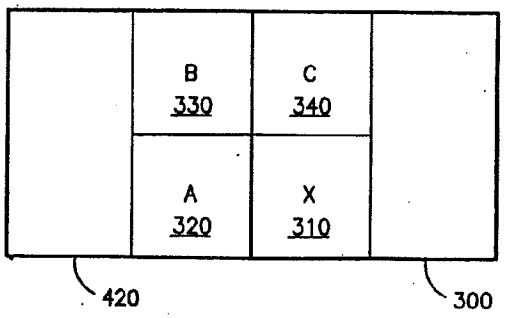
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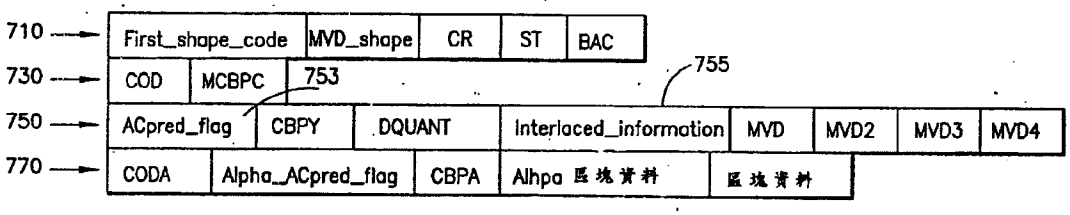
第四圖 B



第五圖

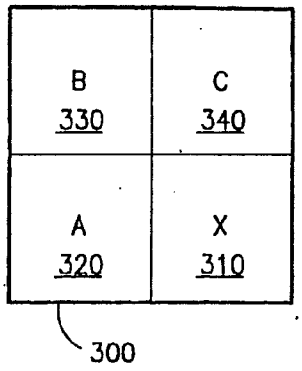


第四圖 C

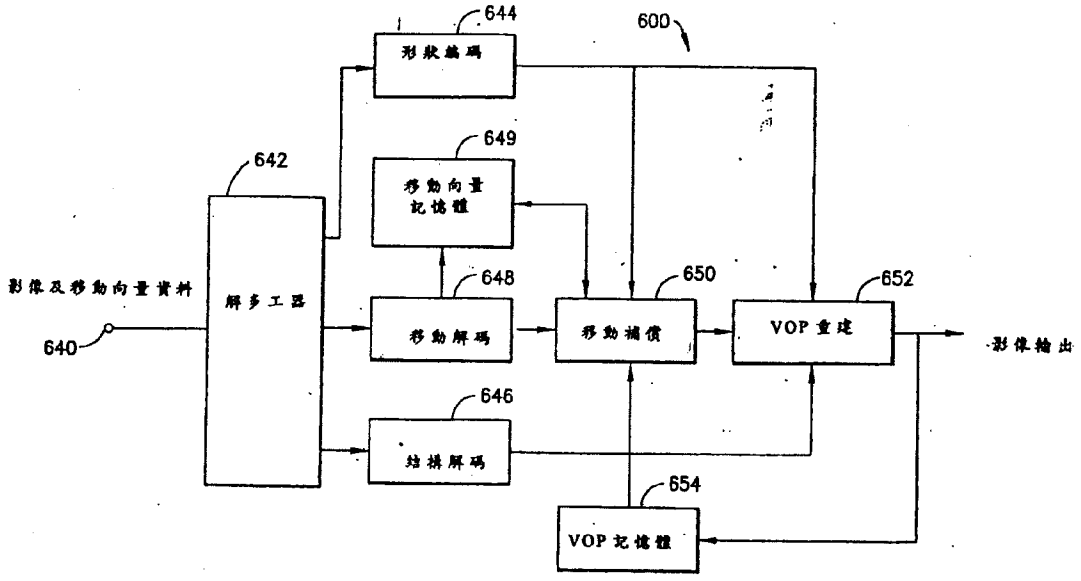


第七圖

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第四圖 D



第六圖

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申請日期	87、3、4
案　　號	87103125
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（以上各欄由本局填註）

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發明 新型 專利說明書

一、發明 新型 名稱	中　文	交錯數位視訊之巨集區塊間之直流及交流係數預測
	英　文	INTRA-MACROBLOCK DC AND AC COEFFICIENT PREDICTION FOR INTERLACED DIGITAL VIDEO
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國（地區）	申請專利，申請日期：	案號：	，□有 □無主張優先權
美國	1997年3月7日	60/040,120	☑有 □無主張優先權
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四、中文發明摘要（發明之名稱：交錯數位視訊之巨集區塊間之直流及交流係數預測）

一種INTRA碼區塊的DC和AC DCT(直流和交流之非連續餘弦轉換)轉換係數是藉由選取來自一左邊附近的區塊及一頂端附近區塊的預測器DC和AC而做不同的編碼。每個區塊係根據資料框模式、重新排列圖場模式、及非重新排列圖場模式而編碼。該AC預測器區塊係根據各自的區塊編碼模式而選取，而區塊具有DC預測器。當頂端區塊及目前的區塊皆是重新排列圖場模式、或兩皆是資料框模式及/或非重新排列圖場模式、及存在頂端區塊的DC預測器時，頂端的區塊係選取當作是AC預測器。當該所選取的區塊不是INTRA碼或並非存在相同的視訊影像物體(VOP)當作是目前的區塊時，零AC空間轉換係數是用來取代來自所選取區塊的AC空間轉換係數。DC係數能夠是非線性性量化。

英文發明摘要（發明之名稱：INTRA-MACROBLOCK DC AND AC COEFFICIENT PREDICTION FOR INTERLACED DIGITAL VIDEO）

DC and AC DCT transform coefficients of an INTRA coded block are differentially encoded by selecting predictor DC and AC coefficients from a left-hand neighboring block and a top neighboring block. Each block is coded according to a frame mode, a reordered field mode, and a non-reordered field mode. The AC predictor block is selected according to the respective coding modes of the blocks, and the block in which a DC predictor resides. The top block is selected as an AC predictor when the top block and current block are both reordered field mode, or both frame mode and/or non-reordered field mode, and the DC predictor resides in the top block. Zeroed AC spatial transform coefficients are used in place of the AC spatial transform coefficients from the selected block when the selected block is not INTRA coded, or does not reside in the same Video Object Plane (VOP) as the current block. DC coefficients may be non-linearly quantized.

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五、發明說明(1　)

發明背景

本發明係有關於用以編碼內部巨區塊數位影像的有關用來編碼DC和AC係數的方法和裝置，特別是當目前的巨區塊及或附近巨區塊是交錯(例如，圖場)碼。來自附近巨區塊的預測器係數係選取用於有效地將一目前巨區塊係數編碼成最佳化的編碼效率。該等係數是從諸如非連續之餘弦轉換(DCT)的一空間轉換而獲得。

本發明特別適合於各種不同多媒體應用上的使用，而且與在文件ISO/IEC/JTC1/SC29/WG11 N1796，標題爲"MPEG-4 Video Verification Model Version 8.0"，斯德哥爾摩(Stockholm)，1997年7月中所描述的MPEG-4版模型(VM) 8.0標準(MPEG-4 VM 8.0)相同，在此僅列出供參考。MPEG-2標準是MPEG-4標準的先驅，而且在文件ISO/IEC 13818-2中描述，標題爲"Information Technology-Generic Coding of Moving Pictures and Associated Audio, Recommendation H.262"，1994年3月25日，在此僅列出供參考。

MPEG-4目前是編碼的標準，其提供一彈性的結構及用以數位聲視訊資料的通信、存取、和處理的一開放式編碼工具。這些工具支援廣泛範圍的特性。MPEG-4的彈性結構支援編碼工具的各種不同地編碼及電腦、電傳視訊、和娛樂(亦即，電視和電影)工業所需應用的相對功能諸如資料庫瀏覽、資訊取回、及交談式通信。

MPEG-4提供有效率的儲存、傳輸、及在多媒體環境中之影像資料處理的標準化核心技術。MPEG-4達成有效的壓

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五、發明說明 (2)

縮、物件比例、空間和暫時比例，及錯誤彈性。

MPEG-4影像VM編碼器/解碼器(codec)是具移動壓縮的一區塊和物件導向的混合編碼器。結構係使用8x8非連續的餘弦轉換(DCT)而編碼，其係利用重疊的區塊移動補償。物體形狀係表示爲Alpha映射，並使用以內容爲導向的算術編碼(CAE)運算法則或修改的DCT編碼器而被編碼，這兩者皆使用暫時的預測。編碼器能處理電腦繪圖的小精靈。諸如微波和小精靈編碼的其它編碼方法也能使用於特殊的應用。

移動補償結構編碼是廣爲所知的影像編碼方法，而且能模組化爲三階段的處理。第一階段是信號處理，包括移動判斷和補償(ME/MC)及二度空間(2-D)空間轉換。ME/MC和空間轉換的目的是要利用在影像順序中的暫時和空間的相互關係，以便最佳化在複雜限制下的量子化和一致性編碼的比率失眞效率。ME/MC的最普通技術已區塊匹配，而最普通的空間轉換已是DCT。

此外，在某些情況上，當巨區塊是諸如INTRA編碼而無需參考暫時的順或先前的預測器巨區塊時，編碼效率便可改良。INTRA編碼意欲能有快速移動的影像序列、景物變化、或在明暗的情況迅速變化，其中可能是小影像框與影像框的相互關係。將附近區塊的係數當作預測器係數使用，編碼效率可藉由不同地編碼一目前區塊的DCT係數而可進一步改良。

然而，諸如MPEG-4的編碼法在影像物體平面(VOP)或其

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五、發明說明 (3)

它影像區域上具有彼此相鄰的影像框模式和圖場模式巨區塊。此外，圖場模式巨區塊在適合的編碼方法中能重新排列或非重新排列。因此，意欲具有用以選取預測器係數的一系統，而此預測器係數係用以不同地編碼一目前INTRA編碼區塊的AC和DC DCT係數，其中目前的區塊及/或附近的區塊是以一影像框、非重新排列圖場模式、及/或重新排列圖場模式而編碼。

該系統應進一步地提供DC轉換係數的非線性性量子化。

本發明提供有上述及其它優點的系統。

發明概要

根據本發明，一方法和裝置係用於選取不同地編碼一目前INTRA碼區塊係數的預測器係數。

用以在數位視訊影像中編碼一目前INTRA區塊之空間轉換係數的方法包括的步驟是識別一毗連左區塊、一毗連的頂端區塊、及毗連左區塊及頂端區塊的一頂端左區塊。左邊區塊、頂端區塊、及頂端左區塊中的每一個具有一DC空間轉換係及許多的AC空間轉換係數。此外，每一區塊係根據一影像框模式、一新排列的圖場模式、或一非重新排列的圖場模式中的一編碼模式而被編碼。預測器AC空間轉換係數是從左區塊，或在不同地編碼目前區塊的AV空間轉換係數中使用的頂端區塊而被選取。選取步驟細考量目前的區塊和頂端區塊的編碼模式。

特別是，AC當頂端區塊係根據影像框模式或非重新排列圖場模式而被編碼時，AC空間轉換係數可從左區塊選取，

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五、發明說明 (4)

而且目前的區塊會根據重新排列圖場模式而被編碼。

當目前的區塊係根據影像框模式或非重新排列圖場模式而被編碼時，AC空間轉換係數可從左邊區塊選取，而且頂端區塊係根據重新排列圖場模式而編碼。

在不同地編碼目前區塊的DC空間轉換係數中所使用的DC空間轉換係數可從左邊區塊或頂端區而被選取，其係跟據左邊區塊和頂端左邊區塊的DC空間轉換係數之間的一梯度，及在頂端區塊和頂端左區塊的DC空間轉換係數之間的一梯度而被選取。

AC空間轉換係數係根據所選取的DC空間轉換係數而可從左邊區塊或頂端區塊選取。

當DC空間轉換係數是從頂端區而被選取時，AC空間轉換係數可從頂端區塊選取，且目前的區塊係根據影像框模式或非重新排列圖場模式而被編碼，而且頂端區塊係根據影像框模式或非重新排列圖場模式而被編碼。

當DC空間轉換係數是從頂端區塊選取，而目前的區塊和頂端區塊係根據重新排列的圖場模式而被編碼時，AC空間轉換係數可從頂端區塊選取。

當所選取的區塊不是INTRA編碼時，零AC空間轉換係數可用來取代來自所選取區塊的AC空間轉換係數。

此外，當目前的區塊存在一目前的影像物體平面(VOP)時，零AC空間轉換係數可用來取代來自選取區塊的AC空間轉換係數，這是當所選取的區塊並未存在目前的VOP時候。

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五、發明說明 (5)

DC係數能夠是非線性性量化。

一對應於解碼方法也會提出。解碼器能藉由操作在編碼器上所使用的選取處理而能識別預測器係數獨立性，或解碼器能恢復來自傳輸識別預測器係數的位元流而可復原一碼字。

相對的裝置也被提出。

圖式之簡單說明

圖1係根據本發明的一編碼器的方塊圖。

圖2係根據本發明而描述在一適合影像框/圖場DCT方法中的圖素線條重新排列。

圖3係根據本發明而描述一INTRA碼區塊的DC係數預測。

圖4(a)-(d)係根據本發明而描述一目前區塊及有可能成爲預測器區塊的四個可能的配置。

圖5係根據本發明而描述一INTRA碼區塊的AC係數預測。

圖6係根據本發明的一解碼器的方塊圖。

圖7係根據本發明而描述一巨區塊封包結構。

發明之詳細說明

一方法和裝置係用以選取不同編碼一目前INTRA寫寫碼巨區塊係數的預測器係數。DC和AC係數係藉由選取來自一左邊附近的區塊及一頂端附近方塊的預測器DC和AC係數而做不同的編碼。每個區塊係根據一影像框模式、一重新排列圖場模式、或一非重新排列圖場模式而被編碼。AC預測

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五、發明說明 (6)

器方係根據相對的區塊編碼模式而被選取，而區塊存有DC預測器。當頂端區塊和目前區塊皆是重新排列圖場模式、或兩皆是影像框模式及/或非重新排列圖場模式、及在頂端區塊中的DC預測器時，頂端區塊係選取爲一AC預測器。當所選取的區塊不是INTRA碼，或未存在相同的影像物體平面(VOP)中當作是目前的區塊時，零AC空間的轉換係數便會使用而取代來自所選取區塊的AC空間轉換係數。在這情況，DC係數能設定成非零值。

圖1係根據本發明的一編碼器的方塊圖。該編碼器適合於與諸如在MPEG-4標準中所定義影像物體平面(VOPs)同時使用。VOPs在影像框中是繪圖元素。一VOP具有任意形狀，而VOPs的繼承就是廣爲所知物件。一完全的矩形影像框也可認爲是一VOP。因此，在此所使用的"VOP"一詞係指出任意及非任意的(例如，矩形)影像區域形狀。在影像框中的每一圖素被識爲是一特殊的VOP。

一VOP係歸類爲一預測的VOP (P-VOP)，它是內部編碼VOP (I-VOP)或一雙向預測VOP (B-VOP)。此外，一單獨的VOP可包括不同類型的巨區塊。特別是，一VOP能包括許多的巨區塊(MBs)，其係使用一內部影像框模式或一影像框之間的模式而分別編碼。隨著內部影像框(INTRA)編碼，MB會被編碼而無需參考先前或隨後的MB。隨著中間的影像框(INTER)編碼，MB能以隨後及先前的參考(例如，最後的影像框)影像框而做不同的編碼。P-VOP的最後影像框(例如，VOP)必須是另一P-VOP或是一I-VOP，而不是B-

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五、發明說明 (7)

VOP。一I-VOP包括本身所具有的(例如，內部編碼)區塊，其並非是預測碼編。

此外，內部影像框和中間框編碼MBs能以一影像框模、一重新排列的圖場模式、或一非重新排列圖場模式而編碼。

B-VOPs能使用P-VOPs的向前預測及後退預測、雙向預測、及直接模式，其所有皆是內部影像框技術。B-VOPs在MPEG-4 VM 8.0下，在目前並未使用內部的影像框，雖然要改變。B-VOP的最後影像框(例如，VOP)必須是一P-VOP或I-VOP，但並非是B-VOP。

通常在100所顯示的編碼器包括一形狀編碼器110、一移動判斷功能120、一移動補償功能130、及一結構編碼器140，其每個接收影像圖素資料輸入是在連接端105輸入。移動判斷功能120、移動補償功能130、結構編碼器140、及形狀編碼器110也在連接端107上接收VOP形狀資訊輸入，諸如MPEG-4參數VOP_of_arbitrary_shape。當此參數是零時，VOP會有一矩形形狀，而因此形狀編碼器110就不使用。

隨著INTER編碼，一重建的最後VOP功能150藉由移動判斷功能120和移動補償功能130而提供一重建的最後VOP功能使用。一目前的VOP是在減法器160上從一移動償還先前的VOP減去，以提供在結構編碼器140上編碼的餘數。結構編碼器140在餘數上執行DCT，以提供結構資訊(例如，轉換係數)給一多工器(MUX) 180。結構編碼器140也提供在一

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五、發明說明 (8)

加法器170上與來自移動補償器130的輸出做加總的資訊，其用以輸入至先前的重建VOP功能150。

對於INTRA編碼而言，DCT是在來自一目前區塊的圖素資料的DCT係數上執行，而不是在餘數上。然而，如下所討論的，DCT係數本身可使用來自一所選取區塊的AC和DC係數預測器而做不同的編碼，而此所選取的區塊是毗連在相同VOP中的目前區塊。

對於INTER編碼區塊而言，移動資訊(例如，移動向量)是從移動判斷功能120至MUX 180而提供，而指示VOP形狀的形狀資訊是從形狀編碼功能110至MUX 180而提供。MUX 180提供一相對的多工資料流給一緩衝器190，用以在一資料通道上能夠通信。

輸入編碼器的圖素資料具有YUV 4:2:0格式。VOP是經由一有邊界的長方形而表現。有邊界長方形的左上方座標係四捨五入而接近於偶數，而不大於較緊長方形的左上座標。因此，在色度元件中的有邊界長方形的左上方座標是亮度元件的一半。

對於某些影像序列而言，諸如存在快速移動或圖場變化，更有效地(亦即，使用較少的位元)能直接編碼一目前區塊的圖素強度值，而取代使用中間VOP的不同編碼。因此，預其有適合選取的決定標準，以便直接(例如，INTRA模式)或不同地(例如，INTER模式)編碼目前的區塊。下列的參數會計算而形成INTRA/INTER決定：

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五、發明說明 (9　)

$$mean = \frac{1}{N^2}\sum_{i=0}^{N-1}\sum_{j=0}^{N-1} c(i,j) \quad \text{and} \quad A = \sum_{i=0}^{N-1}\sum_{j=0}^{N-1} |c(i,j) - mean|,$$

其中N是區塊的大小(例如，當一有16x16巨區塊時，N=16)。c(i，j)係表示目前的巨區塊亮度取樣，其中"i"是水平指標，而"j"是垂直指標。INTRA模式會被選取，如果 $A < (SAD_{inter}(MV_x, MV_y) - 2* Nc)$；否則會使用INTER模式。$SAD_{inter}$是在目前的巨區塊圖素和最佳匹配巨區塊圖素之間的基於圖素接著圖素而取得絕對值差的總和最佳匹配巨區塊是分別由水平和垂直移動向量MV_x和MV_y所參考。Nc是在目前VOP中的圖素數目。一VOP典型包括數個巨區塊。要注意的是，對於此決定而言，在$SAD_{inter}(MV_x, MV_y)$中的MV是在完整的事物圖素解析度。如果選取INPRA模式，移動搜尋會持續一半圖素解析度MV。

圖2係根據本發明而描述在一適合的影像框/圖場DCT方法中的圖素線條的重新排列。

當交錯(亦即，圖場模式)的影像被編碼時，超能量壓縮有時能藉由重新排列一巨區塊的線條而獲得，以形成來自一圖場資料所組成的8x8亮度區塊。DCT然後會在重新排列過的巨區塊上執行，其包括相同的圖場圖素線條(亦即，底部圖場的任一頂端)。當下列情況發生時，圖場DCT線條排列便會使用

$$\sum_{i=0}^{6}\sum_{j=0}^{15}(p_{2i,j} - p_{2i-1,j})^2 + (p_{2i+1,j} - p_{2i+2,j})^2 > \sum_{i=0}^{6}\sum_{j=0}^{15}(p_{2i,j} - p_{2i+2,j})^2 + (p_{2i+1,j} - p_{2i+3,j})^2$$

其中$P_{i,j}$是在8x8 DCT執行之前的INTRA編碼(或INTER編

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五、發明說明 (10)

碼的不同)的空間亮度資料取樣。"i"和"j"係分別爲水平和垂直指標。當MPEG-4旗號dct_type=1(亦即，重新排列過的圖場模式)時，圖場DCT交換會被指示。非重新排列過的圖場模式及影像框模式是由dct_type=0所指示。在使用INTRA或INTER編碼的使用決定之後，重新排列線條的決定會達成。

當圖場DCT模式使用時，在巨區塊空間領域中的INTRA模式(或INTER模式的亮度錯誤)的亮度線條是從影像框DCT方位至圖場DCT結構而重新排列。所產生的巨區塊正常是會轉換、量化和VLC編碼。在解碼一圖場DCT巨區塊上，在所有的亮度區塊已從IDCT獲得之後，倒轉交換便會被執行。在4:2:0格式中，色訊資料並不會受此模式的影響。

一圖場模式影像，諸如一有16x16巨區塊(MB)通常是在20顯示。該MB包括偶數線條202、204、206、208、210、212、214、及216，而奇數線條203、205、207、209、211、213、215、及217。偶數和奇數線條會交錯掃描，而分別形成上和下圖場。

當在影像200中的圖素線條是排列而形成相同圖場亮度區塊時，所顯示的MB通常會在250形成。通常在245所顯示的箭號係指示線條202-217的重新排列。例如，MB 200的第一條線之偶數線202也是MB 250的第一條線。偶數線204是是重新排列過，而當作是在MB 250中的第二條線。同樣地，偶數線206、208、210、212、214、及216是重新排列過，而分別當作是MB 250的第三至第八條線。因此，具有

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五、發明說明 (11)

偶數線條的16x8亮度區域280會形成。同樣地，奇數線條203、205、207、209、211、213、215、及217會形成一有16x8區域285。

對於結構編碼而言，一有8x8 DCT是在頂端區域280中的兩區塊及在底部區域285中的兩區塊上執行。一分離的二度空間DCT會被使用。如下所述，進一步的編碼效率可藉著使用來自毗連目前區塊之區塊的預測器係數之DCT係數不同編碼，而能達成INTRA區塊。

圖3係根據本發明而描述INTRA碼區塊的DC係數預測。DC係數預測並不會受到一區塊是否爲影像框模式或圖場模式的影響。在一致性編碼之前，量化DC和DCT之相同AC係數的無損失預測會被執行，而集中在零附近係數分配，所以一致性編碼能更有效率。一目前區塊的適合DC預測方法包括一目前區塊之左邊區塊的量化DC (QDC)值，或是在前一列的目前區塊正上方區塊的值之選擇。

此外，DC係數的量子化可以是線性或非線性。對於線條的量子化而言，使用八個QDC=dc//8的亮度和色訊元件之DC係數的一量化器步驟大小，其中"dc"是來自DCT的11位元未量子化轉換係數值。"//"係表示四捨五入的除法。

一內部巨區塊之DC係數的非線性量子化可參考表1的描述。

表1

元件：類型	量化器範(Qp)範圍的dc_scaler			
	1至4	5至8	9至24	25至31
亮度	8	2Qp	Qp+8	2Qp−16
色訊	8	(Qp+13)/2		Qp−6

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五、發明說明（12）

DCT區塊之DC係數的一非線性的定標器參數(直流定標器)是以與量子化位準Qp的關係表示。亮度和色訊區塊的DC係數是由對應的非線性定標器而被量子化。例如，對於一亮度區塊具有1-4的Qp範圍而言，dc_scaler=8。對於一亮度區塊具有6的Qp值而言，dc_scaler=2*Qp=12。然後，前向量子化係藉由使用QDC=dc//dc定標器而被執行，而且所重建的DC值係使用dc=dc_scaler*QDC而被計算。

DC預測器係數的適合選取是基於在目前區塊附近的水平和垂直QDC值梯度。例如，假設區塊X 310是在一目前所要編碼的INTRA巨區塊300中的一DCT係數8x8區塊。區塊X包括一DC係數312。區塊A 320是一8x8區塊，其是緊鄰X的左邊，區塊C 340是一8x8區塊，其是緊接在區塊X的頂端，而區塊B 330是一8x8區塊區塊，其是緊接在區塊C的左邊。區塊A包括一DC係數322，區塊C包括一DC係數342，而區塊B包括一DC係數332。

對於DC係數的線性量子化而言，區塊X之QDC'_X的QDC預測器值是從區塊A之QDC_A的QDC值，或區塊C之QDC_C的QDC值而獲得，其係基於水平和垂直的QDC梯度的比較。特別是，如果($|QDC_A-QDC_B| < |QDC_B-QDC_C|$)，然後$QDC'_X=QDC_C$。否則，$QDC'_X=QDC_A$。

一差別的DC值$DQDC_X$然後能由所示的公式獲得：$DQDC_X=QDC_X-QDC'_X$。差別的DC值是可變長碼，並以位元流傳送至解碼器。該處理係獨立地重複於每個巨區塊，而然後是在一VOP或影像框中的每一巨區塊。在解碼器上，

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五、發明說明 (13)

整個DC係數是從操作$QDC_X=DQDC_X+QDC'_X$獲得。如果區塊A、B、或C中的任何一個是在一VOP或影像框邊界的外面時，或它們不屬於INTRA寫寫碼巨區塊時，它們的QDC預測值係假設取$2^{(bits_per_pixel-1)}$值。例如，隨著bits_per_pixel=8，便要使用$2^7=128$的值。DC預測區塊是以一區塊的亮度及兩色訊元件中任一的類似方法而被選取。

當DC定標器不同於區塊A 320、B 330、和C 340時，線性量子化的上述方法是修改爲DC係數的非線性量子化。即是，DC定標器並不同於三個區塊中的一個。既然量子化位準可從巨區塊變成巨區塊，所以這會發生。一解決方法係使用下面的DC預測規則。

$$if\ (|QDC_A^{(1)}-QDC_B^{(1)}|<|QDC_B^{(1)}-QDC_C^{(1)}|)$$
$$QDC_{X'}=QDC_C^{(1)}$$
$$else$$
$$QDC_{X'}=QDC_A^{(1)}.$$

where

$$QDC_{X'}=dc_X\ //\ dc\_scalar_X,$$
$$QDC_A^{(1)}=(QDC_A * dc\_scalar_A)\ //\ dc\_scalar_X, and\ QDC_A=dc_A\ //\ dc\_scalar_A,$$
$$QDC_B^{(1)}=(QDC_B * dc\_scalar_B)\ //\ dc\_scalar_X, and\ QDC_B=dc_B\ //\ dc\_scalar_B,$$
$$QDC_C^{(1)}=(QDC_C * dc\_scalar_C)\ //\ dc\_scalar_X, and\ QDC_C=dc_C\ //\ dc\_scalar_C.$$

本質上，QDC值是根據巨區塊的量子化位準而依比例處理，而此區塊存有DC係數及存在所選取預測區塊的巨區塊。通常，dc_scaler是以MB基礎而在一MB上指定。參數QDC和Qp能以位元流而傳送至一解碼器。Qp是從MB至MB而做不同的編碼，並當作MPEG-4參數DQUANT傳輸。在解碼器上，Qp是從DQUANT獲得，而dc_scaler是根據表1而從

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五、發明說明 (14)

Qp獲得。QDC預測器是藉由重新計算水平和垂直梯度及考慮其它預測器選取標準而被決定，而最後所選取的QDC值QDC(1)係使用非依比例的QDC值及dc_scaler值而獲得。

圖4(a)-4(d)係根據本發明而描述一目前區塊及潛在的預測器區塊的四可能配置。一DC數預測器的選取並不會受到在巨區塊中的目前區塊X的相關位置的影響。

圖4(a)係顯示相對於圖3配置的第一配置。明確地，目前所要編碼的區塊X 310是巨區塊300左上方的區塊，區塊A 320是一巨區塊420的右上方區塊，區塊B是一巨區塊430的右下方區塊，而區塊C 340是一巨區塊440的左下方區塊。

圖4(b)係顯示第二配置，其中區塊X 310是該巨區塊300的右上方區塊，區塊A 320是該巨區塊300左上方的區塊，區塊B 330是該巨區塊440左下方區塊，而區塊C是該巨區塊440的右下方區塊。

通常，在相同巨區塊中的所有區塊可以皆是影像框模式、無需重新排列的所有圖場模式、或重新排列的所有圖場模式。此外，在相同巨區塊中的所有區塊皆是INTRA模式或INTER模式。而且，在毗連巨區塊中的區塊具有不同的模式。因此，在圖4(b)中，區塊A 320和區塊X 310可以皆是影像框模式、無需重新排列的兩圖場模式、或重新排列的兩圖場模式。同樣地，區塊B 330和區塊C 340可以皆是影像框模式、無需重新排列的兩圖場模式、重新排列的兩圖場模式。

圖4(c)係顯示第三配置，其中在區塊X 310是該巨區塊300

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左下方區塊，區塊A 320是該巨區塊420的右下方區塊，區塊B是該巨區塊420右上方區塊，而區塊C是該巨區塊420左上方區塊。區塊A 320和區塊B 330可以皆是影像框模式、無需重新排列的兩圖場模式、重新排列的兩圖場模式。同樣地，區塊X 310和區塊C 340影像框模式、無需重新排列的兩圖場模式、重新排列的兩圖場模式。

圖4(d)係顯示第四配置，在區塊X 310是右下方區塊，區塊A 320是左下方區塊，區塊B 330是左上方區塊，而區塊C 340是右上方區塊，每個是在巨區塊300內。既區塊A、B、C、和D中的每一個是在相同的巨區塊，它們可以皆是影像框模式、無需重新排列的所偶圖場模式、重新排列的所有圖場模式。

圖5係根據本發明而描述一INTRA碼區塊的AC係數預測。隨著AC預測，左邊附近的區塊或頂端附近的區塊係選取使用在不同地編碼一目前區塊的AC DCT係數。在藝術中熟知的技術會承認在DCT區塊中的所有係數皆是AC係數，除了左上方的一DC係數之外。因此，對於一有8x8區塊而言，有六十三個AC係數及一DC係數。"DC"可參考爲直流，其係描述一穩定狀態的係數，而"AC"可參考爲交流，其係描述一相對於DC位準改變的一係數。

典型上，在AC係數中的能量分配是接近於一區塊的右下方部份的許多係數具有一零值或接近於零值，而因此無不同地編碼，而接進於一區塊的左上方部分的係數是做不同地編碼。

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五、發明說明(16)

在圖5中所顯示的是無巨區塊邊界，既然該等區塊係假設如在圖4(a)-(d)中所顯示的四個配置中的一個。此外，當每個區塊包括六十四個係數時，並非所有皆個別地顯示。區塊X 310包括第一列的AC係數314及第一欄的AC係數316，區塊C包括第一列AC係數344，而區塊A包括第一欄的AC係數324。

在區塊A 320中的DC係數322或在區塊C 340中的DC係數342將會選取當作是在區塊X 310中的DC係數312的預測器。此外，來自一先前碼區塊(亦即，在相同的VOP中)的第一列或第一欄的AC係數是用來預測該目前區塊的對應係數。

對於每個區塊而言，當目前的區塊和預測器區塊有相同的dct_type時，DC係數預測之所選擇的方向也用來選取AC係數預測的方向。即是，當目前的區塊和預測器區塊皆具有dct_type=0(亦即，非重新排列圖場模式，或影像框模式)或dct_type=1(亦即，重新排列圖場模式)，DC預測器區塊的AC係數是用來不同地編碼目前區塊的AC係數。MPEG-4旗號"dct_type"係在上面連同圖2描述。

在第一範例中，假設目前的區塊X 310是如圖4(a)中的配置。如果區塊X、A和C具有相同的dct_type，然後DC預測器區塊的AC係數是用來不同地編碼目前區塊的AC係數。

例如，如果區塊C 340是DC預測器區塊，那麼區塊C的第一列AC係數是以係數接著係數爲基礎而用來預測區塊X的第一列AC係數314。即是，第344列的第一AC係數是用來預測由箭號346所指示的第314列的第一個AC係數，第344列的

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五、發明說明（17 ）

第二AC係數是用來預測第314列的第二AC係數等等。同樣地，區塊C 340的第二列AC係數的是用來預測區塊X 310的第二列AC係數等等，直到區塊C的最後一列AC係數是用來預測區塊X的最後一列AC係數爲止。要注意的是，每個區塊的的第一列具有七個AC係數，而其它的列具有八個AC係數。

另一種方式是，仍假設區塊X，A和C所有具有相同的dct_type，如果區塊A是DC預測器區塊時，那麼區塊C的第一欄AC係數324是以係輸接著係數爲基礎而用來預測區塊X的AC係數的第一欄316。例如，第324欄的第一AC係數是用來預測由箭號326所指示的第316欄的第一AC係數。同樣地，區塊A的第二欄AC係數是用來預測X的第二欄AC係數等等，直到區塊A的最後一欄AC係數是用來預測區塊X的AC係數最後欄爲止。要注意的是，每個區塊的最後一欄具有七個AC係數，而其它的欄具有八個AC係數。

仍假設使用圖4(a)的配置，如果區塊X和區塊C具有不同的dct_types，那麼區塊A係選取爲AC預測器區塊，而不管DC預測器區塊。區塊A在這情況係選取爲AC預測器，即使區塊A和區塊X具有有不同的dct_types，既然在一重新排列圖場模式區塊中的線條重新排列並未明顯影響相對於一非重新排列圖場模式區塊或一影像框模式區塊的水平空間頻率的分配。因此，一改良的編碼效率能仍藉由使用區塊A當作是一AC預測器區塊而能預期。

如果區塊X和區塊C具有相同的dct_type，但是區塊X和

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五、發明說明 (18)

區塊A具有不同的dct_type，那麼區塊C係選取爲AC預測器區塊，而不管DC預測器區塊。

因此，DC預測器能來自於區塊C，例如，當AC預測器是來自於區塊A。另一種方式是，DC預測器能來自於區塊A，當AC預測器是來自於區塊C。

通常，當區塊C和區塊X具有不同的dct_types，其圖素線條的重新排列改變在一區塊中的空間能量分配時，這是爲什麼要避免區塊C當作是AC預測器區塊，所以在具有不同dct_types的兩區塊之間的空間頻率之間的相互關係便會明顯地降低。

例如，假設區塊X是具有一垂直邊界的快速移動物體影像，其係水平移動而跨越該區塊。在這種情況，區塊X能編碼爲一重新排列過的圖場模式區塊，以避免垂直邊界的一彎曲或曲折效應。如此，由在上和下圖場之間的一暫時延遲所造成的彎曲在一區塊中是明顯的垂直曲折。然而，如果移動影像的垂直邊界並未延伸至區塊C時，區塊C能以非重新排列圖場模式或影像框模式而被編碼。在這情況，區塊C不能夠提供區塊X的好AC預測器係數，由於AC係數的不良相互關係，如此區塊A是當作AC預測器區塊使用。區塊A通常會提供一較高的相互關係。

在第二範例中，假設目前的區塊係如如圖4(b)中所示的配置。在此，區塊A和X具有與另一個相同的dct_type，而區塊B和C具有與另一個相同的dct_type。如果區塊X和C也具有與另一個相同的dct_type時，那麼DC預測器區塊的AC

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五、發明說明 (19)

係數是用來不同地編碼目前區塊的AC係數。如果區塊X和C具有不同的dct_types時，那麼區塊A是當作AC預測器使用，而不管DC預測器區塊。

在第三範例中，假設目前的區塊是如在圖4(c)中所示的配置。區塊X和C具有與另一個相同的dct_type，而區塊A和B具與另一個相同的dct_type。如果區塊X和A也具與另一個相同的dct_type時，那麼DC預測器區塊的AC係數是用來不同地編碼目前區塊的AC係數。如果區塊X和A具有不同的dct_type時，那麼區塊C是當作AC預測器區塊使用，而不管DC預測器區塊。

在第四的範例中，假設目前的區塊是如在圖4(d)中所示的配置。既然區塊A、B、C、和X是在相同的巨區塊300，所以這些區塊皆具有相同的dct_type。因此，DC預測器區塊的AC係數是用來不同地編碼目前區塊的AC係數。

如一般的規則，只有當區塊X和區塊C具有相同的dct_type，而且DC預測器是來自於區塊C時，區塊C是當作AC預測器使用。否則，區塊A是當作AC預測器使用。而且，AC預測器的執行是類似於亮度及兩色訊元件中的每一個。

要注意的是，當區塊A由預設值(亦即，當區塊X和區塊C具有不同的dct_type)所選取，但實質上沒有區塊A存在，諸如當區塊X是在第一列的第一巨區塊的一半時，零市用於AC預測器。

在圖4和5的範例中，每個區塊係假設爲INTRA編碼，而

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五、發明說明 (20)

且是在共同的VOP邊界內。然而，如區塊A、B、或C中的任何一個是在VOP邊界外，而其包括區塊X，或不屬於一INTRA寫碼巨區塊時，它們的量化AC (QAC)值是假設接受零值，用以計算預測值。QDC值係設定成如所討論的一非零值常數。

此外，若要在目前區塊的AC預測中所使用的先前水平毗連或垂直毗連區塊的量子化中比較差異時，便需有預測係數的比例處理。該預測會修改，所以預測器是藉由目前量子化步驟大小及預測器區塊的量子化步驟大小的比例而決定。

特別是，如果區塊A係選取爲目前區塊(例如，區塊X)的AC預測器時，該依比例的水平AC預測是：

$$QAC_{i0X'}=\frac{QAC_{i0A}\times QP_A}{QP_X}$$

其中QAC_{i0A}是(i，0)係數的非依比例決定的量化AC值，QP_A是區塊A的量子化參數，而QP_X是區塊X的量子化參數。

如果區塊C係選取爲AC預測器時，該依比例決定的垂直AC預測是：

$$QAC_{0jX'}=\frac{QAC_{0jC}\times QP_C}{QP_X}$$

其中QAC_{j0C}是(0，j)係數的非依比例決定的量化AC值，QP_C是區塊C的量子化參數，而QP_X是區塊X的量子化參數。成

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五、發明說明 (21)

對的(i，j)係由水平"i"位置及垂直"j"位置而表示在一區塊中的一特殊係數。例如，(i，j)=(0，0)表示在區塊中左上方的係數，而(i，j)=(8，8)係表示在一區塊中的右下方係數。

如果區塊A或區塊C是在從有區塊X的VOP外面時，那麼對應的QP值係假設等於QP_X。

特別的是，雖然在一INTRA區塊中的DCT係數的不同編碼已連同圖3-5討論，能經常藉由減少表示區塊所需的資料量而改良編碼效率，但這不始終是如此的情況。因此，當AC係數預測當與最初的信號做比較而造成較大的振幅錯誤信號時，期望關閉AC預測。然而，若要避免過度的資料，AC預測基於巨區塊接著巨區塊而能做開啓或關閉的切換，而不是基於區塊接著區塊。

切換開啓或關閉AC預測的決定是基於在一巨區塊中要預測的所有AC係數絕對值總和的比較，及所預測的微分絕對值的總和。特別是，如果區塊A係選取爲AC預測器區塊時，一標準S會依如下所示的而被計算：

$$S=\left(\sum_{i=1}^{7}|QAC_{i0X}|-\sum_{i=1}^{7}|QAC_{i0X}-QAC_{i0X'}|\right)$$

如果區塊C係選取爲目前區塊的DC預測器時，標準S便會依下列式子而被計算：

$$S=\left(\sum_{j=1}^{7}|QAC_{0jX}|-\sum_{j=1}^{7}|QAC_{0jX}-QAC_{0jX'}|\right)$$

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五、發明說明 (22)

其次，對於在巨區塊中要達成一共同決定的所有區塊而言，一單獨的ΣS會被計算，而諸如MPEG-4旗號"ACpred_flag"會設定/重新設定成開啓/關閉AC預測。特別是，如果(ΣS≥0)，設定ACpred_flag=1，以啓動AC預測。否則，設定ACpred_flag=0，使AC預測關閉。DC預測不管在任何情況皆是開啓。ACpred_flag會傳送至解碼器，用於恢復每個區塊的DCT係數。

圖6係根據本發明的一解碼器的方塊圖。通常在600上所顯示的解碼器能用來接收並解碼來自圖1編碼器的已編碼的資料信號。編碼過的視訊影像資料及不同編碼的移動向量(MV)資料是在連接機640上接收，並提供給一解多工器(DEMUX) 642。對於INTER巨區塊而言，該編碼過的視訊影像資料是以作爲一預測錯誤信號(例如，餘數)的DCT轉換係數而做不同的編碼。對於INTRA巨區塊而言，視訊影像本身並不做差異行的編碼，但是DCT係數能使用鄰近的轉換係數而在相同的VOP中做不同地編碼，亦即，根據ACpred_flag。

當VOP具有任意的形狀來恢復形狀資訊時，一形狀解碼法功能644便會處理資料，其會依序地提供一移動補償功能650及一VOP重建功能652。一結構解碼功能646係在轉換係數上執行一倒轉的DCT，以恢復INTER寫碼巨區塊的餘數。

對於INTRA寫碼巨區塊(MBs)而言，圖素資訊能直接恢復，並提供給VOP重建功能652。特別是，當ACpred_flag=0時，在結構解碼功能646上的倒轉DCT能直接地恢復目前區

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五、發明說明 (23)

塊的AC係數，既然AC係數並非是不同地編碼。DC係數係使用頂端或左方區塊的DC係數(例如，預測器)而做不同的編碼。當所選取的預測器區塊是超過目前的VOP外面，或來自一INTER碼區塊時，DC預測器會變成零。整個DC係數是藉由加總具預測器DC係數的目前區塊之DC係數的不同編碼而能恢復，亦即，根據操作$QDC_X = DQDC_X + QDC'_X$。

對於具ACpred_flag=1的INTRA碼巨區塊而言，目前區塊的AC和DC係數是不同地編碼。當ACpred_flag=0時，DC係數是依如上所討論的而恢復。整個AC係數是藉由執行倒轉的DCT而恢復，以獲得目前區塊的不同編碼過的AC係數，並加總具預測器區塊的對應AC係數之不同編碼過的AC係數，亦即，根據操作$QAC_X = DQAC_X + QAC'_X$。當所選取的預測器區塊是在目前的VOP外面時，AC預測器會是零。

因此，對於INTRA碼區塊而言，解碼器分別識別AC和DC係數的適當預測器區塊是需要的。這能藉由以位元流而提供一碼字或某些碼字而達成，用於指出預測器區塊的每一巨區塊。例如，一"00"碼字係指出頂端區塊是AC和DC的係數，一"01"碼字係指出左方區塊是AC和DC係數的預測器，一"10"碼字係指出當頂端區塊是AC係數的預測器時，左方區塊是DC係數的預測器，而一"11"碼字係指出當頂端區塊是DC係數的預測器器，左方區塊是AC係數的預測器。

此外，其它的位元或碼字或類似符號可用來指示一零值預測器可用於DC或AC係數。或解碼器可獨立地檢查是否一所選取的預測器區塊是INTER編碼或超過目前的VOP外面，

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五、發明說明 (24)

並將預測器係數依需要將其設定爲零或一非零的常數。

另一種方式是，在解碼器600上的結構解碼功能646能獨立執行在上面連同圖3-5所討論的選取運算法則，以決定正確的預測器係數。在這情況，結構解碼功能646具有記憶體，用來儲存左方、頂端的解碼過的DCT，左方區塊係使用處理目前的區塊。旗號dct_type必須也能使用於在此情況中的每一巨區塊。適當的電路能以軟體、韌體、或硬體實現，以確認意欲的預測器係數，爲了要解碼目前的區塊。

對於INTER碼區塊及諸如在B-VOPs中的MBs而言，圖素資訊是從結構解碼功能646提供給重建的VOP功能652，其表示在目前的MB和一參考影像之間的殘留。該參考影像可以是來自一單獨MB的圖素資料，其是由一前向或後向所指示。另一種方式是，對於一交錯的MB而言，該參考影像是來自兩參考MBs的平均圖素資料，例如，一過去的MB及一未來的MB。在這情況，解碼器在恢復目前的MB圖素資料之前，必須根據向前和向後MVs而必須計算平均的圖素資料。

對於INTER碼區塊和MBs而言，一移動解碼功能648會處理編碼過的MV資料，以恢復不同的MVs，並將它們提供給移動補償功能650及一移動向量記憶體649，例如RAM。移動補償功能650vu43接收差別的MV資料，並根據編碼的模式及目前MB的pmv[]指標及先前的MB，而以位元流順序決定一PMV。

一旦移動補償功能650決定整個參考MV，並將它與目前

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MB的差別MV加總，目前MB的整個MV便可使用。因此，移動補償功能650現在能從諸如RAM的一VOP記憶體654取回最佳匹配資料的影像框，並依需要計算一平均的影像，並將影像框圖素資料提供給VOP重建功能，以重建目前的MB。

所取回或計算過的最佳資料是在VOP重建功能652上加回到圖素殘留，以便獲得解碼過的目前MB或區塊。所重建的區塊係當作影像輸出信號的輸出，並也提供給VOP記憶體654，以提供新的影像框資料。

圖7係根據本發明而描述一巨區塊儲存器結構。該結構指出由解碼器所接收的資料格式。要注意的是，爲了方便而只顯示四列的封包。封包是以序列方式傳輸，從頂端列開始，而在一列當中是從左至右。第一列710包括圖場第一形狀碼、MVD形狀、CR、ST、和BAC。第二列730包括圖場COD和MCBPC。第三列750包括圖場ACpred_flag 753、CBPY、DQUANT、交錯資訊、MVD、MVD2、MVD3和MVD4。第四列770包括圖場CODA、Alpha_ACpred_flag、CBPA、Alpha區塊資料和區塊資料。上述圖場中的每一個係根據MPEG-4 VM 8.0而定義。

第一形狀碼一持係指出一MB是否在VOP的一邊界盒內。CR係指出二進位Alpha區塊的轉換比率。ST係指出一水平或垂直掃描順序。BAC可參照爲二進位的算術碼字。

COD和CODA可參照爲灰色比例形狀碼。MCBPC可參照爲色訊的一巨區塊類型及碼區塊圖案。如所討論的，

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ACpred_flag 753是一位元的旗號，當設定爲零時，指出只有DC預測是執行於一目前的INTRA區塊。ACpred_flag=1指出AC和DC預測係執行於目前的INTRA區塊。CBPY可參照爲亮度的一編碼區塊圖案。DQUANT係定義從巨區塊到巨區塊的一量化器Qp值的變化。

在第三列750中的圖場交錯資訊係指出一巨區塊是否要交錯編碼。所交錯的資訊圖場能儲存，稍後用在移動向量記憶1349或在解碼器中的其它記憶體。所交錯的資訊圖場也包括已討論的旗號dct_type，其指出在一圖場編碼巨區塊中的上和下圖場圖素線條是否要重新排列。

MVD、MVD2、MVD3、及MVD4可參照爲移動向量資料。Alpha_ACpred_flag可參照爲Alpha形狀編碼的ACpred_flag。Alpha區塊資料可視已知Alpha平面的二進制及灰色比例形狀資訊。

在圖7中所顯示的配置只是一範例。有關資訊與解碼器溝通的各種其它的配置對於在技藝中所熟知技術會更顯而易見。

根據本發明的一位元流語法和MB封包語法的使用是在MPEG-4 VM 8.0及一般在美國專利專利應用案號08/897,847，由愛翡爾及其他的人提出，並於1997年7月21日歸檔，題目爲"Motion Estimation and Compensation of Video Object Planes for Interlaced Digital Video"，在此僅列出以供參考。

因此，可看出本發明提供有效編碼一INTRA碼區塊的DC

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和AC DCT轉換係數的一方法。DC和AC係數藉由選取來自一左方鄰近區塊及一頂端鄰近區塊的預測器DC和AC係數而做不同的編碼。每個區塊係根據一影像框模式、一重新排列圖場模式、或一非重新排列圖場模式而被編碼。AC預測器區塊係根據區塊的寫碼模式及具有DC預測器的區塊而被選取。當頂端區塊和目前區塊皆是重新排列圖場模式、或兩影像框模式及/或非重新排列圖場模式、及在頂端區塊中DC預測器時，頂端區塊係選取爲一AC預測器。當所選取的區塊不是INTRA，或未存在當作目前區塊的相同影像物體平面(VOP)時，零的AC空間轉換係數係用來取代來自所選取區塊的AC空間轉換係數。DC係數在此情況同樣地設定爲非零值。

特別地，本發明係改良在先前方法上的編碼效率，其並未提供當作候選預測器區塊的頂端區塊，或評估目前候選區塊是否要以一影像框模式、非重新排列圖場模式、或重新排列圖場模式來編碼。在目前區塊和頂端區塊之間的空間頻率的相互關係能改良編碼效率。此外，當候選的預測器超過一目前的影像物體平面(VOP)外面而並未INTRA寫碼，或相反地未使用時，該方法藉由提供預測器係數的零處理而包括MPEG-4標準。

此外，該方法與DCT係數的線性和非線性量子化相容。特別地，揭示DC係數非線性的量子化，其中所編碼的係數是根據巨區塊的量子化位準而在解碼器上依比例決定，而此巨區塊具有係數且其所選取的區塊能恢復依比例決定的

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係數。

雖然本發明已連同各種具體化實施例描述，在藝術所熟知的技術歸功於許多的應用和修改並未違背本發明所發表的專利申請範圍及精神。例如，當本發明連同DCT轉換係數討論時，本發明能適用於其它空間轉換的係數使用。

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六、申請專利範圍

1. 一種用以在數位視訊的影像中編碼一目前INTRA碼區塊的空間轉換係數之方法，包括以下步驟：

識別一毗連左區塊、一毗連頂端區塊、和及一左上方區塊，其係鄰近於該左區塊及該頂端區塊；

該左區塊、頂端區塊、及左上方區塊，每個具有DC空間轉換係數及許多的AC空間轉換係數；

該等區塊中的每一個係根據一影像框模式、重新排列圖場模式、及非重新排列圖場域模式中的任一模式予以編碼；及

從該左區塊及該頂端區塊中的一個來選取AC空間轉換係數，用以不同地編碼該目前區塊的各別AC空間轉換係數；

該選取步驟要回覆該目前區塊及該頂端區塊的寫碼模式。

2. 如申請專利範圍第1項之方法，還包括以下步驟：

當該頂端區塊係根據該影像框模式及該非重新排列圖場模式而編碼時，從該左區塊選取該AC空間轉換係數，而且該目前區塊係根據重新排列圖場模式而被編碼。

3. 如申請專利範圍第1項之方法，還包括以下步驟：

當該頂端區塊係根據該影像框模式及該非重新排列圖場模式而編碼時，從該左區塊選取該AC空間轉換係數，而且該頂端區塊係根據重新排列圖場模式而編碼。

4. 如申請專利範圍第1項之方法，還包括以下步驟：

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六、申請專利範圍

選取一DC空間轉換係數，用以不同地編碼來自該左區塊及頂端區塊中的一該目前區塊的該DC空間轉換係數，其係根據(a)在該左區塊及該左上方區塊之間的DC空間轉換係數之間的一梯度，及(b)在該頂端區塊及該左上方區塊的DC空間轉換係數之間的一梯度。

5. 如申請專利範圍第4項之方法，還包括以下步驟：

選取AC空間轉換係數，用以根據所選取的DC空間轉換係數而做不同地編碼來自該左區塊及該頂端區塊中的一個。

6. 如申請專利範圍第4項之方法，還包括以下步驟：

當DC空間轉換是從該頂端區塊時，選取AC空間轉換係數用以來自該頂端區塊的不同編碼，而且該目前的區塊係根據影像框模式或非重新排列圖場模式而被編碼，而且該等端區塊係根據影像框模式或非重新排列圖場模式而編碼。

7. 如申請專利範圍第4項之方法，還包括以下步驟：

當該DC空間轉換係數是從該頂端區塊而選取，而且該目前區塊及該頂端區塊皆根據該重新排列圖場模式而寫碼時，選取AC爲空間轉換係數用以不同地編碼來自該頂端的區塊。

8. 如申請專利範圍第1項之方法，還包括以下步驟：

當該所選取的區塊並非是INTRA時，使用零AC空間轉換係數取代來自所選取區塊的AC空間轉換係數。

9. 如申請專利範圍第1項之方法，其中在一目前影像物體

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六、申請專利範圍

平面(VOP)中存在的該目前區塊還包括以下步驟：

當所選取的區塊並未出現在該目前的VOP時，使用零AC空間轉換係數取代來自所選取區塊的AC空間變換係數。

10. 如申請專利範圍第4項之方法，還包括以下步驟：

非線性地量化目前區塊的該DC空間轉換係數。

11. 一種用以在一數位視訊影像中解碼經由不同地編碼一目前INTRA碼區塊的空間轉換係數之方法，而此數位視訊影像是以一數位位元流傳送，以恢復符合該目前區塊的整個AC空間轉換係數，包括以下步驟如下：

恢復該數位位元流；

該數位位元流是由來自一毗連左區塊、一毗連頂端區塊、及一左上方區塊的資料所組成，而此左上方區塊是毗連該左區塊及該頂端區塊；

該左區塊、頂端區塊、及左上方區塊中的每一個具有一DC空間轉換係數及許多的AC空間變換係數；

該等所要編碼區塊中的每一個係根據一影像框模式、一重新排列圖場模式、及一非重新排列圖場模式中的一模式處理編碼；

選取來自該左區塊及該頂端區塊中的一個的AC空間轉換係數；

加總該所選取的AC空間轉換係數與該對應於該的不同所編碼的AC空間轉換係數，以該目前區塊的該整個AC空間轉換係數；

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六、申請專利範圍

該選取步驟要能回覆該目前區塊及該頂端區塊的編碼模式。

12. 如申請專利範圍第11項之方法，還包括以下步驟：

當該頂端區塊根據該影像框模式及該非重新排列圖場模式中的一模式編碼時，選取來自該左區塊的該加總步驟的AC空間轉換係數，而該目前區塊係根據重新排列圖場模式而編碼。

13. 如申請專利範圍第11項之方法，還包括以下步驟：

當該目前區塊根據該影像框模式及該非重新排列圖場模式中的一模式編碼時，選取來自該左區塊的該加總步驟的AC空間轉換係數，而該頂端區塊係根據該重新排列圖場模式而編碼。

14. 如申請專利範圍第11項之方法，其中該目前區塊的DC空間轉換係數係使用來自該左區塊及該頂端區塊中的一DC空間轉換係數，而在使用數位位元流傳輸之前經過不同地編碼，其係根據(a)在該左區塊及該左上方區塊的DC空間轉換係數之間的第一梯度，及(b)在該左區塊及該左上方區塊的DC空間轉換係數之間的第二梯度，還包括以下步驟：

決定該第一及第二的梯度；及

選取該DC空間轉換係數，其係根據所決定的梯度而不同地編碼來自該左區塊及該頂端區塊中的一該目前區塊的DC空間轉換係數。

15. 如申請專利範圍第14項之方法，還包括以下步驟：

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根據該所選取的DC空間轉換係數選取來自該左區塊及該頂端區塊中的一該加總步驟的AC空間轉換係數。

16. 如申請專利範圍第14項之方法，還包括以下步驟：

當該DC空間轉換係數是從該頂端區塊選取時，選取來自該頂端區塊的該加總步驟的AC空間轉換係數，而且該目前區塊係根據該影像框模式或非重新排列圖場模式而編碼，並且該頂端區塊是根據該影像框模式或該非重新排列圖場模式而編碼。

17. 如申請專利範圍第14項之方法，還包括以下步驟：

當該DC空間轉換係數是從該頂端區塊選取，而該目前區塊及該頂端區塊皆根據該重新排列圖場模式編碼時，選取來自該頂端區塊的該加總步驟的AC空間轉換係數。

18. 如申請專利範圍第11項之方法，還包括以下步驟：

當該所選取的區塊並非是INTRA碼時，使用零AC空間轉換係數編碼取代來自所選取區塊的AC空間轉換係數。

19. 如申請專利範圍第11項之方法，其中該目前區塊是存一目前影像物體平面(VOP)中，還包括以下步驟：

當該所選取的區塊並非在該目前的VOP內時，使用零AC空間轉換係數取代來自該所選取區塊的AC空間轉換係數。

20. 如申請專利範圍第11項之方法，其中：

該選取步驟會回覆在該數位位元流中所提供的一碼

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六、申請專利範圍

字，其是來自該左區塊及該頂端區塊中的一AC空間轉換係數。

21. 如申請專利範圍第14項之方法，其中該目前區塊的DC空間轉換係數是非線性非量化，還包括以下步驟：

恢復來自該所選取區塊及該目前區塊的各別量子化位準的該數位位元流的資料；及

根據該所選取區塊及該目前區塊的各別量子化位準，依比例決定該目前區塊的DC空間轉換係數，以恢復一依比例決定的DC空間轉換係數。

22. 一種用以在一數位視訊影像中編碼一目前INTRA碼區塊的空間轉換係數之裝置，包括：

裝置，用以識別一毗連左區塊、一毗連頂端區塊、及毗連該左區塊及該頂端區塊的一左上方區塊；

該左區塊、頂端區塊、及左上方區塊中的每個具有一DC空間轉換係數及許多的AC空間轉換係數；

該等所要編碼中的每一個係根據一影像框模式、一重新排列圖場模式、及一非重新排列圖場模式中的一模式而編碼；及

裝置，用以選取來自該左區塊及該頂端區塊中的一AC空間轉換係數，用以不同地編碼該目前區塊的各別AC空間轉換係數；

該選取裝置係回覆至該目前區塊及該頂端區塊的編碼模式。

23. 如申請專利範圍第22項之裝置，其中：

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六、申請專利範圍

當該頂端區塊根據該影像框模式及該非重新排列圖場模式中的一模式來編碼時，該裝置用以選取來自該左區塊的AC空間轉換係數，而且該目前區塊係根據該重新排列圖場模式而編碼。

24. 如申請專利範圍第22項之裝置，其中：

當該目前區塊係根據該影像框模式及該非重新排列圖場模式中的一模式來編碼時，該裝置用以許取來自該左區塊的該AC空間轉換係數，而且該頂端區塊係根據該重新排列圖場模式而編碼。

25. 如申請專利範圍第22項之裝置，其中：

其中該目前區塊的DC空間轉換係數係使用來自該左區塊及該頂端區塊中的一DC空間轉換係數，而在使用數位位元流傳輸之前經過不同地編碼，其係根據(a)在該左區塊及該左上方區塊的DC空間轉換係數之間的第一梯度，及(b)在該左區塊及該左上方區塊的DC空間轉換係數之間的第二梯度；

該選取裝置係選取一DC空間轉換係數，使用在來自該左區塊及該頂端區塊中的一該目前區塊的不同編碼DC空間轉換係數，其係根據(a)在該左區塊及該左上方區塊的DC空間轉換係數之間的一梯度，及(b)在該頂端區塊及該左上方區塊的DC空間轉換係數之間的一梯度。

26. 如申請專利範圍第25項之裝置，其中：

該選取裝置選取AC空間轉換係數，其係根據所選取的DC空間轉換係數而使用在來自該左區塊及該頂端區塊

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中的一不同編碼。

27. 如申請專利範圍第25項之裝置，其中：

該選取裝置係用以當DC空間轉換係數是從該頂端區塊選取時，選取使用在來自該頂端區塊不同編碼的AC空間轉換係數，而該目前區塊是根據該影像框模式或該非重新排列圖場模式而編碼，而且該頂端區塊係根據該影像框模式或該非重新排列圖場模式而編碼。

28. 如申請專利範圍第25項之裝置，其中：

該選取裝置係用以當DC空間轉換係數從該頂端區塊選取時，選取來自該頂端區塊不同編碼的AC空間轉換係數，而且該目前區塊及該頂端區塊皆根據該所重新排列的圖場模式而編碼。

29. 如申請專利範圍第22項之裝置，還包括：

裝置，用以當所選取的區塊並非是INTRA碼時，使用零AC空間轉換係數取代來自該所選取區塊的AC空間轉換係數。

30. 如申請專利範圍第22項之裝置，其中該目前區塊係存在一目前的影像物體平面(VOP)中，還包括：

裝置用以當所選取的區塊並非存在該目前的VOP時，使用零AC空間轉換係數取代來自該所選取區塊的AC空間轉換係數。

31. 如申請專利範圍第25項之裝置，還包括：

裝置，用於該目前區塊的非線性量化DC空間轉換係數。

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六、申請專利範圍

32. 一種用以解碼在一數位視訊影像中所不編碼的一目前INTRA碼區塊的空間轉換係數之裝置，其是以數位位元流而傳輸，以恢復符合該目前區塊的整個AC空間轉換係數，包括：

裝置，用以恢復該數位位元流；

該數位位元流係由來自一毗連的左區塊、一毗連的頂端區塊、及毗連該左區塊及該頂端區塊的一左上方區塊的資料所組成；

該左區塊、頂端區塊、及左上方區塊中的每個具有一DC空間轉換係數及許多的AC空間轉換係數；

該等所要編碼區塊的每一個係根據一影像框模式、一重新排列圖場模式、及一非重新排列圖場模式中的一模式來編碼；

第一裝置，用以選取來自該左區塊及該頂端區塊中的一AC空間轉換係數；及

裝置，用以加總該所選取AC空間轉換係數及該目前區塊的對應不同編碼AC空間轉換係數，以恢復該目前區塊的整個AC空間轉換係數；

該第一選取裝置係回覆至該目前區塊及該頂端區塊的編碼模式。

33. 如申請專利範圍第32項之裝置，其中：

該第一選取裝置係當該頂端區塊根據該影像框模式及該非重新排列圖場模式中的一模式而編碼，且該目前區塊係根據該重新排列過的圖場模式編碼時，藉由來自該

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六、申請專利範圍

左區塊的加總處理裝置來選取AC空間轉換係數。

34. 如申請專利範圍第32項之裝置，其中：

該第一選取裝置係當該目前區塊根據該影像框模式及該非重新排列圖場模式中的一模式而編碼，且該頂端區塊係根據該重新排列過的圖場模式編碼時，藉由來自該左區塊的加總處理裝置來選取AC空間轉換係數。

35. 如申請專利範圍第32項之裝置，其中該目前區塊的DC空間轉換係在傳輸之前，以數位位元流而做不同地編碼，其使用來自該左區塊及該頂端區塊中的一DC空間轉換係數，其係根據(a)該左區塊及該左上方區塊的DC空間轉換係數之間的第一梯度，及(b)在該頂端區塊及該左上方區塊的DC空間轉換係數之間的第二梯度，還包括：

裝置，用以決定該第一和第二梯度；及

第二裝置，用以選取該DC空間轉換係數，其係使用在來自該左區塊及該頂端區塊中的一該目前區塊的DC空間轉換係數，而且該頂端區塊係根據所決定的梯度。

36. 如申請專利範圍第35項之裝置，其中：

該第一選取裝置係根據所選取的DC空間轉換係數，而藉由該左區塊及該頂端區塊中的加總處理裝置來選取AC空間轉換係數。

37. 如申請專利範圍第35項之裝置，其中：

該第一選取裝置選取AC空間轉換係數，係加總來自該頂端區塊的平均值，這是當DC空間轉換係數係選自於

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六、申請專利範圍

該頂端區塊，而該目前區塊係根據影像框模式或非重新排列圖場模式而編碼，且該頂端區塊係根據影像框模式或非重新排列圖場模式進行編碼而加總。

38. 如申請專利範圍第35項之裝置，其中：

該第一選取裝置選取AC空間轉換係數，係加總來自該頂端區塊的平均值，這是當DC空間轉換係數係選自於該頂端區塊，而該目前區塊及該頂端區塊係根據重新排列圖場模式進行編碼而加總。

39. 如申請專利範圍第32項之裝置，還包括：

裝置，當所選取的區塊並非是INTRA編碼時，用於零AC空間轉換係數，以取代來自所選取區塊的AC空間轉換係數。

40. 如申請專利範圍第32項之裝置，其中該目前區塊存在於一目前影像物體平面(VOP)，還包括：

裝置，當所選取的區塊並非存在於該目前VOPNTRA時，用於零AC空間轉換係數，以取代來自所選取區塊的AC空間轉換係數。

41. 如申請專利範圍第32項之裝置，其中：

該第一選取裝置係回應於在該數位位元流中所提供的一碼字，其指定來自該左區塊及該頂端區塊其中之一的AC空間轉換係數。

42. 如申請專利範圍第35項之裝置，其中該目前區塊的DC空間轉換係數是非線性量化，還包括：

裝置，用以恢復來自該數位位元流的資料，而此位元

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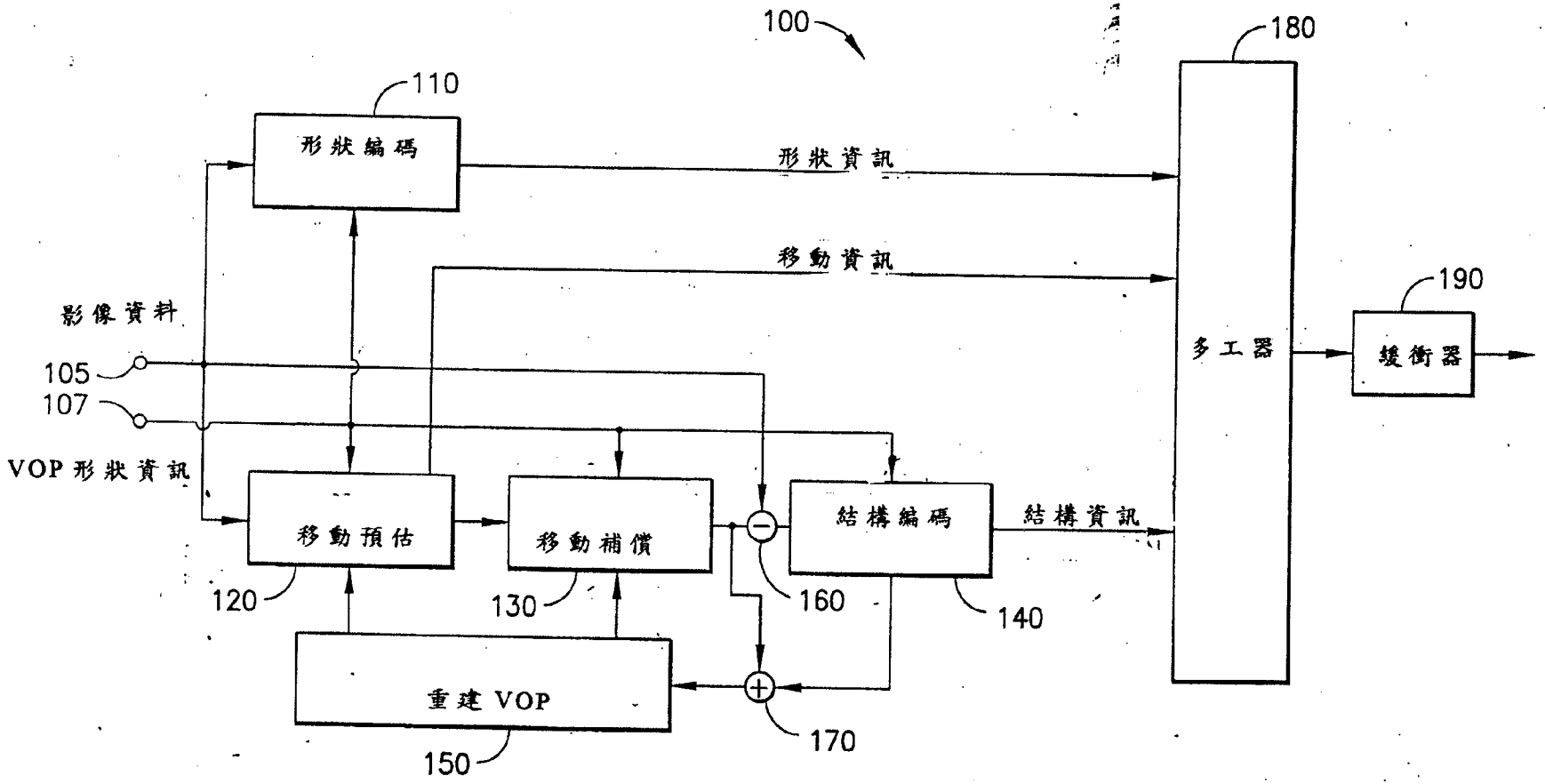


圖 1

六、申請專利範圍

流係指出該所選定區塊及該目前區塊的量子化位準；及

裝置，係根據該所選取區塊及該目前區塊之相對量子化位準，而依比例決定該目前區塊的DC空間轉換係數，以恢復一依比例決定的DC空間轉換係數。

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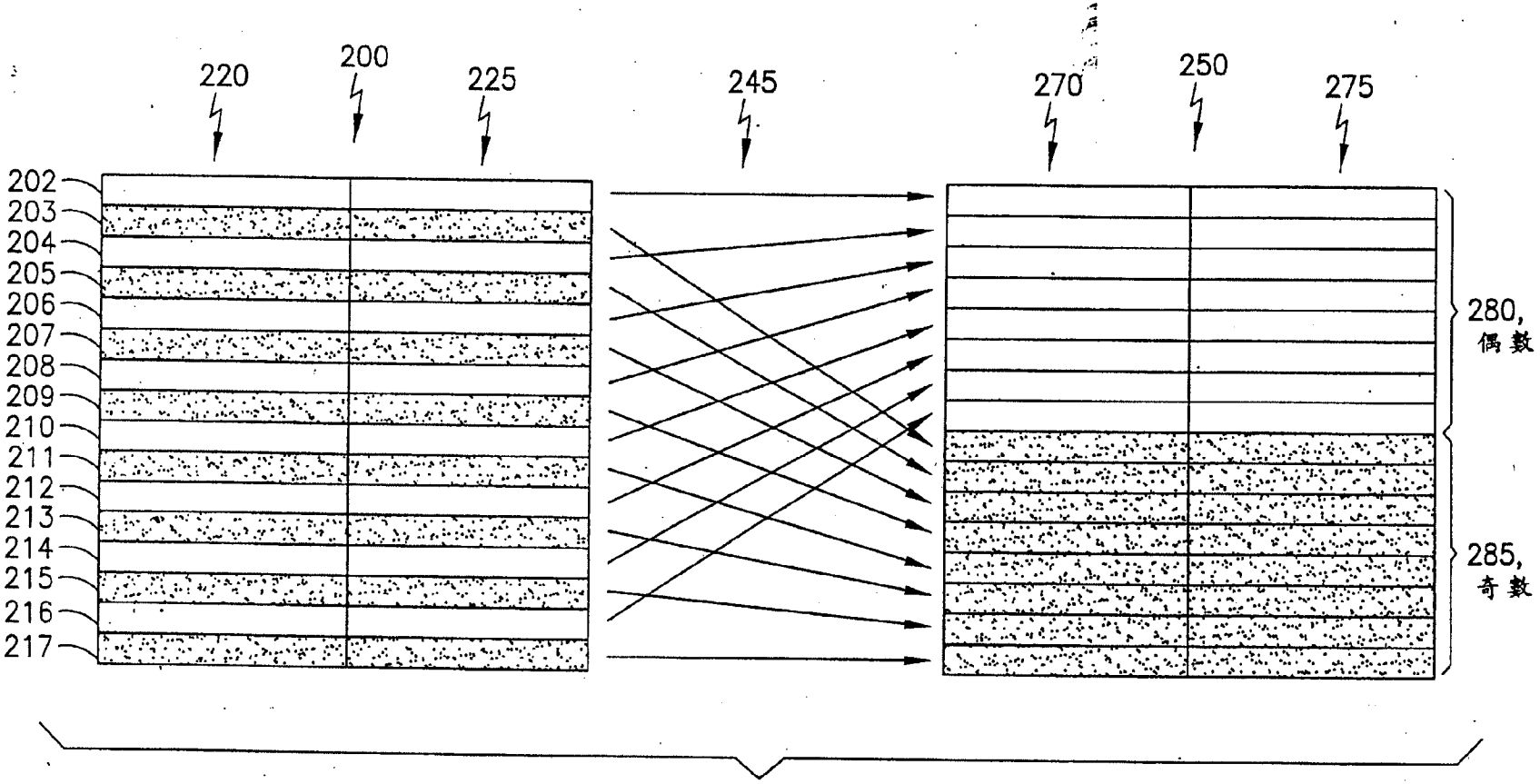


圖 2

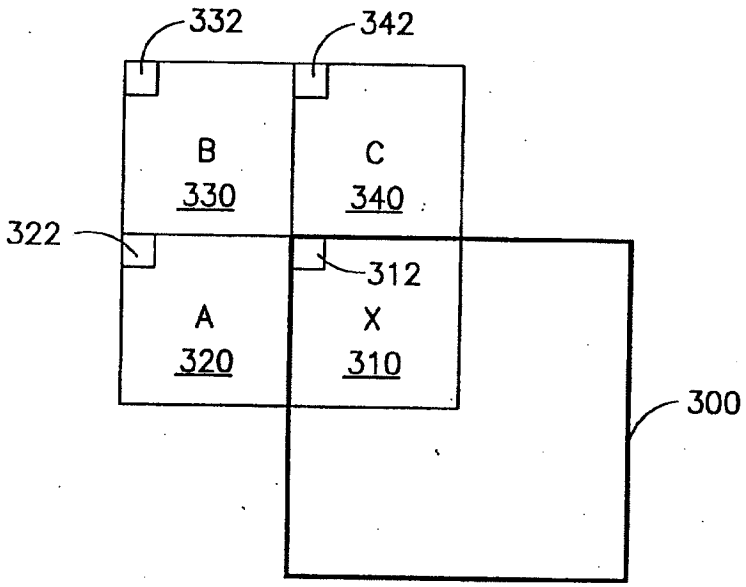


圖 3

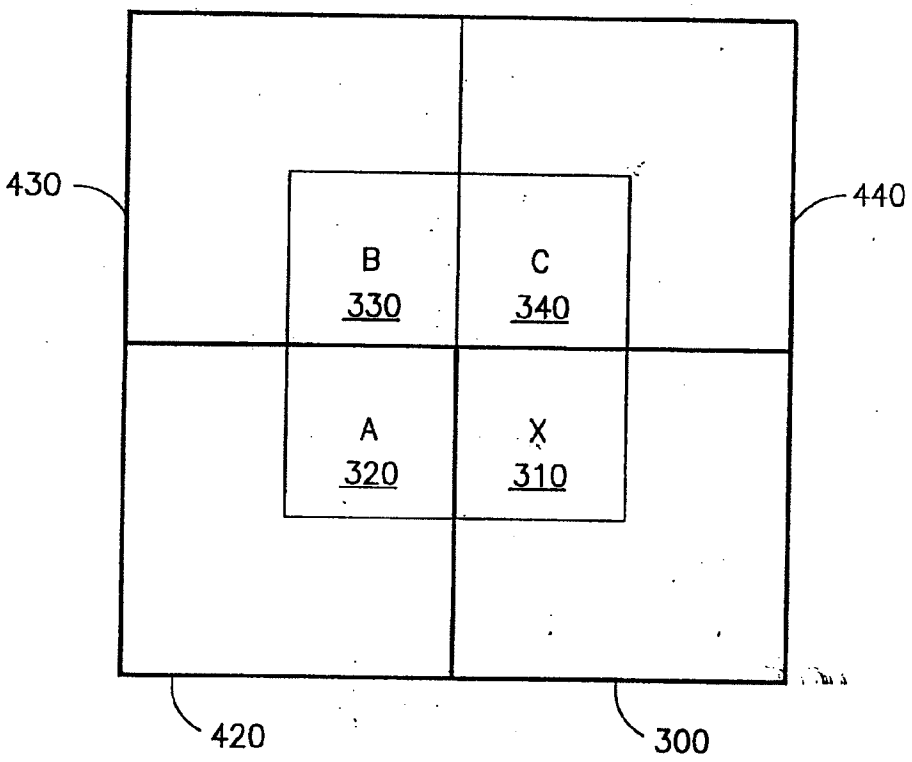


圖 4a

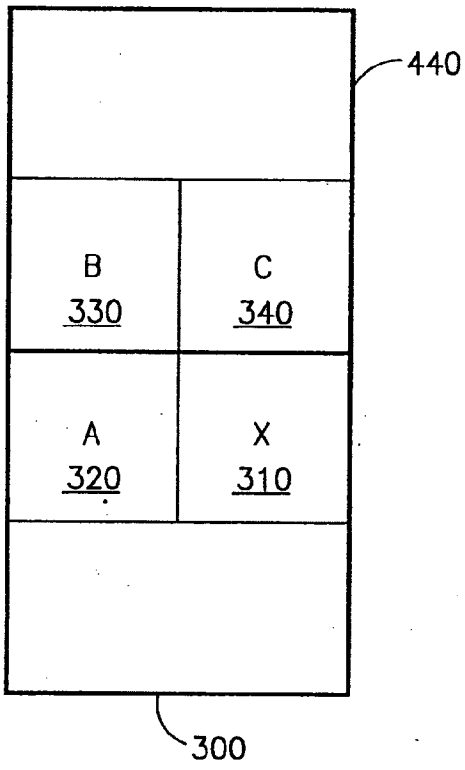

440
B
330
C
340
A
320
X
310
300

圖 4b

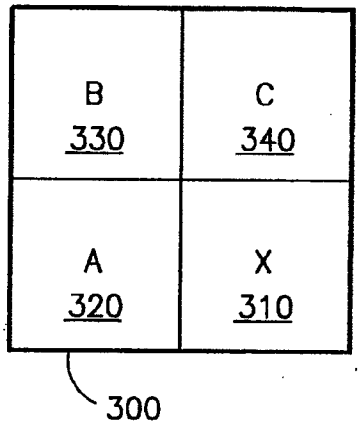

B
330
C
340
A
320
X
310
300

圖 4d

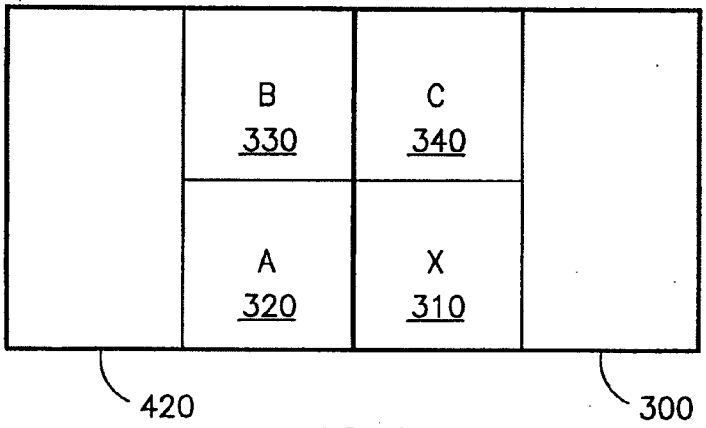

B
330
C
340
A
320
X
310
420
300

圖 4c

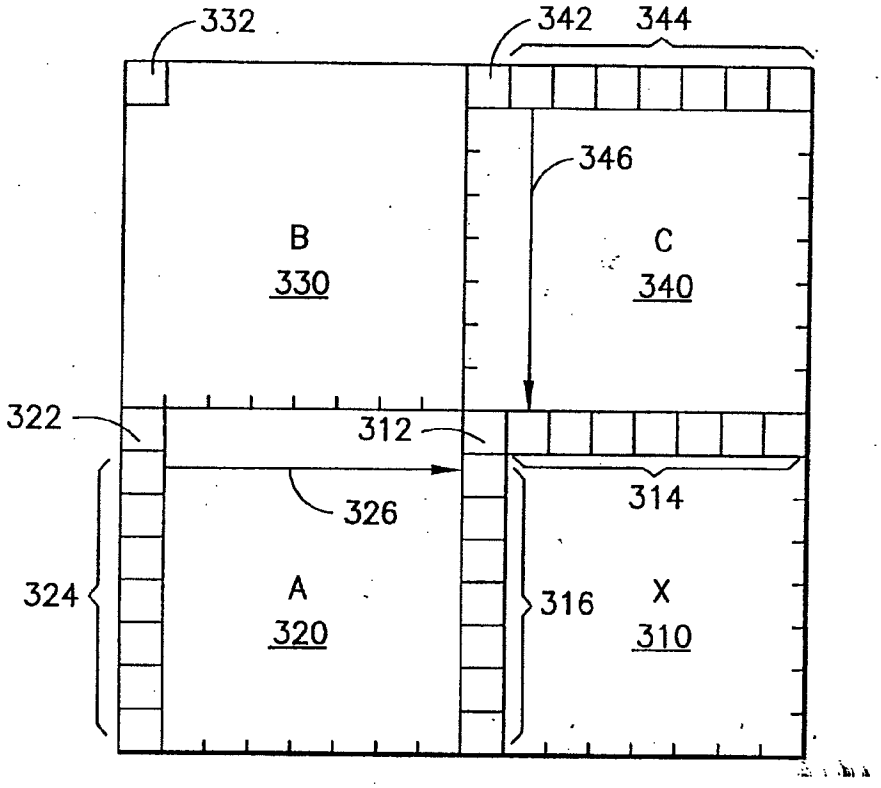


圖 5

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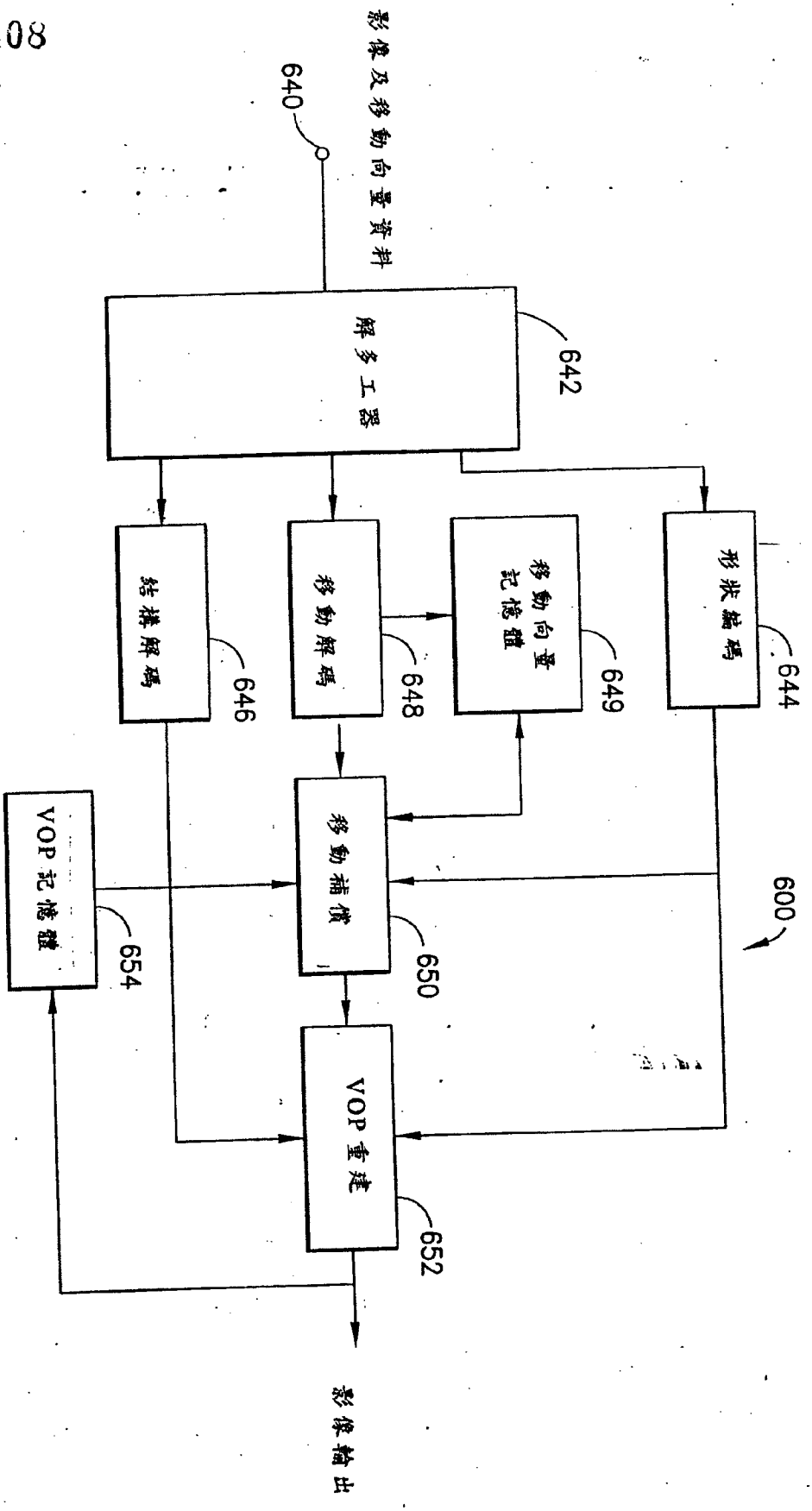


圖 6

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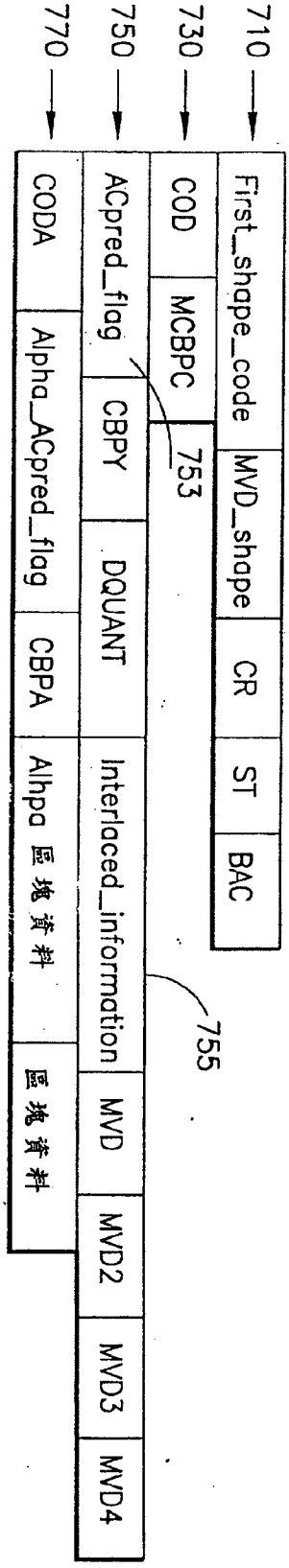

710
730
750
770
First_shape_code
MVD_shape
CR
ST
BAC
COD
MCBPC
753
ACpred_flag
CBPY
DQUANT
Interlaced_information
755
CODA
Alpha_ACpred_flag
CBPA
Alhpa 區塊資料
區塊資料
MVD
MVD2
MVD3
MVD4

圖 7

Taiwanese Patent Publication No. 393856

SPECIFICATION <EXCERPT>

In the program for the variable-length coding VLC, first, a Huffman table 1 (Huff1), which is data corresponding to an appropriate non-zero string, and a Huffman table 0 (Huff0), which is data corresponding to an appropriate run-length string, are generated. A', r_1, and r_0 represent a non-zero value, a non-zero value run-length, and a zero-value run-length, respectively. The variable-length coding VLC can be performed according to the below-described expressions, resulting in a shorter code.

1. Variable-length coding VLC for successive non-zero values is performed as follows:

1 + Huff1 [A'] + Huff0 [r_1]

where +, 1, Huff1 [ ], and Huff0 [ ] are in a step relationship, and indicate equivalence to one first bit, the Huffman table 0, and the Huffman table 1.

2. Variable-length coding VLC for successive zero values is performed as follows:

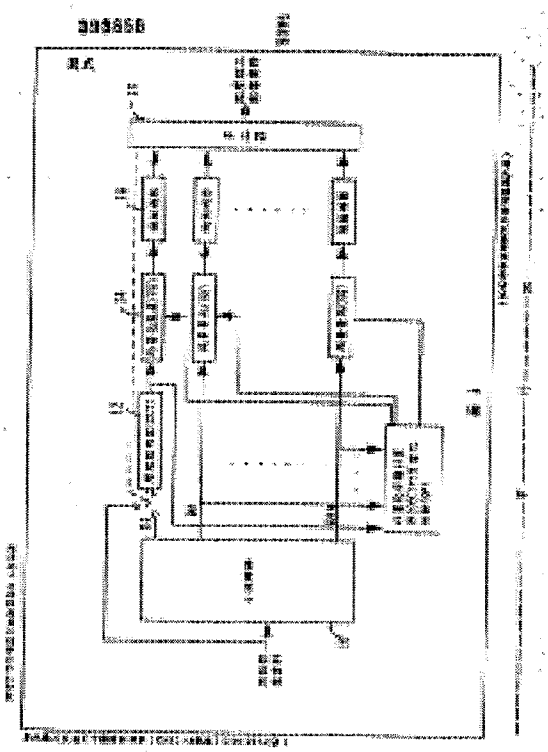
0 + Huff1 [q] + Huff0 [r]

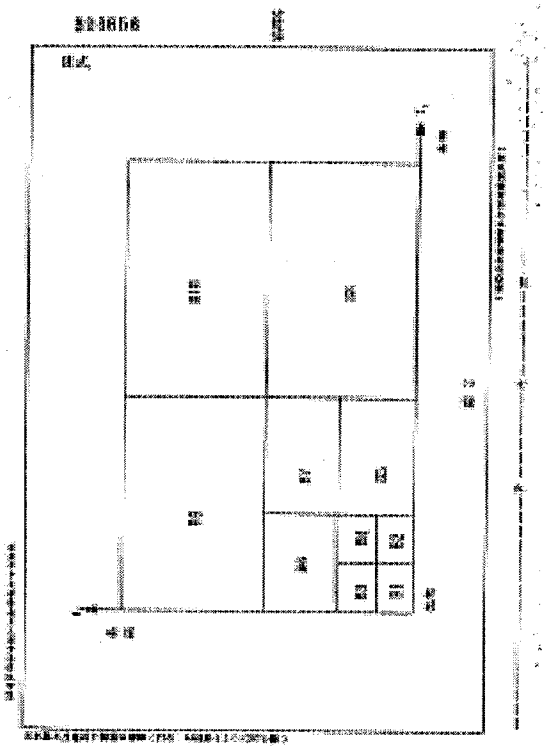
where q and r are the quotient and remainder of $r_0/256$, respectively.

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print out

Patent/Publication No.	393856
Title	Video compression method and device
Publication Date	2000/06/11
Application Date	1994/09/07
Application No.	083108362
Certification_Number	116358
IPC	***H04N-011/02***
Inventor	JUANG, JR-CHUEN TW; MA, JIN-GOU TW
Applicant	INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE TW



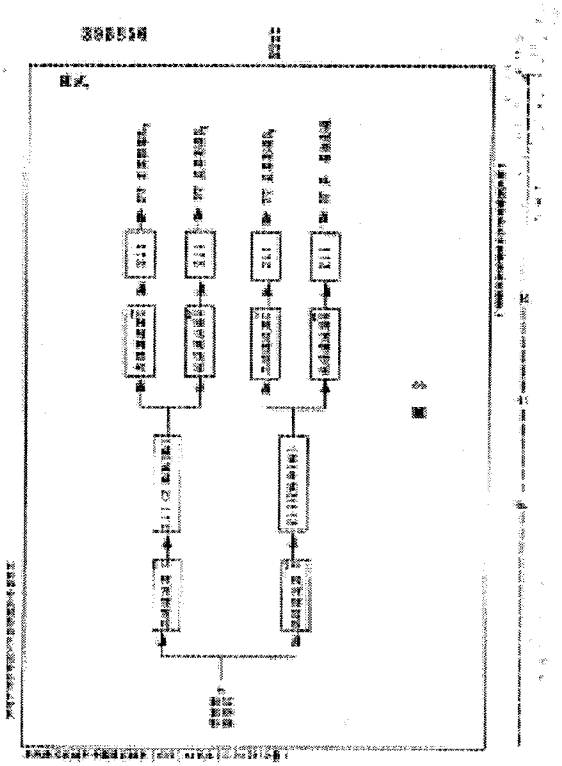


Abstract

This is a static video compression method, in which a scanned high-quality video signal is encoded to create a lower quality coarse image signal and a set of difference image signals, which can be separately used by users requesting different resolutions and video qualities By using a wavelet transformation technology, the input video is decomposed into a coarse image and at least one difference image group. The coarse image encoder uses the combined processing of DCT, vector quantifier VQ, and the entropy

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encoding. The JPEG encoding architecture or the like can replace this compression encoder processing. The difference image group encoder uses the combined encoding architecture of the scalar quantifier SQ and the entropy encoding to encode the difference image group signals. And then the coded coarse image and the difference image group are multiplexed to produce the compressed video. Low quality video service users can receive coarse images and the high-quality video service users can receive coarse images and more than one difference images. The decompression and re-combination of these two sets of video signals allows the higher-quality video to be rebuilt. Both of the vector quantifier VQ quantitative table QT and the scalar quantifier SQ threshold T have adaptability. Adaptability is obtained by multiplying a quantifying factor by the original quantifier table QT and the threshold T. This QF is determined based on the relative values of the corresponding video.



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Individual Y

Patent Right Change

Application Number	083108362
Date of Update	20090520
Licensing	Yes
Mortgage	Yes
Transfer	No
Succession	No
Trust	No
Opposition	No
Invalidation	No
Cessation	
Revocation	
Issue date of patent right	20000611
Patent Grant date	20140906
Maintainance fee due	20140906
Years of maintenance paid	015

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中華民國專利公報 [19] [12]

[11]公告編號：393856
[44]中華民國 89年 (2000) 06月11日
發明 全 3 頁

[51] Int.Cl 06: H04N11/02

[54]名 稱：影像壓縮方法與裝置

[21]申請案號： 083108362 [22]申請日期： 中華民國 83年 (1994) 09月07日
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[74]代 理 人：

1 2

[57]申請專利範圍：

1.一種影像壓縮方法，其步驟包括：
將一原始影像資料，利用小波轉換分解成為一粗影像與多個差異影像；
將該粗影像加以編碼；
將該多個差異影像分別加以編碼；以及將經過編碼的該粗影像與經過編碼的該多個差異影像中的至少一個差異影像組合起來，形成該原始影像資料經過壓縮的編碼資料。

2.根據申請專利範圍第1項之影像壓縮方法，其中該粗影像的編碼係以DCT／向量量化，以及熵編碼為基礎的編碼器進行編碼。

3.根據申請專利範圍第1項之影像壓縮方法，其中經過編碼的該些多個差異影像的編碼以純量量化，以及熵編碼為基礎的編碼器進行編碼。

4.根據申請專利範圍第1項之影像壓縮方法，其中將經過編碼的該粗影像與經過編碼的該些多個差異影像中的至少一個差異影像個組合起來的步驟係為多工組合的步驟。

5.根據申請專利範圍第1項之影像壓縮方法，其中該原始影像資料係以多層式的影像分解分割成為一粗影像與另外多個差異影像，其中該粗影像與另三個對應的差異影像一起形成整個原始影像資料的第一層分解，而第一層的該粗影像可再分解成第二層的一粗影像與另三個對應的差異影像，第二層的粗影像可再分解，直至達到預定層次的多層分解時為止。

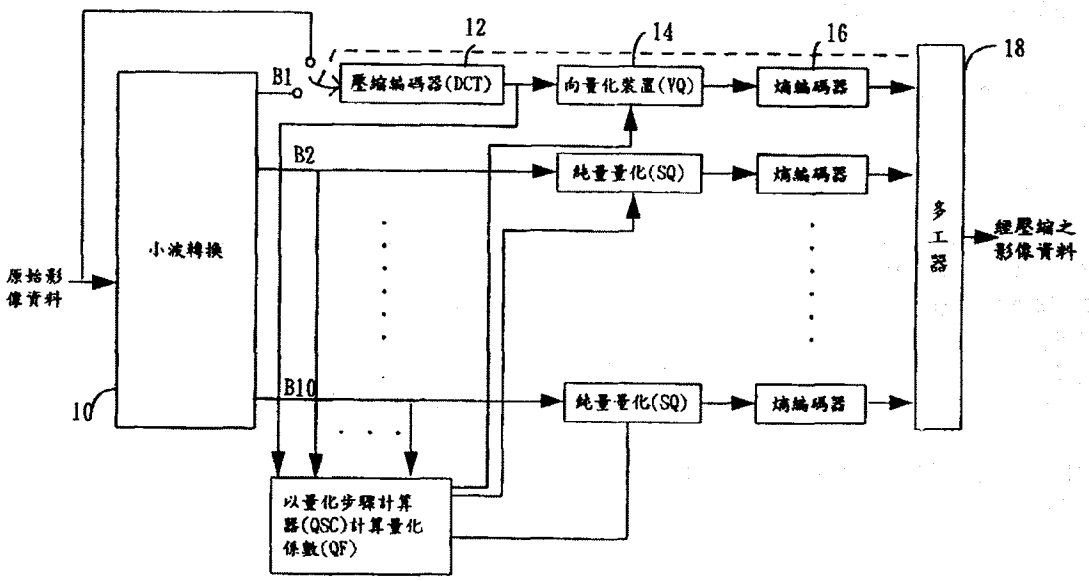
圖式簡單說明：

第一圖為依據本發明之影像壓縮方法一較佳實施例之方法架構方塊示意圖；

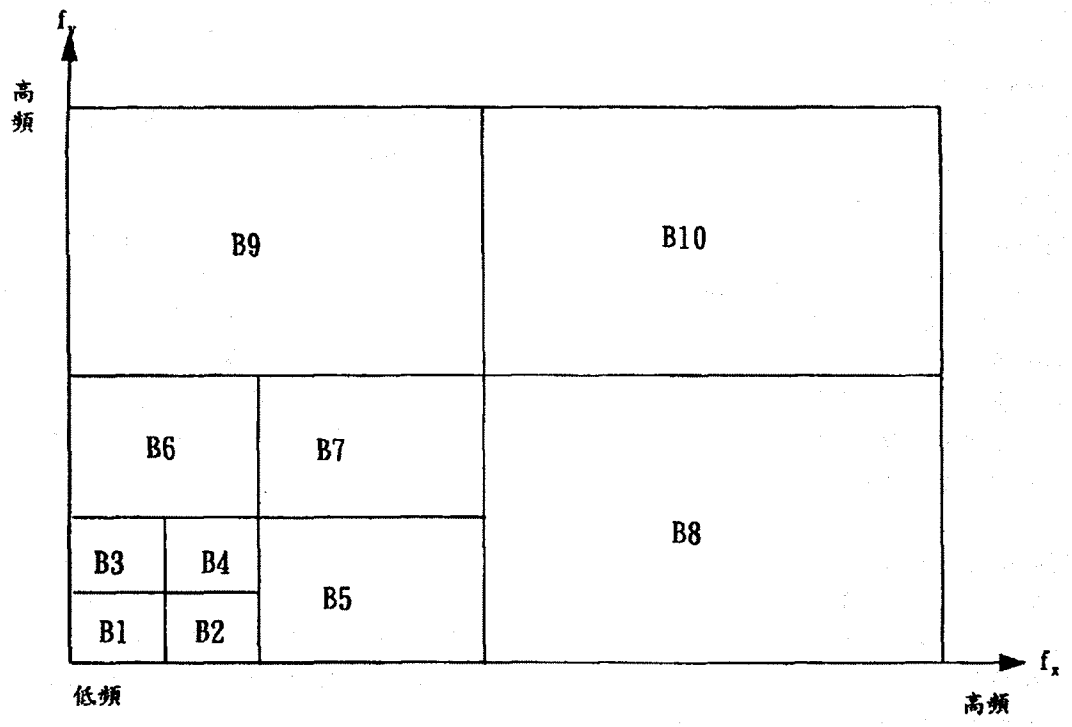
第二圖為本發明影像壓縮方法中三層式多重解析度影像分解之區頻分佈示意圖；與

第三圖為依據本發明之影像小波多重解析度分解示意圖。

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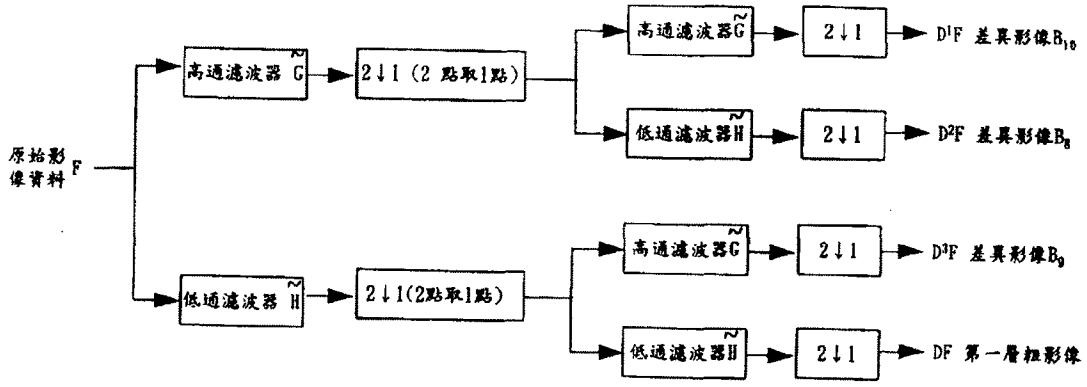


第一圖



第二圖

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第三圖

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公告本

393856

申請日期	83、9、7
案號	83108367
類別	Int.Cl[6] H04N 11/22

（以上各欄由本局填註）

84年11月21日 更正補充

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C4

393856

發明 ~~新型~~ 專利說明書

一、發明新型名稱	中文	影像壓縮方法與裝置
	英文	
二、發明創作人	姓名	莊之純 馬金溝
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三、申請人	姓名（名稱）	財團法人工業技術研究院
	國籍	中華民國
	住、居所（事務所）	新竹縣竹東鎮中興路4段195號
	代表人姓名	孫震

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B5

四、中文發明摘要（發明之名稱：　　）

影像壓縮方法與裝置

本發明係有關於一種靜止影像壓縮之方法，其中經過掃描的一幅高品質影像信號被加以編碼，以產生一個較低品質的粗影像信號，以及一組差異差異影像信號，可以分別讓不同解析度或影像品質的用户加以利用。輸入的影像首先利用小波轉換技術，分解成為一幅粗影像與至少一幅以上之差異影像群。粗影像編碼器使用DCT，向量量化VQ，與熵編碼的組合處理，此壓縮編碼處理亦可用諸如JPEG的編碼架構加以取代。差異影像群編碼器，則使用純量量化SQ，與熵編碼之組合編碼的架構，將差異影像群信號編碼。接著再將經過編碼的粗影像與差異影像群加以多工分配，以便形成壓縮影像。低品質影像服務的用户，可只接收粗影像，而較高品質影像服務的用户，則可接收粗影像與一個以上之差異影像兩者，當此兩組影像信號，被解壓縮後結合在一起時，可以容許將較高品質的影像重建起來。向量量化VQ的量化表(QT)以及純量量化SQ的臨限(T)值皆具適應性，係以原始量化表QT與臨限T數值乘以一個量化係數(QF)而得，此量化係數，是依據其對應影像相對的數值而定。

英文發明摘要（發明之名稱：　　）

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五、發明說明（ 1 ）

本發明係有關於影像之壓縮方法，特定而言，本發明係有關於一種具適應性之靜態影像之壓縮方法，可以高壓縮比進行高品質的影像壓縮儲存與再生處理。

發明之背景

習用技術之中，例如1994年1月4日所頒發的,H. Charavi等人的美國專利第5,276,525號，題為"Two-Dimensional Block Scanning for Subband Image and Video Coding"一案，其中所揭示的影像壓縮方法，強調利用區頻編碼器(subband coder)進行不同頻率頻帶的掃瞄技術，而未強調整體壓縮編碼的架構。該5,276,525號案中的區頻編碼器將所要壓縮的影像分解成為四個不同的的區頻。此外，該5,276,525號案中的編碼器，在其區頻編碼器將差異影像的信號區分割成為不同區塊之後，仍將粗影像的信號保持為其原有的格式。再者，5,276,525號案中，使用PCM量化器來將差異影像的信號加以量化，而未使用純量量化器來進行量化。最後，該5,276,525號案中的編碼器並未具有適應量化步驟能力。

習用技術之中，再加1993年10月12日所頒發的，H. Charavi等人的美國專利第5,253,058號，題為"Efficient Coding Scheme for Multilevel Video Transmission"一案所揭示的影像壓縮方法，利用在目前的視訊框中與在先前一個視訊框之中所取得的像素之間的差異視訊信號來減低計算量，但卻無法以容易的方式來達到一個預定的影像信號壓縮比。此外，該5,253,058號案中，使用較為複

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五、發明說明（ 2）

雜的混合式DCT/PCM編碼器來進行粗影像的編碼，並且也需要以不同的掃描方法來掃描差異影像。

習用技術之中，又如1993年6月1日所頒發的，Sang H. Oh等人的美國專利第5,216,719號，題為'Subband Coding Method and Encoding/Decoding System"一案所揭示的影像壓縮方法，揭示了一種區頻編碼的方法，將影像分解成為正交與對角兩個個方向的部份，而非僅只是正交頻帶方向上的部份而已，並且亦未揭示在區頻編碼之後再利用到的編碼器之架構。

習用技術之中，又如1993年4月13日所頒發的，P. Tourtier的美國專利第5,220,760號，題為"Information Compression Method and Device for Compatible Decoding of a Group of Television Signals with Increasing Resolution"一案，其中所揭示的影像壓縮方法，強調利用區頻編碼的技術應用於不同的用途之上。其方法使用不同的空間尺度，而非利用相同的空間尺度來供包含HDTV以及一般TV的用途利用。此外，該5,220,760號案中所揭示的內容亦不具備適應不同的影像/視訊順序的不同特徵的能力。

因此，本發明之一目的，係在於提供一種影像壓縮方法，可以做為諸如JPEG影像資料壓縮程序的前處理或後處理影像壓縮之用途，以提供更高影像資料壓縮的比例。

本發明之另一目的，係在於提供一種影像壓縮方法，並藉由諸如JPEG的影像壓縮之一般處理程序加以改良，而提供更具效率之高倍率壓縮方法。

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五、發明說明（ 3 ）

本發明之又一目的，係在於提供一種影像壓縮方法，可以處理靜態影像的壓縮，適於在諸如多媒體相關用途之中提供高效率的影像壓縮，以適於影像資料的傳輸與儲存之用途。

附圖之簡要說明

本發明之其他目的與特點，在本說明書中將配合附圖在後面進行詳細說明，其中：

圖1　為依據本發明之影像壓縮方法一較佳實施例之方法架構方塊示意圖；

圖2　為本發明影像壓縮方法中三層式多重解析度影像分解之區頻分佈示意圖；與

圖3　為依據本發明之影像小波多重解析度分解示意圖。

較佳實施例之詳細說明

首先參考圖1，其中顯示依據本發明之影像壓縮方法一較佳實施例之方法架構方塊示意圖。本發明之影像壓縮方法架構係利用小波轉換(wavelet transform)為基礎的一種分枝狀的分解法(hierarchical decomposition scheme)，來將一幅影像分解成為一個粗影像(coarse image)部份，以及數個差異(詳細)影像(difference images)部份。例如三層式之小波轉換，原影像被輸送至小波轉換分解器10，分解成如圖2中所顯示的第三階的一個粗影像B1，以及其餘的九個差異影像B2, B3,.....,B10。

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五、發明說明（4）

圖2中的三層式影像分解是以B1為粗影像，與相當的影像分解部份B2, B3，以及B4一起，形成整個影像第三層的分解。相同的，第二層分解部份，則是第三層影像部份與相當的影像分解部份B5, B6，以及B7形成第二層的分解。第二層分解部份則再與相當的影像分解部份B8, B9，與B10形成整個影像第一層的分解。如同前面所述的，在本發明的此種影像分解架構之中，除了B1被界定是為粗影像之外，其餘的九個分解部份，皆被歸為是屬詳細的差異影像群。利用與此種三層式的小波轉換相似的方式，可進行較為簡化的二層式分解，亦可以進行更多層的，例如四層、五層、甚或更多層的分解，端視需要而定。

小波轉換係利用一對的四次鏡式濾波器(QMF, quadrature mirror filter)$\tilde{G}$與$\tilde{H}$進行的。其中，濾波器$\tilde{G}$為高通濾波器，而$\tilde{H}$則為低通濾波器，$\tilde{G}$與$\tilde{H}$合成起來是一個全通濾波器。圖3之中顯示了依據本發明之影像小波多層解析度分解處理示意圖，其中每一層的多層解析度影像分解，皆係利用小波轉換來進行。每一次皆使用該層分解後之粗影像(CF)，做為下一層級的分解程序的分解程序的輸入影像。經重覆進行三次的小波轉換，便可以完成三層的多重解析度影像分解的動作。

最後一層之粗影像B1，實質上是為原始影像的一個縮小(zoom out)影像，其尺寸在本發明此一實施例之中，係為原始影像的水平與垂直方向尺寸的各八分之一。粗影像之中，包含了整個影像的最低頻率的部份，此部份的頻率，為人類視覺系統中所最敏感的部份。在另一方面，差異影像群，則包含了影像之中的較

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五、發明說明（5）

高頻率的部份，此部份的頻率，是人類視覺系統中較為不靈敏的部份。為了要減低計算的複雜性，以及保持處理程序影像的良好品質，粗影像以及差異影像群，係以不同的方法來進行壓縮，如同圖1中所顯示的情形。

粗影像B1的壓縮編碼器是以DCT 12，向量量化裝置(vector quantizer) VQ 14，以及熵編碼器16為基礎所構成的。DCT區塊的大小尺寸可以為4×4或8×8，依應用的用途而定。不過，對於一個特定的影像而言，此DCT區塊的大小是固定。在由DCT輸出之後，每一個的DCT係數皆是配合一個適應性量化表(AQT, adaptive quantization table)而加以量化的，此即向量量化裝置之操作。習知技藝中之原始量化表(QT, quantization table)的數值是為固定的。而本發明之適應性量化表AQT中的每一個量化數值，則是依據每一個DCT區塊數值，改良其在原始量化表QT中的對應數值，亦即將QT中的每一個量化數值，乘以一個量化調變係數(QF，quantization factor)而獲得的。此量化調變係數是為一個整數，是利用量化步驟計算器(QSC, quantization step calculator)計算而得的。

在說明量化步驟計算器QSC的動作之前，首先應界定粗影像B1的AC能量與DC能量比如下：

$$RB1 = \frac{X^2 DC}{\sigma^2 AC + X^2 AC} \qquad (1)$$

其中RB1為計算QF之參考變數。

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五、發明說明（ 6 ）

σ^2為DCT(Discrete Cosine Transform)區塊之變異數；

X為DCT(Discrete Cosine Transform)區塊之平均值；

AC為DCT區塊之AC能量值；

DC為DCT區塊之DC能量值；

T_i值是做完DCT處理後之影像區塊內之AC數值，經過排序之集合(set)；

T_i^{ℓ}為將彩色影像分解成亮度(luminance)影像與色度(chrominance)影像之亮度影像，經上述壓縮處理時之T_i值；

T_i^{C}為色度(chrominance)影像，經上述壓縮處理時之T_i值。

例如：一個做完2×2 DCT處理之影像區塊值為$\begin{bmatrix} Dc & Ac \\ A & c \; Ac \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

則$X=\frac{1+2+3+4}{4}$

$$\sigma^2=\frac{(1-X)^2+(2-X)^2+(3-X)^2+(4-X)^2}{X^2};$$

$DC = 1^2$；

$AC = 2^2+3^2+4^2$；

$T_i=〔2\ 3\ \ 4〕$；

QT的每一個數值乘以QF即可得到AQT。

令T_i為做完DCT處理之影像區塊AC部份之數值，將這些數值依漸次升高的次序排定，其中i=1,2,.....,n。量化係數QF便可以依據下列方法來取得：

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五、發明說明（7）

1. 令i=1, QF=1；
2. 若$R_{B1}<T_i$即停止；否則即進行至3；
3. 若$i \leq n$，則$i=i+1$；若$T_{i-1}<R_{Bi}<T_i$，則$QF=2^{i-1}$並停止；否則即行4；
4. $QF=2^n$，停止。

熵編碼是連續長度編碼(run-length coding)與霍夫曼編碼(Huffman coding)兩者的組合，可以進一步地將粗影像經過AQT處理的資料加以壓縮。這一部份的編碼，可利用與JPEG編碼之中的完全相同熵編碼部份來進行，或者以更有效的二維連續長度編碼技術來進行。

對於差異影像群(圖1中的B2至B10影像)而言，其純量量化SQ(scalar quantization)可以下列的方法取得：

1. 將小波轉換後之差異影像群之各個像素數值，依漸次升高的次序排定，T_i。
2. 選擇其中之一個數值當臨限值(Threshold)。
3. 差異影像之像素數值若小於臨限值，則將此數值設定為0，否則即將此數值除以臨限值後取整數。

此臨限值可依各個差異影像之特性做調變。例如，在B2差異影像之中，新的臨限值，是將原始臨限值乘以一個量化係數QF而得到的。AC能量與DC能量的比例被界定為：

$$R=\frac{\text{AC能量}}{\text{DC能量}}=\frac{\sigma^2}{X^2} \qquad (2)$$

其中R為經小波轉換後，差異影像之AC與DC能量比。

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五、發明說明（8）

除了利用R取代R_{B1}之外，QF的計算是利用與向量量化表調變係數相似的方法進行的。

1. 令i=1, QF=2；
2. 若$R<T_i^c$即停止；否則即進行至3；
3. 若$i \leq n$，則$i=i+1$；若$T_{i-1}<R<T_i$，則 $QF=2^i$並停止；否則即行4；
4. $QF=2^{n+1}$，停止。

一種可變長度編碼VLC(variable length coding)方法被發展出來以進一步地壓縮純量量化SQ所產生出來的資料。亦即，純量量化SQ的輸出由可變長度編碼VLC程序進一步地加以壓縮。可變長度編碼VLC的設計是依據兩個因素：(1)在純量量化SQ之後會出現一長串的連續0；(2)在T_i^f或T_i^c進行量化之後，會有可以辨別的許多個非零數值出現。資料的掃描是依由左至右，由上而下的方式進行的。就一個可變長度編碼VLC的程序而言，首先是要產生對應於適當的非零串列的資料的一個霍夫曼表1(Huff1)，以及對應於連續度的適當串列的資料的一個霍夫曼表0(Huff0)。令A', r_1與r_0分別表示非零數值，非零數值的連續長度，以及零數值的連續長度，則可變長度編碼VLC便可以依據下列的方式來進行，其亦可使編碼較短：

1. 連續非零數值的對應可變長度為編碼VLC係為

$$1 + \text{Huff1}〔A'〕 + \text{Huff0}〔r_1〕,$$

其中+，1，Huff1〔 〕，與Huff0〔 〕分別代表梯級連結，等於1個第一個位元，霍夫曼表0，以及霍夫曼1；

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五、發明說明（ 9 ）

2.連續零數值的對應可變長編碼VLC係為

$$0 + \text{Huff1}〔q〕 + \text{Huff0}〔r〕,$$

其中的q與r分別為$r_0/256$的商數與餘數。

最後，如圖1中顯示的，多工器18將經過壓縮的資料以一種可適於傳輸與儲存的形式加以重新組合，亦即，可以由多工器18輸出經過壓縮的影像資料。如此一來，需要較低品質影像服務的用户，便可以只接收粗影像，而需要較高品質影像服務的用户，則可以接收到粗影像以及至少一個差異影像，此兩個影像在組合在一起之後，便可以重建高品質的影像信號。

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六、申請專利範圍

1. 一種影像壓縮方法，其步驟包括：

將一原始影像資料，利用小波轉換分解成為一粗影像與多個差異影像；

將該粗影像加以編碼；

將該多個差異影像分別加以編碼；以及

將經過編碼的該粗影像與經過編碼的該多個差異影像中的至少一個差異影像組合起來，形成該原始影像資料經過壓縮的編碼資料。

2. 根據申請專利範圍第1項之影像壓縮方法，其中該粗影像的編碼係以DCT/向量量化，以及熵編碼為基礎的編碼器進行編碼。

3. 根據申請專利範圍第1項之影像壓縮方法，其中經過編碼的該些多個差異影像的編碼以純量量化，以及熵編碼為基礎的編碼器進行編碼。

4. 根據申請專利範圍第1項之影像壓縮方法，其中將經過編碼的該粗影像與經過編碼的該些多個差異影像中的至少一個差異影像個組合起來的步驟係為多工組合的步驟。

5. 根據申請專利範圍第1項之影像壓縮方法，其中該原始影像資料係以多層式的影像分解分割成為一粗影像與另外多個差異影像，其中該粗影像與另三個對應的差異影像一起形成整個原始影像資料的第一層分解，而第一層的該粗影像可再分解成第二層的一粗影像與另三個對應的差異影像，第二層的粗影像可再分解，直至達到預定層次的多層分解時為止。

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A9
B9
C9
D9

圖式

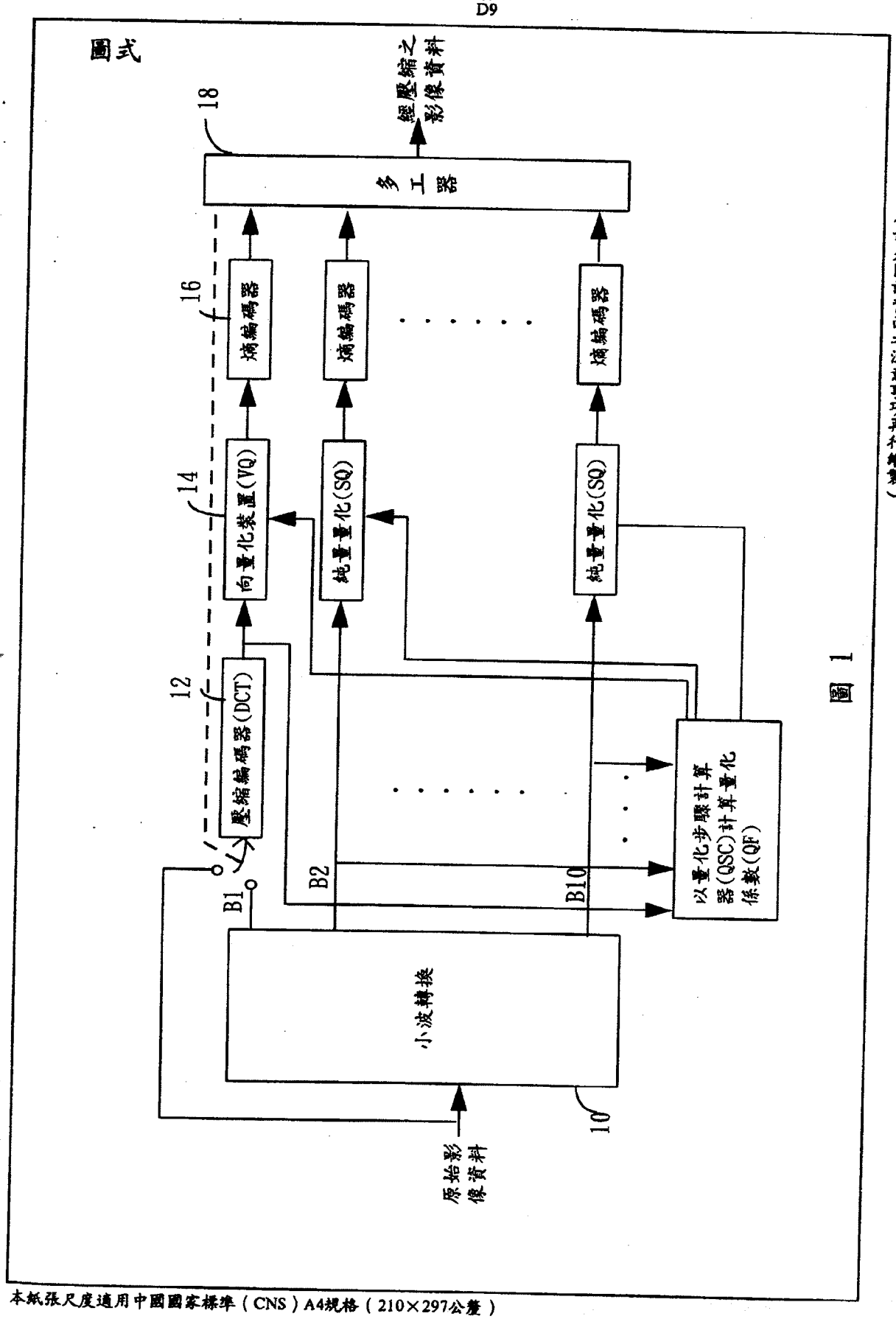


圖 1

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A9
B9
C9
D9

圖式

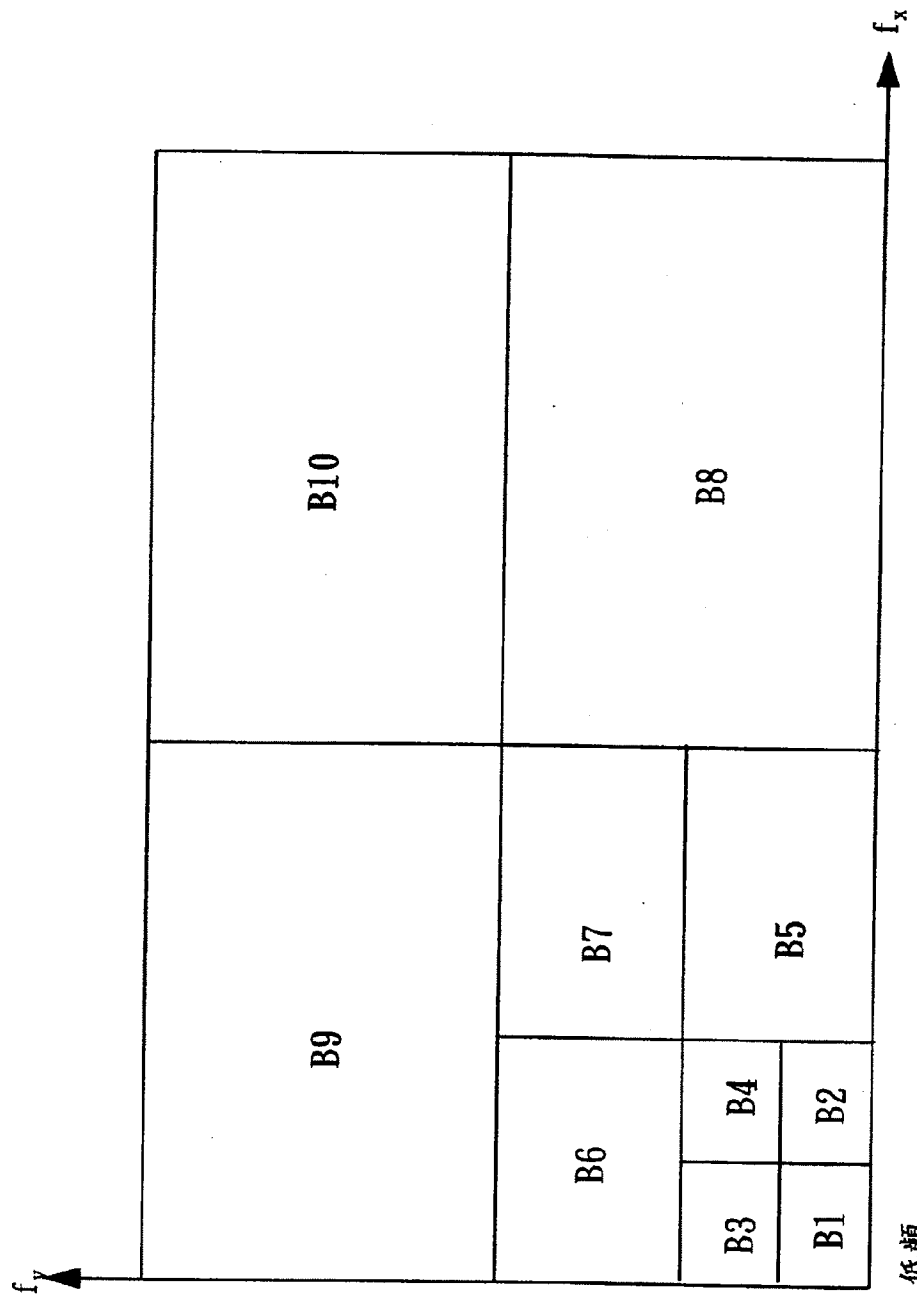


圖 2

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A9
B9
C9
D9

圖式

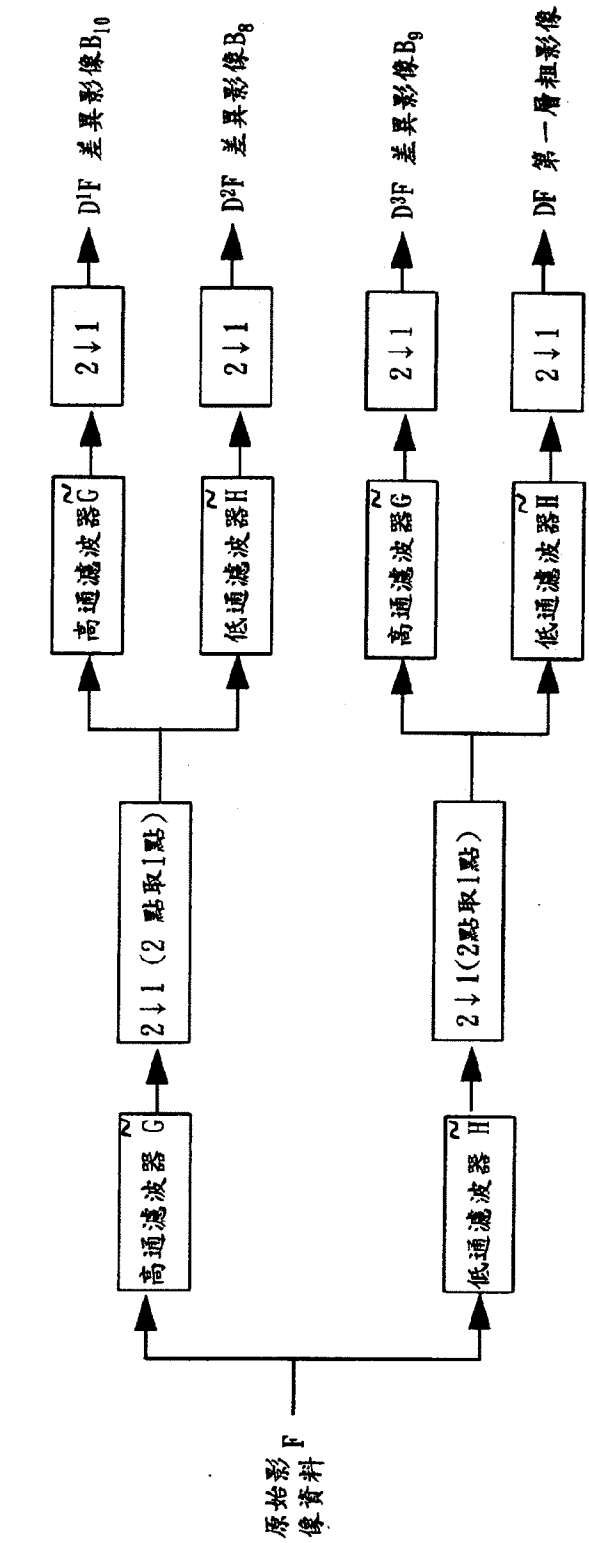


圖 3

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公告本

393856

申請日期	83、9、7
案號	83108367
類別	Int. Cl.[6] H04N 11/22

（以上各欄由本局填註）

86年11月1日 更正補充

A4 C4

393856

發明 ~~新型~~ 專利說明書

一、發明新型名稱	中文	影像壓縮方法與裝置
	英文	
二、發明創作人	姓名	莊之純 馬金溝
	國籍	中華民國 中華民國
	住、居所	新竹縣新豐鄉上坑村坑子口103-32號 新竹縣竹東鎮中興路3段328巷9號
三、申請人	姓名（名稱）	財團法人工業技術研究院
	國籍	中華民國
	住、居所（事務所）	新竹縣竹東鎮中興路4段195號
	代表人姓名	孫震

請委員明示，本案修正後是否變更原實質內容

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將一原始影像資料，利用小波轉換分解成為一粗影像與多個差異影像；

將該粗影像加以編碼；

將該多個差異影像分別加以編碼；以及

將經過編碼的該粗影像與經過編碼的該多個差異影像中的至少一個差異影像組合起來，形成該原始影像資料經過壓縮的編碼資料。

2. 根據申請專利範圍第1項之影像壓縮方法，其中該粗影像的編碼係以DCT/向量量化，以及熵編碼為基礎的編碼器進行編碼。

3. 根據申請專利範圍第1項之影像壓縮方法，其中經過編碼的該些多個差異影像的編碼以純量量化，以及熵編碼為基礎的編碼器進行編碼。

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5. 根據申請專利範圍第1項之影像壓縮方法，其中該原始影像資料係以多層式的影像分解分割成為一粗影像與另外多個差異影像，其中該粗影像與另三個對應的差異影像一起形成整個原始影像資料的第一層分解，而第一層的該粗影像可再分解成第二層的一粗影像與另三個對應的差異影像，第二層的粗影像可再分解，直至達到預定層次的多層分解時為止。

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Electronic Acknowledgement Receipt

EFS ID:	6323210
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	Picture coding method and picture decoding method
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	Kenneth Wayne Fields/sarah pedersen
Filer Authorized By:	Kenneth Wayne Fields
Attorney Docket Number:	2007_1865
Receipt Date:	23-OCT-2009
Filing Date:	26-OCT-2007
Time Stamp:	17:23:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed (SB/08)	AttachZ1_IDS_P03015667.pdf	278453 0e3b9b22a3b9c9c3902b5ed8d45eb0734d37ae6e	no	4

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Warnings:					
Information:					
3	Foreign Reference	ATTACHZBA.PDF	2771172 7f9a021d412654e11cd6298673c3e2edd431d494	no	61
Warnings:					
Information:					
4	Foreign Reference	ATTACHZBB.PDF	1014508 682ee62a45f165526adfe295fb91fb119d90c690	no	25
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2007_1865
Kiyofumi ABE et al.	:	**Confirmation No. 3207**
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel
PICTURE CODING METHOD AND PICTURE DECODING METHOD	:	**Mail Stop: AMENDMENT**

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the provisions of 37 CFR 1.56, 1.97 and 1.98, Applicants request consideration of the references listed on attached Form PTO/SB/08 and any additional information identified below in paragraph 3. A legible copy of each reference listed on the Form PTO/SB/08 is enclosed, except a copy is not provided for:

[X] each U.S. Patent and U.S. Patent application publication;

[] each reference previously cited in prior parent application Serial No._____.

1a. [X] This Information Disclosure Statement is submitted:

within three months of the filing date (or of entry into the National Stage) of the above-entitled application, **or**

before the mailing of a first Office Action on the merits or the mailing of a first Office Action after the filing of an RCE,

and thus no certification and/or fee is required.

The Commissioner is authorized to charge any deficiency or to credit any overpayment associated with this communication to Deposit Account No. 23-0975.

1b. [] This Information Disclosure Statement is submitted

after the events of above paragraph 1a and prior to the mailing date of a final Office Action or a Notice of Allowance or an action which otherwise closes prosecution in the application, and thus:

(1) [] the certification of paragraph 2 below is provided, or

(2) [] the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

1c. [] This Information Disclosure Statement is submitted:

after the mailing date of a final Office Action or Notice of Allowance or action which otherwise closes prosecution in the application, and prior to payment of the issue fee, and thus:

the certification of paragraph 2 below is provided, and

the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

2. It is hereby certified

a. [] that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Statement, or

b. [X] that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the Statement.

3. [] Consideration of the following list of additional information (including any copending or abandoned U.S. application, prior uses and/or sales, etc.) is requested.

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IPR2025-01329

4. For each non-English language reference listed on the attached Form PTO/SB/08, reference is made to:

a. [] a full or partial English language translation submitted herewith,

b. [] a foreign patent office search report (in the English language) submitted herewith,

c. [] the concise explanation contained in the specification of the present application at page ,

d. [] the concise explanation set forth in the attached English language abstract,

e. [] the concise explanation set forth below or on a separate sheet attached to the reference:

5. [X] U.S. Office Actions are enclosed citing the references listed on the attached Form PTO/SB/08.

6. [] Statement Under 37 CFR 1.704(d)

Each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign Patent Office in a counterpart application, and this communication was not received by any individual designated in §1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
By 2009.10.01 13:39:42 -04'00'
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/krg
Washington, D.C. 20005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
October 1, 2009

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Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE LIST OF REFERENCES CITED BY APPLICANT(S) (*Use several sheets if necessary*) Date Submitted to PTO: October 1, 2009	**ATTY DOCKET NO.** 2007_1865	**SERIAL NO.** 11/976,758
	APPLICANT Kiyofumi ABE et al.	
	FILING DATE October 26, 2007	**GROUP** 2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA	6,341,144	1/2002	Haskell et al.			
	AB	6,907,142	6/2005	Kalevo et al.			
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	BA							
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	Office Action issued September 3, 2009 in U.S. Application No. 11/976,552.
	CB	Office Action issued September 9, 2009 in U.S. Application No. 11/976,550.
	CC	
	CD	

EXAMINER	DATE CONSIDERED

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

Electronic Acknowledgement Receipt

EFS ID:	6186053
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	Picture coding method and picture decoding method
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	Kenneth Wayne Fields/sarah pedersen
Filer Authorized By:	Kenneth Wayne Fields
Attorney Docket Number:	2007_1865
Receipt Date:	01-OCT-2009
Filing Date:	26-OCT-2007
Time Stamp:	16:31:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed (SB/08)	AttachZ1_IDS_P03015667.pdf	278427 9eff9bd1dfee9996c8140429e731d51f8b8b6b3a	no	4

Warnings:	
Information:	

Hisense Ex. 1002, p. 342
Hisense v. VideoLabs
IPR2025-01329

This is not an USPTO supplied IDS fillable form

The PDF file has been signed with a digital signature and the legal effect of the document will be based on the contents of the file not the digital signature.

2	NPL Documents	AttachZ2.pdf	271167 63d2fdb548f5bffa7ffebeaf75d1f74e3ca2fdac	no	8
Warnings:					
Information:					
3	NPL Documents	AttachZ3.pdf	275509 0b81b9fe6123d2a3d262f9f4f8a2147cf72b90a7	no	8
Warnings:					
Information:					
		Total Files Size (in bytes):	825103		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2007_1865
Kiyofumi ABE et al.	:	**Confirmation No. 3207**
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel
PICTURE CODING METHOD AND PICTURE DECODING METHOD	:	**Mail Stop: AMENDMENT**

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the provisions of 37 CFR 1.56, 1.97 and 1.98, Applicants request consideration of the reference listed on attached Form PTO/SB/08 and any additional information identified below in paragraph 3. A legible copy of each reference listed on the Form PTO/SB/08 is enclosed, except a copy is not provided for:

[X] each U.S. Patent and U.S. Patent application publication;

[] each reference previously cited in prior parent application Serial No._____.

1a. [X] This Information Disclosure Statement is submitted:

within three months of the filing date (or of entry into the National Stage) of the above-entitled application, **or**

before the mailing of a first Office Action on the merits or the mailing of a first Office Action after the filing of an RCE,

and thus no certification and/or fee is required.

The Commissioner is authorized to charge any deficiency or to credit any overpayment associated with this communication to Deposit Account No. 23-0975.

1b. [] This Information Disclosure Statement is submitted

after the events of above paragraph 1a and prior to the mailing date of a final Office Action or a Notice of Allowance or an action which otherwise closes prosecution in the application, and thus:

(1) [] the certification of paragraph 2 below is provided, or

(2) [] the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

1c. [] This Information Disclosure Statement is submitted:

after the mailing date of a final Office Action or Notice of Allowance or action which otherwise closes prosecution in the application, and prior to payment of the issue fee, and thus:

the certification of paragraph 2 below is provided, and

the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

2. It is hereby certified

a. [X] that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Statement, or

b. [] that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the Statement.

3. [] Consideration of the following list of additional information (including any copending or abandoned U.S. application, prior uses and/or sales, etc.) is requested.

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Hisense v. VideoLabs
IPR2025-01329

4. For each non-English language reference listed on the attached Form PTO/SB/08, reference is made to:

a. [] a full or partial English language translation submitted herewith,

b. [] a foreign patent office search report (in the English language) submitted herewith,

c. [] the concise explanation contained in the specification of the present application at page ,

d. [] the concise explanation set forth in the attached English language abstract,

e. [] the concise explanation set forth below or on a separate sheet attached to the reference:

5. [X] Notice of Allowances for corresponding Taiwanese Application Nos. 95112401 and 95112399 are enclosed citing the information listed on the attached Form PTO/SB/08.

6. [] Statement Under 37 CFR 1.704(d)

Each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign Patent Office in a counterpart application, and this communication was not received by any individual designated in §1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
2009.08.06 14:21:38 -04'00'

By _____
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/krg
Washington, D.C. 2005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
August 6, 2009

Hisense Ex. 1002, p. 346
Hisense v. VideoLabs
IPR2025-01329

Sheet 1 of 1

INFORMATION DISCLOSURE STATEMENT

FORM PTO/SB/08 A&B (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: August 6, 2009

ATTY DOCKET NO.	**SERIAL NO.**
2007_1865	11/976,758
APPLICANT	
Kiyofumi ABE et al.	
FILING DATE	**GROUP**
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA	2002/0037108	3/2002	Matsumoto			
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	BA							
	BB							
	BC							
	BD							
	BE							

OTHER DOCUMENT(S) *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	CA	
	CB	
	CC	
	CD	

EXAMINER	DATE CONSIDERED

**Examiner: initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*

Electronic Acknowledgement Receipt

EFS ID:	5843321
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	Picture coding method and picture decoding method
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	Kenneth Wayne Fields/sarah pedersen
Filer Authorized By:	Kenneth Wayne Fields
Attorney Docket Number:	2007_1865
Receipt Date:	06-AUG-2009
Filing Date:	26-OCT-2007
Time Stamp:	17:03:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed (SB/08)	AttachZ1_P03015667_IDS.pdf	277820 b38110d70a144e973cdd007604321d3f71027612	no	4

Warnings:	
Information:	

Hisense Ex. 1002, p. 348
Hisense v. VideoLabs
IPR2025-01329

This is not an USPTO supplied IDS fillable form

The PDF file has been signed with a digital signature and the legal effect of the document will be based on the contents of the file not the digital signature.

2	NPL Documents	ATTACHZ2.PDF	134434 241a3eefa8ff6af417916d07c9f755bfb28af6f3	no	3
Warnings:					
Information:					
3	NPL Documents	ATTACHZ3.PDF	133077 5c540fc0d4f7cc1287f32b490e009b7bcc5f9897	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	545331		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

MAIL

DEC 02 2008

DIRECTOR'S OFFICE
TECHNOLOGY CENTER 2600

NDQ&M WATCHSTONE LLP
1300 EYE STREET, NW
SUITE 1000 WEST TOWER
WASHINGTON DC 20005

In re Application of
ABE, KIYOFUMI, et al.
Application No. 11/976,758
Filed: October 26, 2007
Attorney Docket No. 2007_1865

DECISION ON REQUEST TO PARTICIPATE IN PATENT PROSECUTION HIGHWAY PROGRAM AND PETITION TO MAKE SPECIAL UNDER 37 CFR 1.102(d)

This is a decision on the request to participate in the Patent Prosecution Highway (PPH) program and the petition under 37 CFR 1.102(d), filed September 29, 2008, to make the above-identified application special.

The request and petition are **GRANTED**.

A grantable request to participate in the PPH program and petition to make special require:

(1) The U.S. application must validly claim priority under 35 U.S.C. 119(a) to one or more applications filed in the JPO;
(2) Applicant must submit a copy of the allowable/patentable claim(s) from the JPO application(s) along with an English translation thereof and a statement that the English translation is accurate;
(3) All the claims in the U.S. application must sufficiently correspond or be amended to sufficiently correspond to the allowable/patentable claim(s) in the JPO application(s);
(4) Examination of the U.S. application has not begun;
(5) Applicant must submit a copy of all the office actions from each of the JPO application(s) containing the allowable/patentable claim(s) along with an English translation thereof and a statement that the English translation is accurate;
(6) Applicant must submit an IDS listing the documents cited by the JPO examiner in the JPO office action along with copies of documents except U.S. patents or U.S. patent application publications; and
(7) The required petition fee under 37 CFR 1.17(h).

The request to participate in the PPH program and petition comply with the above requirements. Accordingly, the above-identified application has been accorded "special" status.

Telephone inquiries concerning this decision should be directed to Kenneth Wieder at 571-272-2986.

All other inquiries concerning the examination or status of the application should be directed to Patent Application Information Retrieval (PAIR) system.

The application is being forwarded to the examiner for action on the merits commensurate with this decision.

Kenneth Wieder
Quality Assurance Specialist
Technology Center 2600
Communications

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	**Confirmation No. 3207**
Kiyofumi ABE et al.	:	Attorney Docket No. 2007_1865
Serial No. 11/976,758	:	Group Art Unit 2624
Filed October 26, 2007	:	Examiner Kanjibhai B. Patel

PICTURE CODING METHOD AND
PICTURE DECODING METHOD

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Prior to initial examination, please amend the above-identified application as follows:

AMENDMENTS TO THE CLAIMS

1-33. **(Canceled)**

34. **(New)** A receiving apparatus which receives multiplexed data which is obtained by multiplexing coded audio data and coded picture data, said receiving apparatus comprising:

a demultiplexing unit configured to separate the multiplexed data into the coded audio data and the coded picture data;

an audio processing unit configured to decode the separated coded audio data; and

a picture decoding unit configured to decode the separated coded picture data,

wherein said picture decoding unit includes a block decoding unit configured to decode coded block data included in the coded picture data, the coded block data being obtained by dividing a picture signal into plural blocks, generating a residual block image from a block image of the respective blocks and a predictive block image obtained by intra-picture prediction or inter-picture prediction, and coding, on a block basis, coefficients obtained by performing orthogonal transformation and quantization on the residual block image,

said block decoding unit includes:

a coefficient number decoding unit configured to decode the coded block data to obtain the number of non-zero coefficients which are coefficients included in a current block to be decoded and having a value other than "0";

a unit configured to obtain coefficients corresponding to a residual block image of the current block by decoding the coded block data;

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a unit configured to obtain the residual block image of the current block by performing inverse quantization and inverse orthogonal transformation on the coefficients corresponding to the residual block image of the current block; and

a reproducing unit configured to reproduce a block image of the current block, from the obtained residual block image and a predictive block image obtained by intra-picture prediction or inter-picture prediction,

said coefficient number decoding unit includes:

a determining unit configured to determine a predictive value for the number of non-zero coefficients included in the current block based on the number of non-zero coefficients included in a decoded block located on a periphery of the current block;

a selecting unit configured to select a variable length code table based on the determined predictive value; and

a variable length decoding unit configured to perform variable length decoding on a coded stream which is generated by coding the number of the non-zero coefficients included in the current block, by using the selected variable length code table.

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REMARKS

Please enter the above amendments prior to consideration of the merits of the present application.

By this amendment, Applicants note that claim 34 has been added such that the claims in the present application sufficiently correspond to the allowed claims in the corresponding JP Application. In this regard, Applicants note that a request for Participation in the Patent Prosecution Highway Program is being submitted concurrently herewith.

If there are any issues that the Examiner feels may best be resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Kiyofumi ABE et al.

/Kenneth W. Fields/
2008.09.29 16:40:31 -04'00'

By: _____
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/krg
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
September 29, 2008

Hisense Ex. 1002, p. 355
Hisense v. VideoLabs
IPR2025-01329

Electronic Patent Application Fee Transmittal

Application Number:	11976758
Filing Date:	26-Oct-2007
Title of Invention:	Picture coding method and picture decoding method
First Named Inventor/Applicant Name:	Kiyofumi Abe
Filer:	Kenneth Wayne Fields/Karen Gass
Attorney Docket Number:	2007_1865

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Petition fee- 37 CFR 1.17(h) (Group III)	1464	1	130	130
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**130**

Electronic Acknowledgement Receipt

EFS ID:	4025207
Application Number:	11976758
International Application Number:	
Confirmation Number:	3207
Title of Invention:	Picture coding method and picture decoding method
First Named Inventor/Applicant Name:	Kiyofumi Abe
Customer Number:	52349
Filer:	Kenneth Wayne Fields/pam veazey
Filer Authorized By:	Kenneth Wayne Fields
Attorney Docket Number:	2007_1865
Receipt Date:	29-SEP-2008
Filing Date:	26-OCT-2007
Time Stamp:	18:38:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$130
RAM confirmation Number	4631
Deposit Account	230975
Authorized User	FIELDS,KENNETH

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition to make special under Patent Prosecution Hwy	ATTACHA_P03015667_MISC.pdf	346609 662dc89b5c85f339c737ef0e1897514aaf463c25	no	6

Warnings:

The PDF file has been signed with a digital signature and the legal effect of the document will be based on the contents of the file not the digital signature.

Information:

2		ATTACHB_P03015667_AMEND-P_REMARK.pdf	169625 63d1d725e5a4b1f36dad4d51656f76411c0a2b78	yes	4

Multipart Description/PDF files in .zip description

Document Description	Start	End
Preliminary Amendment	1	1
Claims	2	3
Applicant Arguments/Remarks Made in an Amendment	4	4

Warnings:

The PDF file has been signed with a digital signature and the legal effect of the document will be based on the contents of the file not the digital signature.

Information:

3	Fee Worksheet (PTO-06)	fee-info.pdf	30014 04a0fb69089a99069d3a8ee69ff1f8b1a00c22fc	no	2

Warnings:

Information:

Total Files Size (in bytes):	546248

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: PPH.PET.652
Document Description: Petition to make special under Patent Pros Hwy

(Substitute) PTO/SB/20JP (01-08)
Approved for use through 12/31/2008. OMB 0651-0058
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REQUEST FOR PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PROGRAM BETWEEN THE JPO AND THE USPTO

Application No.:	11/976,758	First Named Inventor:	Kiyofumi ABE et al.
Filing Date:	October 26, 2007	Attorney Docket No.:	2007_1865
Title of the Invention:	PICTURE CODING METHOD AND PICTURE DECODING METHOD		

THIS REQUEST FOR PARTICIPATION IN THE PPH PROGRAM ALONG WITH THE REQUIRED DOCUMENTS MUST BE SUBMITTED VIA EFS-WEB. INFORMATION REGARDING EFS-WEB IS AVAILABLE AT HTTP://WWW.USPTO.GOV/EBC/EFS_HELP.HTML.

APPLICANT HEREBY REQUESTS PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PROGRAM AND PETITIONS TO MAKE THE ABOVE-IDENTIFIED APPLICATION SPECIAL UNDER THE PPH PROGRAM.

The above-identified application (1) validly claims priority under 35 U.S.C. 119(a) and 37 CFR 1.55 to one or more corresponding JPO application(s) or to a PCT application that does not contain any priority claim, or (2) is a national stage entry of a PCT application that does not contain any priority claim.

The JPO/PCT application number(s) is/are: JPO Application No. 2002-112665 (JPO Application No. 2008-180637 that contains the allowable/patent claims is a divisional application of JPO Application No. 2003-083683, and claims priority to JPO Application No. 2002-112665, which is the priority application claimed in the U.S. application).

The filing date of the JPO/PCT application(s) is/are: April 15, 2002

I. List of Required Documents:

a. **A copy of the latest JPO office actions (other than" Decision to Grant a Patent"*) in the above-identified JPO application(s)**

[] Is attached.

[] Is available via Dossier Access System. Applicant hereby Requests that the USPO obtain these documents via the Dossier Access System.

[X] No Office Action from the JPO application is submitted since the JPO application received a first action allowance.

*It is not necessary to submit a copy of the "Decision to Grant a Patent" and an English translation thereof.

b. **A copy of all claims which were determined to be patentable by the JPO in the above-identified JPO application(s)**

[X] Is attached.

[] Is available via Dossier Access System. Applicant hereby Requests that the USPO obtain these documents via the Dossier Access System.

c. **English translations of the documents in a. and b. above along with a statement that the English translations are accurate are attached (if the documents are not in the English language).**

d. **(1) An information disclosure statement listing the documents cited in the JPO office actions**

[] Is attached.

[] Has already been filed in the above-identified U.S. application on _____

[X] Since there were no Office Actions prior to allowance, there were no references cited in a JPO Office Action

(2) Copies of all documents (except for U.S. patents or U.S. patent application publications)

[] Are attached.

[] Have already been filed in the above-identified U.S. application on _____

This collection of information is required by 35 U.S.C. 119, 37 CFR 1.55, and 37 CFR 1.102(d). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.

(Substitute) PTO/SB/20JP (01-08)
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REQUEST FOR PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PROGRAM BETWEEN THE JPO AND THE USPTO

(continued)

Application No.	11/976,758	First Name Inventor:	Kiyofumi ABE et al.

II. Claims Correspondence Table:

Claims in US Application	Patentable Claims in JPO Application	Explanation regarding the correspondence
34	1	Claim 34 of the U.S. application (see Preliminary Amendment of September 29, 2008) corresponds to claim 1 of the JPO application

III. All the claims in the US application sufficiently correspond to the patentable/allowable claims in the JPO application.

IV. Payment of Fees: The petition fee under 37 CFR 1.17(h) as required by 37 CFR 1.102(d) must be paid via EFS-Web (using credit card, authorization to charge a deposit account, or electronic funds transfer).

The Commissioner is authorized to charge any deficiency or to credit any overpayment associated with this communication to Deposit Account No. 23-0975, with the EXCEPTION of deficiencies in fees for multiple dependent claims in new applications.

Signature /Kenneth W. Fields/ 2008.09.29 16:39:48 -04'00'	Date September 29, 2008
Name (Print/Type) Kenneth W. Fields	52,430 Registration Number

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Hisense v. VideoLabs
IPR2025-01329

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Serial NO.:11/976,758
Filing Date: October 26, 2007
For: PICTURE CODING METHOD AND PICTURE DECODING METHOD

VERIFICATION OF TRANSLATION

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Kazumi KAWATA residing at 5-1, Hotarugaike-nakamachi 4-chome, Toyonaka-shi, Osaka, 560-0033 Japan declares:

(1) that he knows well both the Japanese and English languages;

(2) that he translated the patentable claims from JP2008-180637 from Japanese to English;

(3) that the attached English translation is a true and correct translation of the patentable claims from JP2008-180637 to the best of his knowledge and belief; and

(4) that all statements made of his own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and that such false statements may jeopardize the validity of the application or any patent thereon.

This 5th day of September, 2008

Kawata

Kazumi KAWATA

CLAIMS

1. A receiving apparatus which receives multiplexed data which is obtained by multiplexing coded audio data and coded picture data, said receiving apparatus comprising:

a demultiplexing unit configured to separate the multiplexed data into the coded audio data and the coded picture data;

an audio processing unit configured to decode the separated coded audio data; and

a picture decoding unit configured to decode the separated coded picture data,

wherein said picture decoding unit includes a block decoding unit configured to decode coded block data included in the coded picture data, the coded block data being obtained by dividing a picture signal into plural blocks, generating a residual block image from a block image of the respective blocks and a predictive block image obtained by intra-picture prediction or inter-picture prediction, and coding, on a block basis, coefficients obtained by performing orthogonal transformation and quantization on the residual block image,

said block decoding unit includes:

a coefficient number decoding unit configured to decode the coded block data to obtain the number of non-zero coefficients which are coefficients included in a current block to be decoded and having a value other than "0";

a unit configured to obtain coefficients corresponding to a residual block image of the current block by decoding the coded block data;

a unit configured to obtain the residual block image of the current block by performing inverse quantization and inverse orthogonal transformation on the coefficients corresponding to the residual block image of the current block; and

a reproducing unit configured to reproduce a block image of the current block, from the obtained residual block image and a predictive block image obtained by intra-picture prediction or inter-picture prediction,

said coefficient number decoding unit includes:

a determining unit configured to determine a predictive value for the number of non-zero coefficients included in the current block based on the number of non-zero coefficients included in a decoded block located on a periphery of the current block;

a selecting unit configured to select a variable length code table based on the determined predictive value; and

a variable length decoding unit configured to perform variable length decoding on a coded stream which is generated by coding the number of the non-zero coefficients included in the current block, by using the selected variable length code table.

Allowable claims of the corresponding Japanese patent application No. 2008-180637

【請求項１】

符号化音声データおよび符号化画像データを多重化した多重化データを受信する受信装置であって、

前記受信装置は、

前記多重化データから前記符号化音声データと前記符号化画像データを分離する多重分離部と、

分離された前記符号化音声データを復号化する音声処理部と、

分離された前記符号化画像データを復号化する画像復号化部と、

を有し、

前記画像復号化部は、

画像信号を複数のブロックに分割し、該ブロックのブロック画像と、画面内予測あるいは画面間予測により得られた予測画像とから予測残差画像を生成し、該予測残差画像をブロック毎に直交変換および量子化して得られた係数値を、ブロック毎に符号化して得られたブロック符号化データであって、前記符号化画像データに含まれる前記ブロック符号化データを復号化するブロック復号化手段を備え、

前記ブロック復号化手段は、

前記ブロック符号化データを復号化して、復号化対象ブロックに含まれる係数値が０以外の係数値である非ゼロ係数の個数を得る係数個数復号化手段と、

前記ブロック符号化データを復号化して、前記復号化対象ブロックの係数値を得る手段と、

復号化された前記復号化対象ブロックの係数値に対して逆量子化および逆直交変換を行い、予測残差画像を得る手段と、

前記予測残差画像と、画面内予測あるいは画面間予測により得られた予測画像とから前記復号化対象ブロックのブロック画像を再生する再生手段と、

を有し、

前記係数個数復号化手段は、更に、

前記復号化対象ブロックの周辺に位置する復号化済ブロック中に含まれる非ゼロ係数の個数に基づいて、前記復号化対象ブロック中に含まれる前記非ゼロ係数の個数の予測値を導出する導出手段と、

導出された前記予測値に基づいて、可変長符号テーブルを選択する選択手段と、

選択された前記可変長符号テーブルを用いて、前記復号化対象ブロック中に含まれる前記非ゼロ係数の個数が符号化されている符号列に対して可変長復号化を行う可変長復号化手段と、

を有することを特徴とする受信装置。

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/976,758	10/26/2007	Kiyofumi Abe	2007_1865

CONFIRMATION NO. 3207

52349
WENDEROTH, LIND & PONACK L.L.P.
2033 K. STREET, NW
SUITE 800
WASHINGTON, DC 20006

PUBLICATION NOTICE

OC00000031165642

Date Mailed: 07/24/2008

Title: Picture coding method and picture decoding method

Publication No.US-2008-0175315-A1
Publication Date:07/24/2008

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
11/976,758	10/26/2007	2624	1290	2007_1865	2	1

CONFIRMATION NO. 3207

52349
WENDEROTH, LIND & PONACK L.L.P.
2033 K. STREET, NW
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WASHINGTON, DC 20006

FILING RECEIPT

OC000000029445390

Date Mailed: 04/17/2008

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

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Satoshi Kondo, Yawata-shi, JAPAN;
Makoto Hagai, Moriguchi-shi, JAPAN;

Power of Attorney: The patent practitioners associated with Customer Number 000513

Domestic Priority data as claimed by applicant

This application is a CON of 11/453,078 06/15/2006 PAT 7,308,143
which is a DIV of 10/479,831 12/08/2003 PAT 7,095,896
which is a 371 of PCT/JP03/03794 03/27/2003

Foreign Applications

JAPAN 2002-112665 04/15/2002

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 04/16/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 11/976,758**

Projected Publication Date: 07/24/2008

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Non-Publication Request: No

Early Publication Request: No

Title

Picture coding method and picture decoding method

Preliminary Class

382

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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日 本 国 特 許 庁
JAPAN PATENT OFFICE

別紙添付の書類に記載されている事項は下記の出願書類に記載されている事項と同一であることを証明する。

This is to certify that the annexed is a true copy of the following application as filed with this Office.

出 願 年 月 日
Date of Application: ２００２年 ４月１５日

出 願 番 号
Application Number: 特願２００２－１１２６６５

パリ条約による外国への出願に用いる優先権の主張の基礎となる出願の国コードと出願番号
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is ＪＰ２００２－１１２６６５

出 願 人
Applicant(s): 松下電器産業株式会社

２００８年 ４月１４日

特許庁長官
Commissioner,
Japan Patent Office 肥塚雅博

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【書類名】特許願

【整理番号】2022540142

【あて先】特許庁長官殿

【国際特許分類】

H04N　7/137

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【予納台帳番号】049515

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【提出物件の目録】

【物件名】明細書　1

【物件名】図面　1

【物件名】要約書　1

【プルーフの要否】要

【書類名】　明細書

【発明の名称】　画像の符号化方法および復号化方法

【特許請求の範囲】

【請求項１】　画像を符号化して符号列を生成する画像符号化方法であって、直交変換後の単位ブロック中に含まれる０以外の係数の個数に対して可変長符号化を施す符号化ステップと、可変長符号化施す際に参照するテーブルを切り替えるテーブル切り替えステップとを有し、前記符号化ステップはコードテーブルによって係数個数をコード番号に変換しＶＬＣテーブルによってコード番号を可変長符号に変換する機能を有し、符号化を行う際に前記テーブル切り替えステップによってコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することを特徴とする画像符号化方法。

【請求項２】　画像を符号化して符号列を生成する画像符号化方法であって、直交変換後の単位ブロック中に含まれる０以外の係数の個数に対して可変長符号化を施す符号化ステップと、可変長符号化を施す際に参照するテーブルを切り替えるテーブル切り替えステップと、可変長符号化を施す際に参照するテーブルを符号化済ブロックの係数個数の統計を取ることによって作成するテーブル生成ステップとを有し、前記符号化ステップはコードテーブルによって係数個数をコード番号に変換しＶＬＣテーブルによってコード番号を可変長符号に変換する機能を有し、符号化を行う際に前記テーブル切り替えステップによってＶＬＣテーブルを切り替えて参照し、前記テーブル生成ステップによってコードテーブルを作成して参照することを特徴とする画像符号化方法。

【請求項３】　請求項１記載の画像符号化方法であって、符号化済の周辺ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記符号化ステップは前記予測ステップによって得られた予測値と符号化の対象とするブロック中の係数個数との差分値に対して可変長符号化を施すことを特徴とする画像符号化方法。

【請求項４】　請求項１記載の画像符号化方法であって、符号化済の周辺ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記テーブル切り替えステップは前記予測ステップによって得られた予測値を

用いてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えることを特徴とする画像符号化方法。

【請求項５】　請求項１記載の画像符号化方法であって、前記テーブル切り替えステップは上および左に位置する符号化済のブロック中に含まれる０以外の係数の個数を値に応じてＮ通りに分類したときにできるＮ×Ｎ通りの組み合わせを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とする画像符号化方法。

【請求項６】　請求項１記載の画像符号化方法であって、前記テーブル切り替えステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数を符号化した場合に得られる符号列の長さの和を評価し、それが最も短くなる組み合わせとなるコードテーブルおよびＶＬＣテーブルを選択することを特徴とする画像符号化方法。

【請求項７】　請求項１記載の画像符号化方法であって、前記テーブル切り替えステップは符号化の対象となるブロックが画面内予測符号化を行う場合は画面内予測符号化モードを、画面間予測符号化を行う場合は画面間予測符号化モードを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とする画像符号化方法。

【請求項８】　請求項３または請求項４記載の画像符号化方法であって、前記予測ステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかを用いて予測値を算出することを特徴とする画像符号化方法。

【請求項９】　請求項３または請求項４記載の画像符号化方法であって、前記予測ステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかをシーケンスまたはピクチャまたはスライスごとに最適なものを選択することによって予測値を算出することを特徴し、選択された予測値算出方法を符号列中に記述することを特徴とする画像符号化方法。

【請求項１０】　請求項３または請求項４記載の画像符号化方法であって、前記予測ステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数の平

均値または最大値または最小値または中央値のいずれかを、符号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値の値に応じて選択することによって予測値を算出することを特徴とする画像符号化方法。

【請求項１１】　符号化された画像を復号化する画像復号化方法であって、直交変換後の単位ブロック中に含まれる０以外の係数の個数が可変長符号化によって符号化された符号列に対し可変長復号化を施す復号化ステップと、可変長復号化を施す際に参照するテーブルを切り替えるテーブル切り替えステップとを有し、前記復号化ステップはＶＬＣテーブルによって可変長符号をコード番号に変換しコードテーブルによってコード番号を係数個数に変換する機能を有し、復号化を行う際に前記テーブル切り替えステップによってコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することを特徴とする画像復号化方法。

【請求項１２】　符号化された画像を復号化する画像復号化方法であって、直交変換後の単位ブロック中に含まれる０以外の係数の個数が可変長符号化によって符号化された符号列に対し可変長復号化を施す復号化ステップと、可変長復号化を施す際に参照するテーブルを切り替えるテーブル切り替えステップと、可変長復号化を施す際に参照するテーブルを復号化済ブロックの係数個数の統計を取ることによって適応的に作成するテーブル生成ステップとを有し、前記復号化ステップはＶＬＣテーブルによって可変長符号をコード番号に変換しコードテーブルによってコード番号を係数個数に変換する機能を有し、復号化を行う際に前記テーブル切り替えステップによってＶＬＣテーブルを切り替えて参照し、前記テーブル生成ステップによってコードテーブルを作成して参照することを特徴とする画像復号化方法。

【請求項１３】　請求項１１記載の画像復号化方法であって、復号化済の周辺ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記復号化ステップは前記予測ステップによって得られた予測値と入力された符号列を復号化したときに得られる値との和をとることにより復号化を行うことを特徴とする画像復号化方法。

【請求項１４】　請求項１１記載の画像復号化方法であって、復号化済の周辺

ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記テーブル切り替えステップは前記予測ステップによって得られた予測値を用いてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えることを特徴とする画像復号化方法。

【請求項１５】　請求項１１記載の画像復号化方法であって、前記テーブル切り替えステップは上および左に位置する復号化済のブロック中に含まれる０以外の係数の個数を値に応じてＮ通りに分類したときにできるＮ×Ｎ通りの組み合わせを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とする画像復号化方法。

【請求項１６】　請求項１１記載の画像復号化方法であって、前記テーブル切り替えステップは復号化済の周辺ブロック中に含まれる０以外の係数の個数を符号化した場合に得られる符号列の長さの和を評価し、それが最も短くなる組み合わせとなるコードテーブルおよびＶＬＣテーブルを選択することを特徴とする画像復号化方法。

【請求項１７】　請求項１１記載の画像復号化方法であって、前記テーブル切り替えステップは復号化の対象となるブロックが画面内予測復号化を行う場合は画面内予測符号化モードを、画面間予測復号化を行う場合は画面間予測符号化モードを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とする画像復号化方法。

【請求項１８】　請求項１３または請求項１４記載の画像復号化方法であって、前記予測ステップは復号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかを用いて予測値を算出することを特徴とする画像復号化方法。

【請求項１９】　請求項１３または請求項１４記載の画像復号化方法であって、前記予測ステップは予測値の算出方法として周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれを使用しているかが記述された符号列を解釈することによりそれを用いて復号化することを特徴とする画像復号化方法。

【請求項２０】　請求項１３または請求項１４記載の画像復号化方法であって

、前記予測ステップは復号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかを、復号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値の値に応じて選択することによって予測値を算出することを特徴とする画像復号化方法。

【請求項２１】　コンピュータにより、請求項１から請求項２０のいずれか１項に記載された画像の符号化および復号化の処理を行うためのプログラムを格納したデータ記憶媒体であって、上記プログラムはコンピュータに請求項１から請求項２０のいずれか１項に記載された動画像の符号化および復号化の処理を行わせるものであることを特徴とするデータ記憶媒体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】

本発明は、画像をディジタル符号化して伝送または蓄積するための符号化方法および復号化方法に関するものである。

【０００２】

【従来の技術】

一般に動画像の符号化では、画面をある一定サイズのブロックに分割し、そのブロックごとに画面内予測および画面間予測を行う。その結果得られた予測残差信号に対して、分割の最小単位のブロック（例えば４×４画素）ごとに離散コサイン変換（ＤＣＴ）を適用し、その結果得られたＤＣＴ係数をラン・レングス符号化に基づいた可変長符号化方式によって符号化を行う。

【０００３】

現在標準化中の動画像符号化方法であるＨ．２６Ｌでは、ＤＣＴ係数を可変長符号化する際に選択することのできるコードテーブルおよびＶＬＣテーブルを複数用意し、対象のブロック中に含まれる係数の個数によってそれらのテーブルを切り替えて参照するという符号化方法および復号化方法が提案されている。

【０００４】

【発明が解決しようとする課題】

上記のような符号化および復号化は、ＤＣＴ係数のデータに加えブロック中の

係数の個数のデータも符号列中に記述することによりより効率良く可変長符号化を行うことが可能となる。しかし従来方法では、係数の個数の符号化の方法として４つのＶＬＣテーブルを用意しその中から最適なものをピクチャごとに選択して符号化を行うという方法が用いられていたため、係数の個数がピクチャの位置によって大きく異なるような画像に対しては符号化効率が悪くなるという欠点があった。

【０００５】

本発明は上記の問題点を解決するものであり、ブロック中に含まれる０以外の係数の個数を、対象画像の性質によらず常に高い効率で符号化を行うことを可能とする動画像の符号化方法および復号化方法を提案することを目的とする。

【０００６】

【課題を解決するための手段】

上記課題を解決するために、本発明の画像の符号化方法および復号化方法は、ブロック中に含まれる０以外の係数の個数を符号化するために、その周辺に位置するブロックの係数の個数に基づいて、最適なコードテーブルまたはＶＬＣテーブルまたはその両者を選択し符号化および復号化を行うことを特徴とする。

【０００７】

【発明の実施の形態】

以下、本発明の実施の形態について、図面および数式等を用いて説明する。

（実施の形態１）

本発明の実施の形態１を図１に示した動画像符号化方法のブロック図を用いて説明する。

符号化対象となる動画像は時間順にピクチャ単位でフレームメモリ１０１に入力されここで符号化が行われる順に並び替えられる。各々のピクチャはマクロブロックと呼ばれる例えば水平１６×垂直１６画素のブロックに分割されブロック単位でこれ以降の処理が行われる。

【０００８】

対象とするマクロブロックを画面間予測によって符号化する場合は、まずフレームメモリ１０１から読み出されたマクロブロックを画面間予測器１０７へ入力

する。ここではフレームメモリ１０６に蓄積されている符号化済みのピクチャの復号化画像を参照ピクチャとして用いて、マクロブロックをさらに分割したブロックごとに動きベクトル検出を行う。得られた動きベクトルによって作成された参照画像が差分演算器１１６に入力され、対象のマクロブロックとの差分をとることにより予測残差画像が生成される。

【０００９】

一方、対象とするマクロブロックを画面内予測によって符号化する場合は、まずフレームメモリ１０１から読み出されたマクロブロックを画面内予測器１０８へ入力する。ここでは周辺のブロックの情報を用いて画面内予測がなされ、予測残差画像が生成される。

【００１０】

予測残差画像は単位ブロック（例えば水平４×垂直４画素）ごとに直交変換器１０２および量子化器１０３によって可変長符号化の対象となるＤＣＴ係数に変換される。

【００１１】

係数個数検出器１０９では単位ブロックごとに０以外の値を持つＤＣＴ係数の個数が検出される。ここで検出された係数の個数は係数個数記憶器１１０に保存され、係数個数符号化器１１１では既に符号化されたブロックの係数の個数を係数個数記憶器１１０から読み込むことによりその値を参照して係数の個数の符号化が行われる。また、係数値符号化器１１２では係数個数検出器１０９によって検出された係数の個数を用いてＤＣＴ係数の値そのものの符号化が行われる。最後に符号列生成器１１３において、符号化された係数の個数およびＤＣＴ係数の値を、動きベクトル等のその他の情報とともに符号列へ追加することにより最終的な符号列が生成される。

【００１２】

以上符号化の流れの概要を示したが、係数個数符号化器１１１によってなされる係数の個数の可変長符号化処理について、図２から図６および表１から表７を用いてその詳細を説明する。

【００１３】

図２（ａ）は係数個数符号化器１１１の内部構成を詳しく示したものである。

まず、図１の係数個数記憶器１１０から周辺に位置する符号化済ブロックの係数の個数が入力され、これらの値を基に予測値算出器２０１において平均値または最大値または最小値または中央値のいずれかを予測値として算出する。

【００１４】

図５（ａ）は現在符号化の対象としているブロックと参照する符号化済みのブロックとの位置関係を示したものである。ここでは符号化の対象としているブロックＸに対し、ＢおよびＣおよびＤの位置関係にある３つのブロックを参照ブロックとしている。このときＢおよびＣおよびＤの位置関係にある３つのブロックの中で、符号化されていないもしくはピクチャの外部に位置するブロックが発生した場合は、表１のように参照ブロックの変更がなされる。

【表１】

B	C	D	参照ブロック
○	○	○	B，C，D
○	×	○	A，B，D
×	×	○	D
○	○	×	B，C
×	×	×	なし

【００１５】

表１における○は符号化済ブロック、×は符号化が行われていないもしくはピクチャの外部に位置するブロックを意味している。例えばＣのみが符号化されていない場合はＡ、Ｂ、Ｄを参照することを示している。なお、表１の○×および参照ブロックの項目はこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。

【００１６】

コードテーブル選択器２０３では、予測値算出器２０１によって算出された予測値に応じて、コードテーブル記憶器２０２が持つ複数のコードテーブルの中か

ら実際に使用するテーブルを選択する。

【００１７】

表２はコードテーブル記憶器２０２によって予め用意されている係数の個数とコード番号とを対応付けるコードテーブルの例である。

【表２】

係数個数値	コード テーブル１	コード テーブル２	コード テーブル３	コード テーブル４
0	0	4	8	8
1	1	2	7	7
2	2	0	5	6
3	3	1	4	5
4	4	3	2	4
5	5	5	0	3
6	6	6	1	2
7	7	7	3	1
8	8	8	6	0

【００１８】

この例によると、コードテーブル１は係数個数値に等しいコード番号を割り振り、コードテーブル２は係数個数値の２が中心となるようにコード番号を割り振っている。なお、ここでは４種類のコードテーブルを用意しているが、テーブルの種類の数およびテーブルの値はこれ以外のものを使用した場合も同様に扱うことができる。また、表３は予測値に基づいたコードテーブルの選択基準を示したものである。

【００１９】

【表３】

予測値	参照テーブル
０～２	コードテーブル１
３～５	コードテーブル２
６～８	コードテーブル３
９～１６	コードテーブル４

【００２０】

この例によると、予測値算出器２０１によって算出された予測値が２以下の場合はコードテーブル１を参照し、３以上５以下の場合はコードテーブル２を参照している。なお、表３における予測値の割り振り方または参照テーブルの項目はこれ以外のものを使用した場合も同様に扱うことができる。

【００２１】

ＶＬＣテーブル選択器２０４では、予測値算出器２０１によって算出された予測値に応じて、ＶＬＣテーブル記憶器２０５が持つ複数のＶＬＣテーブルの中から実際に使用するテーブルを選択する。

【００２２】

表４はＶＬＣテーブル記憶器２０５によって予め用意されているコード番号と可変長符号とを対応付けるＶＬＣテーブルの例である。

【表４】

係数 個数値	ＶＬＣ テーブル１	ＶＬＣ テーブル２	ＶＬＣ テーブル３	ＶＬＣ テーブル４
０	１	１	１０	１００
１	０１	０１０	１１	１０１
２	００１	０１１	０１００	１１０
３	０００１	００１００	０１０１	１１１
４	００００１	００１０１	０１１０	０１０００
５	０００００１	００１１０	０１１１	０１００１
６	００００００１	００１１１	００１０００	０１０１０
７	０００００００１	０００１０００	００１００１	０１０１１
８	０００００００００１	０００１００１	００１００１	０１１００

【００２３】

この例によると、ＶＬＣテーブル１はＶＬＣテーブル４と比較するとコード番号の大きい領域ではビット量が多くなる傾向にあるが、コード番号の小さい領域ではビット量が少なくなるように設計されている。コード番号の出現確率が値の小さい領域に集中している場合はＶＬＣテーブル１の方が、値の大きい領域にまで分散している場合はＶＬＣテーブル４の方が、効率よく可変長符号化を行うことが可能であることを示している。なお、ここでは４種類のＶＬＣテーブルを用意しているが、テーブルの種類の数およびテーブルの値はこれ以外のものを使用した場合も同様に扱うことができる。また、表５は予測値に基づいたＶＬＣテーブルの選択基準を示したものである。

【００２４】

【表５】

予測値	参照テーブル
０～１	ＶＬＣテーブル１
２～３	ＶＬＣテーブル２
４～６	ＶＬＣテーブル３
７～１６	ＶＬＣテーブル４

【００２５】

この例によると、予測値算出器２０１によって算出された予測値が１以下の場合はＶＬＣテーブル１を参照し、２以上３以下の場合はＶＬＣテーブル２を参照している。なお、表５における予測値の割り振り方または参照テーブルの項目はこれ以外のものを使用した場合も同様に扱うことができる。

【００２６】

係数個数符号化器２０６では上記の処理によって選択されたコードテーブルおよびＶＬＣテーブルを参照して、入力された符号化対象ブロックの係数の個数の可変長符号化を行う。まずコードテーブルを用いて係数の個数をコード番号に変換し、つぎにＶＬＣテーブルを用いてコード番号に対応する可変長符号に変換する。図６は予測値算出器２０１によって算出された予測値が６で符号化対象ブロックの係数の個数が４であった場合の符号化の例である。予測値が６であることから、コードテーブル選択器２０３においてコードテーブル３が選択され、またＶＬＣテーブル選択器２０４においてＶＬＣテーブル３が選択される。入力された係数個数４はコードテーブル３によりコード番号２に変換され、さらにＶＬＣテーブル３により最終的な符号列０１００が生成される。

【００２７】

以上のように上記実施の形態では、符号化済の周辺ブロックの係数の個数から予測値を算出し、その予測値に応じてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することにより、係数の出現頻度が一様でないピクチャに対しても効率よく係数の個数の符号化を行うことを

可能とする符号化方法を示した。

【００２８】

なお、予測値算出器２０１において参照するブロックとして、図５（ａ）のような３つの周辺ブロックの替わりに図５（ｂ）のように符号化対象のブロックＸに対してＢおよびＤの位置関係にある２つのブロックのみを用いることも可能である。このときＢおよびＤの位置関係にある２つのブロックの中で、符号化されていないもしくはピクチャの外部に位置するブロックが発生した場合は、表６のように参照ブロックの変更がなされる。

【表６】

B	D	参照ブロック
○	○	B，D
×	○	D
○	×	B
×	×	なし

【００２９】

なお、表６の○×および参照ブロックの項目はこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。

【００３０】

なお、予測値算出器２０１において予測値を算出する方法として平均値または最大値または最小値または中央値のいずれかに固定するのではなく、その中から最適なものをシーケンスまたはＧＯＰまたはピクチャまたはスライスごとに選択することも可能である。そのとき選択された算出方法を識別するための符号は符号列のシーケンスまたはＧＯＰまたはピクチャまたはスライスのヘッダ領域に追加される。

【００３１】

なお、予測値算出器２０１において予測値を算出する方法として平均値または

最大値または最小値または中央値のいずれかを符号化済の参照ブロックの係数の個数の平均値によって選択することも可能である。表７はその選択基準を示したものである。

【表７】

平均値	予測値算出方法
０～４	最小値
５～８	平均値
９～１６	最大値

【００３２】

この例によると平均値が４以下であれば複数の参照ブロックの係数個数の中の最小値を予測値とし、平均値が５以上８以下であれば平均値を予測値としている。量子化ステップが小さい場合および動きの複雑なブロックでは係数の個数の大きいものが出現する確率が高くなるため最大値を選択するこにより、逆に量子化ステップが大きい場合および動きの単純なブロックでは係数の個数の小さいものが出現する確率が高くなるため最小値を選択するこにより符号化効率向上の効果が期待できる。なお、表７における平均値の割り振り方または予測値算出方法の項目はこれ以外のものを使用した場合も同様に扱うことができる。

【００３３】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化を行っているが、図２（ｂ）のように予測値算出器２０１による予測値と入力された係数の個数の値との差分値を差分演算器２０７によって算出し、得られた値に対して上記実施の形態と同様の処理によって可変長符号化を行うことも可能である。これにより、輝度および色差の変化が画面全体に渡って単調である場合、周辺ブロック間での係数個数の変化が小さくなるような画像に対して符号化効率向上の効果が期待できる。

【００３４】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルの両者を周辺

ブロックの係数の個数によって切り替えて可変長符号化を行っているが、それらのどちらか一方を切り替えずに固定して使用することも可能である。その場合はテーブル選択器を用いる替わりにある１種類のコードテーブルもしくはＶＬＣテーブルを持った記憶器のみを用いることにより実現可能である。これを適用すると、符号化効率の効果は多少減少するが、テーブル切り替えのための処理量を減らすことが可能となる。それらを組み合わせた構成の例を図３に示す。図３（ａ）はコードテーブルのみを固定して係数個数の可変長符号化を行うための構成である。また、図３（ｂ）はＶＬＣテーブルのみを固定して係数個数の可変長符号化を行うための構成である。なお、係数の個数の値の替わりに予測値との差分値を用いて可変長符号化を行う場合に対しても同様に扱うことが可能である。図４はその例としてコードテーブルおよびＶＬＣテーブルの両者を固定して予測値と係数の個数との差分値に対して可変長符号化を行った場合の構成を示したものである。

【００３５】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化を行う場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化を適用する場合でも同様に扱うことが可能である。

【００３６】

（実施の形態２）

図１に基づいた符号化処理の概要は実施の形態１と全く同等である。ここでは図１の中の係数個数符号化器１１１において実施の形態２でなされる係数の個数の可変長符号化処理について、図７から図８を用いてその詳細を説明する。

【００３７】

図７（ａ）は係数個数符号化器１１１の内部構成を詳しく示したものである。

コードテーブル生成器７０１には、図１の係数個数記憶器１１０から符号化済ブロックの係数の個数が入力され、係数の個数の値ごとにそれと等しい係数の個数を持つ符号化済ブロックが幾つあるかをカウントし、その統計量に基づいて発生頻度が最も高かった係数個数から順にコード番号を割り当てコードテーブルを作成する。図８（ａ）は統計の対象とする符号化済ブロックの位置を表すもので

ある。Ｐ１およびＰ３およびＰ４は画面間予測符号化を行うピクチャであり、Ｉ２は画面内予測符号化を行うピクチャである。現在符号化の対象としているブロックがＰ３に属しているとすると、同じ方式によって符号化された直前のピクチャであるＰ１の全てのブロックが統計の対象となる。なお、図８（ｂ）のように現在符号化の対象となっているピクチャ内にある符号化済ブロックも含めた１ピクチャ分のブロックを統計の対象とする場合も同様に扱うことが可能である。また統計の対象とすることのできる１ピクチャ分の符号化済ブロックが存在しない場合は、初期状態のコードテーブルとして０からの昇順で与えられるテーブルを使用する。なお、ここでは１ピクチャ分のブロックを統計対象としているが、母数としてそれ以外のブロックの個数を用いた場合も同様に扱うことが可能である。

【００３８】

一方、予測値算出器２０１では、周辺に位置する符号化済ブロックの係数の個数が入力され、これらの値を基に実施の形態１と同様に平均値または最大値または最小値または中央値のいずれかを予測値として算出する。このとき参照する符号化済ブロックは実施の形態１と同様に図５（ａ）に示された符号化対象のブロックＸに対してＢおよびＣおよびＤの位置関係にある３つのブロックを用いて表１に従って決定される。なお、表１における○×および参照ブロックの項目はこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。

【００３９】

予測値算出器２０１によって設定された予測値はＶＬＣテーブル選択器２０４においてのみ反映される。ここでは実施の形態１と同様に表４に示されたような予め用意された複数のＶＬＣテーブルの中から表５に従って係数の個数の符号化に使用するＶＬＣテーブルを決定する。

【００４０】

係数個数符号化器２０６では、コードテーブル生成器７０１によって生成されたコードテーブルおよびＶＬＣテーブル選択器２０４によって選択されたＶＬＣテーブルを参照して、実施の形態１と同様に入力された符号化対象ブロックの係

数の個数の可変長符号化を行う。

【００４１】

以上のように上記実施の形態では、符号化済ブロックの係数の個数の統計を取ることによりコードテーブルを作成し、さらに符号化済ブロックの係数の個数から算出された予測値に応じてＶＬＣテーブルを決定し、その両者を参照することにより係数の出現頻度が一様でないピクチャに対しても効率よく係数の個数の符号化を行うことを可能とする符号化方法を示した。

【００４２】

なお、実施の形態１と同様に予測値算出器２０１において参照する符号化済ブロックは、図５（ａ）のような３つの周辺ブロックの替わりに図５（ｂ）のように符号化対象のブロックＸに対してＢおよびＤの位置関係にある２つのブロックのみを用いて表６に従って決定することも可能である。なお、表６における○×および参照ブロックの項目はこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。

【００４３】

なお、実施の形態１と同様に予測値算出器２０１において予測値を算出する方法として平均値または最大値または最小値または中央値のいずれかに固定するのではなく、その中から最適なものをシーケンスまたはＧＯＰまたはピクチャまたはスライスごとに選択することも可能である。そのとき選択された算出方法を識別するための符号は符号列のシーケンスまたはＧＯＰまたはピクチャまたはスライスのヘッダ領域に追加される。

【００４４】

なお、実施の形態１と同様に予測値算出器２０１において予測値を算出する方法として平均値または最大値または最小値または中央値のいずれかを符号化済の参照ブロックの係数の個数の平均値によって選択することも可能である。表７はその選択基準を示したものであるが、ここでの平均値の割り振り方または予測値算出方法の項目はこれ以外のものを使用した場合も同様に扱うことができる。

【００４５】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化を行っているが、実施の形態１と同様に図７（ｂ）のように予測値算出器２０１による予測値と入力された係数の個数の値との差分値を差分演算器２０７によって算出し、得られた値に対して上記実施の形態と同様の処理によって可変長符号化を行うことも可能である。

【００４６】

なお、上記実施の形態ではＶＬＣテーブルを周辺ブロックの係数の個数によって切り替えて可変長符号化を行っているが、実施の形態１と同様にＶＬＣテーブルを切り替えずに固定して使用することも可能である。その場合はＶＬＣテーブル選択器を用いる替わりにある１種類のＶＬＣテーブルを持ったＶＬＣテーブル記憶器のみを用いることにより実現可能である。

【００４７】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化を行う場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化を適用する場合でも同様に扱うことが可能である。

【００４８】

（実施の形態３）

図１に基づいた符号化処理の概要は実施の形態１と全く同等である。ここでは図１の中の係数個数符号化器１１１において実施の形態３でなされる係数の個数の可変長符号化処理について、図９および表８から表９を用いてその詳細を説明する。

【００４９】

図９（ａ）は係数個数符号化器１１１の内部構成を詳しく示したものである。

実施の形態１とは異なり予測値算出器を使用することなく直接符号化済ブロックの係数の個数を使用することによって実際に使用するテーブルを選択する。このとき参照する符号化済ブロックは図５（ｂ）にあるように符号化対象のブロックＸに対しＢ（上）およびＤ（左）の位置関係にある２つのみを用いる。ただし、上および左に位置するブロックが符号化されていないもしくはピクチャの外部であった場合は係数の個数として０もしくはその他の任意の値を代用する。

【００５０】

表８はコードテーブル選択器９０１におけるコードテーブルの選択方法を示したものである。

【表８】

		係数個数（上）	
		０～５	６～１６
係数個数（左）	０～５	コードテーブル１	コードテーブル２
	６～１６	コードテーブル３	コードテーブル４

【００５１】

上および左に位置するブロックの係数の個数それぞれを値に応じて２つのグループに分類し、それらによって形成される４つの組み合わせによってテーブルが選択される。例えば左ブロックの係数の個数が３かつ上ブロックの係数の個数が８であった場合はコードテーブル２が選択されることになる。なお、表８における上および左ブロックの係数の個数を分類する方法およびコードテーブルの割り当て方についてはこれ以外のものを使用した場合も同様に扱うことができる。また、ＶＬＣテーブル選択器９０２では上記手続きと同様にして表９を用いて実際に参照するＶＬＣテーブルを選択する。

【表９】

		係数個数（上）	
		０～５	６～１６
係数個数（左）	０～５	ＶＬＣテーブル１	ＶＬＣテーブル２
	６～１６	ＶＬＣテーブル３	ＶＬＣテーブル４

【００５２】

係数個数符号化器２０６では、コードテーブル選択器９０１によって選択されたコードテーブルおよびＶＬＣテーブル選択器９０２によって選択されたＶＬＣテーブルを参照して、実施の形態１と同様に入力された符号化対象ブロックの係数の個数の可変長符号化を行う。

【００５３】

以上のように上記実施の形態では、上および左に位置する符号化済ブロックの係数の個数を値に応じてＮ個のグループに分類し、そのときに形成されるＮ×Ｎ通りの組み合わせに応じてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することにより、係数の出現頻度が一様でないピクチャに対しても効率よく係数の個数の符号化を行うことを可能とする符号化方法を示した。

【００５４】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化を行っているが、実施の形態１と同様に図９（ｂ）のように予測値算出器２０１による予測値と入力された係数の個数の値との差分値を差分演算器２０７によって算出し、得られた値に対して上記実施の形態と同様の処理によって可変長符号化を行うことも可能である。

【００５５】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルの両者を周辺ブロックの係数の個数によって切り替えて可変長符号化を行っているが、実施の形態１と同様に、それらのどちらか一方を切り替えずに固定して使用することも可能である。その場合はテーブル選択器を用いる替わりにある１種類のコードテーブルもしくはＶＬＣテーブルを持った記憶器のみを用いることにより実現可能である。

【００５６】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化を行う場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化を適用する場合でも同様に扱うことが可能である。

【００５７】

（実施の形態４）

図１に基づいた符号化処理の概要は実施の形態１と全く同等である。ここでは図１の中の係数個数符号化器１１１において実施の形態４でなされる係数の個数の可変長符号化処理について、図１０および図１１を用いてその詳細を説明する。

【００５８】

図１０（ａ）は係数個数符号化器１１１の内部構成を詳しく示したものである。

実施の形態１とは異なり予測値算出器を使用することなく直接符号化済ブロックの係数の個数を使用し、テーブル選択器１００１においてコードテーブルおよびＶＬＣテーブルの両者を同時に評価することによって実際に使用するテーブルを選択する。このとき参照する符号化済ブロックは図５（ａ）にあるように符号化対象のブロックＸに対してＢおよびＣおよびＤの位置関係にある３つのブロックを用いる。ただし、これらに位置するブロックが符号化されていないもしくはピクチャの外部であった場合は係数の個数として０もしくはその他の任意の値を代用する。

【００５９】

テーブル選択器１００１では、コードテーブルおよびＶＬＣテーブルを同時に用いて参照ブロックの係数の個数を符号化した結果生成される符号列の長の和を判断要素として使用するテーブルを選択する。図１１は３つの参照ブロックの係数の個数に対しコードテーブルおよびＶＬＣテーブルによって符号化を行い、得られた符号列の長さの和を算出しそれを評価値とする方法を示したものである。全てのコードテーブルおよびＶＬＣテーブルの組み合わせに対してこの処理を行い、得られた評価値が最も小さくなるコードテーブルおよびＶＬＣテーブルの組み合わせを決定する。

【００６０】

係数個数符号化器２０６では、テーブル選択器１００１によって選択されたコードテーブルおよびＶＬＣテーブルを参照して、実施の形態１と同様に入力された符号化対象ブロックの係数の個数の可変長符号化を行う。

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【００６１】

以上のように上記実施の形態では、符号化済の周辺ブロックの係数の個数に対してコードテーブルおよびＶＬＣテーブルを用いて符号化を行い、そのときの符号列の長さの和を評価値とし、これが最小となる組み合わせのコードテーブルおよびＶＬＣテーブルを参照することにより、係数の出現頻度が一様でないピクチャに対しても効率よく係数の個数の符号化を行うことを可能とする符号化方法を示した。

【００６２】

なお、実施の形態１と同様にテーブル選択器１００１において参照する符号化済ブロックは、図５（ａ）のような３つの周辺ブロックの替わりに図５（ｂ）のように符号化対象のブロックＸに対してＢおよびＤの位置関係にある２つのみを用いても同様に扱うことが可能である。ただし、これらに位置するブロックが符号化されていないもしくはピクチャの外部であった場合は係数の個数として０もしくはその他の任意の値を代用する。

【００６３】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化を行っているが、実施の形態１と同様に図１０（ｂ）のように予測値算出器２０１による予測値と入力された係数の個数の値との差分値を差分演算器２０７によって算出し、得られた値に対して上記実施の形態と同様の処理によって可変長符号化を行うことも可能である。

【００６４】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルを切り替える対象としているが、それらの一方を切り替えずに固定して使用することも可能である。

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化を行う場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化を適用する場合でも同様に扱うことが可能である。

【００６５】

（実施の形態５）

図１２は本発明の実施の形態５の動画像符号化方法の概要を示したブロック図である。符号化処理の概要は実施の形態１と全く同等であるが、相違点として係数個数記憶器１１０は使用せず、係数個数符号化器１２０１において参照する情報として実施の形態１における符号化済ブロックの係数の個数の替わりに画面間予測符号化の場合は画面間予測モードを、また画面内予測符号化の場合は画面内予測モードを用いる。

【００６６】

ここでは図１２の中の係数個数符号化器１２０１においてなされる係数の個数の可変長符号化処理について、図１３および表１０から表１１を用いてその詳細を説明する。

図１３は係数個数符号化器１２０１の内部構成を詳しく示したものである。

画面間予測符号化の場合は画面間予測モードが、また画面内予測符号化の場合は画面内予測モードがコードテーブル選択器１３０１およびＶＬＣテーブル選択器１３０２に入力される。表１０はコードテーブル選択器１３０１におけるコードテーブルの選択方法を示したものである。

【００６７】

【表１０】

参照テーブル	画面間予測モード	画面内予測モード
コードテーブル１	16×16, 16×8, 8×16	平面予測
コードテーブル２	8×8	斜め方向予測
コードテーブル３	8×4, 4×8	斜め方向予測
コードテーブル４	4×4	縦、横方向予測

【００６８】

なお、表１０の各項目についてはこれ以外のものを使用した場合も同様に扱うことができる。また、ＶＬＣテーブル選択器１３０２では上記手続きと同様にして表１１を用いて実際に参照するＶＬＣテーブルを選択する。

【表１１】

参照テーブル	画面間予測モード	画面内予測モード
ＶＬＣテーブル１	16×16, 16×8, 8×16	平面予測
ＶＬＣテーブル２	8×8	斜め方向予測
ＶＬＣテーブル３	8×4, 4×8	斜め方向予測
ＶＬＣテーブル４	4×4	縦、横方向予測

【００６９】

係数個数符号化器２０６では、コードテーブル選択器１３０１によって選択されたコードテーブルおよびＶＬＣテーブル選択器１３０２によって選択されたＶＬＣテーブルを参照して、実施の形態１と同様に入力された符号化対象ブロックの係数の個数の可変長符号化を行う。

【００７０】

以上のように上記実施の形態では、符号化の対象としているブロックが画面間予測符号化の場合は画面間予測モードに、また画面内予測符号化の場合は画面内予測モードに応じてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することにより、係数の出現頻度が一様でないピクチャに対しても効率よく係数の個数の符号化を行うことを可能とする符号化方法を示した。

【００７１】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化を行っているが、実施の形態１と同様に符号化済の周辺ブロックの係数の個数を用いて予測値を決定し、この予測値と入力された係数の個数の値との差分値を求め、得られた値に対して上記実施の形態と同様の処理によって可変長符号化を行うことも可能である。

【００７２】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルの両者を切り替えて可変長符号化を行っているが、実施の形態１と同様に、それらの一方もし

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くは両者を切り替えずに固定して使用することも可能である。その場合はある１種類のコードテーブルもしくはＶＬＣテーブルを持った記憶器のみを用意することにより実現可能である。

【００７３】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化を行う場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化を適用する場合でも同様に扱うことが可能である。

【００７４】

（実施の形態６）

本発明の実施の形態６を図１４に示した動画像復号化方法のブロック図を用いて説明する。ただし、実施の形態１の動画像符号化方法で生成された符号列が入力されるものとする。

まず入力された符号列から符号列解析器１４０１によって動きベクトルおよびＤＣＴ係数個数の符号列およびＤＣＴ係数値の符号列等の各種の情報が抽出される。

【００７５】

係数個数復号化器１４０３にはＤＣＴ係数の個数の符号列が入力され、単位ブロックごとに０以外の値を持つＤＣＴ係数の個数が復号化される。このとき係数個数記憶器１４０２に保存されている復号化済ブロックの係数の個数を参照することによって係数の個数が復号化が行われる。さらに係数値復号化器１４０４では、係数個数復号化器１４０３によって得られた係数の個数情報を用いてＤＣＴ係数の値そのものの復号化が行われる。得られたＤＣＴ係数は逆量子化器１４０５および逆直交変換器１４０６により予測残差画像へ変換される。

【００７６】

対象とするマクロブロックが画面間予測によって符号化されている場合は、符号列解析器１４０１によって抽出された動きベクトルが画面間予測復号器１４０８に入力され、フレームメモリ１４０７に蓄積されている復号化済みのピクチャの復号化画像を参照ピクチャとすることにより動きベクトル情報に基づいて動き補償画像を生成する。このようにして得られた動き補償画像は、加算演算器１４

１１において予測残差画像と加算されることにより復号化画像に変換され最終的な出力画像が生成される。

【００７７】

一方、対象とするマクロブロックが画面内予測によって符号化されている場合は、画面内予測復号器１４０９において周辺の復号化済ブロックの情報を用いて画面内予測がなされ、加算演算器１４１１において予測残差画像と加算されることにより復号化画像に変換され最終的な出力画像が生成される。

【００７８】

以上復号化の流れの概要を示したが、係数個数復号化器１４０３によってなされる係数の個数の復号化処理について、図１５から図１７を用いてその詳細を説明する。

図１５（ａ）は係数個数復号化器１４０３の内部構成を詳しく示したものである。

【００７９】

まず、図１４の係数個数記憶器１４０２から周辺に位置する復号化済ブロックの係数の個数が入力され、これらの値を基に予測値算出器１５０１において平均値または最大値または最小値または中央値のいずれかを予測値として算出する。このとき参照する復号化済ブロックは実施の形態１と同様に図５（ａ）に示された復号化対象のブロックＸに対してＢおよびＣおよびＤの位置関係にある３つのブロックを用いて表１に従って決定される。なお、表１における○×および参照ブロックの項目はこれこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。

【００８０】

コードテーブル選択器１５０３では、予測値算出器１５０１によって算出された予測値に応じて、コードテーブル記憶器１５０２が持つ複数のコードテーブルの中から実際に使用するテーブルを選択する。

【００８１】

表２はコードテーブル記憶器１５０２によって予め用意されている係数の個数

とコード番号とを対応付けるコードテーブルの例である。なお、ここでは４種類のコードテーブルを用意しているが、テーブルの種類の数およびテーブルの値はこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用したテーブルと同じものを使用することが条件となっている。また、表３は予測値に基づいたコードテーブルの選択基準を示したものである。なお、表３における予測値の割り振り方または参照テーブルの項目はこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用したテーブルと同じものを使用することが条件となっている。

【００８２】

ＶＬＣテーブル選択器１５０４では、予測値算出器１５０１によって算出された予測値に応じて、ＶＬＣテーブル記憶器１５０５が持つ複数のＶＬＣテーブルの中から実際に使用するテーブルを選択する。

【００８３】

表４はＶＬＣテーブル記憶器１５０５によって予め用意されている係数の個数とコード番号とを対応付けるコードテーブルの例を示すものである。なお、ここでは４種類のＶＬＣテーブルを用意しているが、テーブルの種類の数およびテーブルの値はこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用したテーブルと同じものを使用することが条件となっている。また、表５は予測値に基づいたＶＬＣテーブルの選択基準を示したものである。なお、表５における予測値の割り振り方または参照テーブルの項目はこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用したテーブルと同じものを使用することが条件となっている。

【００８４】

係数個数符復号化器１５０６では上記の処理によって選択されたコードテーブルおよびＶＬＣテーブルを参照して、入力された符号化対象ブロックの係数の個数の符号列に対し可変長復号化を行う。まずＶＬＣテーブルを用いて係数の個数の符号列をコード番号に変換し、つぎにコードテーブルを用いてコード番号に対応する係数の個数の値に変換する。図１８は予測値算出器１５０１によって算出された予測値が６で復号化対象ブロックの係数の個数の符号列が０１００であっ

た場合の復号化の例である。予測値が６であることから、コードテーブル選択器１５０３においてコードテーブル３が選択され、またＶＬＣテーブル選択器１５０４においてＶＬＣテーブル３が選択される。入力された符号列が０１００はＶＬＣテーブル３によりコード番号２に変換され、さらにコードテーブル３により最終的な係数の個数４が決定される。

【００８５】

以上のように上記実施の形態では、符号化済の周辺ブロックの係数の個数から予測値を算出し、その予測値に応じてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することにより、係数の個数を復号化する復号化方法を示した。

【００８６】

なお、予測値算出器１５０１において参照するブロックとして、図５（ａ）のような３つの周辺ブロックの代わりに図５（ｂ）のように復号化対象のブロックＸに対してＢおよびＤの位置関係にある２つのブロックのみを用いることも可能である。このときＢおよびＤの位置関係にある２つのブロックの中で、復号化されていないもしくはピクチャの外部に位置するブロックが発生した場合は、表６のように参照ブロックの変更がなされる。なお、表６の○×および参照ブロックの項目はこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。ただしこの値は符号化時に使用したものと同じであることが条件となっている。

【００８７】

なお、予測値算出器１５０１において予測値を算出する方法として平均値または最大値または最小値または中央値のいずれかに固定するのではなく、その中から最適なものをシーケンスまたはＧＯＰまたはピクチャまたはスライスごとに選択することも可能である。そのとき選択された算出方法を識別するための符号が符号列のシーケンスまたはＧＯＰまたはピクチャまたはスライスのヘッダ領域に記述されていることを条件とする。

【００８８】

なお、予測値算出器１５０１において予測値を算出する方法として平均値または最大値または最小値または中央値のいずれかを復号化済の参照ブロックの係数の個数の平均値によって選択することも可能である。表７はその選択基準を示したものである。なお、表７における平均値の割り振り方または予測値算出方法の項目はこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用したものと同じものを使用することが条件となっている。

【００８９】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化がなされている符号列の復号化処理方法を示したものであるが、予測値と係数の個数との差分値に対して可変長符号化がなされている符号列の復号化を行うことも可能である。その場合は図１５（ｂ）のように予測値算出器１５０１による予測値と係数個数復号化器１５０６によって復号化された係数の個数の差分値とを加算演算器１５０７において加算することにより係数の個数を決定する。

【００９０】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルの両者を周辺ブロックの係数の個数によって切り替えて可変長復号化を行っているが、それらのどちらか一方を切り替えずに固定して使用することも可能である。その場合はある１種類のコードテーブルもしくはＶＬＣテーブルを持った記憶器のみを用意することにより実現可能である。それらを組み合わせた構成の例を図１６に示す。図１６（ａ）はコードテーブルのみを固定して係数個数の可変長復号化を行うための構成である。また、図１６（ｂ）はＶＬＣテーブルのみを固定して係数個数の可変長復号化を行うための構成である。なお、係数の個数の値の替わりに予測値と係数の個数との差分値に対して可変長符号化がなされている符号列の復号化を行う場合に対しても同様に扱うことが可能である。図１７はその例としてコードテーブルおよびＶＬＣテーブルの両者を固定して予測値と係数の個数との差分値に対して可変長復号化を行った場合の構成を示したものである。

【００９１】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化が行われている符号列に対して複合化を施す場合の例を示したが、ＤＣＴ以外の周波数変換によっ

て生成された係数に対して可変長符号化が行われている符号列を複合化する場合でも同様に扱うことが可能である。

【００９２】

（実施の形態７）

図１４に基づいた復号化処理の概要は実施の形態６と全く同等である。ただし、実施の形態２の動画像符号化方法で生成された符号列が入力されるものとする。ここでは図１４の中の係数個数復号化器１４０３において実施の形態７でなされる係数の個数の可変長復号化処理について、図１９を用いてその詳細を説明する。

【００９３】

図１９（ａ）は係数個数復号化器１４０３の内部構成を詳しく示したものである。

コードテーブル生成器１９０１には、図１４の係数個数記憶器１４０２から復号化済ブロックの係数の個数が入力され、係数の個数の値ごとにそれと等しい係数の個数を持つ復号化済みのブロックが幾つあるかをカウントし、その統計量に基づいて発生頻度が最も高かった係数個数から順にコード番号を割り当てコードテーブルを作成する。図８（ａ）は統計の対象とする復号化済ブロックの位置を表すものである。Ｐ１およびＰ３およびＰ４は画面間予測復号化を行うピクチャであり、Ｉ２は画面内予測復号化を行うピクチャである。現在復号化の対象としているブロックがＰ３に属しているとすると、同じ方式によって復号化された直前のピクチャであるＰ１の全てのブロックが統計の対象となる。なお、図８（ｂ）のように現在復号化の対象となっているピクチャ内にある復号化済ブロックも含めた１ピクチャ分のブロックを統計の対象とする場合も同様に扱うことが可能である。また統計の対象とすることのできる１ピクチャ分の復号化済ブロックが存在しない場合は、初期状態のコードテーブルとして０からの昇順で与えられるテーブルを使用する。なお、ここでは１ピクチャ分のブロックを統計対象としているが、母数としてそれ以外のブロックの個数を用いた場合も同様に扱うことが可能である。ただし符号化時に使用した個数と同じものを使用することが条件となっている。

【００９４】

一方、予測値算出器１５０１では、周辺に位置する復号化済ブロックの係数の個数が入力され、これらの値を基に実施の形態６と平均値または最大値または最小値または中央値のいずれかを予測値として算出する。このとき参照する復号化済ブロックは実施の形態６と同様に図５（ａ）に示された復号化対象のブロックＸに対してＢおよびＣおよびＤの位置関係にある３つのブロックを用いて表１に従って決定される。なお、表１における○×および参照ブロックの項目はこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。ただしこの値は符号化時に使用したものと同じであることが条件となっている。

【００９５】

予測値算出器１５０１によって設定された予測値はＶＬＣテーブル選択器１５０４においてのみ反映される。ここでは実施の形態６と同様に表４に示されたような予め用意された複数のＶＬＣテーブルの中から表５に従って係数の個数の符号化に使用するＶＬＣテーブルを決定する。

【００９６】

係数個数復号化器１５０６では、コードテーブル生成器１９０１によって生成されたコードテーブルおよびＶＬＣテーブル選択器１５０４によって選択されたＶＬＣテーブルを参照して、実施の形態６と同様に入力された係数の個数の符号列に対し可変長復号化を行う。

【００９７】

以上のように上記実施の形態では、復号化済ブロックの係数の個数の統計を取ることによりコードテーブルを作成し、さらに復号化済ブロックの係数の個数から算出された予測値に応じてＶＬＣテーブルを決定し、その両者を参照することにより係数の個数の復号化を行う復号化方法を示した。

【００９８】

なお、実施の形態６と同様に予測値算出器１５０１において参照する復号化済ブロックは、図５（ａ）のような３つの周辺ブロックの替わりに図５（ｂ）のように復号化対象のブロックＸに対してＢおよびＤの位置関係にある２つのブロッ

クのみを用いて表６に従って決定することも可能である。なお、表６における○×および参照ブロックの項目はこれ以外を用いた場合でも同様に扱うことが可能である。なお、参照ブロックがなしと判断された場合は０もしくはその他の任意の値を直接予測値として与える。ただしこの値は符号化時に使用したものと同じであることが条件となっている。

【００９９】

なお、実施の形態６と同様に予測値算出器１５０１において予測値を算出する方法として平均値または最大値または最小値または中央値のいずれかに固定するのではなく、その中から最適なものをシーケンスまたはＧＯＰまたはピクチャまたはスライスごとに選択することも可能である。そのとき選択された算出方法を識別するための符号が符号列のシーケンスまたはＧＯＰまたはピクチャまたはスライスのヘッダ領域に記述されていることを条件とする。

【０１００】

なお、実施の形態６と同様に予測値算出器１５０１において予測値を算出する方法として平均値または最大値または最小値または中央値のいずれかを復号化済の参照ブロックの係数の個数の平均値によって選択することも可能である。表７はその選択基準を示したものであるが、ここでの平均値の割り振り方または予測値算出方法の項目はこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用したものと同じものを使用することが条件となっている。

【０１０１】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化がなされている符号列の復号化処理方法を示したものであるが、予測値と係数の個数との差分値に対して可変長符号化がなされている符号列の復号化を行うことも可能である。その場合は図１９（ｂ）のように予測値算出器１５０１による予測値と係数個数復号化器１５０６によって復号化された係数の個数の差分値とを加算演算器１５０７において加算することにより係数の個数を決定する。

【０１０２】

なお、上記実施の形態ではＶＬＣテーブルを周辺ブロックの係数の個数によって切り替えて可変長復号化を行っているが、実施の形態６と同様にＶＬＣテーブ

ルを切り替えずに固定して使用することも可能である。その場合はＶＬＣテーブル選択器を用いる替わりにある１種類のＶＬＣテーブルを持ったＶＬＣテーブル記憶器のみを用いることにより実現可能である。

【０１０３】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化が行われている符号列に対して複合化を施す場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化が行われている符号列を複合化する場合でも同様に扱うことが可能である。

【０１０４】

（実施の形態８）

図１４に基づいた復号化処理の概要は実施の形態６と全く同等である。ただし、実施の形態３の動画像符号化方法で生成された符号列が入力されるものとする。ここでは図１４の中の係数個数復号化器１４０３において実施の形態８でなされる係数の個数の可変長復号化処理について、図２０を用いてその詳細を説明する。

【０１０５】

図２０（ａ）は係数個数復号化器１４０３の内部構成を詳しく示したものである。

実施の形態６とは異なり予測値算出器を使用することなく直接復号化済ブロックの係数の個数を使用することによって実際に使用するテーブルを選択する。このとき参照する復号化済ブロックは図５（ｂ）にあるように復号化対象のブロックＸに対しＢ（上）およびＤ（左）の位置関係にある２つのみを用いる。ただし、上および左に位置するブロックが復号化されていないもしくはピクチャの外部であった場合は係数の個数として０もしくはその他の任意の値を代用する。ただしこの値は符号化時に使用したものと同じであることが条件となっている。

【０１０６】

表８はコードテーブル選択器２００１におけるコードテーブルの選択方法を示したものである。上および左に位置するブロックの係数の個数それぞれを値に応じて２つのグループに分類し、それによって形成される４つの組み合わせによっ

てテーブルが選択される。なお、表８における上および左ブロックの係数の個数を分類する方法およびコードテーブルの割り当て方についてはこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用したものと同じものを使用することが条件となっている。また、ＶＬＣテーブル選択器２００２では上記手続きと同様にして表９を用いて実際に参照するＶＬＣテーブルを選択する。

【０１０７】

係数個数復号化器１５０６では、コードテーブル選択器９０１によって選択されたコードテーブルおよびＶＬＣテーブル選択器９０２によって選択されたＶＬＣテーブルを参照して、実施の形態６と同様に入力された復号化対象ブロックの係数の個数の可変長復号化を行う。

【０１０８】

以上のように上記実施の形態では、上および左に位置する復号化済ブロックの係数の個数を値に応じてＮ個のグループに分類し、そのときに形成されるＮ×Ｎ通りの組み合わせに応じてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することにより、係数の個数の復号化を行う復号化方法を示した。

【０１０９】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化がなされている符号列の復号化処理方法を示したものであるが、予測値と係数の個数との差分値に対して可変長符号化がなされている符号列の復号化を行うことも可能である。その場合は図２０（ｂ）のように予測値算出器１５０１による予測値と係数個数復号化器１５０６によって復号化された係数の個数の差分値とを加算演算器１５０７において加算することにより係数の個数を決定する。

【０１１０】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルの両者を周辺ブロックの係数の個数によって切り替えて可変長復号化を行っているが、実施の形態６と同様に、それらのどちらか一方を切り替えずに固定して使用することも可能である。その場合はテーブル選択器を用いる替わりにある１種類のコードテ

ーブルもしくはＶＬＣテーブルを持った記憶器のみを用いることにより実現可能である。

【０１１１】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化が行われている符号列に対して複合化を施す場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化が行われている符号列を複合化する場合でも同様に扱うことが可能である。

【０１１２】

（実施の形態９）

図１４に基づいた復号化処理の概要は実施の形態６と全く同等である。ただし、実施の形態４の動画像符号化方法で生成された符号列が入力されるものとする。ここでは図１４の中の係数個数復号化器１４０３において実施の形態９でなされる係数の個数の可変長復号化処理について、図２１および図２２を用いてその詳細を説明する。

【０１１３】

図２１（ａ）は係数個数復号化器１４０３の内部構成を詳しく示したものである。

実施の形態６とは異なり予測値算出器を使用することなく直接復号化済ブロックの係数の個数を使用し、テーブル選択器２１０１においてコードテーブルおよびＶＬＣテーブルの両者を同時に評価することによって実際に使用するテーブルを選択する。このとき参照する復号化済ブロックは図５（ａ）にあるように復号化対象のブロックＸに対してＢおよびＣおよびＤの位置関係にある３つのブロックを用いる。ただし、これらに位置するブロックが復号化されていないもしくはピクチャの外部であった場合は係数の個数として０もしくはその他の任意の値を代用する。ただしこの値は符号化時に使用したものと同じであることが条件となっている。

【０１１４】

テーブル選択器２１０１では、コードテーブルおよびＶＬＣテーブルを同時に用いて参照ブロックの係数の個数を符号化した結果生成される符号列の長の和を

判断要素として使用するテーブルを選択する。図１１は３つの参照ブロックの係数の個数に対しコードテーブルおよびＶＬＣテーブルによって符号化を行い、得られた符号列の長さの和を算出しそれを評価値とする方法を示したものである。全てのコードテーブルおよびＶＬＣテーブルの組み合わせに対してこの処理を行い、得られた評価値が最も小さくなるコードテーブルおよびＶＬＣテーブルの組み合わせを決定する。

【０１１５】

係数個数復号化器１５０６では、テーブル選択器２１０１によって選択されたコードテーブルおよびＶＬＣテーブルを参照して、実施の形態６と同様に入力された復号化対象ブロックの係数の個数の可変長復号化を行う。

【０１１６】

以上のように上記実施の形態では、復号化済の周辺ブロックの係数の個数に対してコードテーブルおよびＶＬＣテーブルを用いて符号化を行い、そのときの符号列の長さの和を評価値とし、これが最小となる組み合わせのコードテーブルおよびＶＬＣテーブルを参照することにより、係数の個数の復号化を行う復号化方法を示した。

【０１１７】

なお、実施の形態６と同様にテーブル選択器２１０１において参照する復号化済ブロックは、図５（ａ）のような３つの周辺ブロックの替わりに図５（ｂ）のように復号化対象のブロックＸに対してＢおよびＤの位置関係にある２つのみを用いても同様に扱うことが可能である。ただし、これらに位置するブロックが復号化されていないもしくはピクチャの外部であった場合は係数の個数として０もしくはその他の任意の値を代用する。ただしこの値は符号化時に使用したものと同じであることが条件となっている。

【０１１８】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化がなされている符号列の復号化処理方法を示したものであるが、予測値と係数の個数との差分値に対して可変長符号化がなされている符号列の復号化を行うことも可能である。その場合は図２１（ｂ）のように予測値算出器１５０１による予測値

と係数個数復号化器１５０６によって復号化された係数の個数の差分値とを加算演算器１５０７において加算することにより係数の個数を決定する。

【０１１９】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルを切り替える対象としているが、それらの一方を切り替えずに固定して使用することも可能である。

【０１２０】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化が行われている符号列に対して複合化を施す場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化が行われている符号列を複合化する場合でも同様に扱うことが可能である。

【０１２１】

（実施の形態１０）

本発明の実施の形態１０を図１４に示した動画像復号化方法のブロック図を用いて説明する。復号化処理の概要は実施の形態６と全く同等であるが、相違点として係数個数復号化器１４０３において参照する情報として実施の形態６における復号化済ブロックの係数の個数の替わりに画面間予測復号化の場合は画面間予測モードを、また画面内予測復号化の場合は画面内予測モードを用いる。ただし実施の形態５の動画像符号化方法で生成された符号列が入力されるものとする。

【０１２２】

ここでは図１４の中の係数個数復号化器１４０３においてなされる係数の個数の可変長復号化処理について、図２２を用いてその詳細を説明する。

図２２は係数個数復号化器１４０３の内部構成を詳しく示したものである。

【０１２３】

画面間予測復号化の場合は画面間予測モードが、また画面内予測復号化の場合は画面内予測モードがコードテーブル選択器２２０１およびＶＬＣテーブル選択器２２０２に入力される。表１０はコードテーブル選択器２２０１におけるコードテーブルの選択方法を示したものである。なお、表１０の各項目についてはこれ以外のものを使用した場合も同様に扱うことができる。ただし符号化時に使用

したものと同じものを使用することが条件となっている。また、ＶＬＣテーブル選択器２２０２では上記手続きと同様にして表１１を用いて実際に参照するＶＬＣテーブルを選択する。

【０１２４】

係数個数復号化器１５０６では、コードテーブル選択器２２０１によって選択されたコードテーブルおよびＶＬＣテーブル選択器２２０２によって選択されたＶＬＣテーブルを参照して、実施の形態６と同様に入力された復号化対象ブロックの係数の個数の可変長復号化を行う。

【０１２５】

以上のように上記実施の形態では、復号化の対象としているブロックが画面間予測復号化の場合は画面間予測モードに、また画面内予測復号化の場合は画面内予測モードに応じてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することにより、係数の個数の復号化を行う復号化方法を示した。

【０１２６】

なお、上記実施の形態では係数の個数の値そのものに対して可変長符号化がなされている符号列の復号化処理方法を示したものであるが、予測値と係数の個数との差分値に対して可変長符号化がなされている符号列の復号化を行うことも可能である。その場合は実施の形態６と同様に符号化済の周辺ブロックの係数の個数を用いて予測値を決定し、その値と係数個数復号化器１５０６によって復号化された係数の個数の差分値とを加算することにより係数の個数を決定する。

【０１２７】

なお、上記実施の形態ではコードテーブルおよびＶＬＣテーブルの両者を切り替えて可変長復号化を行っているが、実施の形態６と同様に、それらの一方もしくは両者を切り替えずに固定して使用することも可能である。その場合はある１種類のコードテーブルもしくはＶＬＣテーブルを持った記憶器のみを用意することにより実現可能である。

【０１２８】

なお、上記実施の形態ではＤＣＴ係数に対して可変長符号化が行われている符

号列に対して複合化を施す場合の例を示したが、ＤＣＴ以外の周波数変換によって生成された係数に対して可変長符号化が行われている符号列を複合化する場合でも同様に扱うことが可能である。

【０１２９】

（実施の形態１１）

さらに、上記各実施の形態で示した符号化処理および復号化処理の構成を実現するための符号化および復号化プログラムを、フレキシブルディスク等のデータ記憶媒体に記録するようにすることにより、上記各実施の形態で示した処理を、独立したコンピュータシステムにおいて簡単に実施することが可能となる。

【０１３０】

図２３は、上記実施の形態１から１０の符号化あるいは復号化処理を、上記符号化および復号化プログラムを格納したフレキシブルディスクを用いて、コンピュータシステムにより実施する場合を説明するための図である。

【０１３１】

図２３（ｂ）は、フレキシブルディスクの正面からみた外観、断面構造、及びフレキシブルディスクを示し、図２３（ａ）は、記録媒体本体であるフレキシブルディスクの物理フォーマットの例を示している。フレキシブルディスクＦＤはケースＦ内に内蔵され、該ディスクの表面には、同心円状に外周からは内周に向かって複数のトラックＴｒが形成され、各トラックは角度方向に１６のセクタＳｅに分割されている。従って、上記プログラムを格納したフレキシブルディスクでは、上記フレキシブルディスクＦＤ上に割り当てられた領域に、上記プログラムとしてのデータが記録されている。

【０１３２】

また、図２３（ｃ）は、フレキシブルディスクＦＤに上記プログラムの記録再生を行うための構成を示す。上記プログラムをフレキシブルディスクＦＤに記録する場合は、コンピュータシステムＣｓから上記プログラムとしてのデータをフレキシブルディスクドライブを介して書き込む。また、フレキシブルディスク内のプログラムにより上記符号化および復号化装置をコンピュータシステム中に構築する場合は、フレキシブルディスクドライブによりプログラムをフレキシブル

ディスクから読み出し、コンピュータシステムに転送する。

【０１３３】

なお、上記説明では、データ記録媒体としてフレキシブルディスクを用いて説明を行ったが、光ディスクを用いても同様に行うことができる。また、記録媒体はこれに限らず、ＩＣカード、ＲＯＭカセット等、プログラムを記録できるものであれば同様に実施することができる。

【０１３４】

【発明の効果】

以上のように本発明（請求項１）に係る動画像符号化方法によれば、画像を符号化して符号列を生成する画像符号化方法であって、直交変換後の単位ブロック中に含まれる０以外の係数の個数に対して可変長符号化を施す符号化ステップと、可変長符号化施す際に参照するテーブルを切り替えるテーブル切り替えステップとを有し、前記符号化ステップはコードテーブルによって前記係数個数をコード番号に変換するコード変換ステップとＶＬＣテーブルによってコード番号を可変長符号に変換するＶＬＣ変換ステップとを有し、前記テーブル切り替えステップによって符号化を行う際にコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することを特徴とするので、前記係数個数を符号化する際に画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１３５】

本発明（請求項２）に係る動画像符号化方法によれば、画像を符号化して符号列を生成する画像符号化方法であって、直交変換後の単位ブロック中に含まれる０以外の係数の個数に対して可変長符号化を施す符号化ステップと、可変長符号化を施す際に参照するテーブルを切り替えるテーブル切り替えステップと、可変長符号化を施す際に参照するテーブルを符号化済ブロックの係数個数の統計を取ることによって適応的に作成するテーブル生成ステップとを有し、前記符号化ステップはコードテーブルによって前記係数個数をコード番号に変換するコード変換ステップとＶＬＣテーブルによって前記コード番号を可変長符号に変換するＶ

ＬＣ変換ステップとを有し、符号化を行う際に前記テーブル切り替えステップによってＶＬＣテーブルを切り替えて参照し、前記テーブル生成ステップによってコードテーブルを作成して参照することを特徴とするので、前記係数個数を符号化する際に画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１３６】

本発明（請求項３）によれば、請求項１記載の画像符号化方法であって、符号化済の周辺ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記符号化ステップは前記予測ステップによって得られた予測値と符号化の対象とするブロック中の係数個数との差分値に対して可変長符号化を施すことを特徴とするので、前記係数個数の出現確率のブロック間での変動が小さい画像では、符号化の対象とする値を小さい領域に集中することが可能となり、符号化効率の向上を図ることができる。

【０１３７】

本発明（請求項４）によれば、請求項１記載の画像符号化方法であって、符号化済の周辺ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記テーブル切り替えステップは前記予測ステップによって得られた予測値を用いてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えることを特徴とするので、前記係数個数を符号化する際に画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１３８】

本発明（請求項５）によれば、請求項１記載の画像符号化方法であって、前記テーブル切り替えステップは上および左に位置する符号化済のブロック中に含まれる０以外の係数の個数を値に応じて各々Ｎ通りに分類したときにできるＮ×Ｎ通りの組み合わせを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とするので、前記係数個数を符号化する際に縦方向もしくは横方向に相関性のある画像に対して画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号

化効率の向上を図ることができる。

【０１３９】

本発明（請求項６）によれば、請求項１記載の画像符号化方法であって、前記テーブル切り替えステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数を符号化した場合に得られる符号列の長さの和を評価し、それが最も短くなる組み合わせとなるコードテーブルおよびＶＬＣテーブルを選択することを特徴とするので、前記係数個数を符号化する際に画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１４０】

本発明（請求項７）によれば、請求項１記載の画像符号化方法であって、前記テーブル切り替えステップは符号化の対象となるブロックが画面内予測符号化を行う場合は画面内予測符号化モードを、画面間予測符号化を行う場合は画面間予測符号化モードを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とするので、前記係数個数を符号化する際に対象ブロック予測符号化方法に応じた最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１４１】

本発明（請求項８）によれば、請求項３または請求項４記載の画像符号化方法であって、前記予測ステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかを用いて予測値を算出することを特徴とするので、前記係数個数を符号化する際に前記係数個数の出現確率が大きい値もしくは小さい値に偏っている画像に対しても最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１４２】

本発明（請求項９）によれば、請求項３または請求項４記載の画像符号化方法であって、前記予測ステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかをピクチャ

ごとに最適なものを選択することによって予測値を算出することを特徴し、選択された予測値算出方法を符号列中に記述することを特徴とするので、前記係数個数を符号化する際に前記係数個数の出現確率が画面全体において大きい値もしくは小さい値に偏っている画像に対しても最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１４３】

本発明（請求項１０）によれば、請求項３または請求項４記載の画像符号化方法であって、前記予測ステップは符号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかを、符号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値の値に応じて選択することによって予測値を算出することを特徴とするので、前記係数個数を符号化する際に前記係数個数の出現確率が画面内において部分的に大きい値もしくは小さい値に偏っている画像に対しても最適なコードテーブルおよびＶＬＣテーブルを参照することが可能となり、符号化効率の向上を図ることができる。

【０１４４】

本発明（請求項１１）に係る動画像復号化方法によれば、符号化された画像を復号化する画像復号化方法であって、直交変換後の単位ブロック中に含まれる０以外の係数の個数が可変長符号化によって符号化された符号列に対し可変長復号化を施す復号化ステップと、可変長復号化施す際に参照するテーブルを切り替えるテーブル切り替えステップとを有し、前記復号化ステップはＶＬＣテーブルによって可変長符号をコード番号に変換するＶＬＣ変換ステップとコードテーブルによってコード番号を係数個数に変換するコード変換ステップとを有し、前記テーブル切り替えステップによって復号化を行う際にコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えて参照することを特徴とするので、画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照して符号化されている符号列を正しく復号化することができる。

【０１４５】

本発明（請求項１２）に係る動画像復号化方法によれば、符号化された画像を復号化する画像復号化方法であって、直交変換後の単位ブロック中に含まれる０

以外の係数の個数が可変長符号化によって符号化された符号列に対し可変長復号化を施す復号化ステップと、可変長復号化を施す際に参照するテーブルを切り替えるテーブル切り替えステップと、可変長復号化を施す際に参照するテーブルを復号化済ブロックの係数個数の統計を取ることによって適応的に作成するテーブル生成ステップとを有し、前記復号化ステップはＶＬＣテーブルによって可変長符号をコード番号に変換するＶＬＣ変換ステップとコードテーブルによってコード番号を係数個数に変換するコード変換ステップとを有し、復号化を行う際に前記テーブル切り替えステップによってＶＬＣテーブルを切り替えて参照し、前記テーブル生成ステップによってコードテーブルを作成して参照することを特徴とするので、画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照して符号化されている符号列を正しく復号化することができる。

【０１４６】

本発明（請求項１３）によれば、請求項１１記載の画像復号化方法であって、復号化済の周辺ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記復号化ステップは前記予測ステップによって得られた予測値と入力された符号列を復号化したときに得られる値との和をとることにより復号化を行うことを特徴とするので、前記係数個数の出現確率のブロック間での変動が小さい画像に対して符号化の対象とする値を小さい領域に集中させることによって高い符号化効率を実現している符号列を正しく復号化することができる。

【０１４７】

本発明（請求項１４）によれば、請求項１１記載の画像復号化方法であって、復号化済の周辺ブロック中に含まれる０以外の係数の個数から予測値を算出する予測ステップを有し、前記テーブル切り替えステップは前記予測ステップによって得られた予測値を用いてコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替えることを特徴とするので、画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照して符号化されている符号列を正しく復号化することができる。

【０１４８】

本発明（請求項１５）によれば、請求項１１記載の画像復号化方法であって、前記テーブル切り替えステップは上および左に位置する復号化済のブロック中に含まれる０以外の係数の個数を値に応じて各々Ｎ通りに分類したときにできるＮ×Ｎ通りの組み合わせを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とするので、縦方向もしくは横方向に相関性のある画像に対して画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照して符号化されている符号列を正しく復号化することができる。

【０１４９】

本発明（請求項１６）によれば、請求項１１記載の画像復号化方法であって、前記テーブル切り替えステップは復号化済の周辺ブロック中に含まれる０以外の係数の個数を符号化した場合に得られる符号列の長さの和を評価し、それが最も短くなる組み合わせとなるコードテーブルおよびＶＬＣテーブルを選択することを特徴とするので、画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照して符号化されている符号列を正しく復号化することができる。

【０１５０】

本発明（請求項１７）によれば、請求項１１記載の画像復号化方法であって、前記テーブル切り替えステップは復号化の対象となるブロックが画面内予測復号化を行う場合は画面内予測符号化モードを、画面間予測復号化を行う場合は画面間予測符号化モードを用いて、コードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を切り替えることを特徴とするので、画面内予測符号化モードまたは画面間予測符号化モードを用いて画面内の部分領域ごとに最適なコードテーブルおよびＶＬＣテーブルを参照して符号化されている符号列を正しく復号化することができる。

【０１５１】

本発明（請求項１８）によれば、請求項１３または請求項１４記載の画像復号化方法であって、前記予測ステップは復号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかを用いて予測値を算出することを特徴とするので、前記係数個数の出現確率が大きい

値もしくは小さい値に偏っている画像に対して高い符号化効率を実現している符号列を正しく復号化することができる。

【０１５２】

本発明（請求項１９）によれば、請求項１３または請求項１４記載の画像復号化方法であって、前記予測ステップは予測値の算出方法として周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれを使用しているかが記述された符号列を解釈することによりそれを用いて復号化することを特徴とするので、前記係数個数の出現確率が画面全体において大きい値もしくは小さい値に偏っている画像に対して高い符号化効率を実現している符号列を正しく復号化することができる。

【０１５３】

本発明（請求項２０）によれば、請求項１３または請求項１４記載の画像復号化方法であって、前記予測ステップは復号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値または最大値または最小値または中央値のいずれかを、復号化済の周辺ブロック中に含まれる０以外の係数の個数の平均値の値に応じて選択することによって予測値を算出することを特徴とするので、前記係数個数の出現確率が画面内において部分的に大きい値もしくは小さい値に偏っている画像に対して高い符号化効率を実現している符号列を正しく復号化することができる。

【０１５４】

本発明（請求項２１）によれば、コンピュータにより、請求項１から請求項２０のいずれか１項に記載された画像の符号化および復号化の処理を行うためのプログラムを格納したデータ記憶媒体であって、上記プログラムはコンピュータに請求項１から請求項２０のいずれか１項に記載された動画像の符号化および復号化の処理を行わせるものであることを特徴とするデータ記憶媒体であるので、該プログラムをコンピュータにロードすることにより、請求項１から請求項２０のいずれか１項に記載された画像の符号化および復号化の処理を実現することができる。

【図面の簡単な説明】

【図１】

本発明における符号化処理の動作を説明するためのブロック図

【図２】

本発明の実施の形態１における係数個数符号化処理の動作を説明するためのブロック図

【図３】

本発明の実施の形態１における係数個数符号化処理の動作を説明するためのブロック図

【図４】

本発明の実施の形態１における係数個数符号化処理の動作を説明するためのブロック図

【図５】

参照するブロックの位置関係を示すための模式図

【図６】

係数個数がテーブルを参照することによって符号列に変換される流れの例を示すための模式図

【図７】

本発明の実施の形態２における係数個数符号化処理の動作を説明するためのブロック図

【図８】

本発明の実施の形態２および実施の形態７における係数個数の統計を取る対象となるブロックの位置を示すための模式図

【図９】

本発明の実施の形態３における係数個数符号化処理の動作を説明するためのブロック図

【図１０】

本発明の実施の形態４における係数個数符号化処理の動作を説明するためのブロック図

【図１１】

本発明の実施の形態４および実施の形態９におけるテーブル切替の評価値を算出する方法を示すためのブロック図

【図１２】

本発明の実施の形態５における符号化処理の動作を説明するためのブロック図

【図１３】

本発明の実施の形態５における係数個数符号化処理の動作を説明するためのブロック図

【図１４】

本発明における復号化処理の動作を説明するためのブロック図

【図１５】

本発明の実施の形態６における係数個数復号化処理の動作を説明するためのブロック図

【図１６】

本発明の実施の形態６における係数個数復号化処理の動作を説明するためのブロック図

【図１７】

本発明の実施の形態６における係数個数復号化処理の動作を説明するためのブロック図

【図１８】

係数個数の符号列がテーブルを参照することによって係数個数に変換される流れの例を示すための模式図

【図１９】

本発明の実施の形態７における係数個数復号化処理の動作を説明するためのブロック図

【図２０】

本発明の実施の形態８における係数個数復号化処理の動作を説明するためのブロック図

【図２１】

本発明の実施の形態９における係数個数復号化処理の動作を説明するためのブロ

ック図

【図２２】

本発明の実施の形態１０における係数個数復号化処理の動作を説明するためのブロック図

【図２３】

本発明の実施の形態１１におけるデータ記憶媒体について説明するための模式図

【符号の説明】

１０１　フレームメモリ
１０２　直交変換器
１０３　量子化器
１０４　逆量子化器
１０５　逆直交変換器
１０６　フレームメモリ
１０７　画面間予測器
１０８　画面内予測器
１０９　係数個数検出器
１１０　係数個数記憶器
１１１　係数個数符号化器
１１２　係数値符号化器
１１３　符号列生成器
１１４　スイッチ
１１５　スイッチ
１１６　差分演算器
１１７　加算演算器
２０１　予測値算出器
２０２　コードテーブル記憶器
２０３　コードテーブル選択器
２０４　ＶＬＣテーブル記憶器
２０５　ＶＬＣテーブル選択器

２０６　係数個数符号化器
２０７　差分演算器
３０１　コードテーブル記憶器
３０２　ＶＬＣテーブル記憶器
７０１　コードテーブル生成器
９０１　コードテーブル選択器
９０２　ＶＬＣテーブル選択器
１００１　テーブル選択器
１２０１　係数個数符号化器
１３０１　コードテーブル選択器
１３０２　ＶＬＣテーブル選択器
１４０１　符号列解析器
１４０２　係数個数記憶器
１４０３　係数個数復号化器
１４０４　係数値復号化器
１４０５　逆量子化器
１４０６　逆直交変換器
１４０７　フレームメモリ
１４０８　画面間予測復号器
１４０９　画面内予測復号器
１４１０　スイッチ
１４１１　加算演算器
１５０１　予測値算出器
１５０２　コードテーブル記憶器
１５０３　コードテーブル選択器
１５０４　ＶＬＣテーブル記憶器
１５０５　ＶＬＣテーブル選択器
１５０６　係数個数復号化器
１５０７　加算演算器

１６０１　コードテーブル記憶器

１６０２　ＶＬＣテーブル記憶器

１９０１　コードテーブル生成器

２００１　コードテーブル選択器

２００２　ＶＬＣテーブル選択器

２１０１　テーブル選択器

２２０１　コードテーブル選択器

２２０２　ＶＬＣテーブル選択器

Ｓｅ　　セクタ

Ｔｒ　　トラック

ＦＤ　　フレキシブルディスク

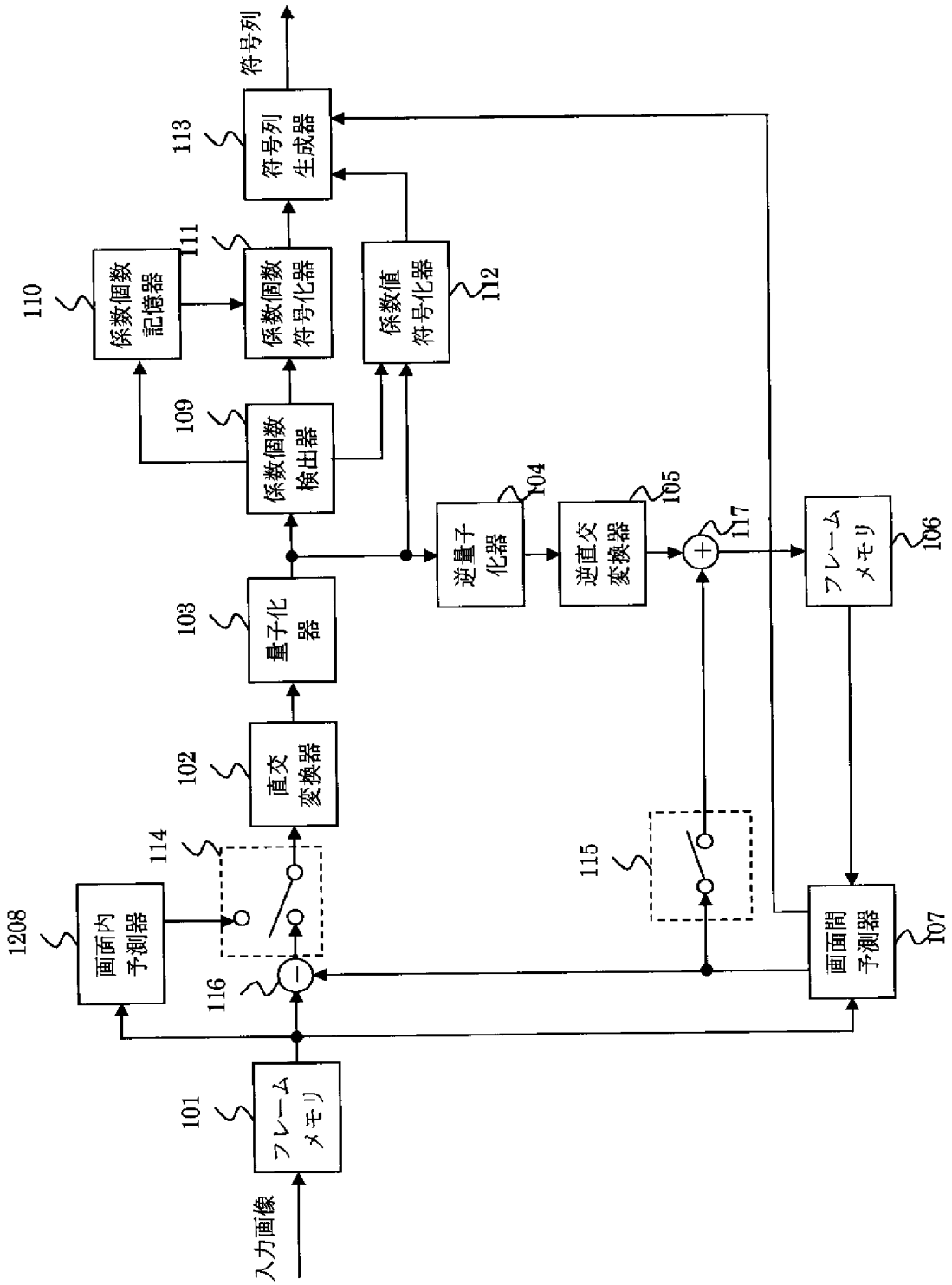
Ｆ　　フレキシブルディスクケース

Ｃｓ　　コンピュータ・システム

ＦＤＤ　　フレキシブルディスクドライブ

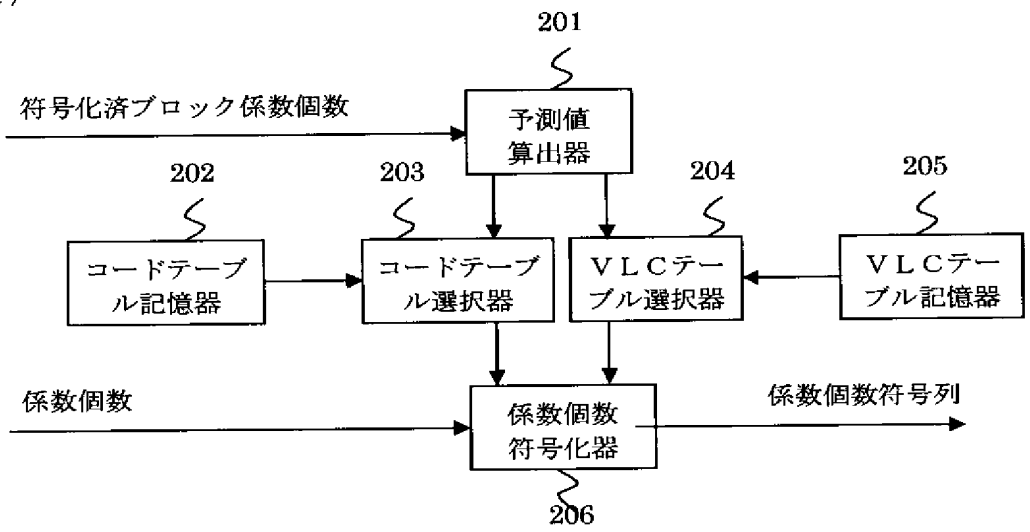
【書類名】　　図面

【図１】

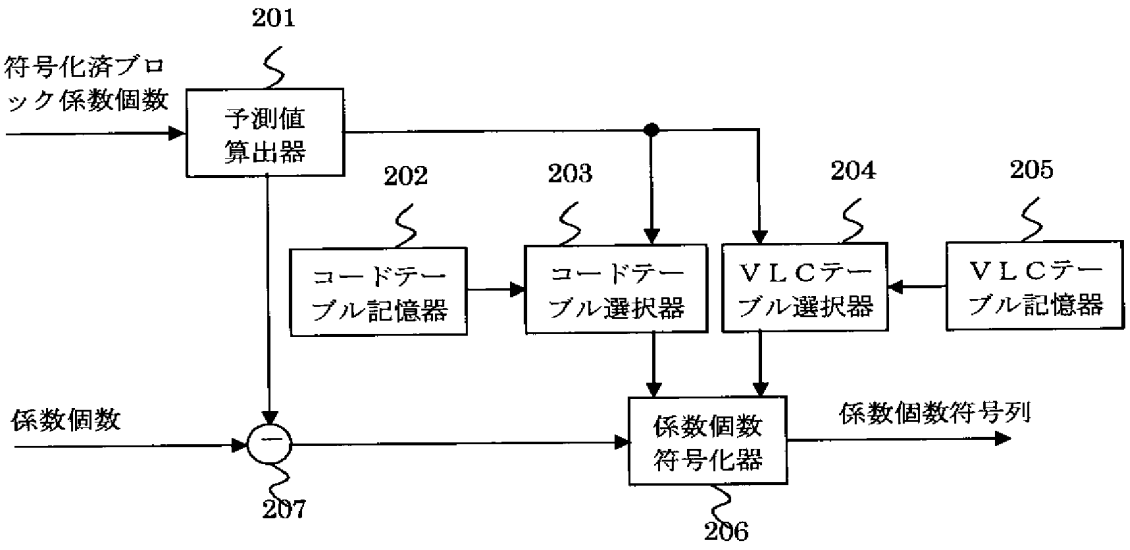

入力画像
フレームメモリ
101
画面内予測器
1208
画面間予測器
107
フレームメモリ
106
直交変換器
102
量子化器
103
逆量子化器
104
逆直交変換器
105
係数個数検出器
109
係数個数記憶器
110
係数個数符号化器
111
係数値符号化器
112
符号列生成器
113
符号列
114
115
116
117

【図２】

（ａ）

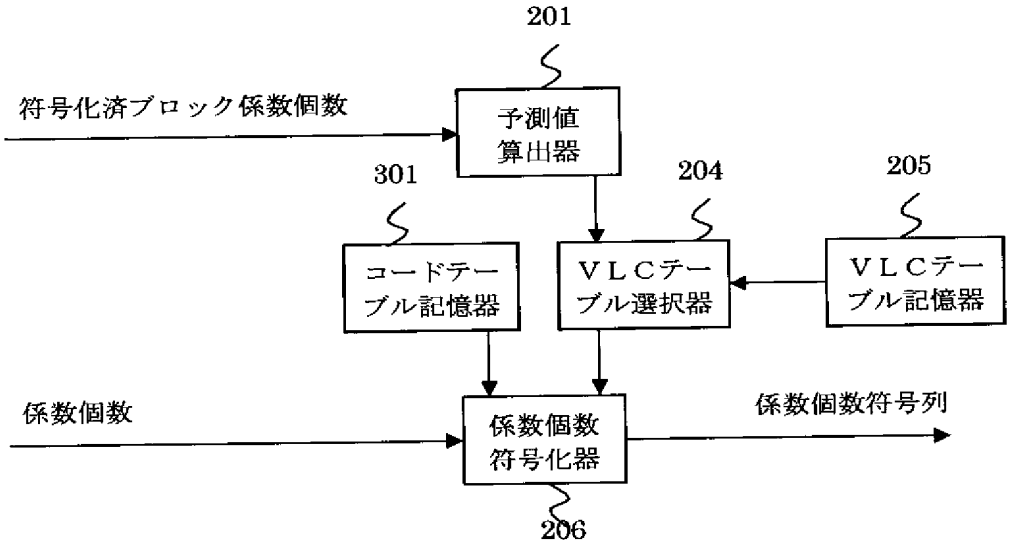

201
符号化済ブロック係数個数
予測値
算出器
202
203
204
205
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数
符号化器
係数個数符号列
206

（ｂ）

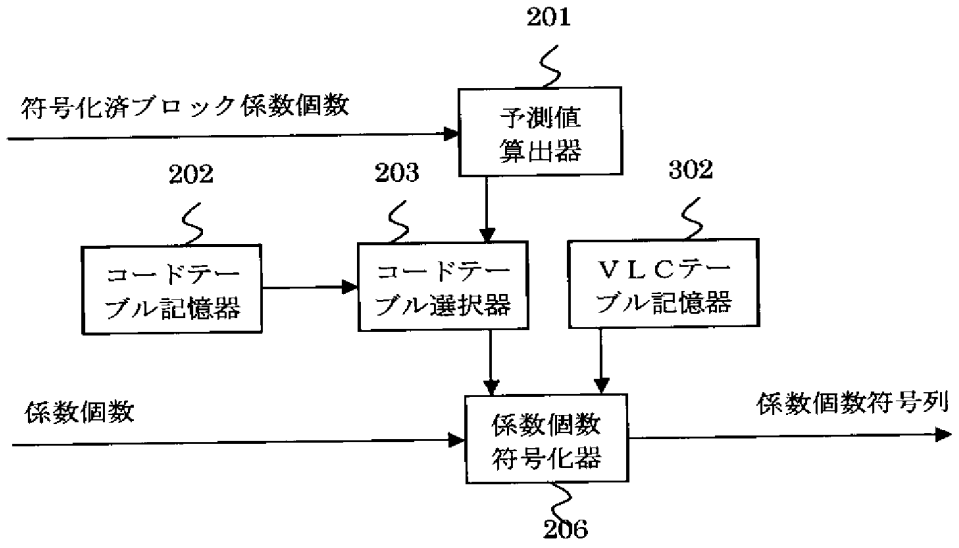

201
符号化済ブロック係数個数
予測値
算出器
202
203
204
205
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数
符号化器
係数個数符号列
207
206

【図３】

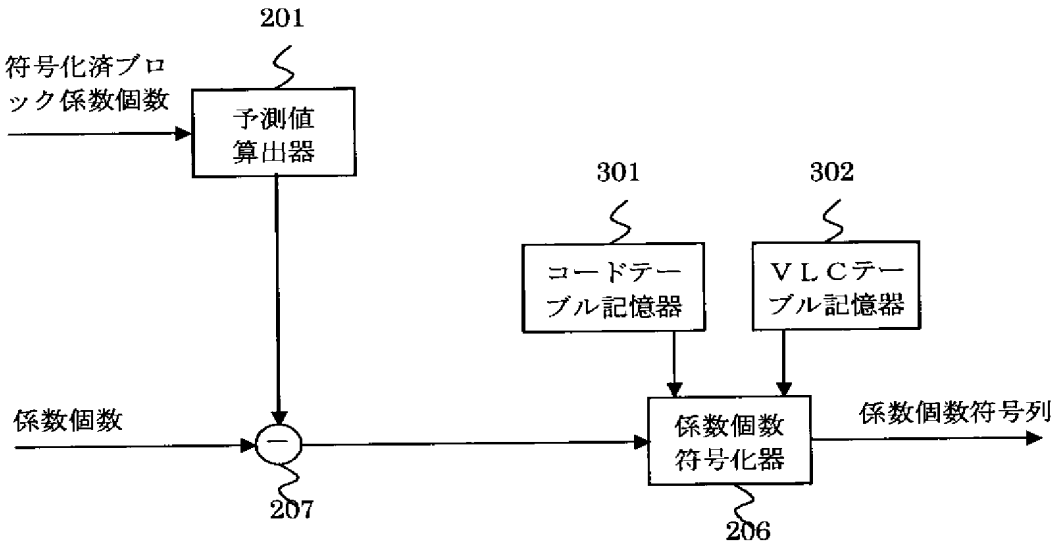
（ａ）


201
符号化済ブロック係数個数
予測値
算出器
301
204
205
コードテー
ブル記憶器
ＶＬＣテー
ブル選択器
ＶＬＣテー
ブル記憶器
係数個数
係数個数
符号化器
係数個数符号列
206

（ｂ）

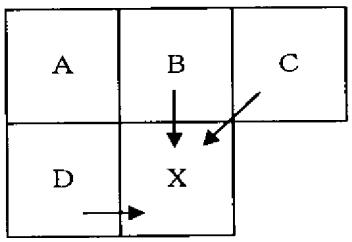

201
符号化済ブロック係数個数
予測値
算出器
202
203
302
コードテー
ブル記憶器
コードテー
ブル選択器
ＶＬＣテー
ブル記憶器
係数個数
係数個数
符号化器
係数個数符号列
206

【図４】

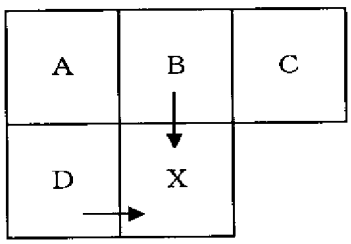

201
符号化済ブロック係数個数
予測値算出器
301
302
コードテーブル記憶器
ＶＬＣテーブル記憶器
係数個数
係数個数符号化器
係数個数符号列
207
206

【図５】

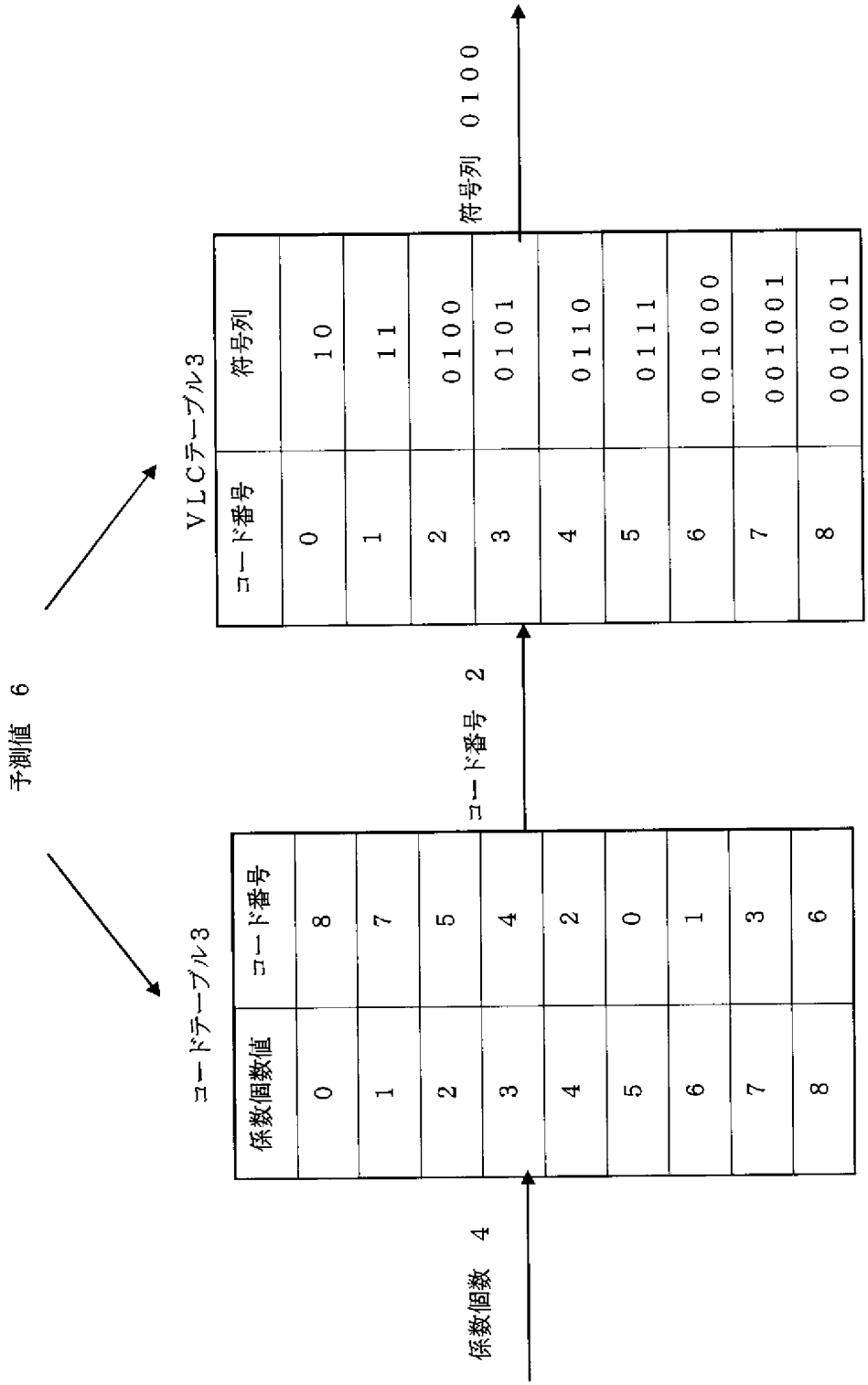
（ａ）


A
B
C
D
X

（ｂ）

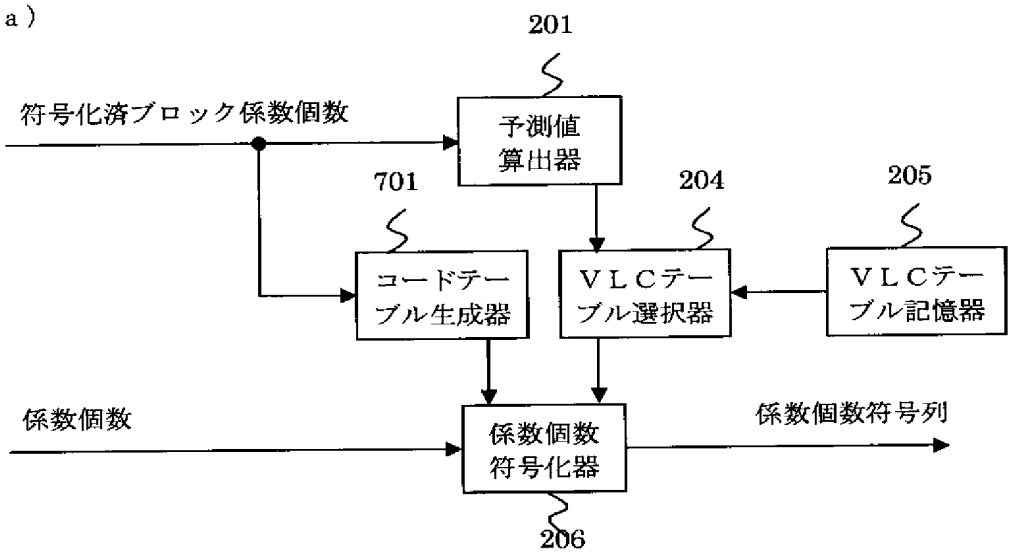

A
B
C
D
X

【図６】

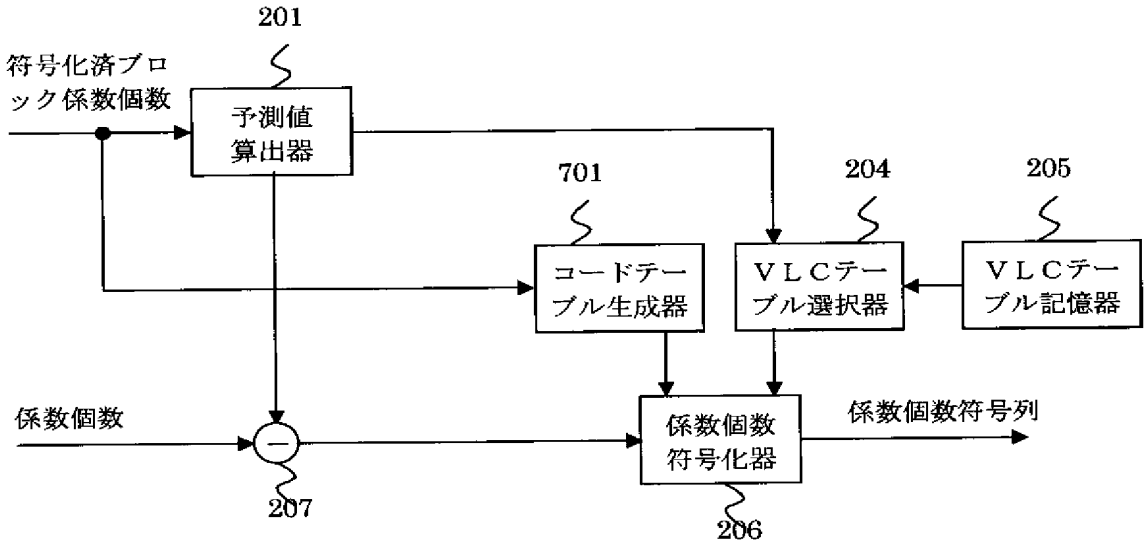

係数個数　4
コードテーブル3
係数個数値
コード番号
0 8
1 7
2 5
3 4
4 2
5 0
6 1
7 3
8 6
コード番号　2
予測値　6
VLCテーブル3
コード番号
符号列
0 10
1 11
2 0100
3 0101
4 0110
5 0111
6 001000
7 001001
8 001001
符号列　0100

【図７】

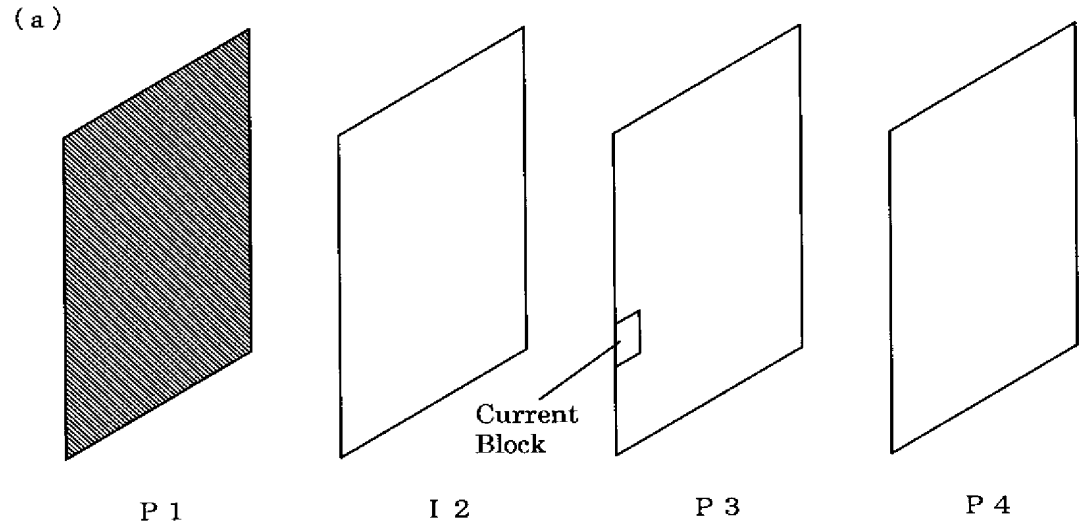
（ａ）

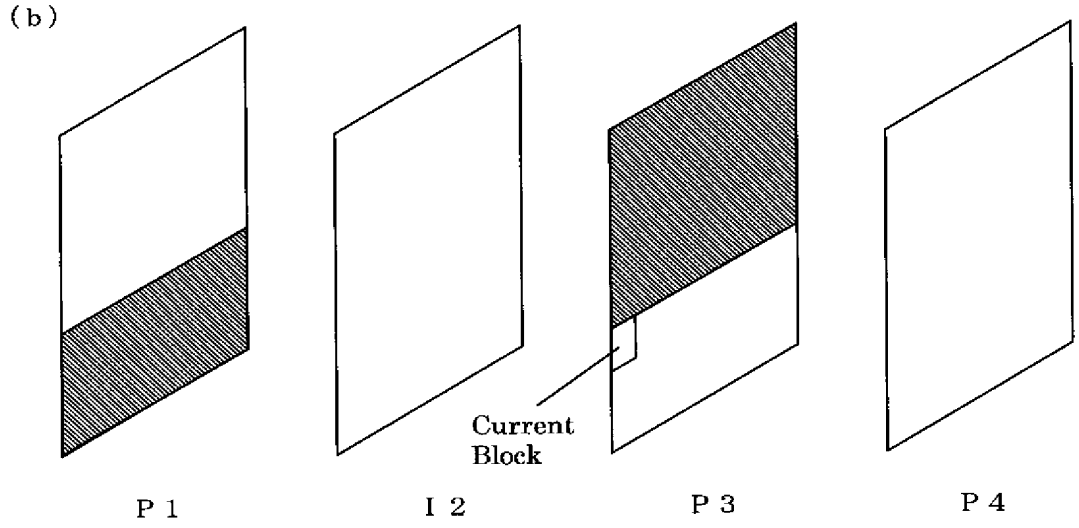

201
符号化済ブロック係数個数
予測値
算出器
701
204
205
コードテーブル生成器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数
符号化器
係数個数符号列
206

（ｂ）


201
符号化済ブロック係数個数
予測値
算出器
701
204
205
コードテーブル生成器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数
符号化器
係数個数符号列
207
206

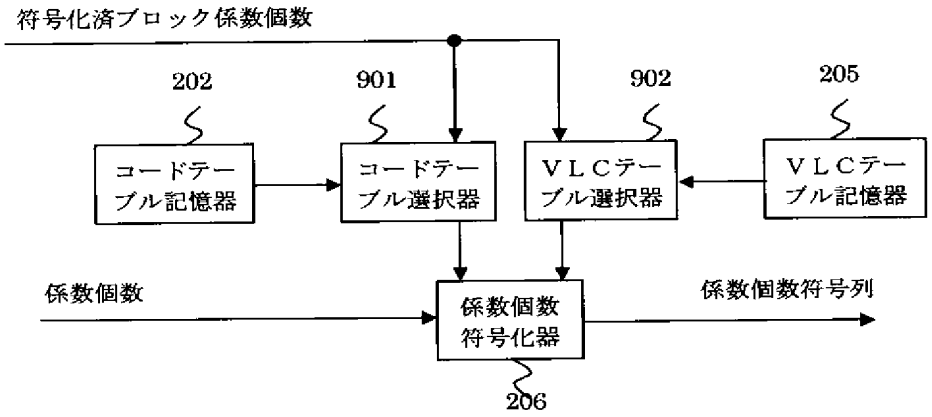
【図８】



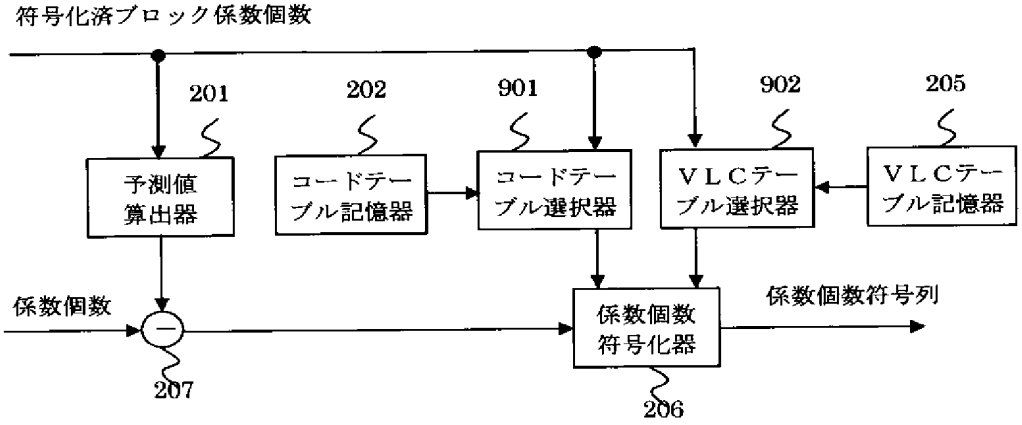


【図９】

（ａ）

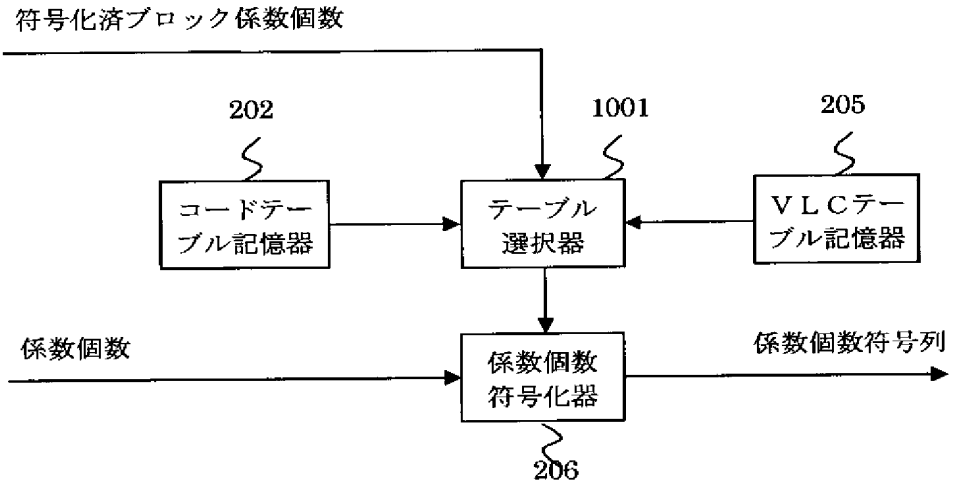

符号化済ブロック係数個数
202
901
902
205
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数符号化器
係数個数符号列
206

（ｂ）

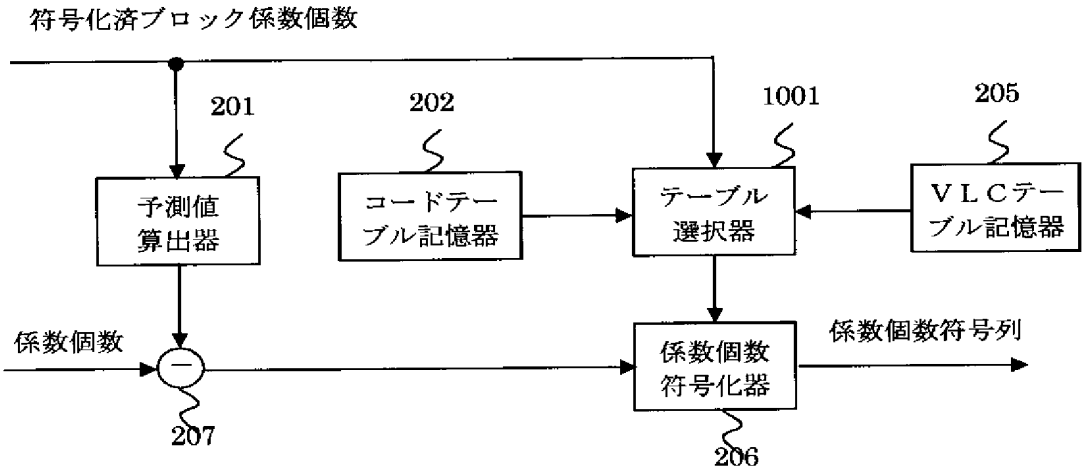

符号化済ブロック係数個数
201
202
901
902
205
予測値算出器
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数符号化器
係数個数符号列
207
206

【図１０】

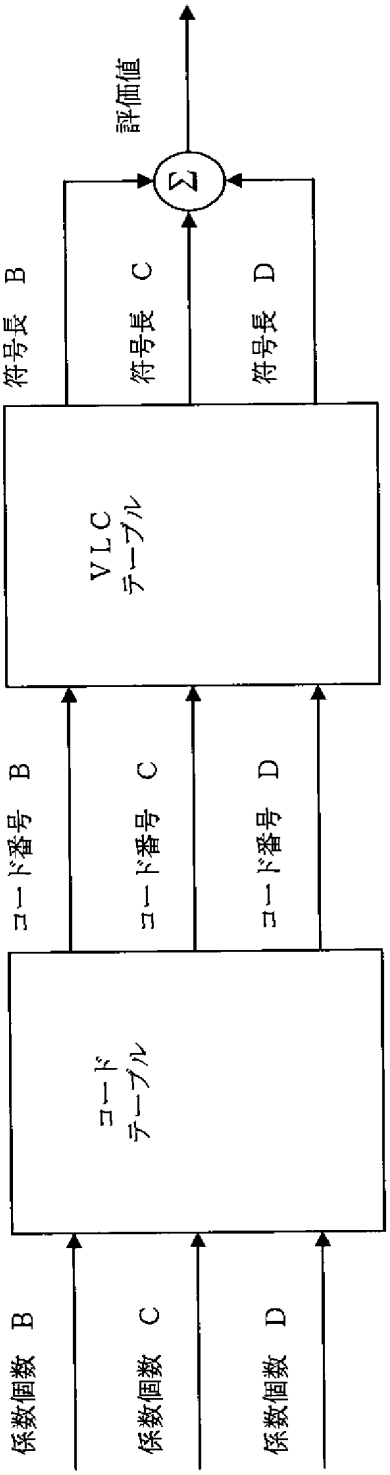
（ａ）


符号化済ブロック係数個数
202
1001
205
コードテーブル記憶器
テーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数符号化器
係数個数符号列
206

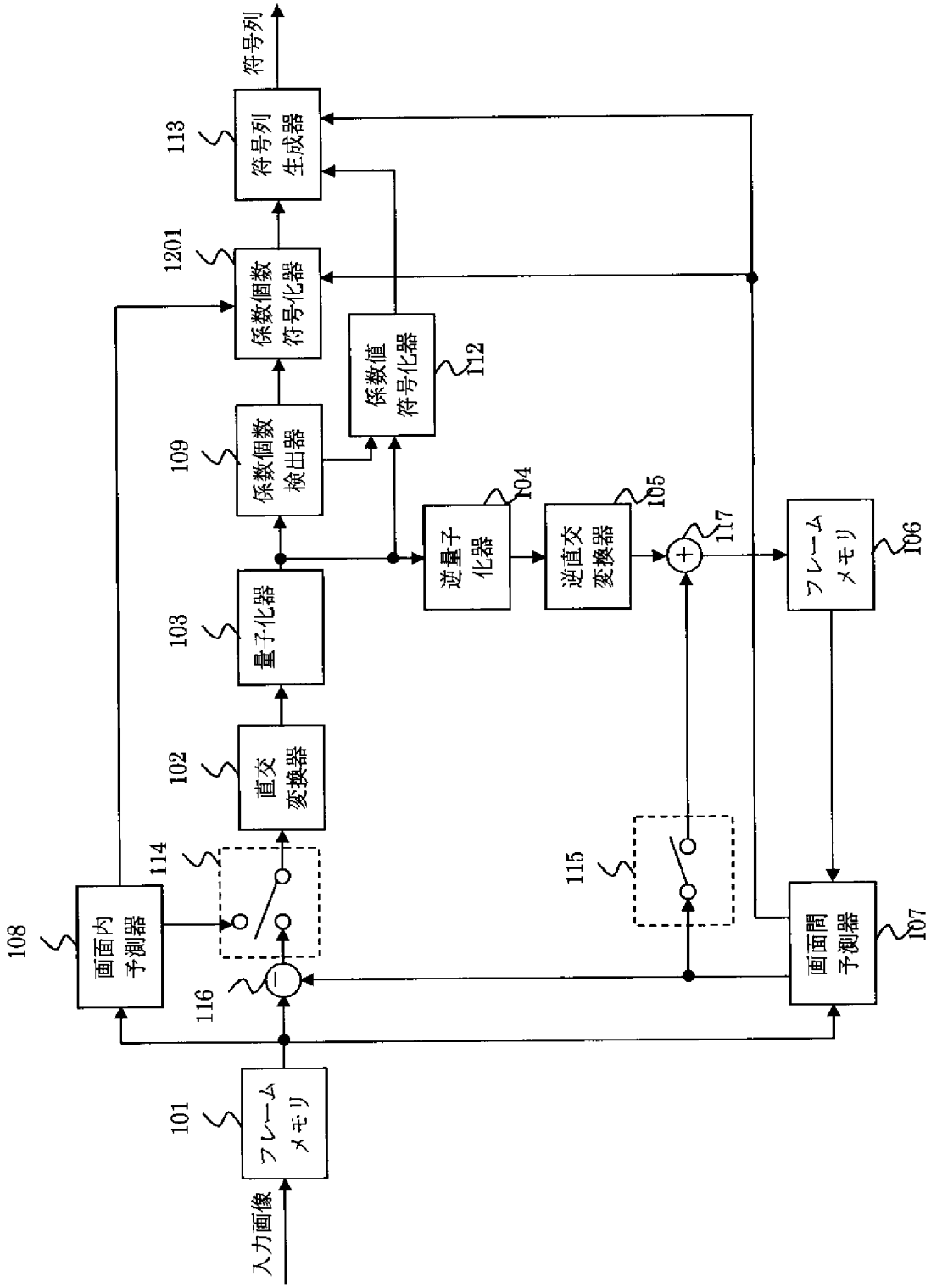
（ｂ）


符号化済ブロック係数個数
201
202
1001
205
予測値算出器
コードテーブル記憶器
テーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数符号化器
係数個数符号列
207
206

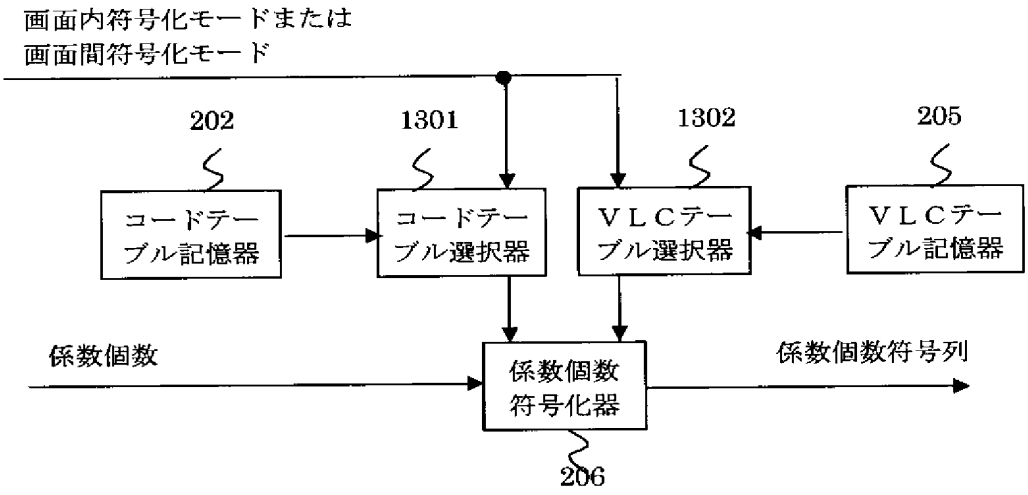
【図１１】


係数個数 B
係数個数 C
係数個数 D
コード テーブル
コード番号 B
コード番号 C
コード番号 D
VLC テーブル
符号長 B
符号長 C
符号長 D
Σ
評価値

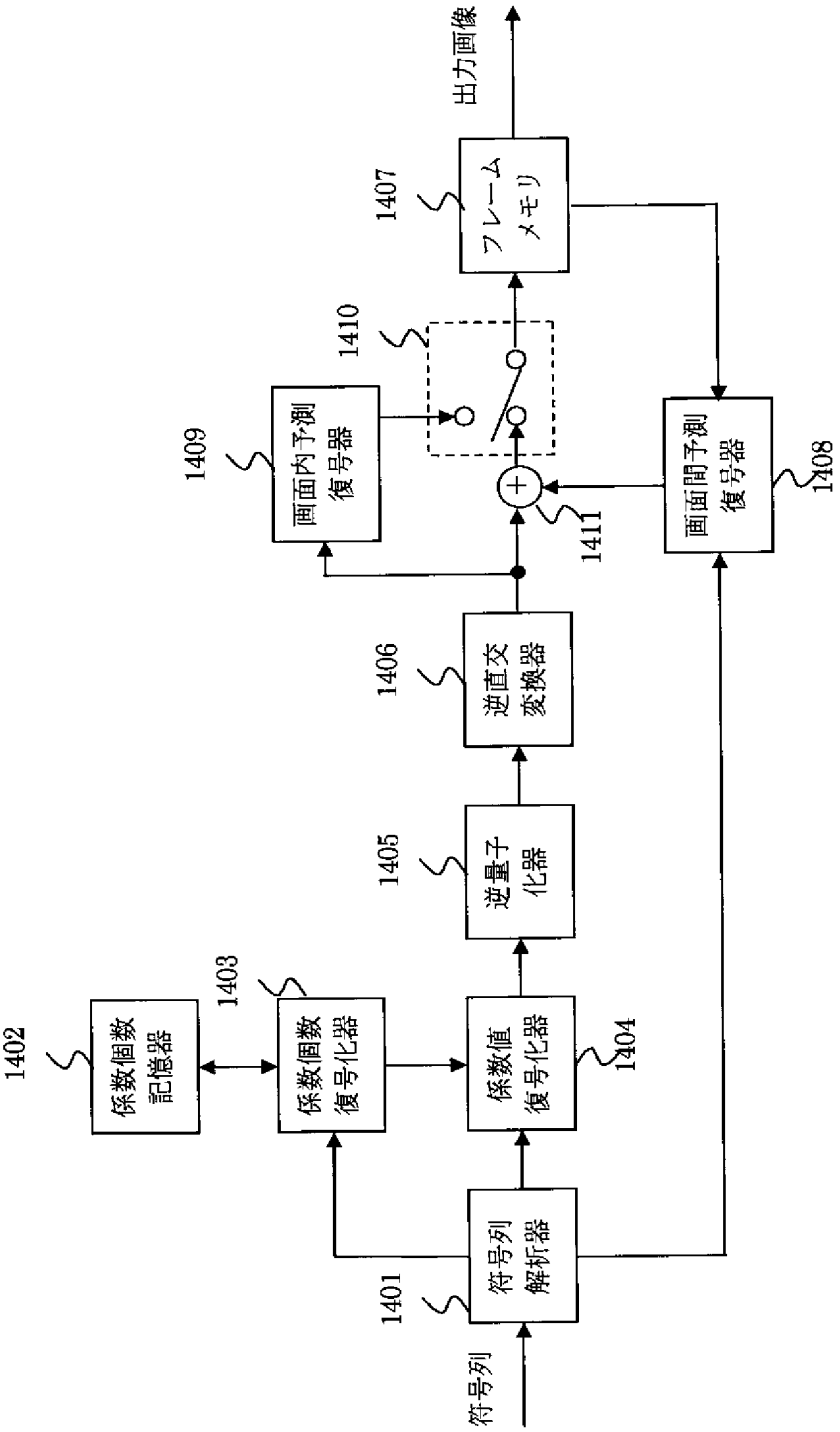
【図１２】


入力画像
フレームメモリ
101
画面内予測器
108
画面間予測器
107
直交変換器
102
量子化器
103
逆量子化器
104
逆直交変換器
105
フレームメモリ
106
係数個数検出器
109
係数個数符号化器
1201
係数値符号化器
112
符号列生成器
113
符号列
114
115
116
117

【図１３】

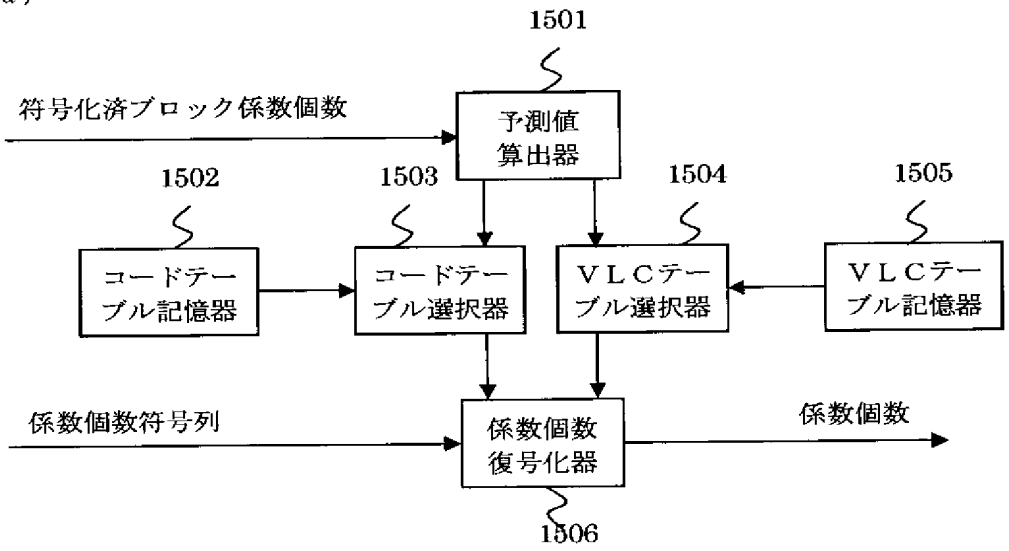

画面内符号化モードまたは
画面間符号化モード
202
1301
1302
205
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数
係数個数符号化器
係数個数符号列
206

【図１４】

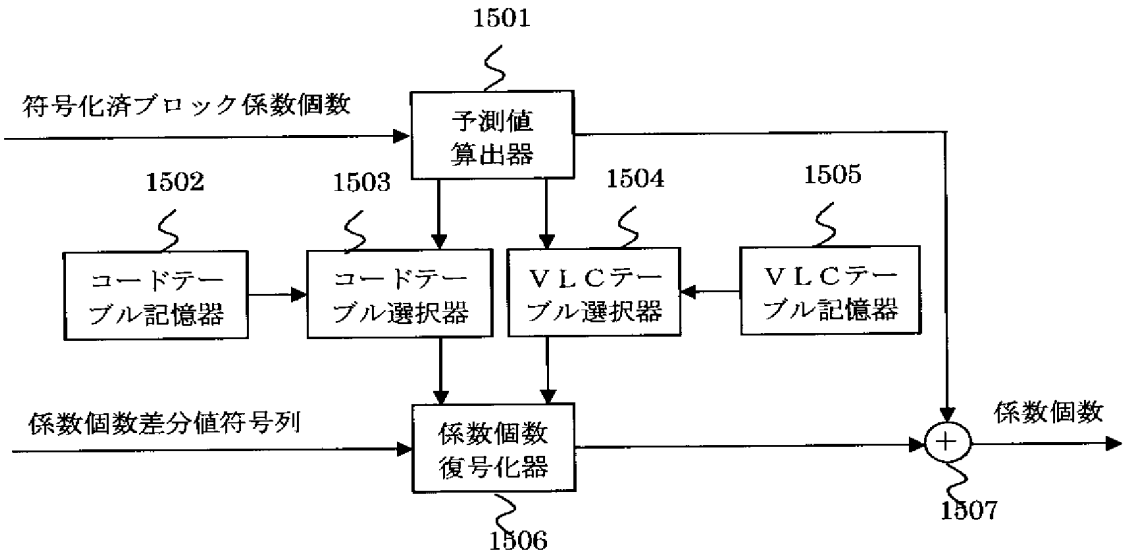

符号列
1401
符号列解析器
1402
係数個数記憶器
1403
係数個数復号化器
1404
係数値復号化器
1405
逆量子化器
1406
逆直交変換器
1407
フレームメモリ
出力画像
1408
画面間予測復号器
1409
画面内予測復号器
1410
1411

【図１５】

（ａ）

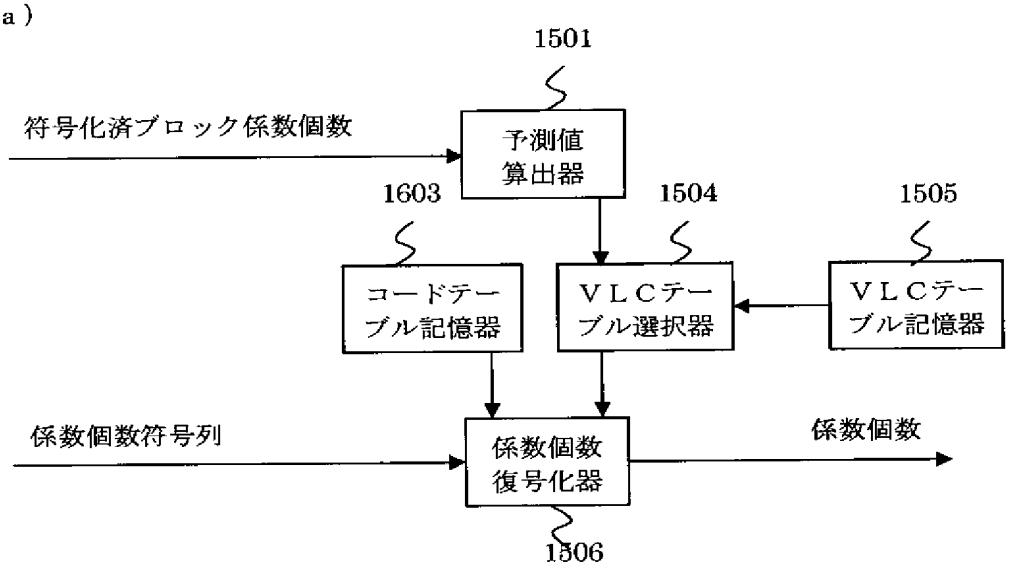

1501
符号化済ブロック係数個数
予測値
算出器
1502
1503
1504
1505
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数符号列
係数個数
復号化器
1506

（ｂ）

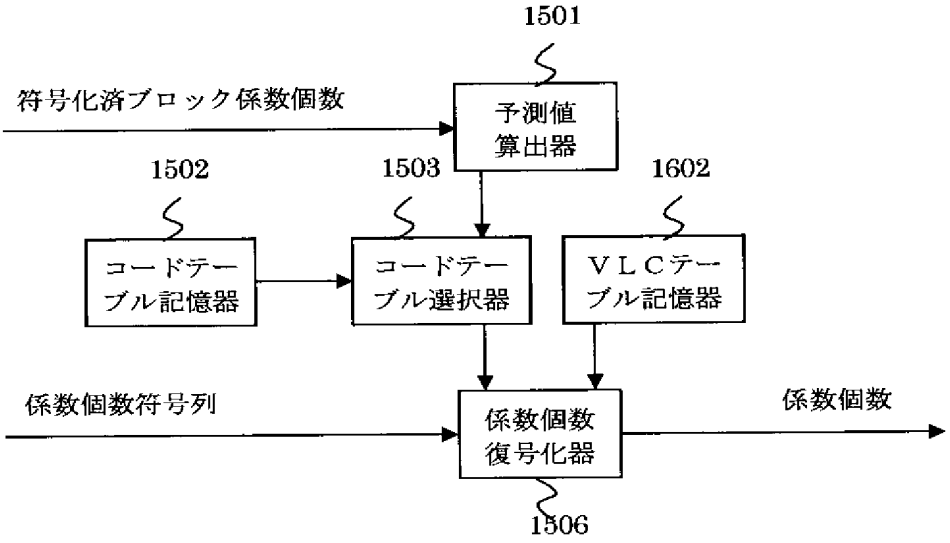

1501
符号化済ブロック係数個数
予測値
算出器
1502
1503
1504
1505
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数差分値符号列
係数個数
復号化器
1506
1507

【図１６】

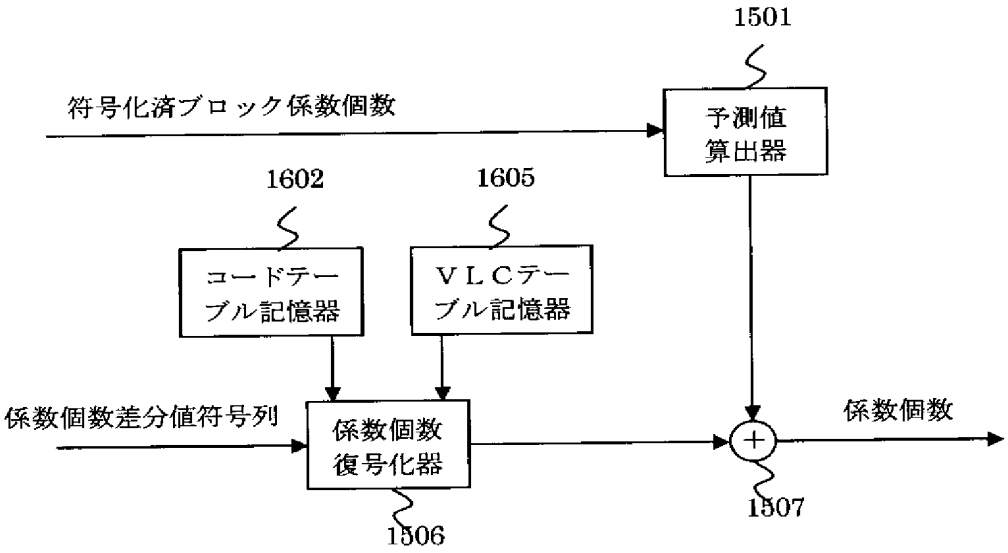
（ａ）


1501
符号化済ブロック係数個数
予測値
算出器
1603
1504
1505
コードテーブル記憶器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数符号列
係数個数
復号化器
1506

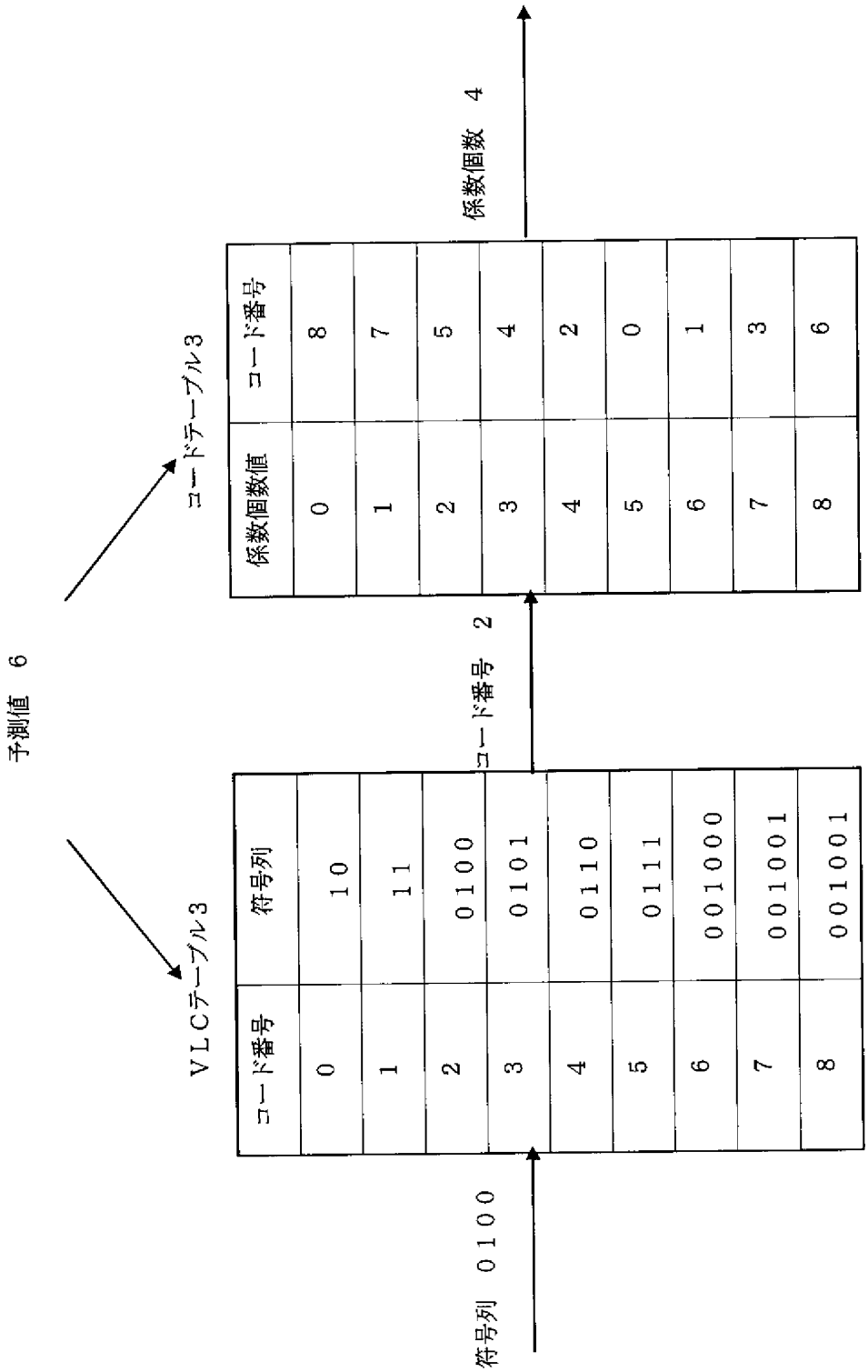
（ｂ）


1501
符号化済ブロック係数個数
予測値
算出器
1502
1503
1602
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル記憶器
係数個数符号列
係数個数
復号化器
1506

【図１７】

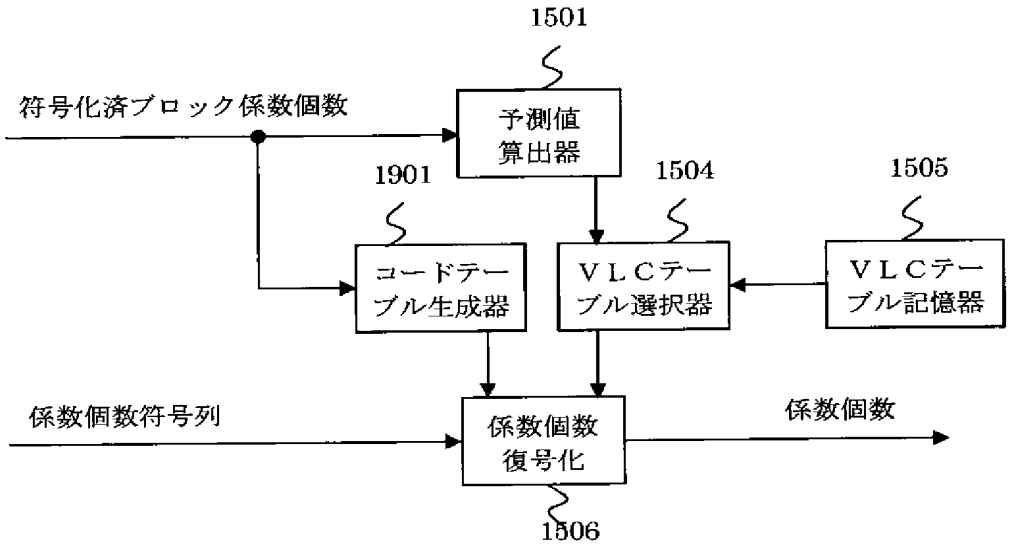

1501
符号化済ブロック係数個数
予測値
算出器
1602
1605
コードテー
ブル記憶器
ＶＬＣテー
ブル記憶器
係数個数差分値符号列
係数個数
復号化器
係数個数
1506
1507

【図１８】

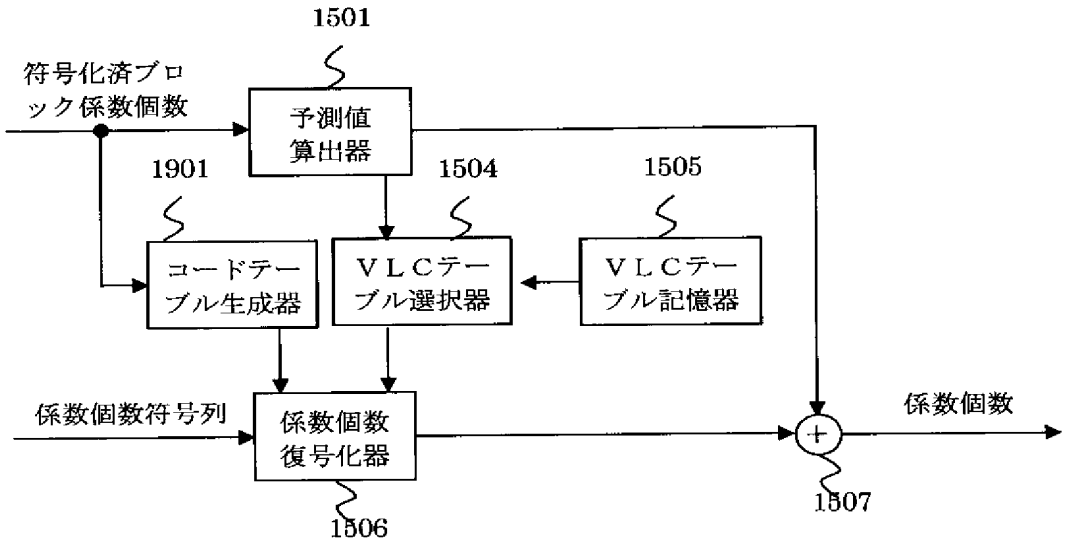

予測値　6
VLCテーブル3
コード番号
符号列
0
10
1
11
2
0100
3
0101
4
0110
5
0111
6
001000
7
001001
8
001001
符号列　0100
コード番号　2
コードテーブル3
係数個数値
コード番号
0
8
1
7
2
5
3
4
4
2
5
0
6
1
7
3
8
6
係数個数　4

【図１９】

（ａ）

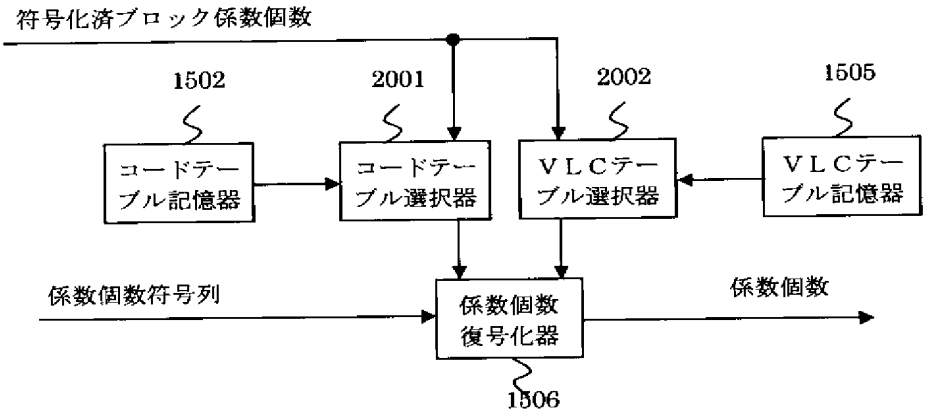

1501
符号化済ブロック係数個数
予測値
算出器
1901
1504
1505
コードテー
ブル生成器
ＶＬＣテー
ブル選択器
ＶＬＣテー
ブル記憶器
係数個数符号列
係数個数
復号化
係数個数
1506

（ｂ）

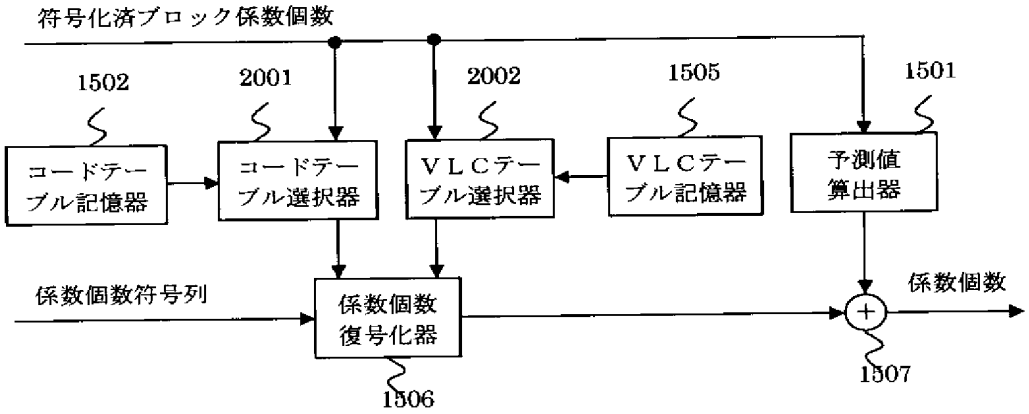

1501
符号化済ブロ
ック係数個数
予測値
算出器
1901
1504
1505
コードテー
ブル生成器
ＶＬＣテー
ブル選択器
ＶＬＣテー
ブル記憶器
係数個数符号列
係数個数
復号化器
係数個数
1507
1506

【図２０】

（ａ）

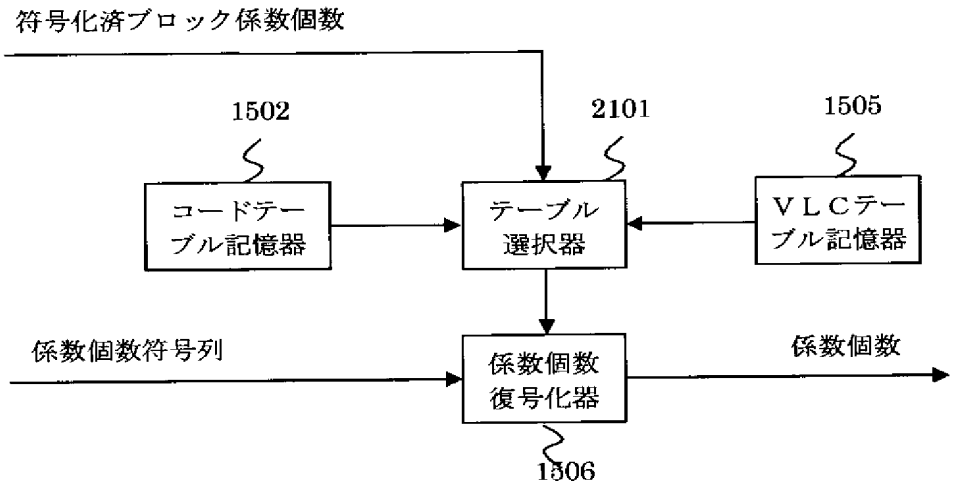

符号化済ブロック係数個数
1502
2001
2002
1505
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数符号列
係数個数復号化器
係数個数
1506

（ｂ）

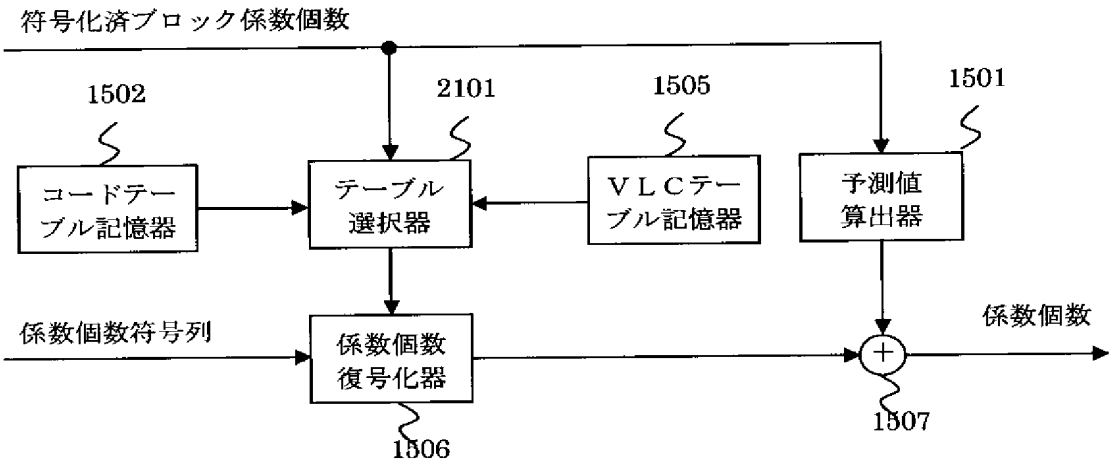

符号化済ブロック係数個数
1502
2001
2002
1505
1501
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
予測値算出器
係数個数符号列
係数個数復号化器
係数個数
1506
1507

【図２１】

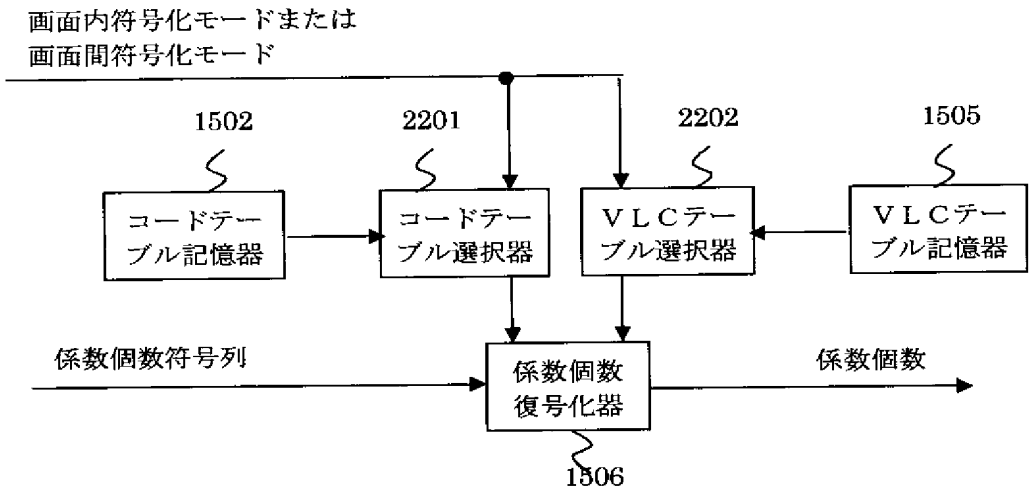
（ａ）


符号化済ブロック係数個数
1502
2101
1505
コードテーブル記憶器
テーブル選択器
ＶＬＣテーブル記憶器
係数個数符号列
係数個数復号化器
係数個数
1506

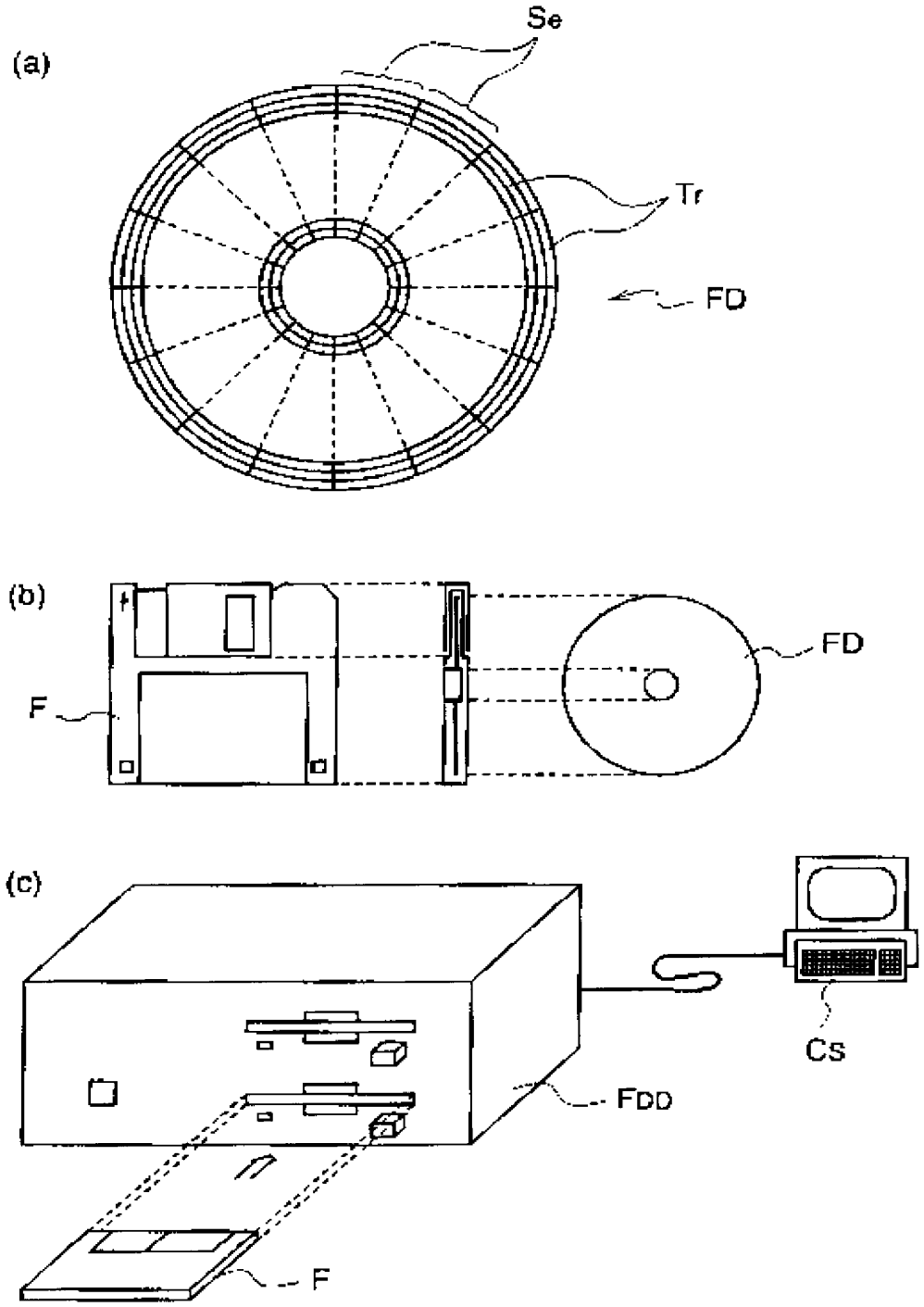
（ｂ）


符号化済ブロック係数個数
1502
2101
1505
1501
コードテーブル記憶器
テーブル選択器
ＶＬＣテーブル記憶器
予測値算出器
係数個数符号列
係数個数復号化器
係数個数
1506
1507

【図２２】


画面内符号化モードまたは
画面間符号化モード
1502
2201
2202
1505
コードテーブル記憶器
コードテーブル選択器
ＶＬＣテーブル選択器
ＶＬＣテーブル記憶器
係数個数符号列
係数個数復号化器
係数個数
1506

【図２３】



【書類名】　要約書

【要約】

【課題】符号化装置および復号化装置おける直交変換によって生成された係数の個数を対象画像の性質によらず常に高い効率で符号化を行うことを実現する。

【解決手段】画像の符号化において、直交変換後の単位ブロック中に含まれる係数の個数に対して可変長符号化を施す動画像符号化装置において、前記係数の個数の符号化行うために符号化済の周辺ブロックの係数個数を用いることによってコードテーブルもしくはＶＬＣテーブルの少なくともどちらか一方を適応的に切り替え、最適なコードテーブルおよびＶＬＣテーブルによって可変長符号化を実現する係数個数符号化器１１１を備えることによって、対象画像の性質によらない高い符号化効率を実現した。

【選択図】　図１

【書類名】手続補正書（方式）

【提出日】平成14年 6月19日

【あて先】特許庁長官殿

【事件の表示】

【出願番号】特願2002-112665

【補正をする者】

【識別番号】000005821

【氏名又は名称】松下電器産業株式会社

【代理人】

【識別番号】100109210

【弁理士】

【氏名又は名称】新居　広守

【発送番号】042201

【手数料補正】

【補正対象書類名】特許願

【予納台帳番号】049515

【納付金額】100

【プルーフの要否】要

出願人履歴

０００００５８２１

19900828

新規登録

５０６１７８４４９

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松下電器産業株式会社

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/976,758	10/26/2007	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 10/29/2007

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 10	Minus	** 20	= 0	X $ =		OR	X $50=	0
Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $210=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT 04/07/2008

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 10	Minus	** 20	= 0	X $ =		OR	X $50 =	0
Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	X $ =		OR	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LYNN NELSON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

U.S. PTO
11/976758
10/26/2007

16179
102607
U.S. PTO

PTO/SB/ (01/01)
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1994, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b)

Attorney Docket No.: 2007_1865

First Named Inventor : Kiyofumi ABE et al.

Title: PICTURE CODING METHOD AND PICTURE DECODING METHOD

Express Mail Label No.:

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

1. [X] Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)

2. [] Small Entity Status is hereby asserted.

3. [X] Specification *[Total Pages: 82]*
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Sequence Listing, a table, or a computer program listing appendix.
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings *(if filed)*
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

4. [X] Drawing(s) *(35 USC 113)* *[Total Sheets: 30]*

5. [X] Oath or Declaration *[Total Pages : 3]*
a.1. [] Newly executed (original or copy)
a.2. [] Unexecuted
b. [X] Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 18 completed)
i. [] DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

6. [] Application Data Sheet (see 37 CFR 1.76)

7. [] CD-ROM or CD-R in duplicate, large table or computer program *(Appendix)*

8. [] Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
a. [] Computer Readable Form
b. Specification Sequence Listing on:
i. [] CD-ROM or CD-R (2 copies); or
ii. [] Paper
c. [] The paper and computer readable copies are identical

ACCOMPANYING APPLICATION PARTS

9. [] Assignment Papers (cover sheet & document(s))
10. [] 37 CFR 3.73(b) Statement *(when there is an assignee)*
[] Power of Attorney
11. [] English Translation Document *(if applicable)*
12. [X] Information Disclosure Statement (IDS)/PTO-1449
[] Copies of IDS Citations
13. [X] Preliminary Amendment
14. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. [] Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. [] Request and Certification under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. [X] Other Claim of Priority under 35 U.S.C. 119

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below, and in a preliminary amendment, or in an Application Data Sheet :*
[X] Continuation [] Divisional [] Continuation-in-part (CIP) of prior application No. 11/453,078

Prior Application Information Examiner Kanjibhai B Patel Group Art Unit 2624

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference therein. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

19. CORRESPONDENCE ADDRESS

CUSTOMER NO.
52349

THE COMMISSIONER IS AUTHORIZED TO CHARGE AND CREDIT DEFICIENCIES IN THE FEE ACCOUNT NO. 23-0975 BY THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

Kenneth W. Fields
Registration No. 52,430

WENDEROTH, LIND & PONACK, L.L.P.
2033 "K" Street, N.W., Suite 800
Washington, D.C. 20006-1021
Phone:(202) 721-8200
Fax:(202) 721-8250

October 26, 2007

Hisense Ex. 1002, p. 451
Hisense v. VideoLabs
IPR2025-01329

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :

Kiyofumi ABE et al. :

Serial No. NEW :

Filed October 26, 2007 : Attorney Docket No. 2007_1865

PICTURE CODING METHOD AND
PICTURE DECODING METHOD
(Rule 1.53(b) Continuation of Serial No. 11/453,078, Filed June 15, 2006)

PATENT OFFICE FEE TRANSMITTAL FORM

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

THE COMMISSIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEES FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

Sir:

Attached hereto is a check in the amount of $1,290.00 to cover Patent Office fees relating to filing the following attached papers:

Rule 53(b) divisional application filing fee	$310.00
Rule 53(b) divisional application examination fee	$210.00
Rule 53(b) divisional application search fee	$510.00
Specification/drawings in excess of 100 pages (1 unit of 50)	$260.00

A duplicate copy of this paper is being submitted for use in the Accounting Division, Office of Finance.

The Commissioner is authorized to charge any deficiency or to credit any overpayment associated with this communication to Deposit Account No. 23-0975, with the EXCEPTION of deficiencies in fees for multiple dependent claims in new applications.

Respectfully submitted,

Kiyofumi ABE et al.

By Kenneth W. Fields
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/ra
WENDEROTH, LIND & PONACK, L.L.P.
2033 K St., N.W., Suite 800
Washington, D.C. 20006-1021
Telephone (202) 721-8200
October 26, 2007

[Check No. 82995]

Hisense Ex. 1002, p. 452
Hisense v. VideoLabs
IPR2025-01329

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :

Kiyofumi ABE et al. :

Serial No. NEW :

Filed October 26, 2007 : Attorney Docket No. 2007_1865

PICTURE CODING METHOD AND
PICTURE DECODING METHOD
(Rule 1.53(b) Continuation
of Serial No. 11/453,078,
Filed June 15, 2006)

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

THE COMMISSIONER IS AUTHORIZED
TO CHARGE ANY DEFICIENCY IN THE
FEES FOR THIS PAPER TO DEPOSIT
ACCOUNT NO. 23-0975

Sir:

Prior to initial examination, please amend the above-identified application as follows:

AMENDMENTS TO THE SPECIFICATION

On page 1, immediately after the title of the invention, please add the following:

This application is a continuation of U.S. patent application Serial No. 11/453,078, filed June 15, 2006, which is a divisional of U.S. Patent Application Serial No. 10/479,831, now Patent No. 7,095,896, which is the National Stage of International Application No. PCT/JP03/03794, filed March 27, 2003.

Hisense Ex. 1002, p. 454
Hisense v. VideoLabs
IPR2025-01329

AMENDMENTS TO THE CLAIMS

1. (Original) A picture coding method for coding, on a block-to-block basis, an image by transforming the image into coefficients showing spatial frequency components, the method comprising:

a predicting step for calculating a predictive value of the number of coefficients other than 0 contained in a current block to be coded based on the numbers of coefficients other than 0 contained in coded blocks located on a periphery of the current block;

a table selecting step for selecting tables for variable length coding based on the predictive value calculated in the predicting step; and

a variable length coding step for performing variable length coding for the number of coefficients other than 0 contained in the current block, with reference to the tables for variable length coding selected in the table selecting step.

2. **(Original)** The picture coding method according to Claim 1,

wherein in the predicting step, the predictive value is calculated using an average value of the numbers of the coefficients other than 0 contained in the coded blocks.

3-33. **(Cancelled)**

Hisense Ex. 1002, p. 455
Hisense v. VideoLabs
IPR2025-01329

REMARKS

The present Preliminary Amendment is submitted to cancel original claims 3-33, and to provide the requisite cross-reference to the parent applications.

If there are any issues that the Examiner feels may best be resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Kiyofumi ABE et al.

By _____
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/ra
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
October 26, 2007

Hisense Ex. 1002, p. 456
Hisense v. VideoLabs
IPR2025-01329

DESCRIPTION

PICTURE CODING METHOD AND PICTURE DECODING METHOD

Technical Field

The present invention relates to a picture coding method and a picture decoding method for coding an image digitally so as to transfer or store it.

Background Art

A coding of moving pictures, in general, divides a picture into a certain size of blocks and performs intra picture prediction and inter picture prediction for each block. It then applies orthogonal transformation, for example, discrete cosine transform or the like for each block of the smallest unit of a division (i.e. 4x4 pixels) so as to perform coding using variable length coding based on run level coding for coefficients showing spatial frequency components gained by orthogonal transformation.

The variable length coding assigns variable length code to values of the coefficients contained in the block to which orthogonal transformation is applied (level) as well as to numbers consisting of a series of a coefficient 0 (run). In this case, a table which corresponds the values with variable length code is called a VLC table. Under the conventional method, only one table is prepared as a VLC table respectively for intra prediction coding and inter prediction coding (reference to ISO/IEC 14496-2:1999(E) Information technology -- coding of audio-visual objects Part 2: Visual (1999-12-01) P. 119 7.4.1 Variable length decoding).

Under the variable length coding method explained in the existing technique, only one table is prepared as a VLC table respectively for intra prediction coding and inter prediction coding. Therefore, it contains a problem that coding efficiency differs greatly depending on a quality of a current picture to be coded.

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In order to solve this problem, a method of preparing a plurality of tables so as to refer to them by switching between them according to the number of coefficients other than 0 contained in a current block to which orthogonal transformation is applied is conceivable. For realizing this, it is necessary to perform coding by applying variable length coding for the numbers of the coefficients other than 0, however, the coding method and the decoding method are not yet established.

Disclosure of Invention

The present invention has been devised in view of these circumstances and it is an object of the present invention to suggest a picture coding method as well as a picture decoding method that realize coding of the number of coefficients other than 0 contained in the block to which orthogonal transformation is applied with high efficiency regardless of the quality of the current picture.

In order to solve the problem as mentioned above, a picture coding method according to the present invention codes, on a block-to-block basis, an image by transforming the image into coefficients showing spatial frequency components and comprises: a predicting step for calculating a predictive value of the number of coefficients other than 0 contained in a current block to be coded based on the numbers of coefficients other than 0 contained in coded blocks located on a periphery of the current block; a table selecting step for selecting tables for variable length coding based on the predictive value calculated in the predicting step; and a variable length coding step for performing variable length coding for the number of the coefficients other than 0 contained in the current block with reference to the tables for variable length coding selected in the table selecting step.

Thus, it realizes an improvement in coding efficiency since it

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is possible to refer to optimal tables for variable length coding when coding the number of the coefficients other than 0 contained in the current block.

Also, in the predicting step, the predictive value is calculated using an average value of the numbers of the coefficients other than 0 contained in the coded blocks.

Also, the tables for variable length coding include at least one VLC table. In the table selecting step, the VLC table is selected based on the predictive value calculated in the predicting step and in the variable length coding step, the number of the coefficients other than 0 contained in the current block is transformed into a variable length code with reference to the VLC table selected in the table selecting step.

The tables for variable length coding include at least one code table and one VLC table. In the table selecting step, a code table and a VLC table are selected based on the predictive value calculated in the predicting step and in the variable length coding step, the number of the coefficients other than 0 contained in the current block is transformed into a code number with reference to the code table selected in the table selecting step and then the code number is transformed into a variable length code with reference to the VLC table selected in the table selecting step.

The picture coding method comprises a keeping step for keeping the numbers of the coefficients other than 0 contained in the coded blocks neighboring an uncoded block at least until the uncoded block is coded.

In the predicting step, the predictive value of the number of the coefficients other than 0 contained in the current block is calculated based on the numbers of the coefficients other than 0 contained in the coded blocks located above and on the left of the current block.

In the predicting step, a value 0 is set as the predictive value

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when no coded blocks are found above and on the left of the current block.

In the predicting step, an average value of the numbers of the coefficients other than 0 contained in the coded blocks located above and on the left of the current block is calculated as the predictive value when the coded blocks are found above and on the left of the current block.

In the predicting step, the number of the coefficients other than 0 contained in the coded block on the left of the current block is set as the predictive value when the coded block is found on the left but not above the current block.

In the predicting step, the number of the coefficients other than 0 contained in the coded block above the current block is set as the predictive value when the coded block is found above but not on the left of the current block.

In the predicting step, a value 0 is set as the predictive value when upper and left boundaries of the current block are either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections.

In the predicting step, an average value of the numbers of the coefficients other than 0 contained in the coded blocks located above and on the left of the current block is set as the predictive value when upper and left boundaries of the current block are neither a boundary of pictures, each of which is a unit of the picture nor a boundary of slices, each of which is what the picture is divided into a plurality of sections.

In the predicting step, the number of the coefficients other than 0 contained in the coded block on the left of the current block is set as the predictive value when an upper boundary of the current block is either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the

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picture is divided into a plurality of sections, and the left boundary is neither the boundary of pictures nor the boundary of slices.

In the predicting step, the number of the coefficients other than 0 contained in the coded block above the current block is set as the predictive value when a left boundary of the current block is either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections, and an upper boundary is neither the boundary of pictures nor the boundary of slices.

A picture decoding method according to the present invention decodes, on a block-to-block basis, an image that is coded by transforming the image into coefficients showing spatial frequency components and comprises:

a predicting step for calculating a predictive value of the number of the coefficients other than 0 contained in a current block to be decoded based on numbers of coefficients other than 0 contained in decoded blocks located on a periphery of the current block;

a table selecting step for selecting tables for variable length decoding based on the predictive value calculated in the predicting step; and

a variable length decoding step for performing variable length decoding for the number of the coefficients other than 0 contained in the current block with reference to the tables for variable length decoding selected in the table selecting step.

Thus, it realizes a correct decoding of a bit stream, in which the number of the coefficients other than 0 contained in the block is coded, referring to optimal tables for variable length decoding.

Also, in the predicting step, the predictive value is calculated using an average value of the numbers of the coefficients other than 0 contained in the decoded blocks.

Also, the tables for variable length decoding include at least

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one VLC table. In the table selecting step, the VLC table is selected based on the predictive value calculated in the predicting step, and in the variable length decoding step, a variable length code showing the number of coefficients other than 0 contained in the current block is transformed into said number of the coefficients other than 0 contained in the current block, with reference to the VLC table selected in the table selecting step.

The tables for variable length decoding include at least one code table and one VLC table. In the table selecting step, the code table and the VLC table are selected based on the predictive value calculated in the predicting step, and in the variable length decoding step, a variable length code showing the number of coefficients other than 0 contained in the current block is transformed into a code number with reference to the VLC table selected in the table selecting step, and then the code number is transformed into said number of the coefficients other than 0 contained in the current block, with reference to the code table selected by the table selecting step.

The picture decoding method comprises a keeping step for keeping the numbers of the coefficients other than 0 contained in the decoded blocks neighboring an undecoded block at least until the undecoded block is decoded.

In the predicting step, the predictive value of the number of the coefficients other than 0 contained in the current block is calculated based on the numbers of the coefficients other than 0 contained in the decoded blocks located above and on the left of the current block.

In the predicting step, a value 0 is set as the predictive value when no decoded blocks are found above and on the left of the current block.

In the predicting step, an average value of the numbers of the coefficients other than 0 contained in the decoded blocks

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located above and on the left of the current block is set as the predictive value when the decoded blocks are found above and on the left of the current block.

In the predicting step, the number of the coefficients other than 0 contained in the decoded block on the left of the current block is set as the predictive value when the decoded block is found on the left but not above.

In the predicting step, the number of the coefficients other than 0 contained in the decoded block above the current block is set as the predictive value when the decoded block is found above but not on the left of the current block.

In the predicting step, a value 0 is set as the predictive value when upper and left boundaries of the current block are either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections.

In the predicting step, an average value of the numbers of the coefficients other than 0 contained in the decoded blocks located above and on the left of the current block is set as the predictive value when upper and left boundaries of the current block are neither a boundary of pictures, each of which is a unit of the picture nor a boundary of slices, each of which is what the picture is divided into a plurality of sections.

In the predicting step, the number of the coefficients other than 0 contained in the decoded block on the left of the current block is set as the predictive value when an upper boundary of the current block is either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections, and a left boundary of the block is neither the boundary of pictures nor the boundary of slices.

In the predicting step, the number of coefficients other than

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0 contained in the decoded block above the current block is set as the predictive value when a left boundary of the current block is either the boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections, and an upper boundary of the block is neither the boundary of pictures nor the boundary of slices.

The present invention is realized not only as a picture coding method and a picture decoding method, but also as a picture coding device and a picture decoding device including the characteristic steps contained in these methods as means. It is realized also as a program which causes a computer to execute these steps or as a bit stream created by the picture coding method. Such a program can surely be distributed through a storage medium like CD-ROM and a transmission medium like Internet.

Brief Description of Drawings

Fig. 1 is a block diagram showing a structure of an embodiment of a picture coding device using a picture coding method according to the present invention.

Fig. 2A is a pattern diagram showing a sketch of a processing order of macroblocks in each picture. Fig. 2B is a pattern diagram showing macroblocks which belong to coded blocks used for reference in order to encode a number of coefficients of a current block to be coded.

Fig. 3A is a block diagram showing a structure of a coefficient number encoder according to the first embodiment of the present invention. Fig. 3B is a block diagram showing a structure of a transformational example of the coefficient number encoder.

Fig. 4A and Fig. 4B are pattern diagrams showing a physical position of a current block to be coded and the coded blocks used for the reference. Fig. 4A presents a case of using three adjacent

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blocks whereas Fig. 4B presents a case of using two adjacent blocks.

Fig. 5 is a pattern diagram showing an example of a flow when the number of coefficients is transformed into a bit stream with reference to tables.

Fig. 6A and Fig. 6B are pattern diagrams showing reference blocks for a current macroblock to be coded. Fig. 6A presents a case of using three adjacent blocks whereas Fig. 6B presents a case of using two adjacent blocks.

Fig. 7A, Fig. 7B and Fig. 7C are pattern diagrams showing an operation in which a coefficient number storing unit stores the numbers of coefficients. Fig. 7A presents a case where a processing proceeds to the next macroblock whereas Fig. 7B presents a case where the processing further proceeds to the next macroblock. Fig. 7C presents a case where the current macroblock is located at the right edge of the picture and the processing shifts to the next macroblock.

Fig. 8A, Fig. 8B and Fig. 8C are block diagrams showing a structure of a transformational example of a coefficient number encoder according to the first embodiment of the present invention. Fig. 8A presents a case of fixing a code table. Fig. 8B presents a case of fixing a VLC table. The Fig. 8C presents a case of using only a VLC table without using code tables.

Fig. 9 is a block diagram showing a structure of a transformational example of the coefficient number encoder according to the first embodiment of the present invention.

Fig. 10A is a block diagram showing a structure of a coefficient number encoder according to the second embodiment of the present invention. Fig. 10B is a block diagram showing a structure of a transformational example of the coefficient number encoder.

Fig. 11A and Fig. 11B are pattern diagrams for showing a

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position of blocks targeted for statistics of the numbers of coefficients according to the second and the seventh embodiments of the present invention.

Fig. 12A is a block diagram showing a structure of a coefficient number encoder according to the third embodiment of the present invention. Fig. 12B is a block diagram showing a structure of a transformational example of the coefficient number encoder.

Fig. 13A is a block diagram showing a structure of a coefficient number encoder according to the fourth embodiment of the present invention. Fig. 13B is a block diagram showing a structure of a transformational example of the coefficient number encoder.

Fig. 14 is a block diagram for showing a method of calculating an evaluation value obtained by the table switching according to the fourth and the ninth embodiments of the present invention.

Fig. 15 is a block diagram showing a structure of a picture coding device according to the fifth embodiment of the present invention.

Fig. 16 is a block diagram showing a structure of a coefficient number encoder according to the fifth embodiment of the present invention.

Fig. 17 is a block diagram showing a structure of an embodiment of a picture decoding device using a picture decoding method according to the present invention.

Fig. 18A is a block diagram showing a structure of a coefficient number decoder according to the sixth embodiment of the present invention. Fig. 18B is a block diagram showing a structure of a transformational example of the coefficient number decoder.

Fig. 19 is a pattern diagram showing an example of a flow when a bit stream of a number of coefficients is transformed into

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the number of coefficients with reference to tables.

Fig. 20A and Fig. 20B are block diagrams showing a structure of a transformational example of a coefficient number decoder according to the sixth embodiment of the present invention. Fig. 20A presents a case of fixing a code table. Fig. 20B presents a case of fixing a VLC table. Fig. 20C presents a case of using a VLC table without using code tables.

Fig. 21 is a block diagram showing a structure of a transformational example of a coefficient number decoder according to the sixth embodiment of the present invention.

Fig. 22A is a block diagram for explaining an operation of processing showing a structure of a coefficient number decoder according to the seventh embodiment of the present invention. Fig. 22B is a block diagram showing a structure of a transformational example of the coefficient number decoder.

Fig. 23A is a block diagram for explaining an operation of processing showing a structure of a coefficient number decoder according to the eighth embodiment of the present invention. Fig. 23B is a block diagram showing a structure of a transformational example of the coefficient number decoder.

Fig. 24A is a block diagram for explaining an operation of processing which shows a structure of the coefficient number decoder according to the ninth embodiment of the present invention. Fig. 24B is a block diagram showing a structure of a transformational example of the coefficient number decoder.

Fig. 25 is a block diagram for explaining an operation of processing which shows a structure of a coefficient number decoder according to the tenth embodiment of the present invention.

Fig. 26A and Fig. 26B are illustrations regarding a recording medium for storing a program in order to realize a picture coding method as well as a picture decoding method of each embodiment

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in a computing system. Fig.26A is an explanatory diagram showing an example of a physical format of a flexible disk which is a main body of a recording medium. Fig. 26B is an explanatory diagram showing a full appearance of the flexible disk, a structure at cross section and the flexible disk itself. Fig. 26C is an illustration showing a structure for recording and reproducing the program on the flexible disk FD.

Fig. 27 is a block diagram showing a whole structure of a content providing system which realizes a content delivery service.

Fig. 28 is a sketch showing an example of a cell phone.

Fig. 29 is a block diagram showing an internal structure of the cell phone.

Fig. 30 is a block diagram showing a whole system of a digital broadcasting system.

Best Mode for Carrying Out the Invention

The following describes the embodiments of the present invention with reference to the diagrams and equations.

(First embodiment)

Fig. 1 is a block diagram showing a structure of an embodiment of a picture coding device using a picture coding method according to the present invention.

The picture coding device includes, as shown in Fig. 1, frame memories 101 and 106, an orthogonal transforming unit 102, a quantizing unit 103, an inverse quantizing unit 104, an inverse orthogonal transforming unit 105, an inter picture predicting unit 107, an intra picture predicting unit 108, a coefficient number detecting unit 109, a coefficient number storing unit 110, a coefficient number encoder 111, a coefficient value encoder 112, a bit stream generating unit 113, switches 114 and 115, a difference calculating unit 116 and an addition calculating unit 117.

The frame memory 101 stores moving pictures inputted on a picture-to-picture basis in display order. The inter picture

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predicting unit 107 detects motion vectors which show a position predicted as optimal in the searching area in the picture, using picture data reconstructed in a coding device as reference pictures so as to create predictive picture data based on the motion vectors. The difference calculating unit 116 calculates a difference between the input picture data read out from the frame memory 101 and the predictive picture data inputted from the inter picture predicting unit 107 so as to create predictive residual picture data.

The intra picture predicting unit 108 creates predictive picture data using the picture data of the coded area in the current picture and creates predictive residual picture data by calculating the difference between the created predictive picture data and the input picture data.

The orthogonal transforming unit 102 performs orthogonal transformation to the inputted predictive residual picture data. The quantizing unit 103 performs a quantization to the orthogonal transformed data and creates coefficients showing spatial frequency components which is an object for variable length coding. The inverse quantizing unit 104 performs inverse quantization to the coefficients created in the aforementioned processing. The inverse orthogonal transforming unit 105 performs inverse orthogonal transformation to the inverse quantized data and creates reconstructed predictive residual picture data. The addition calculating unit 117 adds the reconstructed residual picture data inputted from the inverse orthogonal transforming unit 105 and the predictive picture data inputted from the inter predicting unit 107 and creates reconstructed picture data. The frame memory 106 stores the created reconstructed picture data.

The coefficient number detecting unit 109 detects the number of coefficients having a value other than 0 (hereafter simply refers to number of coefficients) from each block by examining the value of the created coefficient. The coefficient

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number storing unit 110 stores the numbers of coefficients detected by the coefficient number detecting unit 109. The coefficient number encoder 111 refers to the values of the coefficients in the block, that are already coded and stored in the coefficient number storing unit 110 and performs coding for the numbers of the coefficients using a method to be mentioned later. The coefficient value encoder 112 performs variable length coding for the values of the coefficients themselves with reference to VLC tables necessary for variable length coding by switching between them using the numbers of the coefficients detected by the coefficient number detecting unit 109. The bit stream generating unit 113 generates a bit stream by adding other information on the motion vectors or the like inputted from the inter picture prediction unit 107 to the numbers of the coefficients and the values of the coefficients, which are coded.

Next, an explanation regarding an operation of a picture coding device constructed as above follows.

The moving pictures targeted for coding are inputted to the frame memory 101 on a picture-to-picture basis in display order and then reordered in the order of coding. Each picture is divided into a block of, for instance, 16 (horizontal) x 16 (vertical) pixels called macroblock, and subsequent processing take place using the unit of macroblock. Fig. 2A is a pattern diagram showing a sketch of a processing order of macroblocks in each picture whereas Fig. 2B is a pattern diagram showing macroblocks to which the coded blocks used for reference in order to encode the numbers of the coefficients in the current block belong. The Fig. 2B shows a case where a macroblock MB13 is the current macroblock.

Coding of the macroblocks in each picture starts from upper left, one by one, to the right, as shown in the Fig. 2A, goes one step down when it comes to the right edge and starts again from the left to the right. The macroblock, which is read out from the frame

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memory 101, is firstly inputted to the inter picture predicting unit 107 when a current macroblock to be coded is coded using inter picture prediction. The inter picture predicting unit 107 uses reconstructed picture data of the coded pictures stored in the frame memory 106 as reference pictures for detecting motion vectors in each block [i.e. 4 (horizontal) x 4(vertical) pixels] which is a further divided macroblock. The inter picture predicting unit 107 outputs predictive picture data created by the detected motion vectors to the difference calculating unit 116. The difference calculating unit 116 creates predictive residual picture data by measuring the difference between the predictive picture data and the input picture data of the current macroblock.

On the contrary, for coding the target macroblock by means of intra picture prediction, the macroblock which is read out from the frame memory 101 is firstly inputted to the intra picture predicting unit 108. The intra picture predicting unit 108 performs intra picture prediction using the information on the surrounding blocks and creates predictive residual picture data.

The thus created predictive residual picture data goes through processing of orthogonal transformation at the orthogonal transforming unit 102, processing of a quantization at the quantizing unit 103 for each block and then is transformed into the coefficients for which variable length coding is to be performed. These coefficients are inputted to the coefficient number detecting unit 109, to the coefficient value encoder 112 and to the inverse quantizing unit 104.

The coefficient number detecting unit 109 detects the number of coefficients having a value other than 0 in each block. The numbers of coefficients detected here are stored in the coefficient number storing unit 110. The coefficient number encoder 111 refers to the values by reading out from the coefficient number storing unit 110 the numbers of the coefficients in the

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coded blocks and performs coding for the number of the coefficients of the current block. Also, the coefficient value encoder 112 performs coding of the values of the coefficients themselves using the numbers of the coefficients detected by the coefficient number detecting unit 109. Lastly, the bit stream generating unit 113 generates a definitive bit stream by adding, to the bit stream, the numbers of the coefficients and the values of the coefficients, which are coded, together with other information on the motion vectors or the like.

The coefficients inputted to the inverse quantizing unit 104 go through the processing of inverse quantization at the inverse quantizing unit 104 as well as the processing of inverse orthogonal transformation at the inverse orthogonal transforming unit 105, and then, are transformed into reconstructed predictive residual picture data. Next, the addition calculating unit 117 adds the reconstructed predictive residual picture data and the predictive picture data inputted from the inter picture predicting unit 107 so as to create reconstructed picture data and stores it in the frame memory 106.

Thus, a sequence of coding is explained above. As for variable length coding processing of the numbers of coefficients performed by the coefficient number encoder 111, the detail is explained with reference to Fig. 3 ~ Fig. 9 as well as Chart 1 ~ Chart 7.

Fig. 3A is a block diagram showing in detail an internal structure of the coefficient number encoder 111.

Here, an example of using two tables of a code table and a VLC table in order to perform variable length coding for the number of coefficients is shown. The code table is a table for transforming the number of coefficients into a code number whereas the VLC table is a table for transforming the code number gained by the code table into variable length code.

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The coefficient number encoder 111 includes, as shown in Fig. 3A, a predictive value calculating unit 201, a code table storing unit 202, a code table selecting unit 203, a VLC table selecting unit 204, a VLC table storing unit 205 and a coefficient number encoder 206.

Firstly, the numbers of coefficients of coded blocks on the periphery are inputted from the coefficient number storing unit 110 shown in the Fig. 1 to the predictive value calculating unit 201. The predictive value calculating unit 201 determines the predictive value by calculating an average value of these values. A maximum value, a minimum value or a medium value may be used instead of the average value as a method to determine the predictive value.

Fig. 4A is a pattern diagram showing a location relationship between a current block to be coded and the coded blocks to be used for the reference. Here, a block X is a current block whereas three blocks in a position of blocks B, C and D are reference blocks. As for the three blocks in the position of the blocks B, C and D, when blocks which are neither coded nor located outside the picture or outside the slice which is a picture divided into a plurality of sections, occurs, a change is made to the reference blocks as in Chart 1.

<Chart 1>

B	C	D	Reference block
○	○	○	B, C, D
○	×	○	A, B, D
×	×	○	D
○	○	×	B, C
×	×	×	None

As for signs in Chart 1, a sign ○ signifies a coded block and a sign X signifies a block which can not be referred to since it is

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neither coded nor located outside the picture or outside the slice. For example, when only a block C can not be referred to, it shows that the references are blocks A, B and D. Chart 1 shows a relation between a condition of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. Also, if no reference blocks are found, either a value 0 or other arbitrary value is given directly as a predictive value.

The code table selecting unit 203 selects a code table for an actual use from a plurality of code tables stored in the code table storing unit 202 in accordance with a predictive value calculated by the predictive value calculating unit 201.

Chart 2 is an example of a code table in which numbers of coefficients correspond to code numbers prepared beforehand by the code table storing unit 202.

<Chart 2>

Coefficient number value	Code table 1	Code table 2	Code table 3	Code table 4
0	0	4	8	8
1	1	2	7	7
2	2	0	5	6
3	3	1	4	5
4	4	3	2	4
5	5	5	0	3
6	6	6	1	2
7	7	7	3	1
8	8	8	6	0

According to this example, a code table 1, for example, assigns code numbers which are identical to numbers of coefficients whereas a code table 2 assigns the code numbers so that a value 2 of the coefficient number plays a central role. Four types of code tables are prepared here; however, the numbers of

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types of tables and values of tables are not limited to those used in Chart 2. Also, Chart 3 presents selection criteria for code tables based on a predictive value.

<Chart 3>

Predictive value	Reference table
0~2	Code table 1
3~5	Code table 2
6~8	Code table 3
9~16	Code table 4

According to this example, the code table selecting unit 203 selects a code table as follows: it refers to a code table 1 when the predictive value calculated by the predictive calculating unit 201 is no more than 2 whereas it refers to a code table 2 when the predictive value is more than or equal to 3 and less than or equal to 5. The way of assigning predictive values and the items of reference tables are not limited to those used in Chart 3.

The VLC table selecting unit 204 selects a VLC table for actual use from a plurality of VLC tables stored in the VLC table storing unit 205 in accordance with the predictive value calculated by the predictive calculating unit 201.

Chart 4 is an example of a VLC table in which code numbers prepared in advance by the VLC table storing unit 205 correspond with variable length codes.

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<Chart 4>

Code number	VLC table 1	VLC table 2	VLC table 3	VLC table 4
0	0	1	10	100
1	01	010	11	101
2	001	011	0100	110
3	0001	00100	01012	111
4	00001	00101	0110	01000
5	000001	00110	0111	01001
6	0000001	00111	001000	01010
7	00000001	0001000	001001	01011
8	000000001	0001001	001010	01100

According to this example, a VLC table 1, in comparison with a VLC table 4, is designed with a tendency that an amount of bit increases if the code number is large and decreases if the code number is small. It shows that the VLC table 1 can perform variable length coding more efficiently when an apparition probability of the code number concentrates in the area where the values are small while the VLC table 4 can perform more efficiently when the apparition probability scatters to the area where the values are big. Four types of tables are prepared here; however, the numbers of types of tables and the values of tables are not limited to those used in Chart 4. Also, Chart 5 presents selection criteria for VLC tables based on a predictive value.

<Chart 5>

Predictive value	Reference table
0~1	VLC table 1
2~3	VLC table 2
4~6	VLC table 3
7~16	VLC table 4

According to this example, the VLC table selecting unit 204 selects a VLC table as follows: it refers to a VLC table 1 when the

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predictive value calculated by the predictive value calculating unit 201 is no more than 1 whereas it refers to a VLC table 2 when the predictive value is more than or equal to 2 and less than or equal to 3. The way of assigning predictive values and the items of reference tables are not limited to those used in Chart 5.

The coefficient number encoder 206 refers to the code table and the VLC table which are selected by the above processing and performs variable length coding of the number of the coefficients in the inputted current block. The coefficient number encoder 206 firstly transforms the number of coefficients into a code number using the code table and then transforms it into a variable length code corresponded to the code number, using the VLC table. Fig. 5 is a pattern diagram showing an example of coding when the predictive value calculated by the predictive calculating unit 201 is "6" and the number of the coefficients in the current block is "4". A code table 3 shown in Fig. 5 is selected at the code table selecting unit 203 using Chart 3 and Chart 2 according to the predictive value "6" and also a VLC table 3 shown in Fig. 5 is selected at the VLC table selecting unit 204 using Chart 5 and Chart 4. The coefficient number encoder 206 transforms the inputted number of the coefficients "4" into a code number "2" according to the code table 3 and furthermore creates a definitive bit stream "0100" according to the VLC table 3.

Next, as for a storing processing of number of coefficients performed by the coefficient number storing unit 110, the detail is explained. Fig. 6A is a pattern diagram showing reference blocks with respect to a current macroblock to be coded in the predictive value calculating unit 201. Here, a black border containing the blocks coded as B1 ~ B16 shows the current macroblock whereas a hatched section shows the reference blocks with respect to the current macroblock. Also, the numbers assigned to the blocks indicate the order of coding in the macroblock.

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The coefficient number storing unit 110, for example, at the time of starting the processing of the current macroblock shown in Fig. 6A stores the numbers of coefficients detected by the coefficient number detecting unit 109, at least for the reference blocks shown in Fig. 6A which are necessary for the current macroblock. Namely, the coefficient number storing unit 110 stores the numbers of coefficients detected according to the blocks of the current macroblock (B1, B2, B3, ... and B16) which are to be processed sequentially. For example, when the current block is a block B6, the coefficient number storing unit 110 stores the numbers of each coefficient of B1, B2, B3, B4 and B5 which are already processed in addition to the reference blocks shown as hatched in Fig. 6A. Then, the coefficient number storing unit 110 stores the number of coefficients of this block B6 when it is detected by the coefficient number detecting unit 109. Thus, the coefficient number storing unit 110 stores the numbers of the coefficients detected from the blocks in the current macroblocks (B1, B2, B3, ... and B16) which are to be processed sequentially.

Then, for example, when the current macroblock is a macroblock MB11 shown in Fig. 2, the coefficient number storing unit 110 at least stores the numbers of the coefficients of the blocks in a bottom row and a right column (hatched blocks) of the macroblock MB11 as shown in Fig. 7A when the processing of the macroblock MB11 terminates and proceeds to the next macroblock MB12. Next, when the processing of the macroblock MB12 terminates and the processing proceeds to the next macroblock MB13, the coefficient number storing unit 110 stores at least the numbers of the coefficients for the blocks located in the bottom row and in the right column of the macroblock MB12 in the same way as well as the numbers of coefficients of the blocks in the bottom row of the macroblock MB11 (hatched blocks) as shown in Fig. 7B.

For example, when the current macroblock is located in the

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right edge of the picture as the macroblock MB9 shown in Fig. 2B, the coefficient number storing unit 110 stores at least the numbers of coefficients of the blocks in the bottom row of the macroblock MB9 (hatched blocks) as shown in Fig. 7B when the processing of the macroblock MB9 terminates and the processing proceeds to the next macroblock MB10.

When the current macroblock is located in the bottom edge of the picture as MBm shown in Fig. 2B, the coefficient number storing unit 110 stores at least the numbers of the coefficients of the blocks in the right column of the macroblock MBm as shown in Fig. 7C when the processing of the macroblock MBm terminates and the processing proceeds to the next macroblock MBn.

The coefficient number storing unit 110 thus stores the numbers of coefficients for the blocks to be referred to. It is possible to delete, in an arbitrary timing, the information on the number of coefficients of the blocks other than those to be stored in the above explanation if they are no longer used for reference. For example, it is possible to delete when processing proceeds to the next macroblock as well as while processing the macroblock. Also, the numbers of coefficients in the blocks which are no longer used for reference do not always need processing of deleting. For instance, the coefficient number storing unit 110 may identify the numbers of coefficients in the blocks which are not referred to any longer as unnecessary and may overwrite to them if necessary.

It is explained above that it is possible to refer to the numbers of the coefficients of the coded blocks by storing them in the coefficient number storing unit 110. A system for calculating the number of coefficients, however, may be used, if necessary, by storing not the values of the number of the coefficients themselves but, for instance, the values of the coefficients in the blocks, which are transformed into spatial frequency components.

In the present embodiment, it is possible, as mentioned

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above, to calculate a predictive value using the numbers of the coefficients in the coded adjacent blocks so as to perform coding of the number of coefficients efficiently even to the pictures whose apparition probability of the coefficients is not even by referring to the code table and the VLC table adaptively according to the predictive value.

Also, it can, as described above, correspond to a fluctuation of a position where the apparition probability of the number of coefficients is the highest with reference to the code table by switching them according to the predictive value. It can also correspond to the size of the dispersion of the apparition probability of the number of coefficients by switching the VLC tables for reference according to the predictive value. Consequently, it is possible to perform effectively coding of the number of coefficients.

It is also possible to use only two blocks located in the position of blocks B and D for a current block X to be coded as shown in Fig. 4B in stead of using three neighboring blocks as reference blocks as shown in Fig. 4A at the predictive value calculating unit 201. A change is made concerning reference blocks as in Chart 6 when it happens that either of two blocks in the position of the blocks B and D is neither coded nor located outside the picture nor outside the slice.

<Chart 6>

B	D	Reference block
○	○	B, D
×	○	D
○	×	B
×	×	None

As for signs in Chart 6, a sign ○ signifies a coded block and a sign X signifies a block which can not be referred to since it is

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neither coded nor located outside the picture nor outside the slice as in Chart 1. Chart 6 shows a relation between conditions of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. If no reference blocks are found, either a value 0 or other arbitrary value can be given directly as a predictive value. In this case, the coefficient number storing unit 110 may only store the numbers of coefficients detected at the coefficient number detecting unit 109, at least for the reference blocks shown in Fig. 6B, which are necessary for the current macroblock.

It is also possible, as a method to calculate a predictive value in the predictive value calculating unit 201, for example, to select an optimal method according to each sequence, each GOP, each picture or each slice rather than to fix the method to use either of an average value, a maximum value, a minimum value or a medium value. The code for identifying the calculating method then selected is added at a header section of the sequence, the GOP, the picture or the slice. The slice is a picture divided into a plurality of sections. A section of one column in a transverse direction sectioned on a macroblock-to-macroblock basis is an example of this.

Also, it is possible to select, for example, either of an average value, a maximum value, a minimum value or a medium value according to the average value of the number of the coefficients in the coded reference blocks. Chart 7 shows its selection criteria.

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<Chart 7>

Average value	Predictive value calculation method
0~4	Minimum value
5~8	Average value
9~16	Maximum value

According to this example, a minimum value of the numbers of the coefficients of more than one reference blocks is applied as a predictive value when, for example, an average value is less than or equal to 4 and an average value is applied as a predictive value when the average value is more than or equal to 5 and less than or equal to 8. The positive effects of improvement in coding efficiency can be obtained in both cases: by selecting a maximum value since a probability that greater number of coefficients appears becomes higher in the blocks in which the quantization step is small and the movements are complicated; and by selecting a minimum value since a probability that smaller number of coefficients appears becomes higher in the blocks in which the quantization step is inversely big and the movement is simple. The way of assigning the average value or the items indicated as predictive value calculating methods is not limited to those indicated in Chart 7.

The coefficient number encoder 111 in the present embodiment performs variable length coding for the value of the number of coefficients itself. The difference calculating unit 207 may, however, calculate a difference value between the predictive value calculated at the predictive value calculating unit 201 and the value of number of coefficients which is inputted so as to perform coding for the gained value with the same processing as described in the above embodiment. The positive effects can be obtained for the improvement in coding efficiency for a picture in which a

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change in the number of coefficients among the surrounding blocks becomes smaller when changes in luminance and in chrominance are monotonous across the screen.

Also, the coefficient number encoder 111 performs coding by switching both the code table and the VLC table according to the predictive value based on the number of coefficients in the neighboring blocks; however, these tables may not be switched but fixed. This can be realized by using only a storing unit which has either one certain type of code tables or one certain type of VLC tables in stead of using table selecting units. Fig. 8A is a block diagram showing a structure of the coefficient number encoder 111 for performing variable length coding of the number of coefficients by fixing only a code table. Also, Fig 8B is a block diagram showing a structure of the coefficient number encoder 111 for performing variable length coding of the number of coefficients by fixing only a VLC table. In case of fixing only a code table, the coefficient number encoder 111 as shown in Fig 8A includes a code table storing unit 301 in stead of the code table storing unit 202 and the code table selecting unit 203 shown in Fig. 3A. The code table storing unit 301 has one type of code table. Then, the coefficient number encoder 206 first transforms the number of coefficients into a code number using a code table stored in the code table storing unit 301 then transforms the code number to variable length code using a VLC table selected by the VLC table selecting unit 204.

On the other hand, the coefficient number encoder 111 as shown in Fig. 8B includes a VLC table storing unit 302 in stead of the VLC table storing unit 205 and the VLC table selecting unit 204 shown in Fig. 3A. The VLC table storing unit 302 has one type of VLC table. Then, the coefficient number encoder 206 firstly transforms the number of coefficients into a code number using the code table selected by the code table selecting unit 203 then

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transforms the code number into a variable length code using the VLC table stored in the VLC table storing unit 302.

Thus by fixing either the code table or the VLC table in stead of switching between them, the throughput for switching tables can be reduced or an amount of memory for storing a plurality of tables can be reduced although the effects of coding efficiency decreases more or less.

Also, the coefficient number encoder 111 may perform variable length coding by switching only the VLC tables according to the predictive value based on the numbers of coefficients in the neighboring blocks without using code tables. Fig. 8C is a block diagram showing a structure of the coefficient number encoder 111 for performing variable length coding of the number of coefficients using only the VLC tables without code tables. In this case, as shown in Fig. 8C, the coefficient number encoder 111 includes neither the code table storing unit 202 nor the code table selecting unit 203. The coefficient number encoder 111 selects a VLC table for actual use from a plurality of VLC tables stored in the VLC table storing unit 304. Then, the coefficient number encoder 206 directly transforms the number of coefficients into variable length code without transforming it into the code number as shown above. In this case, in the examples of VLC tables shown in Chart 4, the part shown as code numbers is replaced by values of number of coefficients.

Also, the case in which the coefficient number encoder 111 performs variable length coding using a difference value between a predictive value and a value of number of coefficients instead of a value of number of coefficients can be handled in the same way. Fig. 9 is a block diagram showing, as an example of it, a structure of the coefficient number encoder 111 for performing variable length coding for a difference value between the predictive value and the number of coefficients by fixing both a code table and a

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VLC table. In this case, the coefficient number encoder 111 as in Fig. 9 includes a code table storing unit 301 in stead of the code table storing unit 202 and the code table selecting unit 203 shown in Fig. 3A as well as a VLC table storing unit 302 in stead of the VLC table storing unit 205 and the VLC table selecting unit 204. The code table storing unit 301 has one type of code tables whereas the code VLC table storing unit 302 has one type of VLC tables. Then, the coefficient number encoder 206 firstly transforms the difference value between the number of coefficients and the predictive value into a code number using the code table stored in the code table storing unit 301 then transforms the code number into a variable length code using the VLC table stored in the VLC table storing unit 302.

(Second embodiment)

The structure of the picture coding device and the outline of the coding processing according to the present embodiment are totally the same as those described in the first embodiment excepting the coefficient number encoder 111 shown in Fig. 1. Here, regarding variable length coding processing of the number of coefficients performed by the coefficient number encoder 111 in the second embodiment, the detail is explained using Figs. 10 and 11.

Fig. 10A is a block diagram showing in detail an internal structure of the coefficient number encoder 111.

As shown in Fig. 10A, the coefficient number encoder 111 includes a code table generating unit 701 in stead of the code table storing unit 202 and the code table selecting unit 203 shown in Fig. 3A. The numbers of coefficients in the coded blocks are inputted to the code table generating unit 701 from the coefficient number storing unit 110. The code table generating unit 701 counts the number of the coded blocks having the same number of coefficients

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as the value of the number of coefficients at each of the values and creates code tables by assigning code numbers in descending order starting from a coefficient number which recorded the highest frequency based on the statistic. Fig. 11A is a pattern diagram presenting a position of the coded blocks targeted for statistic. Here, a P1, a P3 and a P4 are pictures in which inter picture prediction coding is performed whereas an I2 is a picture in which intra picture prediction coding is performed. Supposing that a current block belongs to the P3, all the blocks, which are coded using the same method as used for the current block, contained in the P1, which is a picture immediately preceding the current picture, are targeted for statistics. The case in which the blocks equivalents of one picture including the coded blocks in the current picture are targeted for statistics as in Fig. 11B can be handled in the same way. Also, a table for the initial condition in ascending order starting from the number 0 shall be used as a code table when the coded blocks equivalent to one picture which can be targeted for statistic do not exist. Here, the blocks equivalent to one picture are targeted for statistics, however, the case in which the number of blocks other than this is used as a parameter can be handled in the same way. In case of applying a referring method as shown in Fig. 11A so as to generate a code table, the table may be generated only once when encoding of the current picture is started.

Meanwhile, the numbers of coefficients in the coded blocks situated on the periphery are inputted to the predictive value calculating unit 201. The predictive value calculating unit 201 determines the predictive value by calculating an average value based on these values as described in the first embodiment. A maximum value, a minimum value or a medium value may be used in stead of the average value as a method to determine the predictive value. The coded blocks then used as the reference,

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are determined according to Chart 1 using three blocks in the position of the blocks B, C and D for the current block X shown in Fig. 4A in the first embodiment. Chart 1 shows a relation between conditions of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. Either a value 0 or other arbitrary value is given directly as a predictive value when no reference blocks are found.

The predictive value calculated by the predictive value calculating unit 201 is used only at the VLC table selecting unit 204. The VLC table selecting unit 204 selects, as in the first embodiment, according to this predictive value, a VLC table for coding the number of coefficients from a plurality of VLC tables prepared in the VLC table storing unit 205 in advance as shown in Chart 4 in accordance with the selection criteria shown in Chart 5.

The coefficient number encoder 206 refers to the code table created by the code table generating unit 701 and the VLC table selected by the VLC table selecting unit 204 and then performs variable length coding of the number of the coefficients in the current block targeted for coding which is inputted in the same way as described in the first embodiment.

Thus, in the present embodiment, a code table is created by taking statistics of the numbers of the coefficients in the coded blocks, furthermore, a VLC table is determined according to the predictive value calculated from the number of the coefficients in the coded blocks, and by referring to both of the tables, it is possible to perform coding of the number of coefficients efficiently even for a picture whose apparition frequency of coefficients is uneven.

As in the first embodiment, it is also possible to determine the coded blocks used for reference at the predictive value calculating unit 201 as in the first embodiment according to Chart 6 using only two blocks located in the position of the blocks B and

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D for the current block X shown in Fig. 4B in stead of using three neighboring blocks as shown in Fig. 4A. Chart 6 shows a relation between conditions of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. Either a value 0 or other arbitrary value is given directly as a predictive value when no reference blocks are found.

As in the first embodiment, it is also possible to select, for example, either of an average value, a maximum value, a minimum value or a medium value according to an average value of the numbers of the coefficients in the coded reference blocks as a method to calculate a predictive value in the predictive value calculating unit 201 as in the first embodiment. Chart 7 shows the selection criteria, however a way of assigning the average value and items indicated as predictive value calculating methods are not limited to this.

In the present embodiment, the coefficient number encoder 111 performs variable length coding for the value of the number of coefficients itself. However, as in the first embodiment, it is possible, as shown in Fig. 10, that a difference value between the predictive value calculated by the predictive value calculating unit 201 and the inputted value of the number of coefficients is calculated by the subtractor 207 and variable length coding is performed for the gained value by the same processing as described above.

Also, in the present embodiment, the coefficient number encoder 111 performs variable length coding by switching the VLC tables according to the predictive value based on the numbers of coefficients in the neighboring blocks. It is, however, possible to fix the table rather than to switch the VLC tables as in the first embodiment. In this case, this is realized by using only a VLC table storing unit which has one certain type of VLC tables in stead of using the VLC table selecting unit.

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(Third embodiment)

The structure of the picture coding device and the outline of the coding processing according to the present embodiment are totally the same as those described in the first embodiment, excepting the coefficient number encoder 111 shown in Fig. 1. Here, regarding variable length coding processing of the number of coefficients performed at the coefficient number encoder 111 in the third embodiment, the detail is explained using Figs. 12A and 12B as well as Charts 8 and 9.

Fig. 12A is a block diagram showing in detail an internal structure of the coefficient number encoder 111.

As shown in Fig. 12A, the coefficient number encoder 111 does not include the predictive value calculating unit 201 shown in Fig. 3A. A code table selecting unit 901 and a VLC table selecting unit 902 therefore select a table for actual use differently from the first embodiment by using directly the numbers of the coefficients in the coded blocks, without using a predictive value. As for the coded blocks then used for the reference as shown in Fig. 4B, only two blocks in the position of the block B (above) and the block D (left) for the current block X are used. However, when the blocks located above and on the left are neither coded nor situated outside the picture nor outside the slice, either a value 0 or other arbitrary value can be substituted.

Chart 8 shows a method of selecting a code table in the code table selecting unit 901.

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<Chart 8>

		Coefficient number (above)	
		0~5	6~16
Coefficient number (left)	0~5	Code table 1	Code table 2
	6~16	Code table 3	Code table 4

The code table selecting unit 901 classifies into two groups the respective number of coefficients in the blocks situated above and on the left of the current block as shown in Chart 8 according to the value and selects a table using a combination of the four thus formed. For example, a code table 2 is selected when the number of the coefficients in the left block is 3 and the number of the coefficients in the above block is 8. The method to classify the number of the coefficients in the upper and the left blocks and the way to assign code tables are not limited to those used in Chart 8.

Chart 9 shows a method of selecting a VLC table at the VLC table selecting unit 902.

<Chart 9>

		Coefficient number (above)	
		0~5	6~16
Coefficient number (left)	0~5	VLC table 1	VLC table 2
	6~16	VLC table 3	VLC table 4

The VLC table selecting unit 902 selects a VLC table for actual reference using the selection method as shown in Chart 9 as in the case of code table selecting unit 901.

The coefficient number encoder 206 refers to the code table selected by the code table selecting unit 901 and the VLC table selected by the VLC table selecting unit 902 so as to perform variable length coding for the number of coefficients in the current

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block which is inputted in the same way as in the first embodiment.

Thus, in the present embodiment, by classifying the numbers of coefficients in the coded blocks located above and on the left of the current block into "n" group(s) according to the value with reference to the code table and the VLC table according to the combination of N x N ways then formed and by switching between them adaptively, it is possible to perform efficiently the coding of the number of coefficients for the picture whose apparition frequency of coefficients is uneven.

In the present embodiment, the coefficient number encoder 111 performs variable length coding for the value of the number of coefficients itself. The difference calculating unit 207 may, however, calculate a difference value between the predictive value calculated at the predictive value calculating unit 201 as shown in Fig. 12B as in the first embodiment and a value of the number of coefficients inputted so as to perform variable length coding.

Also, in the present embodiment, the coefficient number encoder 111 performs variable length coding by switching both the VLC table and the code table according to the numbers of the coefficients in the neighboring blocks. It is, however, possible to fix either of these tables rather than to switch them as in the first embodiment. In this case, variable length coding is realized by using a storing unit which has either one certain type of code tables or one certain type of VLC tables in stead of using table selecting units. Furthermore, it is also possible to perform variable length coding by switching only the VLC tables according to the numbers of the coefficients in the neighboring blocks without using code tables, as in the first embodiment.

(Fourth embodiment)

The structure of the picture coding device and the outline of the coding processing according to the present embodiment are

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totally the same as those described in the first embodiment, excepting the coefficient number encoder 111 shown in Fig. 1. Here, regarding variable length coding processing of the number of coefficients performed by the coefficient number encoder 111 in the fourth embodiment, the detail is explained using Figs. 13 and 14.

Fig. 13A is a block diagram showing in detail an internal structure of the coefficient number encoder 111.

The coefficient number encoder 111 as shown in Fig. 13A includes a table selecting unit 1001 in stead of the predictive value calculating unit 201, the code table selecting unit 203 and the VLC table selecting unit 204 shown in Fig. 3A . The table selecting unit 1001 uses directly the number of coefficients in the coded blocks without using a predictive value so as to select tables for actual use by evaluating both a code table and a VLC table at the same time, which is different from the first embodiment. As for the coded blocks then used for the reference, the three blocks in the position of the blocks B, C and D for the current block X are used as in Fig. 4A. However, when the blocks located as such are neither coded nor situated outside the picture nor outside the slice, either a value 0 or other arbitrary value can be substituted.

The table selecting unit 1001 calculates a sum of a length of a bit stream which is created as a result of coding the numbers of the coefficients in the reference blocks using both the code table and the VLC table at the same time and determines it as an evaluation value. Fig. 14 is a pattern diagram showing a method to perform coding for the numbers of coefficients in the three reference blocks using the code tables and the VLC tables and calculate the sum of the length of the gained bit stream so as to determine it as the estimation value. Then, the table selecting unit 1001 performs this processing to all the combinations of the code tables and the VLC tables stored in the code table storing unit

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202 as well as the VLC table storing unit 205 and selects a combination of a code table and a VLC table in which the gained evaluation value is the smallest.

The coefficient number encoder 206 refers to the code table and the VLC table selected by the table selecting unit 1001 and performs variable length coding of the number of the coefficients in the current block which is inputted in the same way as described in the first embodiment.

In the present embodiment as shown above, it is possible to perform coding for the numbers of the coefficients in the neighboring blocks which are coded using the code table and the VLC table and determine the sum of the length of the bit stream at that time as an estimation value so as to perform efficiently the coding of the number of coefficients even for the picture whose apparition frequency of coefficients is uneven.

As for the coded blocks then used for the reference, the case in which only two blocks in the position of blocks B and D in stead of using three blocks in the position of blocks B, C and D for the current block X as shown in Fig. 4A are used can be treated in the same way. In this regard, when the blocks located above and on the left are neither coded nor situated outside the picture nor outside the slice, either a value 0 or other arbitrary value can be substituted.

In the present embodiment, the coefficient number encoder 111 performs variable length coding for the value of the number of coefficients itself. However, as in the first embodiment, it is possible, as shown in Fig. 13, that a difference value between the predictive value calculated by the predictive value calculating unit 201 and the inputted value of the number of coefficients is calculated by the difference value calculating unit 207 and variable length coding is performed for the gained value by the same processing as described in the above-mentioned embodiments.

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Also, in the present embodiment, the code table and the VLC table are to be switched in the coefficient number encoder 111, however, it is possible to fix either of them rather than to switch between them.

(Fifth embodiment)

Fig. 15 is a block diagram showing a structure of a picture coding device in the fifth embodiment using a picture coding method according to the present invention. A sequence of coding processing is totally the same as the first embodiment. The difference, however, is that the present embodiment does not use the coefficient number storing unit 110 but employs inter picture prediction mode in case of inter picture prediction coding and intra picture prediction mode in case of intra picture prediction coding as referring information at a coefficient number encoder 1201 instead of using the number of the coefficients in the coded blocks as in the first embodiment.

Here, regarding an explanation of variable length coding processing at the coefficient number encoder 1201 shown in Fig. 15, the detail is explained using Fig. 16, Chart 10 and Chart 11.

Fig. 16 is a block diagram showing in detail an internal structure of the coefficient number encoder 1201.

As shown in Fig. 16, the coefficient number encoder 1201 does not include the predictive value calculating unit 201 shown in Chart 3A. An inter picture prediction mode is inputted from an inter picture predicting unit 107 and an intra picture prediction mode is inputted from an intra picture predicting unit 108 to a code table selecting unit 1301 and a VLC table selecting unit 1302. Consequently, the code table selecting 1301 selects a table based on the mode: the inter picture prediction mode for inter picture prediction and the intra picture prediction mode for intra picture prediction. Chart 10 shows a selection method for code tables at

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the code table selecting unit 1301.

<Chart 10>

Reference table	Inter picture prediction mode	Intra picture prediction mode
Code table 1	16×16, 16×8, 8×16	Plane prediction
Code table 2	8×8	Oblique prediction
Code table 3	8×4, 4×8	Oblique prediction
Code table 4	4×4	Vertical and horizontal prediction

For example, in case where the current picture is coded using inter picture prediction, a code table 2 is selected accordingly for variable length coding of the number of coefficients when a prediction of the current block sized 8 x 8 is selected. The items are not limited to those used in Chart 10. Chart 11 shows a selecting method at the VLC table selecting unit 1302.

<Chart 11>

Reference table	Inter picture prediction mode	Intra picture prediction mode
VLC table 1	16×16, 16×8, 8×16	Plane prediction
VLC table 2	8×8	Oblique prediction
VLC table 3	8×4, 4×8	Oblique prediction
VLC table 4	4×4	Vertical and horizontal prediction

The VLC table selecting unit 1302 selects a VLC table for actual reference using a selection method shown in Chart 11 as in the case of the code table selecting unit 1301.

The coefficient number encoder 206 refers to the code table selected by the code table selecting unit 1301 and a VLC table selected by the VLC table selecting unit 1302 and performs variable length coding for the numbers of the coefficients in the current block which is inputted in the same way as in the first embodiment.

The present embodiment as shown above has shown a coding method which realizes efficient coding of the number of coefficients even for the picture whose apparition frequency of coefficients is uneven, with reference to the code table and the VLC table by

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switching between them adaptively according to the mode: inter picture prediction mode for inter picture prediction coding and intra picture prediction mode for intra picture prediction coding.

In the present embodiment, the coefficient number encoder 1201 performs variable length coding for the value of the number of coefficients itself as in the first embodiment. However, it is possible, as in the first embodiment, to determine a predictive value using the numbers of the coefficients in the neighboring blocks which are coded as in the first embodiment and obtain a difference value between this predictive value and the inputted value of the number of coefficients so as to perform variable length coding for the gained value in the same processing as in the above-mentioned embodiments.

Also, in the present embodiment the coefficient number encoder 1201 performs variable length coding by switching both the code table and the VLC table. It is, however, possible to fix either of them rather than switching either or both of them. In this case, this is realized by preparing only a storing unit which has one certain type of code tables or one certain type of VLC tables in stead of using table selecting units.

(Sixth embodiment)

Fig. 17 is a block diagram showing a structure of an embodiment of a picture decoding device using a picture decoding method according to the present invention. The bit stream created by the picture coding device according to the first embodiment shall be inputted here.

The picture decoding device includes a bit stream analyzing unit 1401, a coefficient number storing unit 1402, a coefficient number decoder 1403, a coefficient value decoder 1404, an inverse quantizing unit 1405, an inverse orthogonal transforming unit 1406, a frame memory 1407, an inter picture prediction decoder

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1408, an intra picture prediction decoder 1409 and a switch 1410.

The bit stream analyzing unit 1401 extracts from the inputted bit stream various types of information such as a coding mode, motion vectors used for coding, a bit stream of the number of coefficients (the number of coefficients showing a spatial frequency component which has a value other than 0 for each block) and various types of information on the bit stream of the value of the coefficients. The coefficient number storing unit 1402 stores the numbers of the coefficients of the decoded blocks. The coefficient number decoder 1403 decodes the bit stream of the numbers of coefficients by referring to the numbers of the coefficients in the decoded blocks.

The coefficient value decoder 1404 decodes the bit stream of the value of the coefficients using the numbers of coefficients decoded by the coefficient number decoder 1403. The inverse quantizing unit 1405 performs inverse quantization to the decoded coefficients. The inverse orthogonal transforming unit 1406 performs inverse orthogonal transformation to the data inversely quantized and transforms it to predictive residual picture data.

The inter picture prediction decoder 1408 creates motion compensation picture data based on the motion vectors extracted by the bit stream analyzing unit 1401 as well as decoded pictures or the like when a current macroblock to be decoded is coded with inter picture prediction. An addition calculating unit 1411 adds the predictive residual picture data inputted from the inverse orthogonal transforming unit 1406 and the motion compensation picture data inputted from the inter picture prediction decoder 1408 so as to create decoded picture data. The frame memory 1407 stores the created decoded picture data.

The intra picture prediction decoder 1409 performs intra picture prediction using information on the adjacent decoded blocks so as to create decoded picture data when the current

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macroblock is coded with intra picture prediction.

Next, an explanation of an operation of a picture decoding device as constructed above follows.

As a start, a bit stream is inputted to the bit stream analyzing unit 1401. The bit stream analyzing unit 1401 extracts from the inputted bit stream various types of information on motion vectors, a bit stream of the number of coefficients and a bit stream of the value of the coefficients and so on. Then, the bit stream analyzing unit 1401 outputs respectively as follows: the motion vectors to the inter picture prediction decoding unit 1408, the bit stream of the number of coefficients to the coefficient number decoder 1403 and the bit stream of the value of the coefficients to the coefficient value decoder 1404.

The coefficient number decoder 1403 to which the bit stream of the number of coefficients is inputted decodes this bit stream as the number of coefficients which has a value other than 0 for each block. In this case, the coefficient number decoder 1403 performs decoding by referring to the numbers of coefficients in the decoded blocks stored in the coefficient number storing unit 1402 with a method which is to be explained later on. Then, the coefficient value decoder 1404 performs decoding of the value of the coefficients itself with reference to the code tables and the VLC tables necessary for variable length decoding by switching between them using number information of the coefficient gained by the coefficient number decoder 1403. The gained coefficient is transformed into predictive residual picture data by the inverse quantizing unit 1405 as well as the inverse orthogonal transforming unit 1406.

The motion vectors extracted by the bit stream analyzing unit 1401 are inputted to the inter picture prediction decoder 1408, when a current macroblock to be decoded is coded with inter picture prediction. The inter picture prediction decoder 1408

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creates motion compensation picture data by having decoded picture data of the decoded pictures stored in the frame memory 1407 as reference pictures, based on the information on the motion vectors. The motion compensation picture data thus gained is created as decoded picture data by being added to the predictive residual picture data at the addition calculating unit 1411 and then stored in the frame memory 1407.

On the other hand, when the current macroblock is coded using intra picture prediction, intra picture prediction is performed using information on the adjacent decoded blocks by the intra picture prediction decoder 1409, and decoded picture data is created and stored in the frame memory 1407. Then, the frame memory 1407 outputs it as definitive output picture in display order.

The outline of a flow of decoding has been explained above. Next, a decoding processing of the number of coefficients performed by the coefficient number decoder 1403 is explained in detail using Fig. 18 ~ Fig. 21.

Fig. 18A is a block diagram showing in detail an internal structure of the coefficient number decoder 1403.

Here, an example of using two tables of a VLC table and a code table for performing variable length decoding of the numbers of coefficients. The VLC table is a table used for transforming variable length code in a bit stream into a code number whereas the code table is table used for transforming the code number gained by the VLC table into the number of coefficients.

As shown in Fig. 18A, the coefficient number decoder 1403 includes a predictive value calculating unit 1501, a code table storing unit 1502, a code table selecting unit 1503, a VLC table selecting unit 1504, a VLC table storing unit 1505 and a coefficient number decoder 1506.

Firstly, the numbers of the coefficients in the decoded blocks

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located on the periphery are inputted from the coefficient number storing unit 1402 as shown in Fig. 17 to the predictive value calculating unit 1501. The predictive value calculating unit 1501 determines a predictive value by calculating an average value of these values. A maximum value, a minimum value or a medium value may be used according to the predictive value calculating method for coding. The decoded blocks to be then referred to are determined following Chart 1 using three blocks in the position of blocks B, C and D for the current block X shown in Fig. 4A, as in the first embodiment. As for signs in Chart 1, a sign O signifies a coded block and a sign X signifies a block which can not be referred to since it is either not decoded or situated outside the picture or outside the slice. Chart 1 shows a relation between conditions of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. If no reference blocks are found, either a value 0 or other arbitrary value can be given directly as a predictive value.

The code table selecting unit 1503 selects a code table for actual use from a plurality of code tables stored in the code table storing unit 1502, according to the predictive value calculated by the predictive value calculating unit 1501.

Cart 2 is an example of a code table which relates numbers of coefficients and code numbers, prepared in advance by the code table storing unit 1502. Here, four types of code tables are prepared; however, the numbers of types of tables and the values indicated in the tables are not limited to those used in Chart 2. In this case, however, the same table as the one used for coding shall be used. Also, Chart 3 shows selection criteria for code tables based on a predictive value. The way of assigning the predictive value or the items of table is not limited to those used in Chart 3. However, the same table as the one used for coding shall be used.

The VLC table selecting unit 1504 selects a VLC table for

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actual use from a plurality of VLC tables stored in the VLC table selecting unit 1505 according to the predictive value calculated by the predictive value calculating unit 1501.

Chart 4 shows an example of a VLC table which relates number of coefficients and code numbers, prepared in advance by the VLC table storing unit 1505. Here, four types of VLC tables are prepared, however, the numbers of types of tables and the values indicated in the tables are not limited to those used in Chart 4. However, in this case, the same table as the one used for coding shall be used. Also, Chart 5 shows selecting criteria for VLC tables based on a predictive value. The way of assigning the predictive value and the items indicated in the reference tables are not limited to those used in Chart 5. However, in this case, it is conditioned to use the same table as the one used for coding.

The coefficient number decoder 1506 refers to the code table as well as the VLC table selected in the above processing and performs variable length decoding for a bit stream of the number of the coefficients in the inputted current block. The coefficient number decoder 1506 first transforms the number of coefficients into a code number using the VLC table and then transforms it into a value of the number of coefficients corresponding to the code number using the code table. Fig. 19 is a pattern diagram showing an example of decoding when a predictive value calculated at the predictive value calculating unit 1501 is "6" and a bit stream of the number of coefficients in the current block is "0100". The predictive value being "6", the code table selecting unit 1503 selects a code table 3 shown in Fig. 19 using Chart 3 and Chart 2, and the VLC table selecting unit 1504 selects a VLC table 3 shown in Fig. 19 using Chart 5 and Chart 4. The coefficient number decoder 1506 transforms the inputted bit stream "0100" into a code number "2" according to the VLC table 3 and then determines the definitive number of coefficients "4" according to the code table

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3.

The following describes in detail storing processing of the number of coefficients performed by the coefficient number storing unit 1402, the detail is explained. Fig. 6A used for the description of the first embodiment is used here, however, a black boarder containing blocks coded B1~B16 shows a current macroblock to be decoded whereas hatched blocks show reference blocks for the current macroblock. The numbers put for the blocks indicates an order of decoding performed within the macroblock.

The coefficient number storing unit 1402 stores the numbers of coefficients decoded by the coefficient number decoder 1403, at least for the reference blocks which are hatched as shown in Fig. 6A necessary for the current macroblock at the time of starting the processing of the current macroblock shown in Fig. 6A. Namely, the coefficient number storing unit 1402 stores the number of the coefficients detected from the blocks of the current macroblock (B1, B2, B3, ... and B16) which are to be processed sequentially. For example, when a block B6 is a current block, the coefficient number storing unit 1402 stores the numbers of each coefficient of the block B1, B2, B3, B4 and B5 which are already processed, in addition to those of the reference blocks as shown in Fig. 6A. When the coefficient number decoder 1403 decodes the number of coefficients of the block B6, the coefficient number storing unit 1402 stores it. The coefficient number storing unit 1402 thus stores the numbers of the coefficients of the blocks in the current macroblock, which are to be processed sequentially.

When a current macroblock is a macroblock MB11 shown in Fig. 2B, the coefficient number storing unit 1402 at least stores the numbers of the coefficients of the blocks in the bottom row and in the right column of the macroblock MB11 (hatched blocks) in Fig. 7A when the processing of this macroblock MB11 terminates and shifts to the next macroblock MB12. Next, the coefficient number

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storing unit 1402 at least stores the numbers of the coefficients of the blocks in the bottom row and in the right column of the macroblock MB12 in the same way as well as the numbers of the coefficients of the blocks in the bottom row of the macroblock MB11 (shaded blocks) as shown in Fig. 7B when the processing of the macroblock MB12 terminates and the processing proceeds to the next macroblock MB13.

When a current macroblock is located at the right edge of the picture as in a macroblock MB9 shown in Fig. 2B, the coefficient number storing unit 1402 at least stores the numbers of the coefficients of the blocks in the bottom row of the macroblock MB9 when the processing of this macroblock MB9 terminates and proceeds to the next macroblock MB10.

When a current block is located at the bottom edge of the picture as a macroblock MBm shown in Fig. 2B, the coefficient number storing unit 1402 at least stores the numbers of the coefficients of the blocks in the right column of this macroblock MBm (hatched blocks) as shown in Fig. 7C.

Thus the coefficient number storing unit 1402 at least stores the numbers of coefficients for the blocks to be referred to. It is possible to delete, in an arbitrary timing, the information on the numbers of coefficients of the blocks other than those to be stored as described in the above explanation when the blocks are no longer used for reference. For example, it is possible to delete the information when processing proceeds to the next macroblock as well as while processing the macroblock. Also, the numbers of the coefficients of the blocks which are not used for reference do not always need processing of deleting. For instance, the coefficient number storing unit 1402 may identify the numbers of coefficients of the blocks which are not referred to any longer as unnecessary and may overwrite to them if necessary.

It is explained above that it is possible to refer to the

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numbers of the coefficients of the decoded blocks by storing them in the coefficient number storing unit 1402. However, a system for calculating the number of coefficients, may be used, if necessary, by storing not the values of the number of coefficients themselves but, for instance, the values of the coefficients of the blocks, indicating spatial frequency components.

Thus, in the present embodiment, it is possible to calculate the predictive value using the numbers of coefficients in the decoded adjacent blocks and decode the number of coefficients with reference to the code table and the VLC table by switching between them adaptively according to the predictive value.

Also, it handles the changes in a position where the apparition probability of the number of coefficients is the highest, with reference to the code tables by switching them adaptively according to the predictive value. At the same time, it can correspond to a size of the dispersion of the apparition probability of the number of coefficients with reference to the VLC tables by switching them according to the predictive value.

It is possible to use only two blocks in the position of the blocks B and D as the blocks to be referred to by the predictive value calculating unit 1501 for the current block X as shown in Fig. 4B instead of using three neighboring blocks as shown in Fig. 4A. In this case, changes in the reference blocks can be made as in Chart 6 when the blocks are either not decoded or located outside the picture or outside the slice. As for the signs in Chart 6, a sign O signifies a decoded block and a sign X signifies a block which can not be referred to since it is either not decoded or situated outside the picture or outside the slice, as in Chart 1. Chart 6 shows a relation between conditions of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. Either a value 0 or other arbitrary value is given directly as a predictive value when no reference blocks are found.

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However, the same value as the one used for coding shall be used. In this case, the coefficient number storing unit 1402 may only store the numbers of coefficients decoded by the coefficient number decoder 1403, at least those of the reference blocks necessary for the current macroblock, shown in Fig. 6B.

It is also possible, as a method to calculate a predictive value at the predictive value calculating unit 1501, for example, to select an optimal method according to each sequence, each GOP, each picture or each slice rather than to fix the method of using either of an average value, a maximum value, a minimum value or a medium value. In this case, a calculating method is determined by decoding the signals for identifying a calculation method described in the header section of the sequence or the picture or the slice, of the bit stream. The slice is a picture further divided into a plurality of sections. A section equivalent to one column in transverse direction in each macroblock is an example of this.

Also, it is possible to select, for example, either of an average value, a maximum value, a minimum value or a medium value according to the average value of the numbers of coefficients in the decoded reference blocks as a method to calculate a predictive value at the predictive value calculating unit 1501. Chart 7 shows the selection criteria. The way of assigning the average value and the items indicated as predictive value calculation methods are not limited to those used in Chart 7. In this regard, the same method as the one used for coding shall be used.

The present embodiment shows a decoding processing method of a bit stream in which variable length coding is performed for the values of the number of coefficients themselves by the coefficient number decoder 1403. It is, however, possible to perform decoding of a bit stream in which variable length coding is performed for a difference value between the predictive value and the number of coefficients. In this case, the number of

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coefficients is determined by the fact that the addition calculating unit 1507 adds the predictive value calculated by the predictive value calculating unit 1501 to the difference value of the number of coefficients decoded by the coefficient number decoder 1506.

Also, the coefficient number decoder 1403 performs variable length decoding by switching both the code table and the VLC table according to the predictive value based on the numbers of the coefficients of the neighboring blocks. It is, however, possible to fix either of them rather than to switch between them. In this case, this is realized by preparing a storing unit which has either one certain type of code tables or one certain type of VLC tables. Fig. 20A is a block diagram showing a structure of the coefficient number decoder 1403 for performing variable length decoding of the number of coefficients by fixing only the code table. Fig. 20 B is a block diagram showing a structure of the coefficient number decoder 1403 for performing variable length decoding of the number of coefficients by fixing only the VLC table. In case of fixing only the code table, the coefficient number decoder 1403 as shown in Fig. 20A includes a code table storing unit 1601 in stead of the code table storing unit 1502 and the code table selecting unit 1503 shown in Fig. 18A. The code table storing unit 1601 has one certain type of code tables. The coefficient number decoder 1506 first transforms variable length code into a code number using the VLC table selected by the VLC table selecting unit 1504 and then transforms the code number into the number of coefficients using the code table stored in the code table storing unit 1601.

On the other hand, in case of fixing only the VLC table, the coefficient number decoder 1403 as shown in Fig. 20B includes a VLC table storing unit 1602 in stead of the VLC table storing unit 1505 and the VLC table selecting unit 1504 shown in Fig. 18A. The VLC table storing unit 1602 has one certain type of VLC table. The coefficient number decoder 1506 firstly transforms a variable

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length code into a code number using the VLC table stored in the VLC table storing unit 1602 and then transforms the code number into the number of coefficients using the code table selected by the code table selecting unit 1503.

Thus it is possible to reduce memory capacity for storing a plurality of tables by fixing either of a code table and a VLC table.

It is also possible to perform variable length decoding in the coefficient number decoder 1403 by switching only the VLC tables without using code tables, according to the predictive value based on the numbers of the coefficients of the neighboring blocks. Fig. 20C is a block diagram showing a structure of the coefficient number decoder 1403 when performing variable length decoding of the coefficient number using only a VLC table without using code tables. In this case, as shown in Fig. 20C, the coefficient number decoder 1403 includes neither the code table storing unit 1502 nor the code table selecting unit 1503 shown in Fig. 18A. In the coefficient number decoder 1403, the VLC table selecting unit 1603 selects the VLC table for actual use from a plurality of VLC tables stored in the VLC table storing unit 1604, based on the predictive value calculated by the predictive value calculating unit 1501. Then, the coefficient number decoder 1506 transforms directly a variable length code into the number of coefficients without transforming the number of coefficients into a code number using the code table as described above.

Thus by fixing either of the code table or the VLC table in stead of switching between them, the throughput for switching tables can be reduced or an amount of memory for storing a plurality of tables can be reduced although the effects of coding efficiency decreases more or less.

Also, a case in which the coefficient number decoder 1403 decodes a bit stream in which variable length coding is performed to the difference value between the predictive value and the

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number of coefficients, in stead of the value of the number of coefficients, can be handled in the same way. Fig. 21 is a block diagram of its example showing a structure of the coefficient number decoder 1403 for performing decoding of the bit stream in which variable length decoding is performed to the difference value between the predictive value and the number of coefficients by fixing both the code table and the VLC table. In this case, as shown in Fig. 21, the coefficient number decoder 1403 includes a code table storing unit 1601 in stead of the code table storing unit 1502 and the code table selecting unit 1503 shown in Fig. 18A as well as a VLC table storing unit 1602 in stead of the VLC table storing unit 1505 and the VLC table selecting unit 1504 shown in Fig. 18A. This code table storing unit 1601 has one certain type of code tables whereas the VLC table storing unit 1602 has one certain type of VLC table. The coefficient number decoder 1506 first transforms a variable length code into a code number using the VLC table stored in the VLC table storing unit 1602 and then transforms the code number into a difference value between the predictive value and the number of coefficients using the code table stored in the code table storing unit 1601. The addition calculating unit 1507 calculates the number of coefficients by adding the difference value to the predictive value.

(Seventh embodiment)

The structure of the picture decoding device and the outline of the decoding processing are totally the same as in the sixth embodiment, apart from the coefficient number decoder 1403 shown in Fig. 17. As for a variable length decoding processing of the number of coefficients performed at the coefficient number decoder 1403 according to the seventh embodiment, the detail is explained here using Figs. 11 and 22. The bit stream created at the picture coding device according to the second embodiment

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shall be inputted.

Fig. 22A is a block diagram showing in detail an internal structure of the coefficient number decoder 1403.

As shown in Fig. 22A, the coefficient number decoder 1403 includes a code table generating unit 1901 in stead of the code table storing unit 1502 and the code table selecting unit 1503 shown in Fig. 18A. The numbers of coefficients in the decoded blocks are inputted from the coefficient number storing unit 1402 shown in Fig.17 to the code table generating unit 1901. The code table generating unit 1901 counts the number of the decoded blocks having the same number of coefficients as the value of the number of coefficients at each value of the number of coefficients and creates code tables by assigning code numbers in descending order starting from a number of coefficients which recorded the highest frequency based on the statistic. Fig. 11A is a pattern diagram presenting a position of decoded blocks targeted for statistics. Here, a P1, a P3 and a P4 are pictures in which inter picture prediction is performed whereas an I2 is a picture in which intra picture prediction is performed. Supposing that a current block to be decoded belongs to the P3, all the blocks in the P1, a picture immediately preceding the current picture decoded with the same method, are targeted for statistics. The case in which the blocks equivalent to one picture including the decoded blocks in the current picture are targeted for statistics can be handled in the same way. Also, a table for the initial condition in ascending order starting from the value 0 is used when the decoded blocks equivalent to one picture which can be targeted for statistics do not exist. Here, the blocks equivalent to one picture are targeted for statistics, however, the case in which the number of blocks other than this is used as a parameter can be handled in the same way. In this regard, the same number as the one used for coding shall be used. In the case of generating the code table as described above

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by making reference as shown in Fig. 11A, the table may be generated only once when encoding of the current picture is started.

Meanwhile, the numbers of coefficients in the decoded blocks located on the periphery are inputted to the predictive value calculating unit 1501. The predictive value calculating unit 1501 determines the predictive value by calculating an average value based on these values as in the sixth embodiment. A maximum value, a minimum value or a medium value may be used in stead of the average value as a method to determine the predictive value. As in the sixth embodiment, the decoded blocks then used as reference, are determined using the three blocks located in the position of the blocks B, C and D for the current block X shown in Fig. 4A according to Chart 1. Chart 1 shows a relation between conditions of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. Either a value 0 or other arbitrary value is given directly as a predictive value when no reference blocks are found. In this regard, the same value as the one used for coding shall be used.

The predictive value calculated by the predictive value calculating unit 1501 is used only in the VLC table selecting unit 1504. The VLC table selecting unit 1504 selects, as in the sixth embodiment, a VLC table for decoding the number of coefficients from a plurality of VLC tables prepared beforehand in the VLC table storing unit 1505 as shown in Chart 4, according to the selection criteria shown in Chart 5.

The coefficient number decoder 1506 refers to the code table created by the code table generating unit 1901 and the VLC table selected by the VLC table selecting unit 1504 and performs variable length decoding for the bit stream of the number of coefficients inputted in the same way as in the sixth embodiment.

Thus, in the present embodiment, it is possible to create a

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code table by taking statistics of the numbers of coefficients in the decoded blocks and determine a VLC table according to the predictive value calculated using the numbers of the coefficients in the decoded blocks and perform the decoding of the number of coefficients by referring to both of the tables.

It is also possible to determine the decoded blocks to be used for reference at the predictive value calculating unit 1501 as in the sixth embodiment according to Chart 6, using only two blocks located in the position of the blocks B and D with respect to the current block X shown in Fig. 4B, in stead of using three adjacent blocks as shown in Fig. 4A. Chart 6 shows a relation between conditions of the reference blocks and the block(s) which can be referred to, however, the patterns are not limited to this. Either a value 0 or other arbitrary value is given directly as a predictive value when no reference blocks are found. In this regard, the same value as the one used for coding shall be used.

It is also possible, as a method to calculate a predictive value at the predictive value calculating unit 1501, for example, to select an optimal method according to each sequence, each GOP, each picture or each slice rather than to fix the method to use either of an average value, a maximum value, a minimum value or a medium value. In this case, the calculation method is determined by decoding the signals for identifying the calculating method described in the header of the sequence, the GOP or the picture or the slice, of the bit stream.

Also, it is possible to select, for example, either of an average value, a maximum value, a minimum value or a medium value according to the average value of the numbers of coefficients in the decoded reference blocks as a method to calculate a predictive value at the predictive value calculating unit 1501. Chart 7 shows its selection criteria. The way of assigning the average value and the items indicated as predictive value

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calculation methods are not limited to those used in Chart 7. In this regard, the same method as the one used for coding shall be used.

Also, the present embodiment shows a decoding processing method of a bit stream in which variable length coding is performed to the values of the number of coefficients themselves. It is, however, possible to perform decoding of a bit stream in which variable length coding is performed to a difference value between a predictive value and the number of coefficients. In this case, the number of coefficients is determined by the fact that the addition calculating unit 1507 adds the difference value between the predictive value calculated at the predictive value calculating unit 1501 as shown in Fig. 22 to the number of coefficients decoded by the coefficient number decoder 1506.

Also, in the above-mentioned embodiment, the coefficient number decoder 1403 performs variable length decoding by switching the VLC tables according to the predictive value based on the numbers of the coefficients in the adjacent blocks. It is, however, possible to fix the table rather than to switch between the tables as in the sixth embodiment. In this case, this is realized by using only a VLC table storing unit which has one certain type of VLC tables, in stead of using the VLC table selecting unit.

(Eighth embodiment)

The structure of the picture decoding device and the outline of the decoding processing are totally the same as in the sixth embodiment, apart from the coefficient number decoder 1403 shown in Fig. 17. As for variable length decoding processing of the number of coefficients performed by the coefficient number decoder 1403 according to the eighth embodiment, the detail is explained here using Fig. 23, Chart 8 and Chart 9. The bit stream created by the picture coding device according to the third

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embodiment shall be inputted.

Fig. 23A is a block diagram showing in detail an internal structure of the coefficient number decoder 1403.

As shown in Fig. 23A, the coefficient number decoder 1403 does not include the predictive value calculating unit 1501 shown in Fig. 18A. A code table selecting unit 2001 and a VLC table selecting unit 2002 select a table for actual use by using directly the numbers of coefficients in the decoded blocks without using a predictive value, which is different from the sixth embodiment. As for the decoded blocks then used for the reference shown in Fig. 4B, only two blocks in the position of the block B (above) and the block D (left) with respect to the current block X are used. However, when the blocks located above and on the left are neither decoded nor situated outside the picture nor outside the slice, either a value 0 or other arbitrary value can be substituted. In this regard, the same value as the one used for coding shall be used.

Chart 8 shows a selection method for code tables at the code table selecting unit 2001. The code table selecting unit 2001 classifies into two groups the respective numbers of coefficients in the blocks situated above and on the left of the current block, as shown in Chart 8, according to the value, and selects a table using a combination of the four thus formed. The method to classify the number of coefficients in the upper and the left blocks and the way to assign the code tables are not limited to those used in Chart 8. In this regard, the same method as the one used for coding is used in this case. Also, the VLC table selecting unit 2002 selects a VLC table for actual reference using the selection method shown in Chart 9, as in the case of the code table selecting unit 2001.

The coefficient number decoder 1506 refers to the code table selected by the code table selecting unit 2001 and the VLC table selected by the VLC table selecting unit 2002 and performs variable length decoding for the number of coefficients in the current block

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which is inputted in the same way as in the sixth embodiment.

The present embodiment as shown above, by classifying the number of coefficients in the decoded blocks located above and on the left of the current block into "N" group(s) according to the value with reference to the code table and the VLC table, according to the combination of N x N ways then formed, and by switching between them adaptively, it is possible to perform efficiently the decoding of the number of coefficients.

The present embodiment shows a decoding processing method of a bit stream in which variable length coding is performed to the values of the number of coefficients themselves. It is, however, possible to perform decoding of a bit stream in which variable length coding is performed to a difference value between the predictive value and the number of coefficients. In this case, the number of coefficients is determined by the fact that the addition calculating unit 1507 adds the difference value between the predictive value calculated at the predictive value calculating unit 1501 to the number of coefficients decoded by the coefficient number decoder 1506.

Also, the coefficient number decoder 1403 performs variable length decoding by switching both the code table and the VLC table according to the numbers of coefficients in the neighboring blocks. It is, however, possible to fix either of these tables rather than to switch between them as in the sixth embodiment. In this case, this is realized by using a storing unit which has either one certain type of code tables or one certain type of VLC tables, in stead of using the table selecting units. Furthermore, it is possible to perform variable length decoding by switching only the VLC tables without using code tables according to the numbers of coefficients in the adjacent blocks, as in the sixth embodiment.

(Ninth embodiment)

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The structure of the picture decoding device and the outline of the decoding processing according to the present embodiment are totally the same as the sixth embodiment apart from the coefficient number decoder 1403 shown in Fig. 17. Regarding variable length decoding processing of the number of coefficients performed by the coefficient number decoder 1403 according to the ninth embodiment, the detail is explained here using Figs. 24 and 14. The bit stream created by the picture coding device according to the fourth embodiment shall be inputted.

Fig. 24A is a block diagram showing in detail an internal structure of the coefficient number decoder 1403.

As shown in Fig. 24A, the coefficient number decoder 1403 includes a table selecting unit 2101 instead of the predictive value calculating unit 1501, the code table selecting unit 1503 and the VLC table selecting unit 1504 shown in Fig. 18A. The table selecting unit 2101 uses directly the number of the coefficients in the decoded blocks without using a predictive value and selects a table for actual use by evaluating both the code table and the VLC table at the same time, which is different from the sixth embodiment. As for the decoded blocks then used for the reference, the three blocks in the position of the blocks B, C and D with respect to the current block X are used as in Fig. 4A. In this regard, when the blocks thus located are neither decoded nor situated outside the picture nor outside the slice, either a value 0 or other arbitrary value is substituted as the number of coefficients. However, the same value as the one used for coding shall be used.

As shown in Fig.14, the table selecting unit 2101 calculates a sum of a length of a bit stream which is created as a result of coding the numbers of the coefficients in the reference blocks using both the code table and the VLC table at the same time and determines it as an evaluation value as in the fourth embodiment. Then, the table selecting unit 2101 performs this processing for all

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the combinations of the code table and the VLC table stored in the code table storing unit 1502 as well as the VLC table storing unit 1505 and selects a combination of a code table and a VLC table in which the gained evaluation value is the smallest.

The coefficient number decoder 1506 refers to the code table and the VLC table selected by the table selecting unit 2101 and performs variable length coding for the number of the coefficients in the current block which is inputted in the same way as in the sixth embodiment.

Thus, in the present embodiment, the coding is performed for the numbers of coefficients in the neighboring blocks which are decoded using the code table and the VLC table, an estimation value is determined using the sum of the length of the bit stream at that time and decoding is performed for the number of coefficients by referring to the code table and the VLC table whose combination generates the smallest evaluation value.

As for the decoded blocks used for reference by the table selecting unit 2101, a case of using only two blocks located in the position of the blocks B and D with respect to the current block X as shown in Fig. 4B in stead of using three neighboring blocks shown in Fig. 4A, can be handled in the same way as in the sixth embodiment. In this regard, when the blocks thus located are neither decoded nor situated outside the picture nor outside the slice, either a value 0 or other arbitrary value can be substituted as a number of coefficients.

Also, the present embodiment shows a decoding processing method of a bit stream in which variable length coding is performed for the values of the number of coefficients themselves. It is, however, possible to perform decoding of a bit stream in which variable length coding is performed for a difference value between the predictive value and the number of coefficients. In this case, the number of coefficients is determined by the fact that the

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addition calculating unit 1507 adds the difference value between the predictive value calculated by the predictive value calculating unit 1501 to the number of coefficients decoded by the coefficient number decoder 1506, as shown in Fig. 24B.

Also, in the present embodiment, the code table and the VLC table are targeted for switching in the coefficient number decoder 1403, however, it is possible to fix either of them rather than to switch between them.

(Tenth embodiment)

The structure of the picture decoding device and the outline of the decoding processing according to the present embodiment are totally the same as in the sixth embodiment, apart from the coefficient number decoder 1403 shown in Fig. 17. The present embodiment uses an inter picture prediction mode for inter picture prediction decoding and an intra picture prediction mode for intra picture prediction decoding as referring information at the coefficient number decoder 1403 in stead of the numbers of coefficients in the decoded blocks as in the sixth embodiment. The bit stream which is created at the picture coding device according to the fifth embodiment shall be inputted.

Here, regarding variable length decoding processing of the number of coefficients performed by the coefficient number decoder 1403 shown in Fig. 17, the detail is explained with reference to Fig. 25.

Fig. 25 is a block diagram showing in detail an internal structure of the coefficient number decoder 1403.

As shown in Fig. 25, the coefficient number decoder 1403 does not include the predictive value calculating unit 1501 shown in Fig. 18A. The inter picture prediction mode for inter picture prediction decoding and the intra picture prediction mode for intra picture prediction decoding are inputted from the bit stream

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analyzing unit 1401 to a code table selecting unit 2201 as well as a VLC table selecting unit 2202. The code table selecting unit 2201 selects a table to be used based on the mode: the inter picture prediction mode for inter picture prediction decoding and the intra picture prediction mode for intra picture prediction decoding. Chart 10 shows a selection method for the code tables stored in the code table selecting unit 2201.

For example, in case where the current picture is decoded using inter picture prediction, a code table 2 is selected accordingly for variable length decoding of the number of coefficients when the size of the current block 8 x 8 is selected for prediction. The items are not limited to those used in Chart 10. In this regard, the same items as the ones used for coding shall be used.

Also, the VLC table selecting unit 2202 selects a VLC table for actual reference using the selection method as shown in Chart 11 as in the case of the code table selecting unit 2201.

The coefficient number decoder 1506 refers to the code table selected by the code table selecting unit 2201 as well as to the VLC table selected by the VLC table selecting unit 2202 so as to perform variable length decoding of the number of the coefficients in the current block which is inputted in the same way as in the sixth embodiment.

Thus in the present embodiment can perform decoding of the number of coefficients by referring to the code table and the VLC table in switching between them adaptively according to the mode: the inter picture prediction mode for inter picture prediction decoding and the intra picture prediction mode for intra picture prediction decoding.

The present embodiment shows a decoding processing method of a bit stream in which variable length coding is performed to the values of the number of coefficients themselves. It is, however, possible to perform decoding of a bit stream in which

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variable length coding is performed to a difference value between a predictive value and a number of coefficients. In this case, the predictive value is determined by using the numbers of the coefficients in the adjacent decoded blocks and the number of coefficients is determined by adding this value to the difference value of the number of coefficients, w hich is decoded by the coefficient number decoder 1506, as in the sixth embodiment.

Also, in the present embodiment, the coefficient number decoder 1403 performs variable length decoding by switching both of the code table and the VLC table. It is, however, possible to fix them rather than switching either or both of them. In this case, this is realized by preparing only a storing unit which has either one certain type of code tables or one certain type of VLC tables.

(Eleventh embodiment)

If a program for realizing the structure of the coding method or the decoding method as shown in the above-mentioned embodiments is recorded on a memory medium such as a flexible disk, it becomes possible to perform the processing as shown in these embodiments easily in an independent computer system.

Figs. 26A, 26B and 26C are illustrations showing the case where the processing shown in the 1~10 above-mentioned embodiments is performed in a computer system using a flexible disk which stores the coding method or the decoding method of the above-mentioned embodiments.

Fig. 26B shows a full appearance of a flexible disk, its structure at cross section and the flexible disk itself whereas Fig. 26A shows an example of a physical format of the flexible disk as a main body of a recording medium. A flexible disk FD is contained in a case F, a plurality of tracks Tr are formed concentrically from the periphery to the inside on the surface of the disk, and each track is divided into 16 sectors Se in the angular direction.

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Therefore, the flexible disk storing the above-mentioned program stores the data as the aforementioned program in an area assigned for it on the flexible disk FD.

Fig. 26C shows a structure for recording and reading out the program on the flexible disk FD. When the program is recorded on the flexible disk FD The computer system Cs writes in the data as the program via a flexible disk drive. When the coding device and the decoding device are constructed in the computer system by the program on the flexible disk, the program is read out from the flexible disk by the flexible disk drive and then transferred to the computer system.

The above explanation is made on an assumption that a flexible disk is used as a data recording medium, but the same processing can also be performed using an optical disk. In addition, the recording medium is not limited to a flexible disk and an optical disk, but any other medium such as an IC card and a ROM cassette capable of recording a program can be used.

Following is an explanation of the applications of the picture coding method as well as the picture decoding method as shown in the above-mentioned embodiments, and a system using them.

Fig. 27 is a block diagram showing an overall configuration of a content supply system ex100 for realizing content distribution service. The area for providing communication service is divided into cells of desired size, and cell sites ex107~ex110 which are fixed wireless stations placed in respective cells.

This content supply system ex100 is connected to devices such as a computer ex111, a PDA (Personal Digital Assistant) ex112, a camera ex113, a cell phone ex114 and a cell phone with a camera ex115 via the Internet ex101, an Internet service provider ex102, a telephone network ex104 and cell sites ex107~ex110.

However, the content supply system ex100 is not limited to

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the configuration as shown in Fig. 27 and may be connected to a combination of any of them. Also, each device may be connected directly to the telephone network ex104 not through the cell sites ex107~ex110.

The camera ex113 is a device capable of shooting video such as a digital video camera. The cell phone ex114 may be a cell phone of a PDC (Personal Digital Communications) system, a CDMA (Code Division Multiple Access) system, a W-CDMA (Wideband-Code Division Multiple Access) system or a GSM (Global System for Mobile Communications) system, a PHS (Personal Handyphone System) or the like.

A streaming server ex103 is connected to the camera ex113 via the telephone network ex104 and the cell site ex109, which realizes a live distribution or the like using the camera ex113 based on the coded data transmitted from the user. Either the camera ex113 or the server which transmits the data may code the data. Also, the picture data shot by a camera ex116 may be transmitted to the streaming server ex103 via the computer ex111. In this case, either the camera ex116 or the computer ex111 may code the picture data. An LSI ex117 included in the computer ex111 or the camera ex116 actually performs coding processing. Software for coding and decoding pictures may be integrated into any type of storage medium (such as a CD-ROM, a flexible disk and a hard disk) that is a recording medium which is readable by the computer ex111 or the like. Furthermore, a cell phone with a camera ex115 may transmit the picture data. This picture data is the data coded by the LSI included in the cell phone ex115.

The content supply system ex100 codes contents (such as a music live video) shot by users using the camera ex113, the camera ex116 or the like in the same way as shown in the above-mentioned embodiments and transmits them to the streaming server ex103, while the streaming server ex103 makes

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stream distribution of the content data to the clients at their requests. The clients include the computer ex111, the PDA ex112, the camera ex113, the cell phone ex114 and so on capable of decoding the above-mentioned coded data. In the content supply system ex100, the clients can thus receive and reproduce the coded data, and can further receive, decode and reproduce the data in real time so as to realize personal broadcasting.

When each device in this system performs coding or decoding, the picture coding device or the picture decoding device, as shown in the above-mentioned embodiments, can be used.

A cell phone will be explained as an example of the device.

Fig. 28 is a diagram showing the cell phone ex115 using the picture coding method and the picture decoding method explained in the above-mentioned embodiments. The cell phone ex115 has an antenna ex201 for communicating with the cell site ex110 via radio waves, a camera unit ex203 such as a CCD camera capable of shooting moving and still pictures, a display unit ex202 such as a liquid crystal display for displaying the data such as decoded pictures and the like shot by the camera unit ex203 and received by the antenna ex201, a body unit including a set of operation keys ex204, a voice output unit ex208 such as a speaker for outputting voices, a voice input unit 205 such as a microphone for inputting voices, a storage medium ex207 for storing coded or decoded data such as data of moving or still pictures shot by the camera, data of received e-mails and data of moving or still pictures, and a slot unit ex206 for attaching the storage medium ex207 to the cell phone ex115. The storage medium ex207 stores in itself a flash memory element, a kind of EEPROM (Electrically Erasable and Programmable Read Only Memory) that is a nonvolatile memory electrically erasable from and rewritable to a plastic case such as a SD card.

Next, the cell phone ex115 will be explained with reference

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to Fig. 29. In the cell phone ex115, a main control unit ex311, designed in order to control overall each unit of the main body which contains the display unit ex202 as well as the operation keys ex204, is connected mutually to a power supply circuit unit ex310, an operation input control unit ex304, a picture coding unit ex312, a camera interface unit ex303, an LCD (Liquid Crystal Display) control unit ex302, a picture decoding unit ex309, a multiplexing/demultiplexing unit ex308, a read/write unit ex307, a modem circuit unit ex306 and a voice processing unit ex305 via a synchronous bus ex313.

When a call-end key or a power key is turned ON by a user's operation, the power supply circuit unit ex310 supplies respective units with power from a battery pack so as to activate the camera attached digital cell phone ex115 as a ready state.

In the cell phone ex115, the voice processing unit ex305 converts the voice signals received by the voice input unit ex205 in conversation mode into digital voice data under the control of the main control unit ex311 including a CPU, ROM and RAM, the modem circuit unit ex306 performs spread spectrum processing of the digital voice data, and the communication circuit unit ex301 performs digital-to-analog conversion and frequency transformation of the data, so as to transmit it via the antenna ex201. Also, in the cell phone ex115, the communication circuit unit ex301 amplifies the data received by the antenna ex201 in conversation mode and performs frequency transformation and analog-to-digital conversion to the data, the modem circuit unit ex306 performs inverse spread spectrum processing of the data, and the voice processing unit ex305 converts it into analog voice data, so as to output it via the voice output unit 208.

Furthermore, when transmitting an e-mail in data communication mode, the text data of the e-mail inputted by operating the operation keys ex204 of the main body is sent out to

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the main control unit ex311 via the operation input control unit ex304. In the main control unit ex311, after the modem circuit unit ex306 performs spread spectrum processing of the text data and the communication circuit unit ex301 performs digital-to-analog conversion and frequency transformation to it, the data is transmitted to the cell site ex110 via the antenna ex201.

When picture data is transmitted in data communication mode, the picture data shot by the camera unit ex203 is supplied to the picture coding unit ex312 via the camera interface unit ex303. When it is not transmitted, it is also possible to display the picture data shot by the camera unit ex203 directly on the display unit 202 via the camera interface unit ex303 and the LCD control unit ex302.

The picture coding unit ex312, which includes the picture coding device as explained in the present invention, compresses and codes the picture data supplied from the camera unit ex203 by the coding method used for the picture coding device as shown in the above-mentioned first embodiment so as to transform it into coded picture data, and sends it out to the multiplexing/demultiplexing unit ex308. At this time, the cell phone ex115 sends out the voices received by the voice input unit ex205 during the shooting with the camera unit ex203 to the multiplexing/demultiplexing unit ex308 as digital voice data via the voice processing unit ex305.

The multiplexing/demultiplexing unit ex308 multiplexes the coded picture data supplied from the picture coding unit ex312 and the voice data supplied from the voice processing unit ex305 using a predetermined method, the modem circuit unit ex306 performs spread spectrum processing of the multiplexed data obtained as a result of the multiplexing, and the communication circuit unit ex301 performs digital-to-analog conversion and frequency

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transformation of the data for the transmission via the antenna ex201.

As for receiving data of a moving picture file which is linked to a Web page or the like in data communication mode, the modem circuit unit ex306 performs inverse spread spectrum processing of the data received from the cell site ex110 via the antenna ex201, and sends out the multiplexed data obtained as a result of the processing to the multiplexing/demultiplexing unit ex308.

In order to decode the multiplexed data received via the antenna ex201, the multiplexing/demultiplexing unit ex308 separates the multiplexed data into a bit stream of picture data and a bit stream of voice data, and supplies the coded picture data to the picture decoding unit ex309 and the voice data to the voice processing unit ex305 respectively via the synchronous bus ex313.

Next, the picture decoding unit ex309, which includes the picture decoding device as explained in the above-mentioned invention, decodes the bit stream of picture data by the decoding method corresponding to the coding method as shown in the above-mentioned embodiments to generate reproduced moving picture data, and supplies this data to the display unit ex202 via the LCD control unit ex302, and thus picture data included in a moving picture file linked to a Web page, for instance, is displayed. At the same time, the voice processing unit ex305 converts the voice data into analog voice data, and supplies this data to the voice output unit ex208, and thus voice data included in the moving picture file linked to a Web page, for instance, is reproduced.

The present invention is not limited to the above-mentioned system, and either the picture coding device or the picture decoding device in the above-mentioned embodiments can be incorporated into a digital broadcasting system as shown in Fig. 30. Such ground-based or satellite digital broadcasting has been in the

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news lately. More specifically, a bit stream of video information is transmitted from a broadcast station ex409 to or communicated with a broadcast satellite ex410 via radio waves. Upon receipt of it, the broadcast satellite ex410 transmits radio waves for broadcasting. Then, a home-use antenna ex406 with a satellite broadcast reception function receives the radio waves, and a television (receiver) ex401 or a set top box (STB) ex407 decodes the bit stream for reproduction. The picture decoding device as shown in the above-mentioned embodiment can be implemented in the reproducing device ex403 for reading out and decoding the bit stream recorded on a storage medium ex402 that is a recording medium such as a CD and a DVD. In this case, the reproduced video signals are displayed on a monitor ex404. It is also conceivable to implement the picture decoding device in the set top box ex407 connected to a cable ex405 for a cable television or the antenna ex406 for satellite and/or ground-based broadcasting so as to reproduce them on a monitor ex408 of the television ex401. The picture decoding device may be incorporated into the television, not in the set top box. Also, a car ex412 having an antenna ex411 can receive signals from the satellite ex410 or the cell site ex107 for reproducing moving pictures on a display device such as a car navigation system ex413.

Furthermore, the picture coding device as shown in the above-mentioned embodiments can code picture signals for recording on a recording medium. As a concrete example, there is a recorder ex420 such as a DVD recorder for recording picture signals on a DVD disk ex421 and a disk recorder for recording them on a hard disk. They can be recorded on an SD card ex422. If the recorder ex420 includes the picture decoding device as shown in the above-mentioned embodiments, the picture signals recorded on the DVD disk ex421 or the SD card ex422 can be reproduced for display on the monitor ex408.

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As for the structure of the car navigation system ex413, the structure without the camera unit ex203, the camera interface unit ex303 and the picture coding unit ex312, out of the components shown in Fig. 29, is conceivable. The same goes for the computer ex111, the television (receiver) ex401 and others.

In addition, three types of implementations can be conceived for a terminal such as the above-mentioned cell phone ex114; a sending/receiving terminal implemented with both an encoder and a decoder, a sending terminal implemented with an encoder only, and a receiving terminal implemented with a decoder only.

As described above, it is possible to use the picture coding method or the picture decoding method in the above-mentioned embodiments for any of the above-mentioned devices and systems, and by using this method, the effects described in the above-mentioned embodiments can be obtained.

Also, the present invention is not limited to the above-mentioned embodiments and a wide range of variations or modifications within the scope of the following claims are possible.

A picture coding method according to the present invention improves coding efficiency since optimal tables for variable length coding can be referred to when the number of coefficients other than 0 contained in a current block to be coded is encoded.

Also, a picture decoding method according to the present invention decodes correctly a bit stream in which a number of coefficients other than 0 contained in a block after orthogonal transformation is coded with reference to optimal tables for variable length coding.

Industrial Applicability

Thus, the picture coding method and the picture decoding method according to the present invention are useful as a method

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to encode an image so as to create a bit stream as well as to decode the created bit stream using devices such as a cell phone, a DVD device, a personal computer or the like.

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CLAIMS

1. A picture coding method for coding, on a block-to-block basis, an image by transforming the image into coefficients showing spatial frequency components, the method comprising:

a predicting step for calculating a predictive value of the number of coefficients other than 0 contained in a current block to be coded based on the numbers of coefficients other than 0 contained in coded blocks located on a periphery of the current block;

a table selecting step for selecting tables for variable length coding based on the predictive value calculated in the predicting step; and

a variable length coding step for performing variable length coding for the number of coefficients other than 0 contained in the current block, with reference to the tables for variable length coding selected in the table selecting step.

2. The picture coding method according to Claim 1,

wherein in the predicting step, the predictive value is calculated using an average value of the numbers of the coefficients other than 0 contained in the coded blocks.

3. The picture coding method according to Claim 1,

wherein the tables for variable length coding include at least one VLC table,

in the table selecting step, the VLC table is selected based on the predictive value calculated in the predicting step, and

in the variable length coding step, the number of the coefficients other than 0 contained in the current block is transformed into a variable length code with reference to the VLC table selected in the table selecting step.

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4. The picture coding method according to Claim 1,

wherein the tables for variable length coding include at least one code table and one VLC table,

in the table selecting step, the code table and the VLC table are selected based on the predictive value calculated in the predicting step, and

in the variable length coding step, the number of the coefficients other than 0 contained in the current block is transformed into a code number with reference to the code table selected in the table selecting step, and then the code number is transformed into a variable length code with reference to the VLC table selected in the table selecting step.

5. The picture coding method according to Claim 1, further comprising, a keeping step for keeping the numbers of the coefficients other than 0 contained in the coded blocks neighboring an uncoded block at least until the uncoded block is coded.

6. The picture coding method according to Claim 1,

wherein in the predicting step, the predictive value of the number of the coefficients other than 0 contained in the current block is calculated based on the numbers of the coefficients other than 0 contained in the coded blocks located above and on the left of the current block.

7. The picture coding method according to Claim 6,

wherein in the predicting step, a value 0 is set as the predictive value when no coded blocks are found above and on the left of the current block.

8. The picture coding method according to Claim 6,

wherein in the predicting step, an average value of the

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numbers of the coefficients other than 0 contained in the coded blocks located above and on the left of the current block is calculated as the predictive value when the coded blocks are found above and on the left of the current block.

9. The picture coding method according to Claim 6,

wherein in the predicting step, the number of the coefficients other than 0 contained in the coded block located on the left of the current block is set as the predictive value when the coded block is found on the left of but not above the current block.

10. The picture coding method according to Claim 6,

wherein in the predicting step, the number of the coefficients other than 0 contained in the coded block above the current block is set as the predictive value when the coded block is found above but not on the left of the current block.

11. The picture coding method according to Claim 6,

wherein in the predicting step, a value 0 is set as the predictive value when upper and left boundaries of the current block are either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what a picture is divided into a plurality of sections.

12. The picture coding method according to Claim 6,

wherein in the predicting step, an average value of the numbers of the coefficients other than 0 contained in the coded blocks located above and on the left of the current block is set as the predictive value when upper and left boundaries of the current block are neither a boundary of pictures, each of which is a unit of the picture nor a boundary of slices, each of which is what the picture is divided into a plurality of sections.

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13. The picture coding method according to Claim 6,

wherein in the predicting step, the number of the coefficients other than 0 contained in the coded block on the left of the current block is set as the predictive value when an upper boundary of the current block is either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections and a left boundary is neither the boundary of pictures nor the boundary of slices.

14. The picture coding method according to Claim 6,

wherein in the predicting step, the number of the coefficients other than 0 contained in the coded block above the current block is set as the predictive value when a left boundary of the current block is either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections and an upper boundary is neither the boundary of pictures nor the boundary of slices.

15. A picture decoding method for decoding, on a block-to-block basis, an image that is coded by transforming the image into coefficients showing spatial frequency components, the method comprising:

a predicting step for calculating a predictive value of the number of coefficients other than 0 contained in a current block to be decoded based on numbers of coefficients other than 0 contained in decoded blocks located on a periphery of the current block;

a table selecting step for selecting tables for variable length decoding based on the predictive value calculated in the predicting

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step; and

a variable length decoding step for performing variable length decoding for a bit stream obtained by coding the number of the coefficients other than 0 contained in the current block, with reference to the tables for variable length decoding selected in the table selecting step.

16. The picture decoding method according to Claim 15,

wherein in the predicting step, the predictive value is calculated using an average value of the numbers of the coefficients other than 0 contained in the decoded blocks.

17. The picture coding method according to Claim 15,

wherein the tables for variable length decoding include at least one VLC table,

in the table selecting step, the VLC table is selected based on the predictive value calculated in the predicting step, and

in the variable length decoding step, a variable length code showing the number of coefficients other than 0 contained in the current block is transformed into said number of the coefficients with reference to the VLC table selected in the table selecting step.

18. The picture coding method according to Claim 15,

wherein the tables for variable length decoding include at least one code table and one VLC table,

in the table selecting step, the code table and the VLC table are selected based on the predictive value calculated in the predicting step, and

in the variable length decoding step, a variable length code showing the number of the coefficients other than 0 contained in the current block is transformed into a code number with reference to the VLC table selected in the table selecting step, and the code

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number is transformed into said number of the coefficients with reference to the code table selected in the table selecting step.

19. The picture decoding method according to Claim 15, further comprising, a keeping step for keeping the numbers of the coefficients other than 0 contained in the decoded blocks neighboring an undecoded block at least until the undecoded block is decoded.

20. The picture decoding method according to Claim 15,

wherein in the predicting step, the predictive value of the number of the coefficients other than 0 contained in the current block is calculated based on the numbers of coefficients other than 0 contained in the decoded blocks located above and on the left of the current block.

21. The picture decoding method according to Claim 20,

wherein in the predicting step, a value 0 is set as the predictive value when no decoded blocks are found above and on the left of the current block.

22. The picture decoding according to Claim 20,

wherein in the predicting step, an average value of the numbers of the coefficients other than 0 contained in the decoded blocks located above and on the left of the current block is calculated as the predictive value when the decoded blocks are found above and on the left of the current block.

23. The picture decoding method according to Claim 20,

wherein in the predicting step, the number of the coefficients other than 0 contained in the decoded block located on the left of the current block is set as the predictive value when the

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decoded block is found on the left of but not above the current block.

24. The picture decoding method according to Claim 20, wherein in the predicting step, the numbers of the coefficients other than 0 contained in the decoded block above the current block is set as the predictive value when the current block finds the decoded block above but not on the left of the current block.

25. The picture decoding method according to Claim 20, wherein in the predicting step, a value 0 is set as the predictive value when upper and left boundaries of the current block are either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections.

26. The picture decoding method according to Claim 20, wherein in the predicting step, an average value of the numbers of the coefficients other than 0 contained in the decoded blocks located above and on the left of the current block is set as the predictive value when upper and left boundaries of the current block are neither a boundary of pictures, each of which is the unit of the picture nor the boundary of slices, each of which is what the picture is divided into a plurality of sections.

27. The picture decoding method according to Claim 20, wherein in the predictive step, the number of the coefficients other than 0 contained in the decoded block located on the left of the current block is set as the predictive value when an upper boundary of the current block is either a boundary of pictures, each of which is a unit of the picture or a boundary of

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slices, each of which is what the picture is divided into a plurality of sections and a left boundary of the block is neither the boundary of pictures nor the boundary of slices.

28. The picture decoding method according to Claim 20,

wherein in the predicting step, the number of the coefficients other than 0 contained in the decoded block above the current block is set as the predictive value when a left boundary of the current block is either a boundary of pictures, each of which is a unit of the picture or a boundary of slices, each of which is what the picture is divided into a plurality of sections and the upper boundary of the block is neither the boundary of pictures nor the boundary of slices.

29. A picture coding device for coding, on a block-to-block basis, an image by transforming the image into coefficients showing spatial frequency components, the device comprising:

a predicting unit operable to calculate a predictive value of the number of coefficients other than 0 contained in a current block to be coded, based on numbers of coefficients other than 0 contained in coded blocks located on a periphery of the current block;

a table selecting unit operable to select a table for variable length coding based on the predictive value calculated in the predicting step; and

a variable length coding unit operable to perform variable length coding for the number of the coefficients other than 0 contained in the current block, with reference to the tables for variable length coding selected in the table selecting step.

30. A picture decoding device for decoding, on a block-to-block basis, an image that is coded by transforming the image into

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coefficients showing spatial frequency components, the device comprising:

a predicting unit operable to calculate a predictive value of the number of the coefficients other than 0 contained in a current block to be decoded, based on numbers of coefficients other than 0 contained in decoded blocks located on a periphery of the current block;

a table selecting unit operable to select tables for variable length decoding based on the predictive value calculated by the predicting unit; and

a variable length decoding unit operable to perform variable length decoding for the number of the coefficients other than 0 contained in the current block, with reference to the tables for variable length decoding selected by the table selecting unit.

31. A program for coding an image on a block-to-block basis, the program causing a computer to execute the steps included in the picture coding method according to any one claim of Claim 1 to Claim 14.

32. A bit stream created using a picture coding method for coding an image on a block-to-block basis, the bit stream comprising the number of coefficients other than 0 contained in a current block to be coded, the current block being coded using the picture coding method according to any one claim of Claim 1 to Claim 14.

33. A program for decoding a coded image causing a computer to execute the steps included in the picture decoding method according to any one claim of Claim 15 to Claim 28.

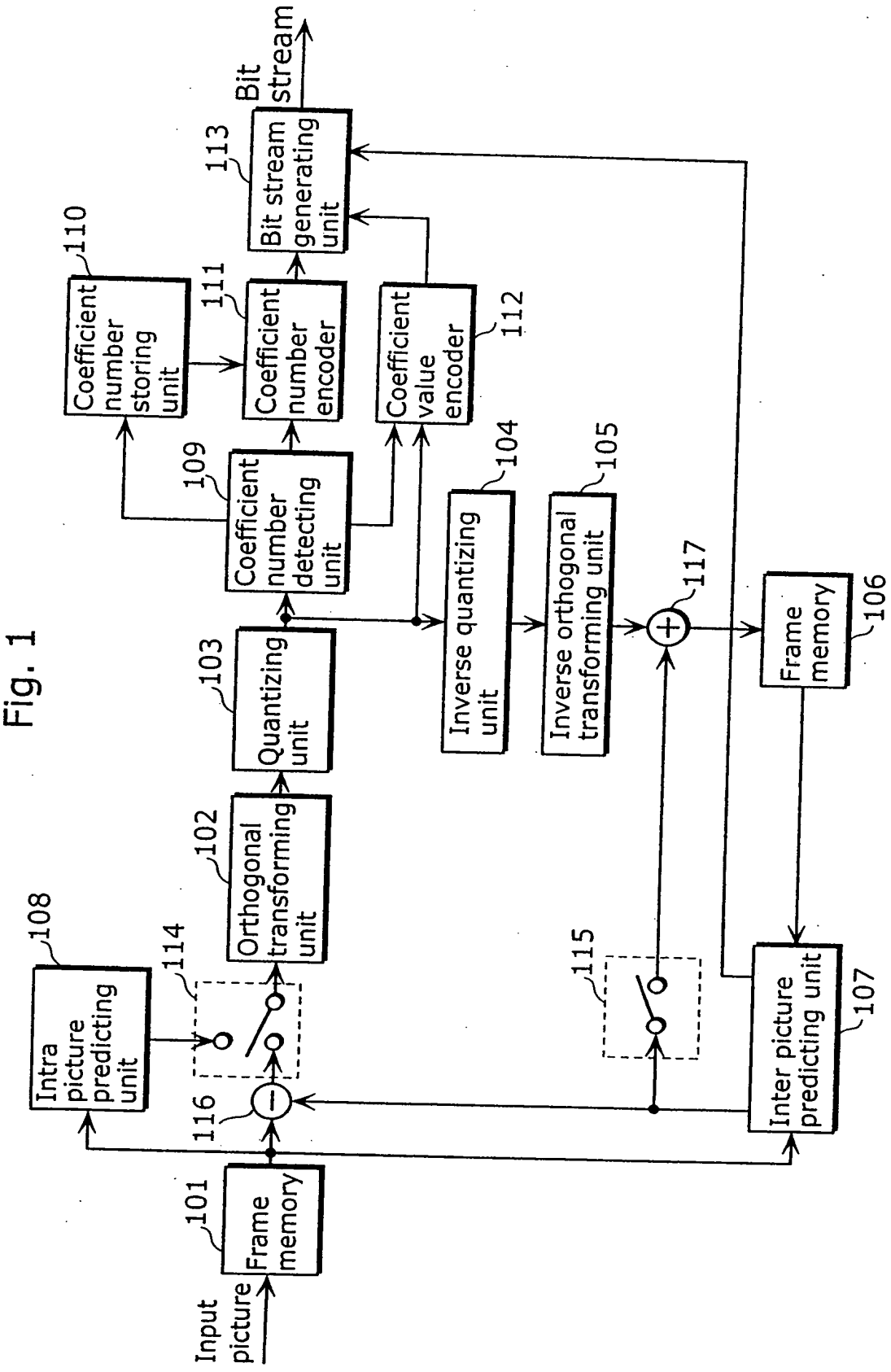
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ABSTRACT

The method includes the following units: a coefficient number detecting unit (109) for detecting the number of coefficients which has a value other than 0 for each block according to the generated coefficient, a coefficient number storing unit (110) for storing the number of coefficients detected, a coefficient number coding unit (111) for selecting a table for variable length coding based on the numbers of coefficients in the coded blocks located on the periphery of a current block to be coded with reference to the selected table for variable length coding so as to perform variable length coding for the number of coefficients.

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Fig. 1



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Fig. 2A

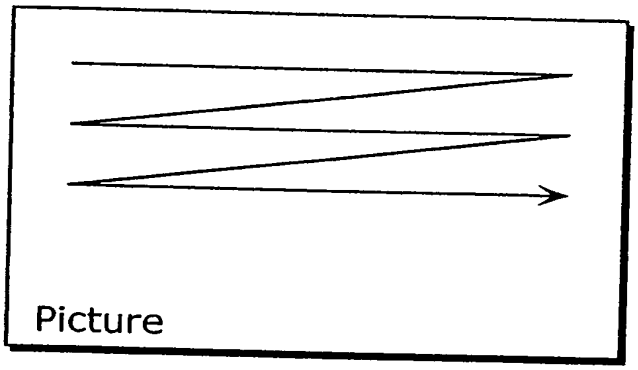
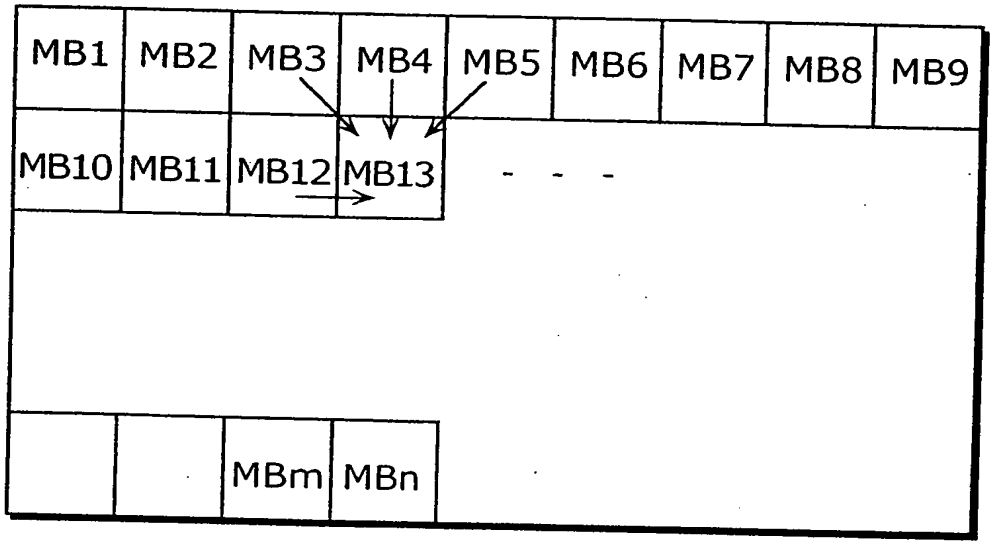


Fig. 2B



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Fig. 3A

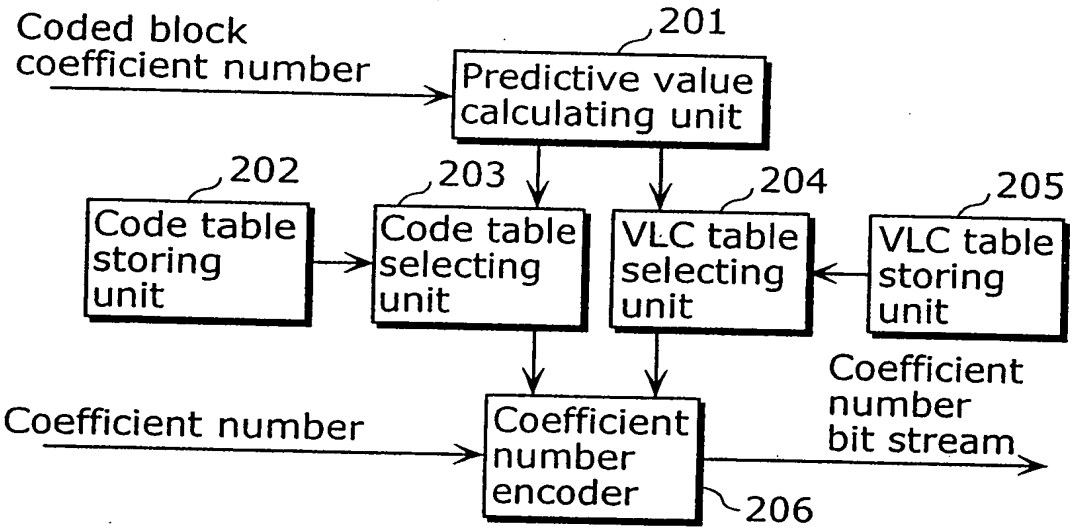
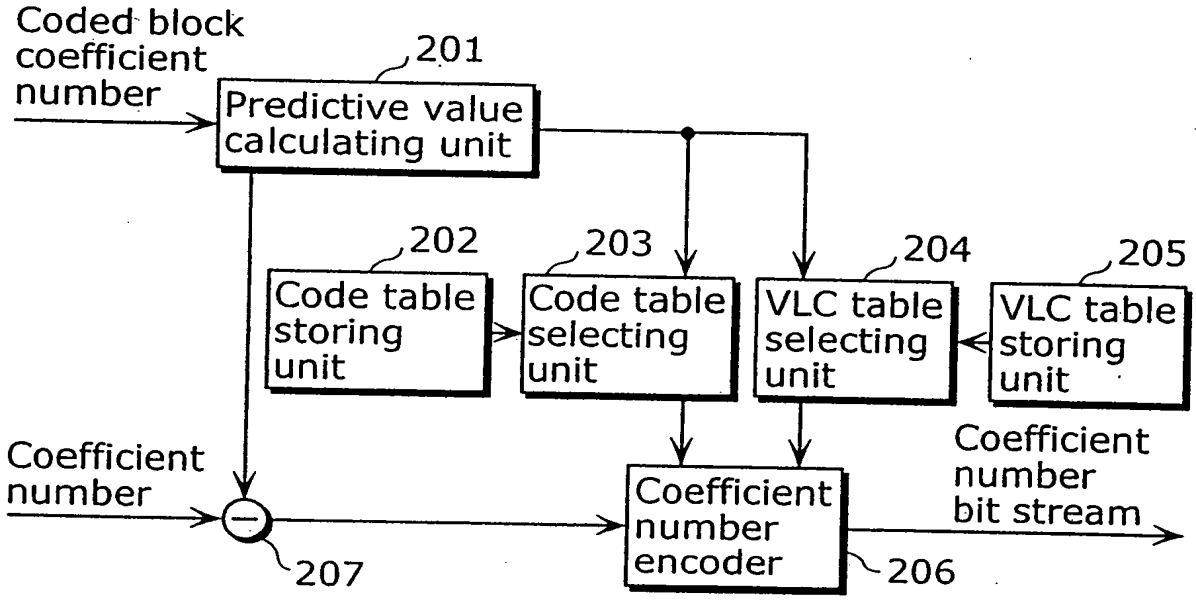


Fig. 3B



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Fig. 4A

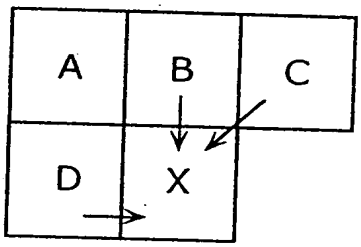
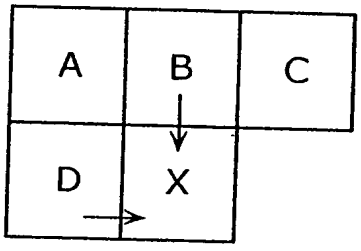
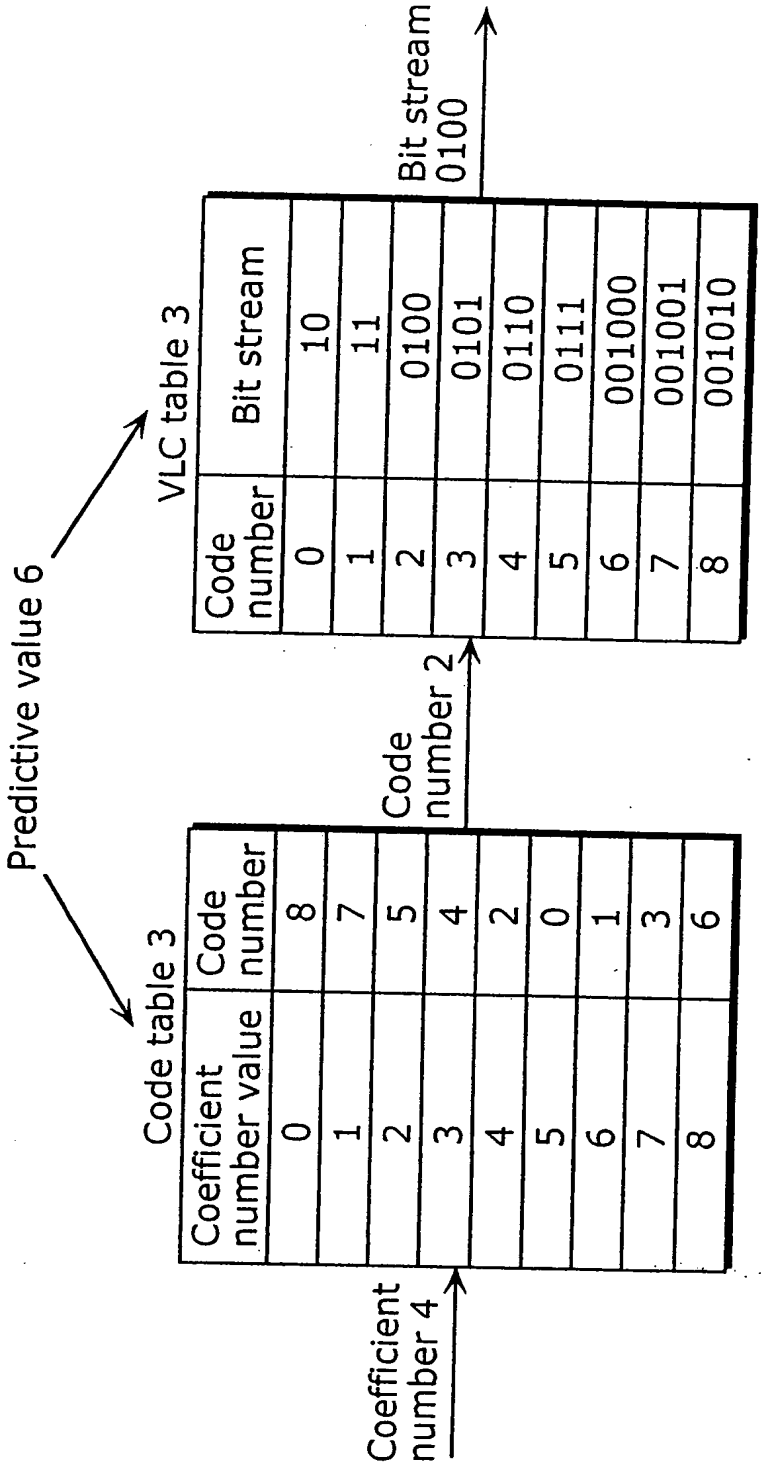


Fig. 4B



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Fig. 5



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Fig. 6B

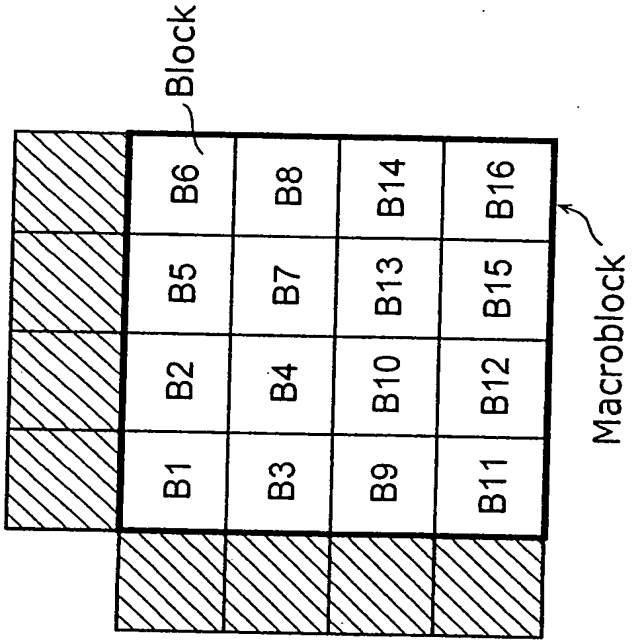
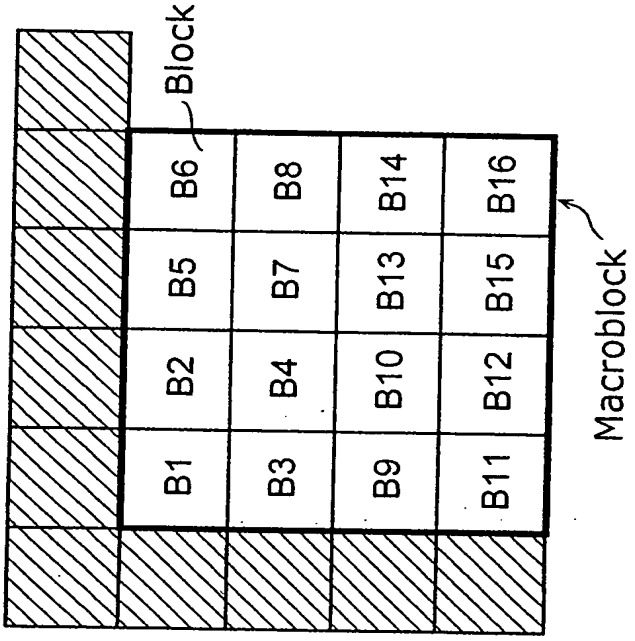


Fig. 6A



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Fig. 7A

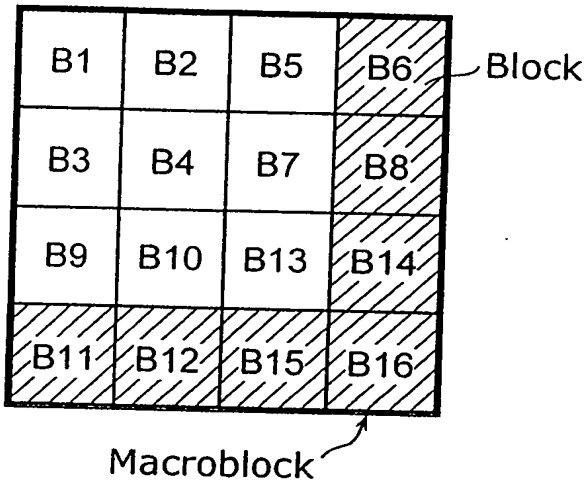


Fig. 7B

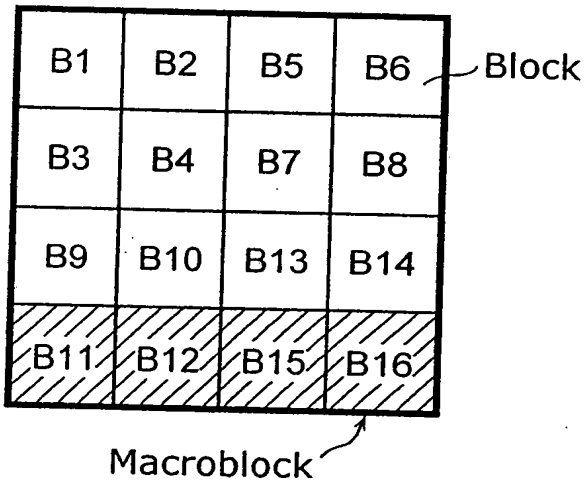
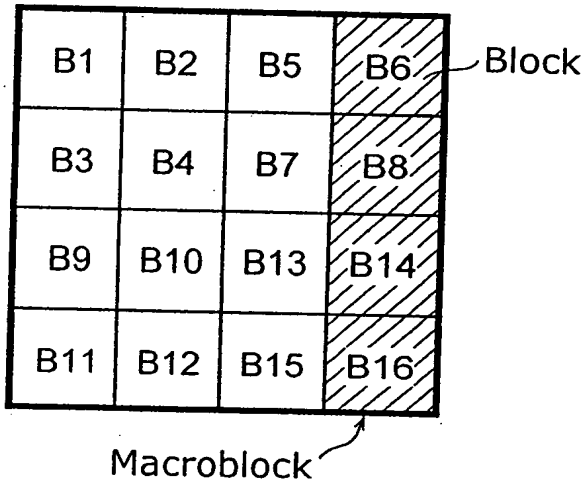


Fig. 7C



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Fig. 8A

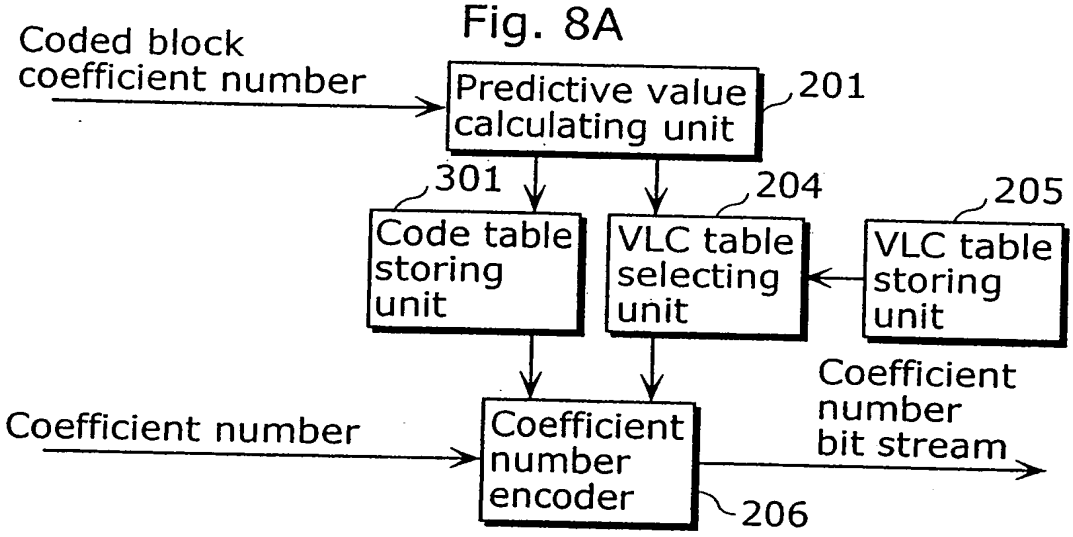


Fig. 8B

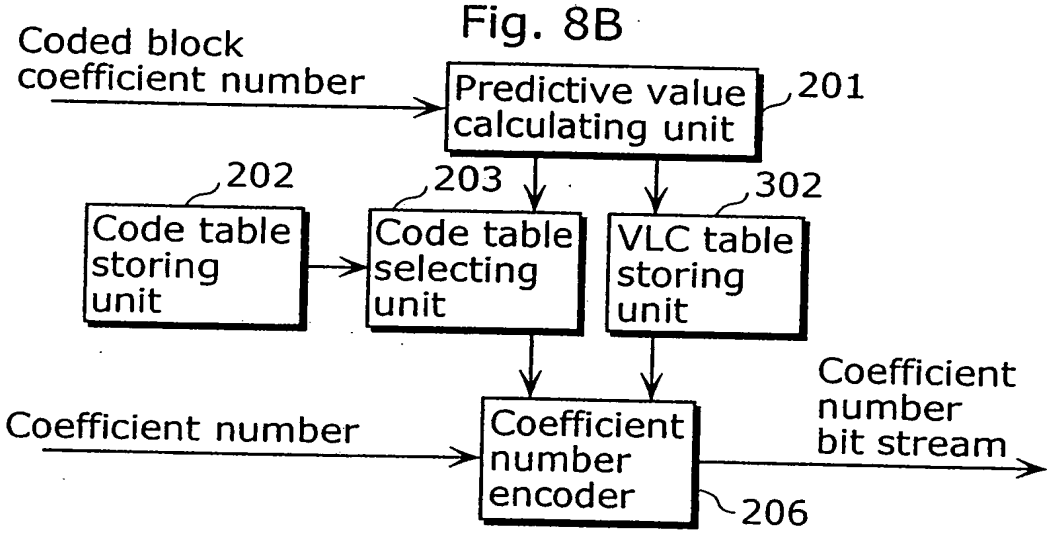
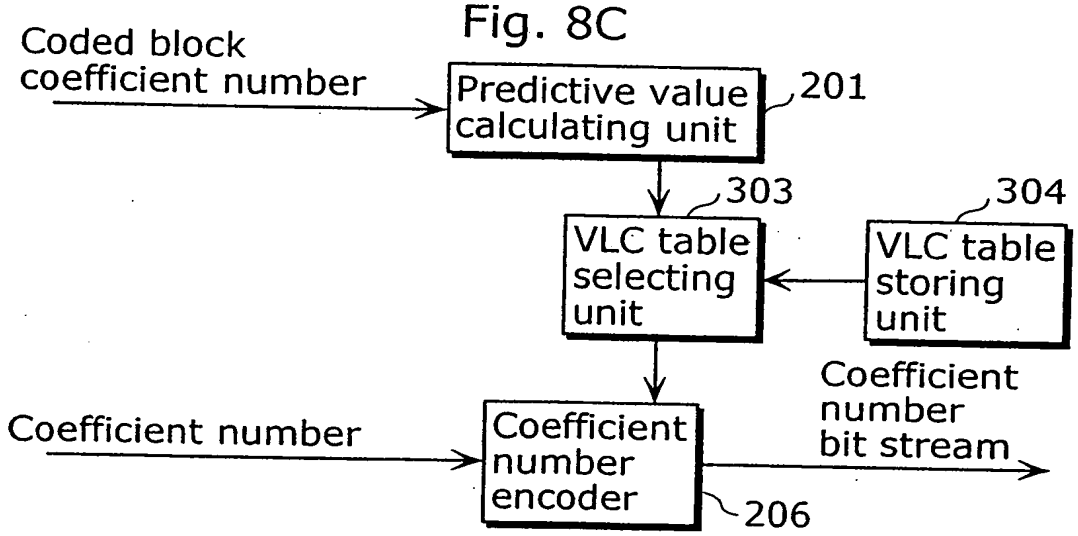
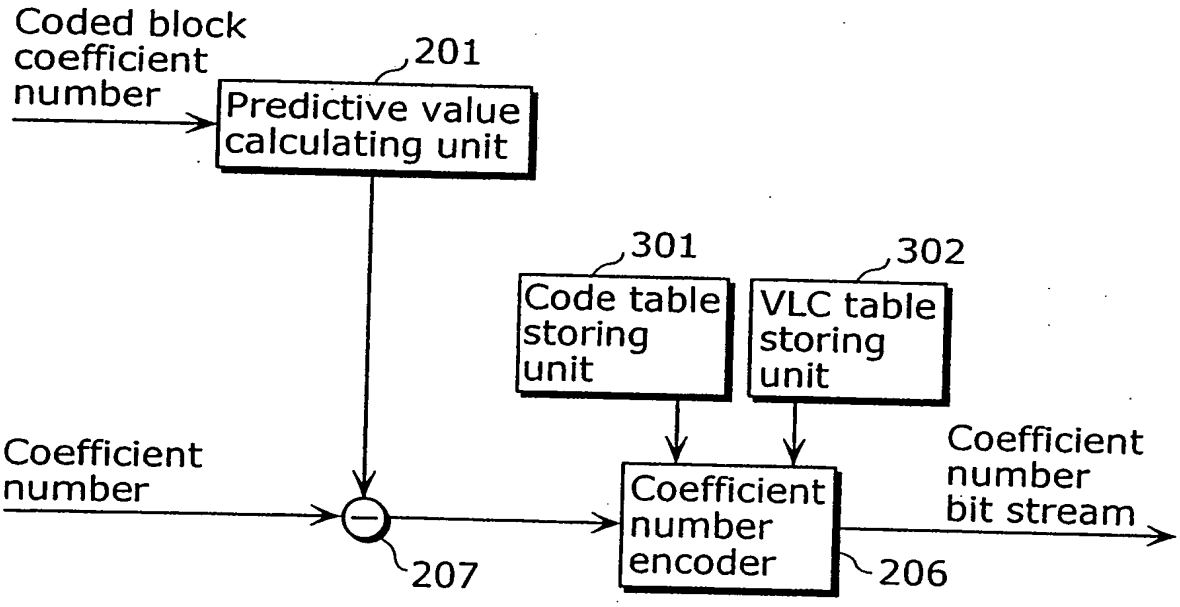


Fig. 8C



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Fig. 9



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Fig. 10A

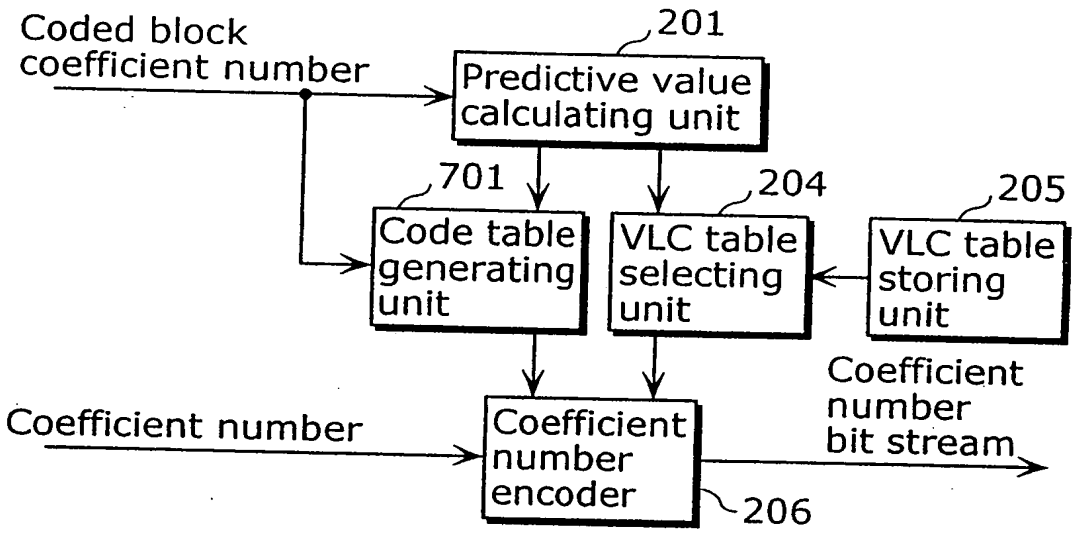
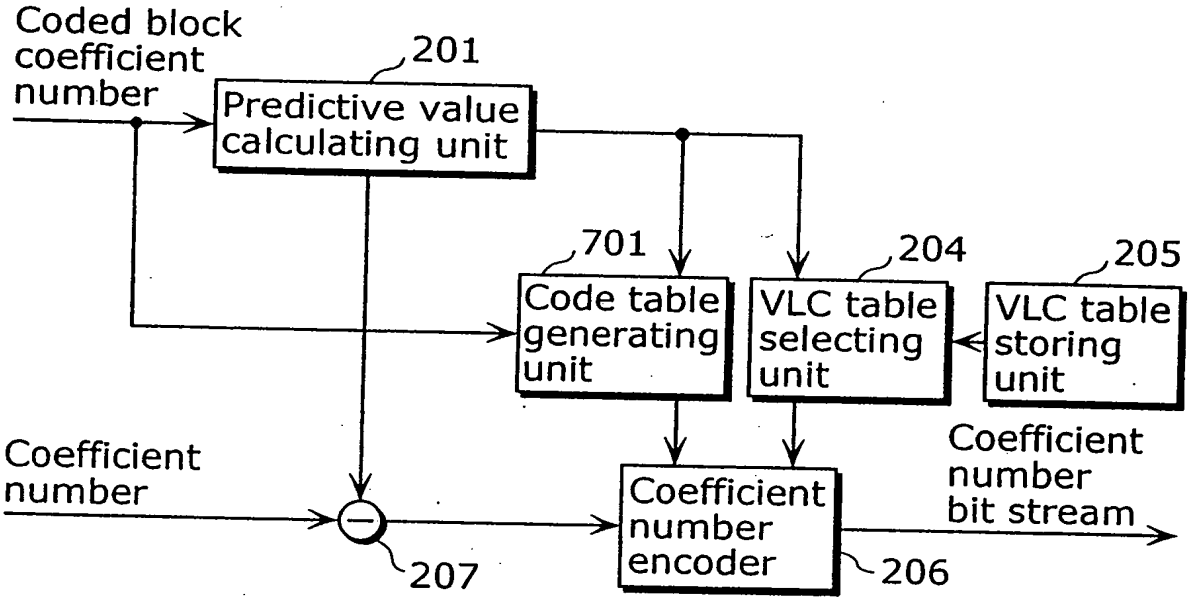
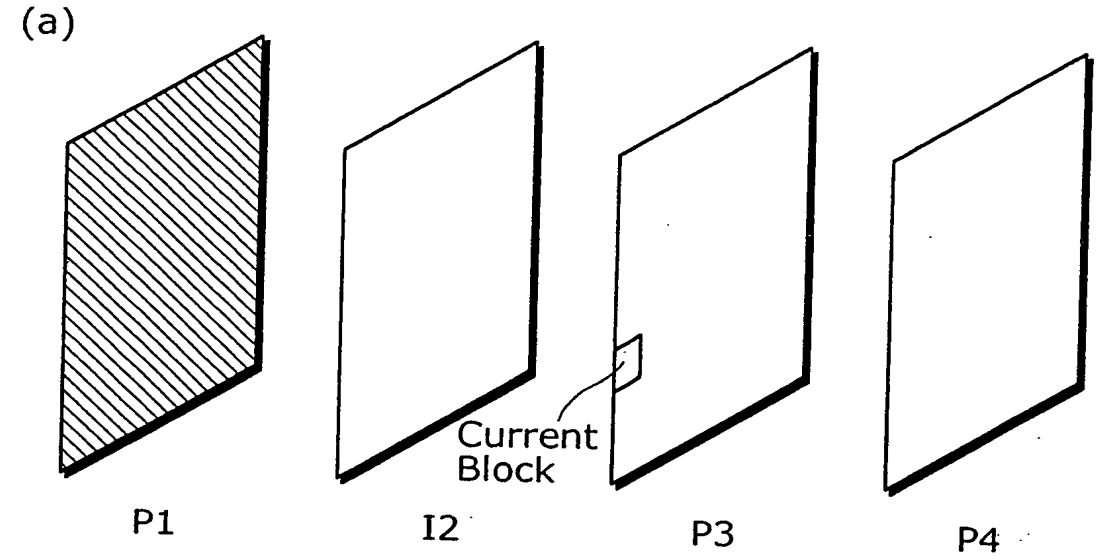


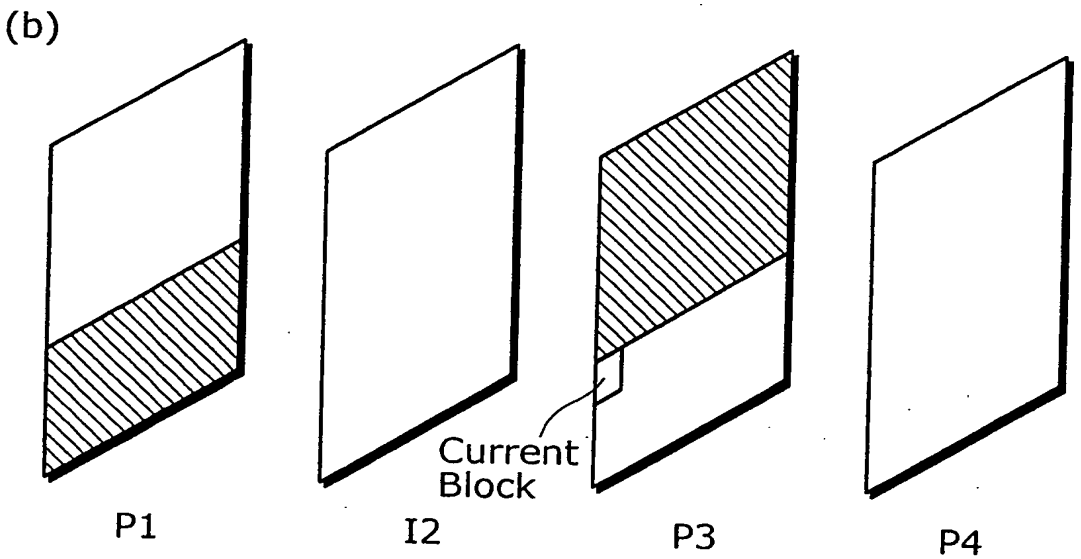
Fig. 10B



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Fig. 11





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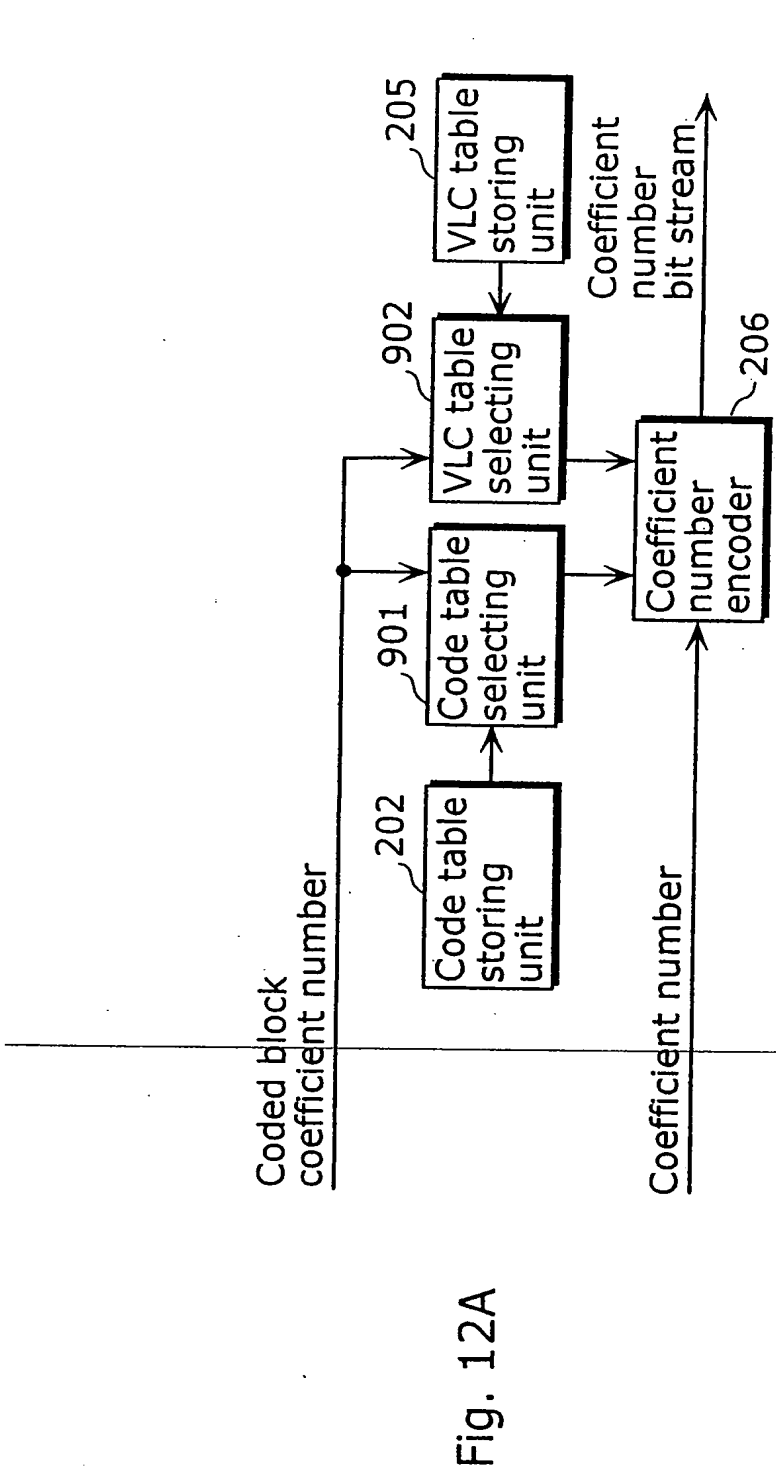


Fig. 12A

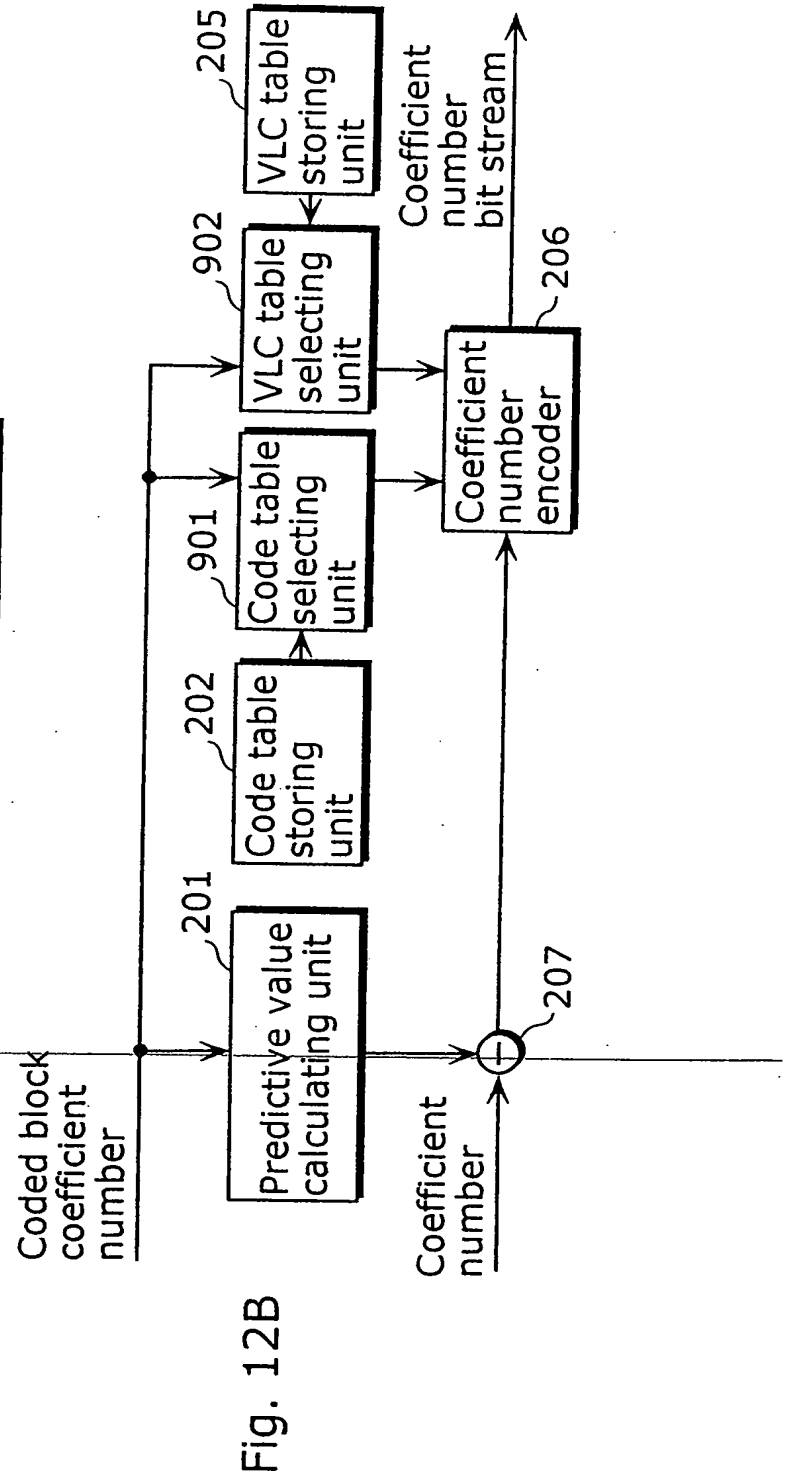


Fig. 12B

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Fig. 13A

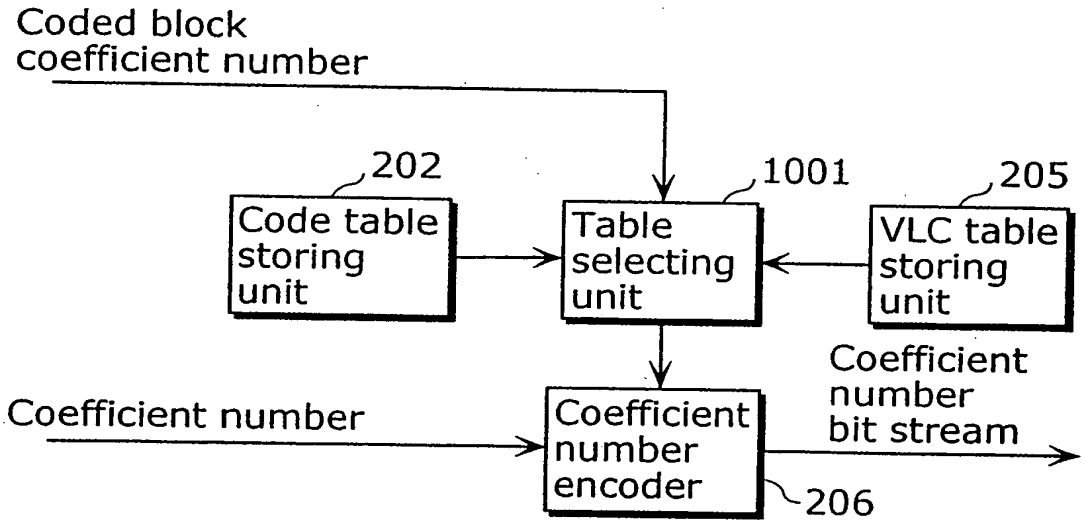
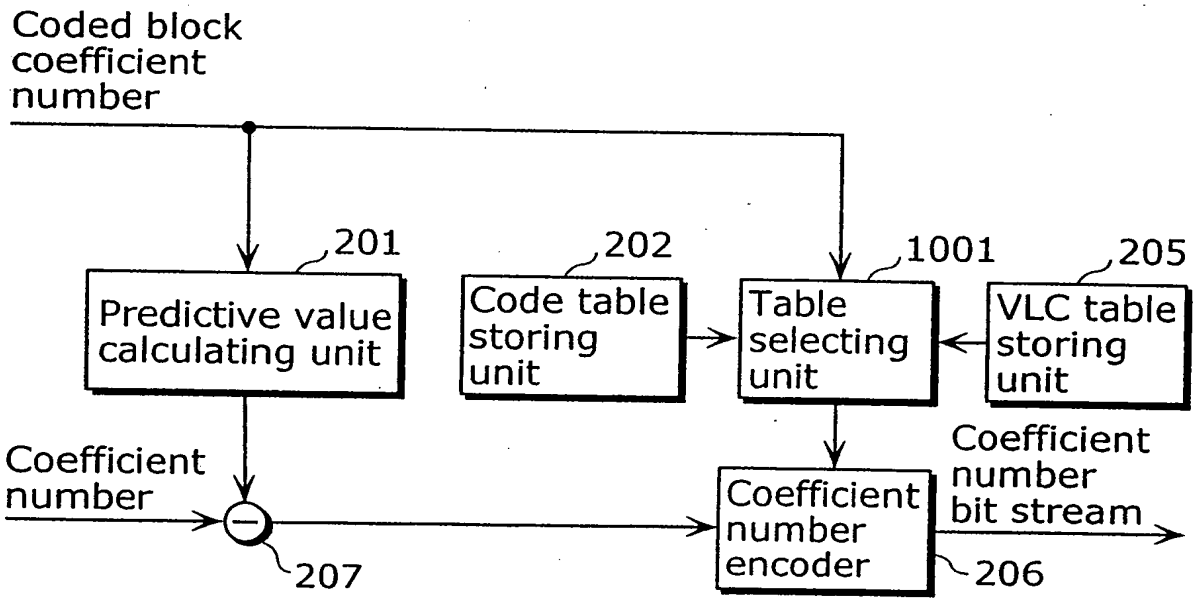
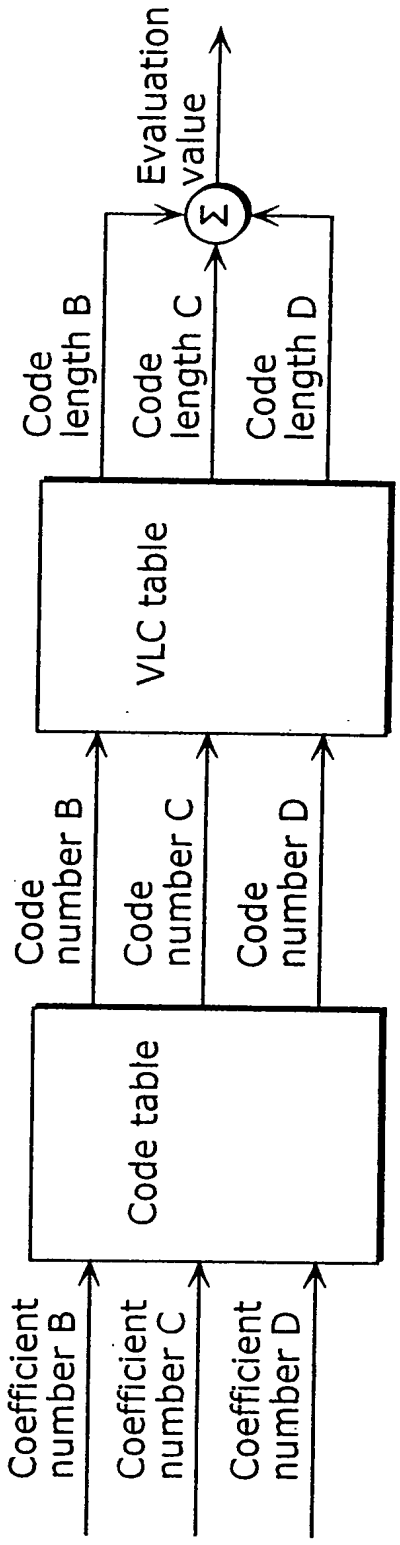


Fig. 13B



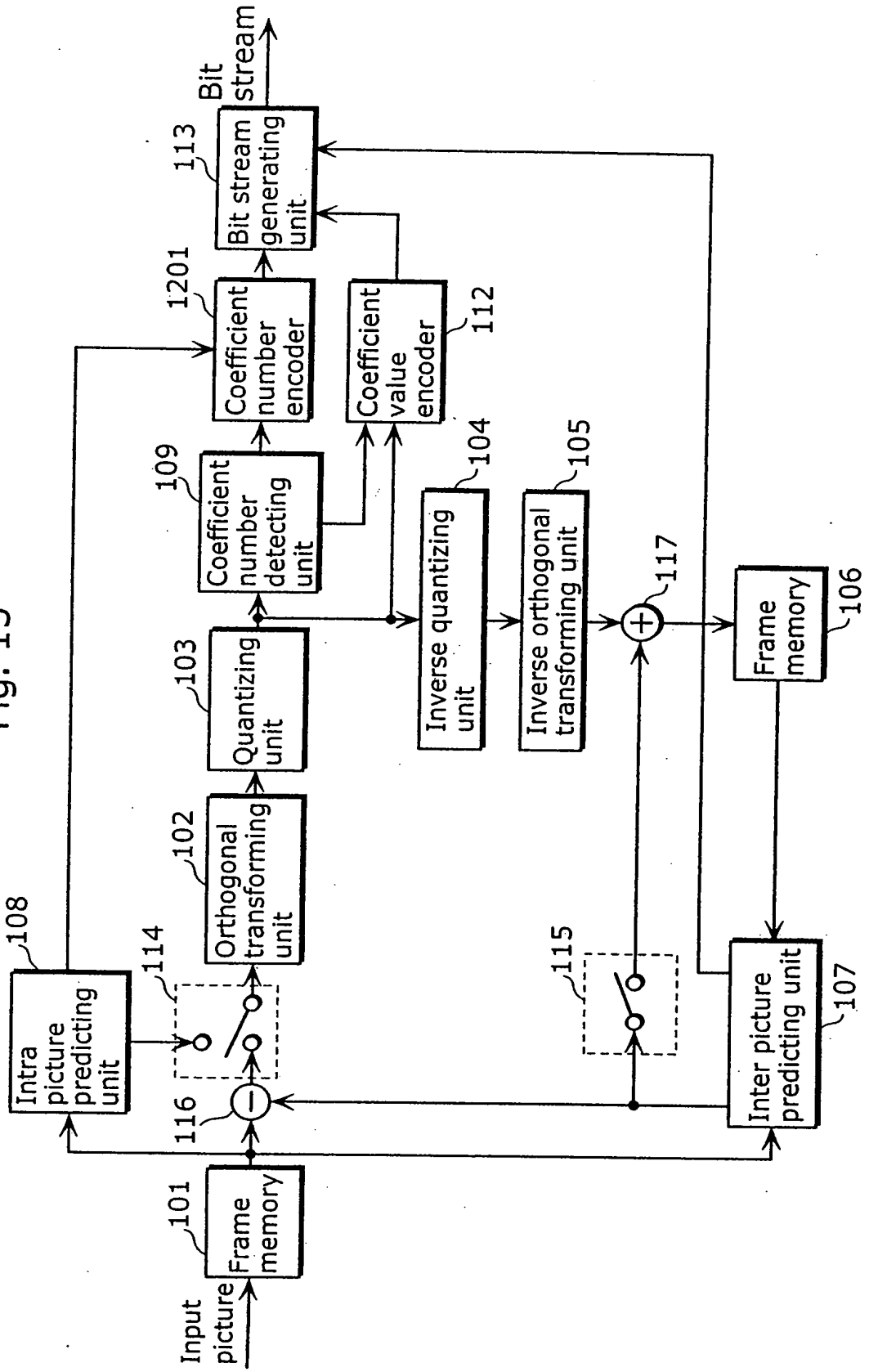
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Fig. 14



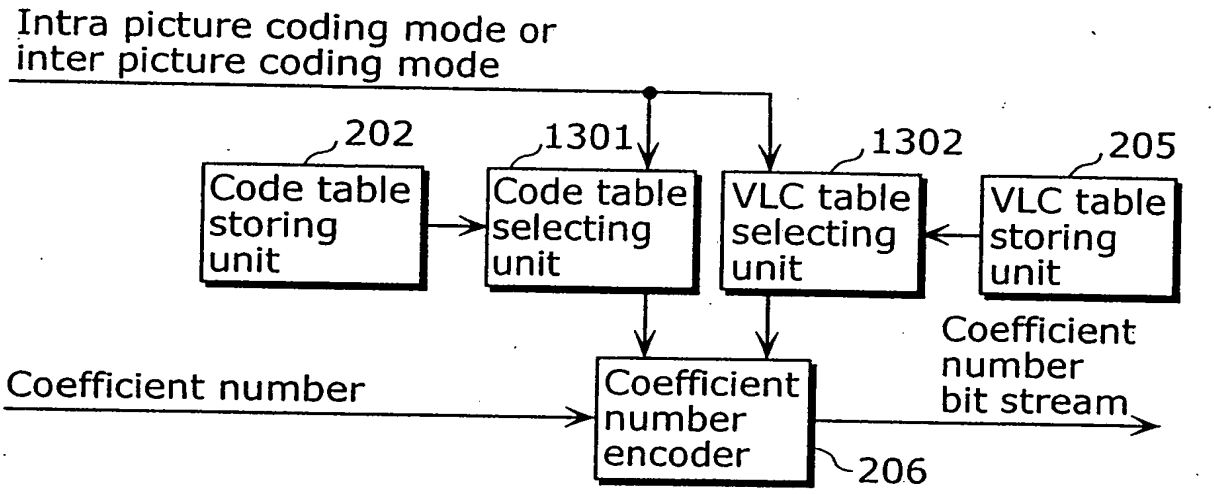
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Fig. 15



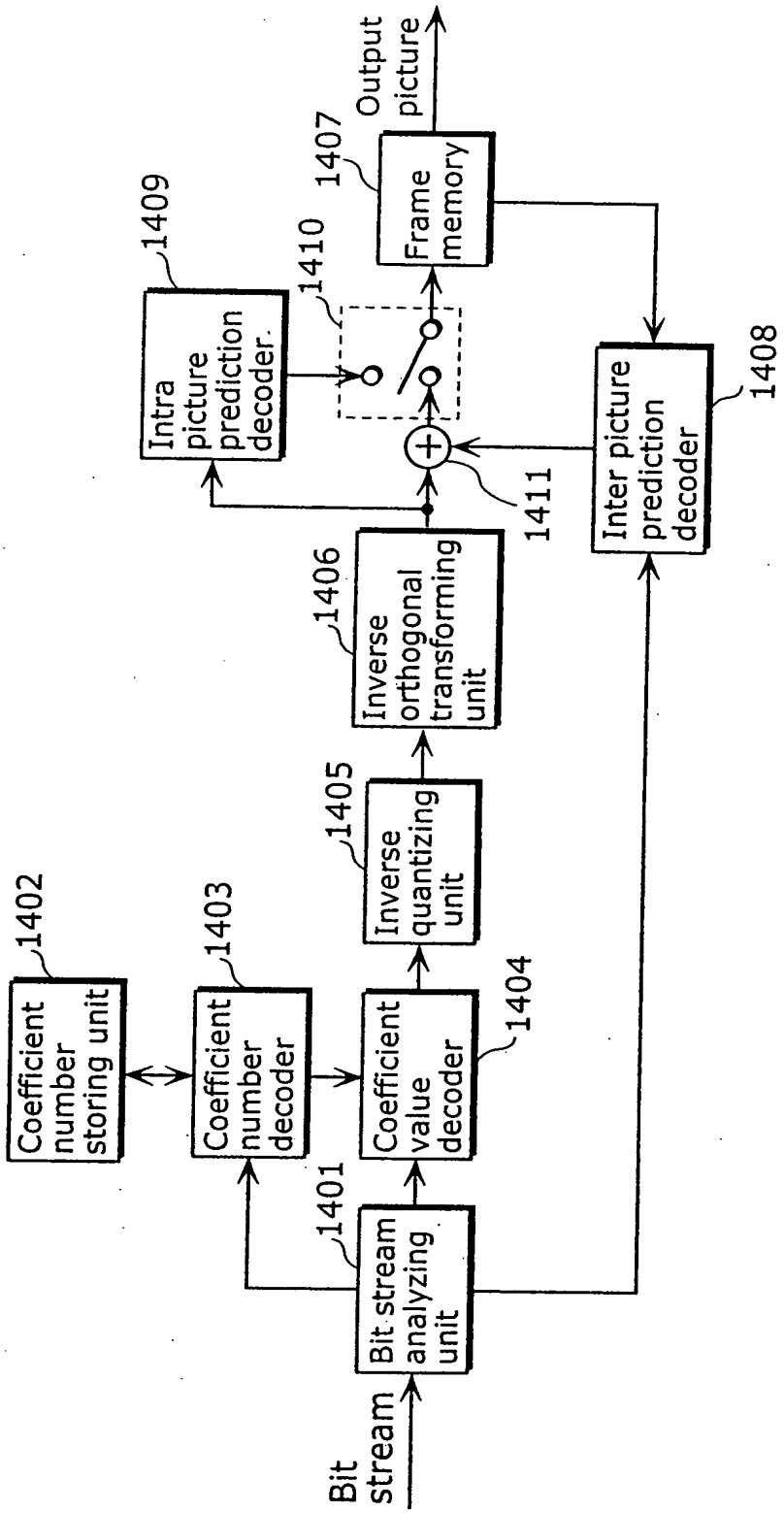
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Fig. 16



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Fig. 17



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Fig. 18A

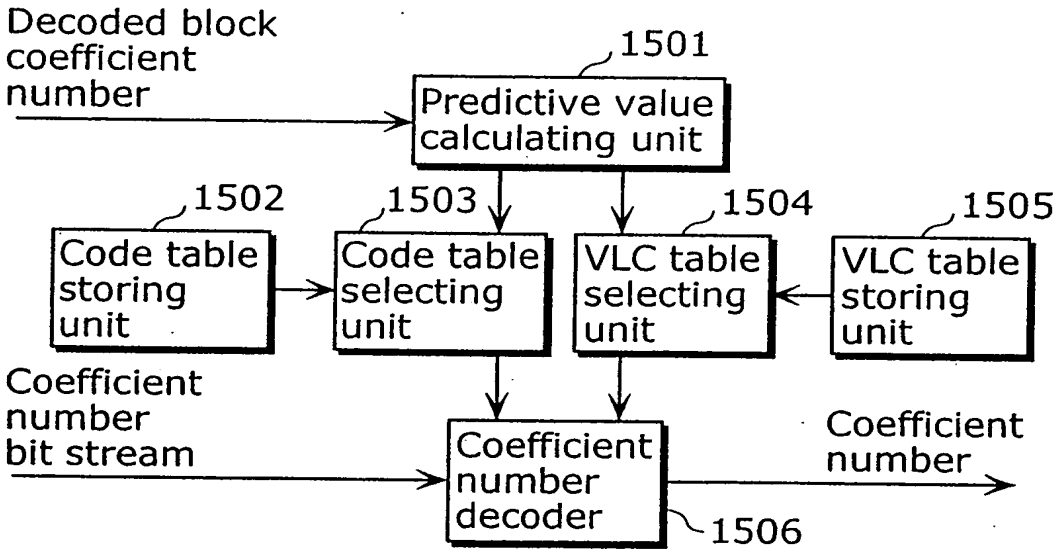
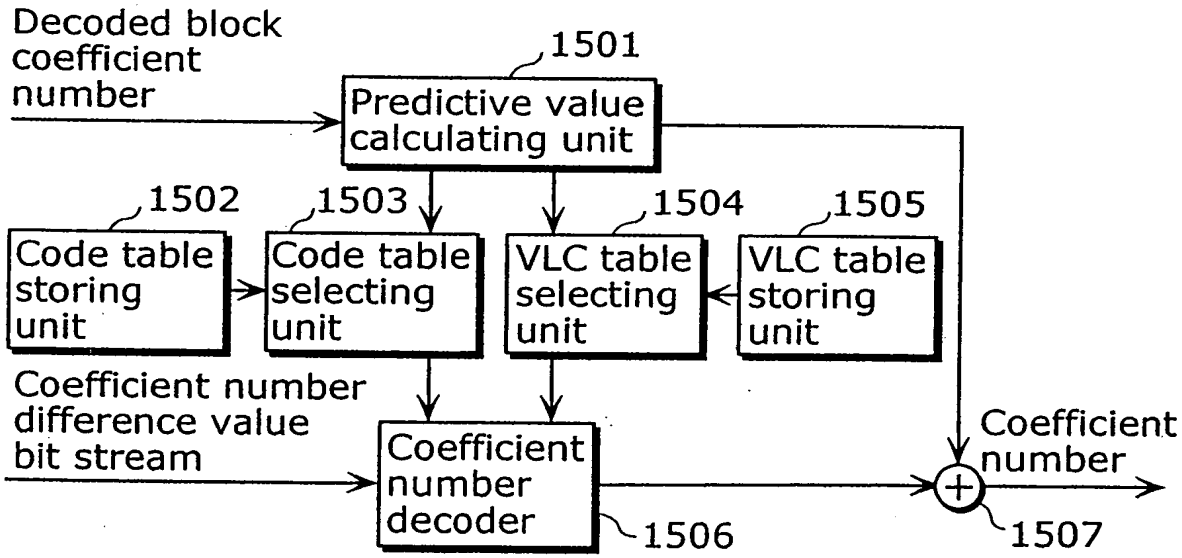


Fig. 18B



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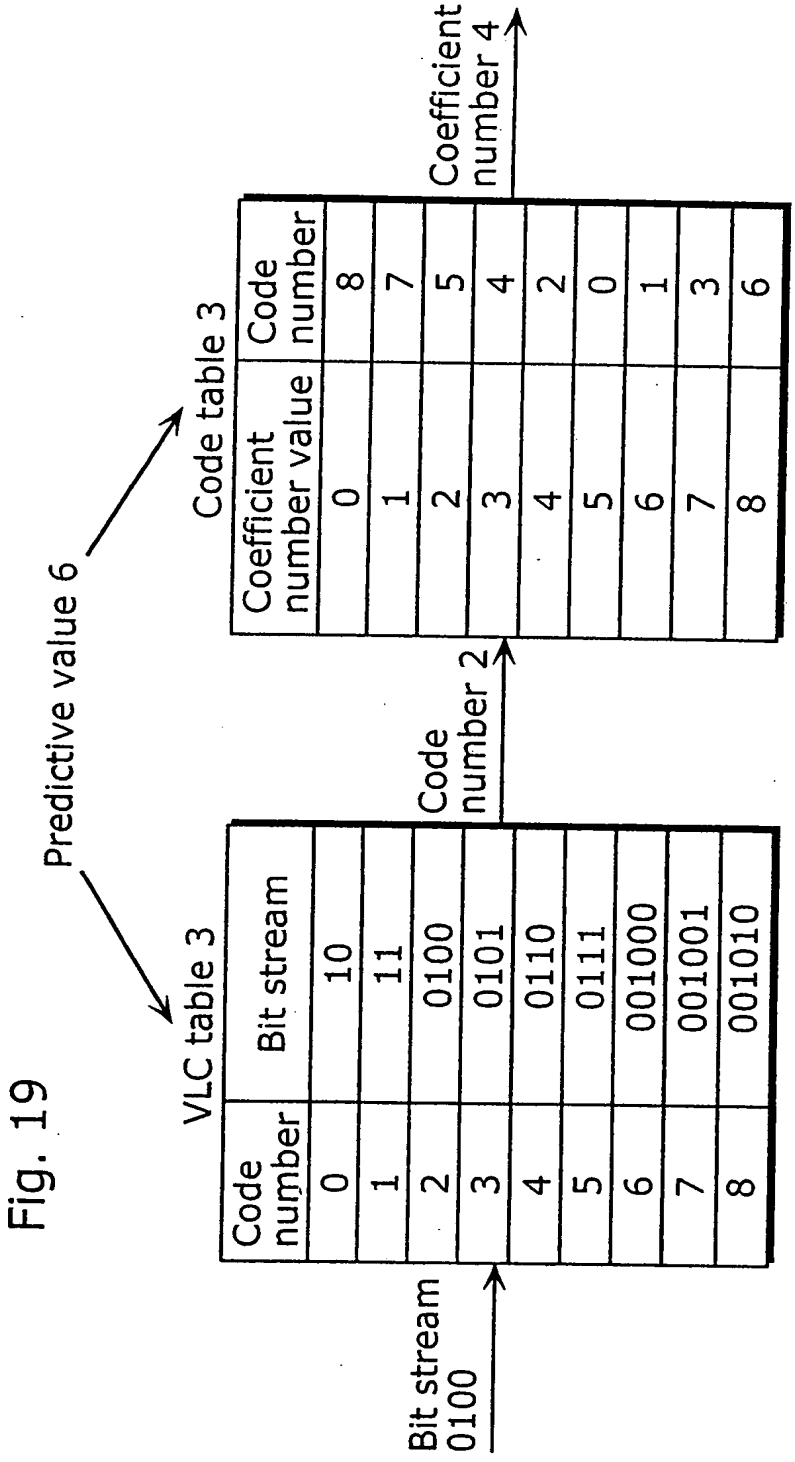


Fig. 19

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Fig. 20A

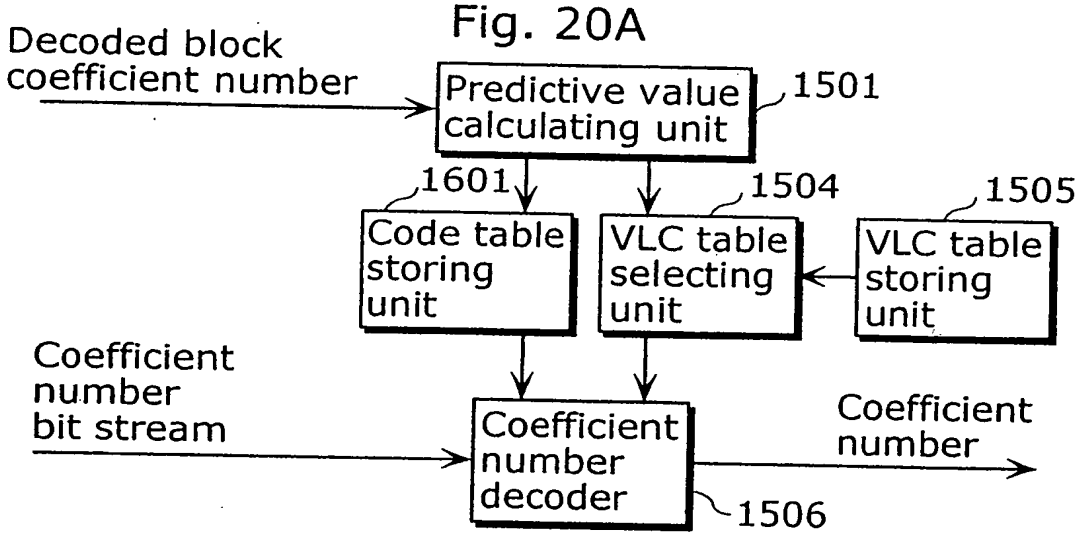


Fig. 20B

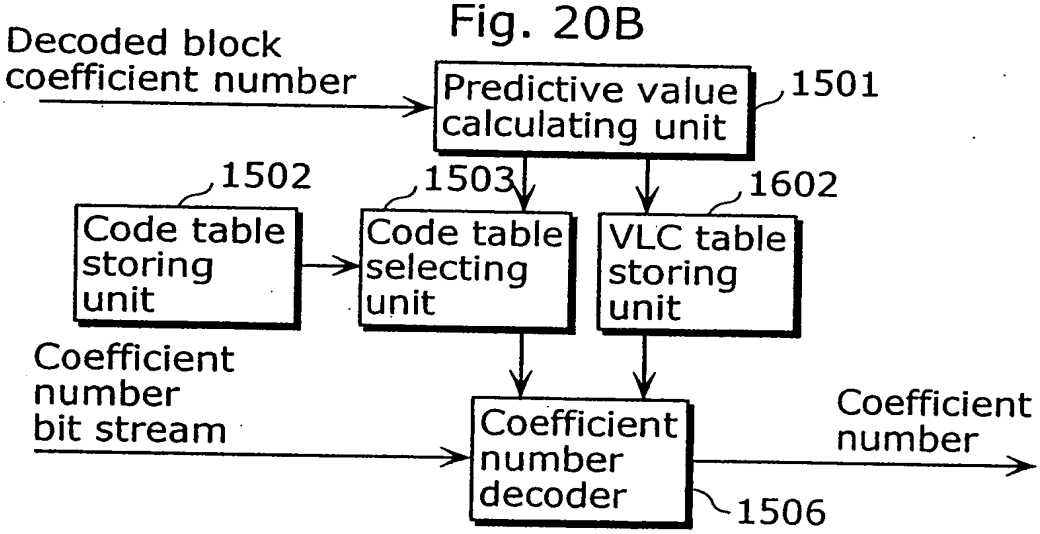
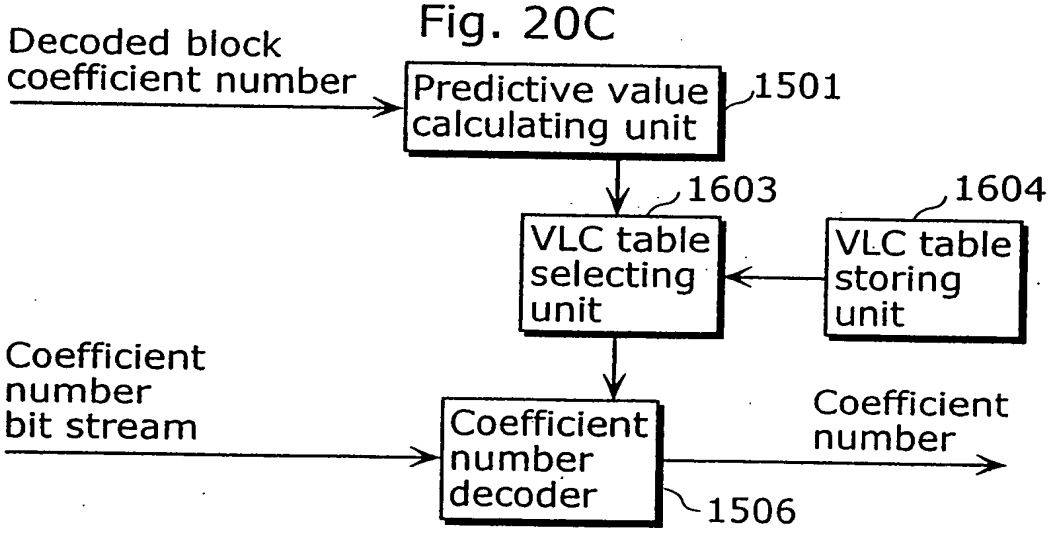
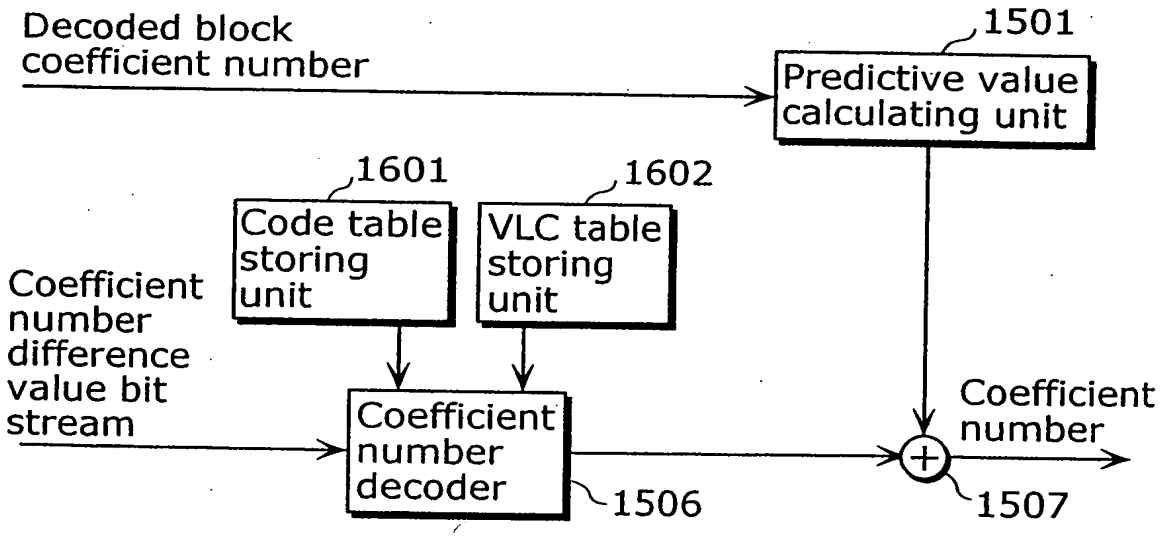


Fig. 20C



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Fig. 21



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Fig. 22A

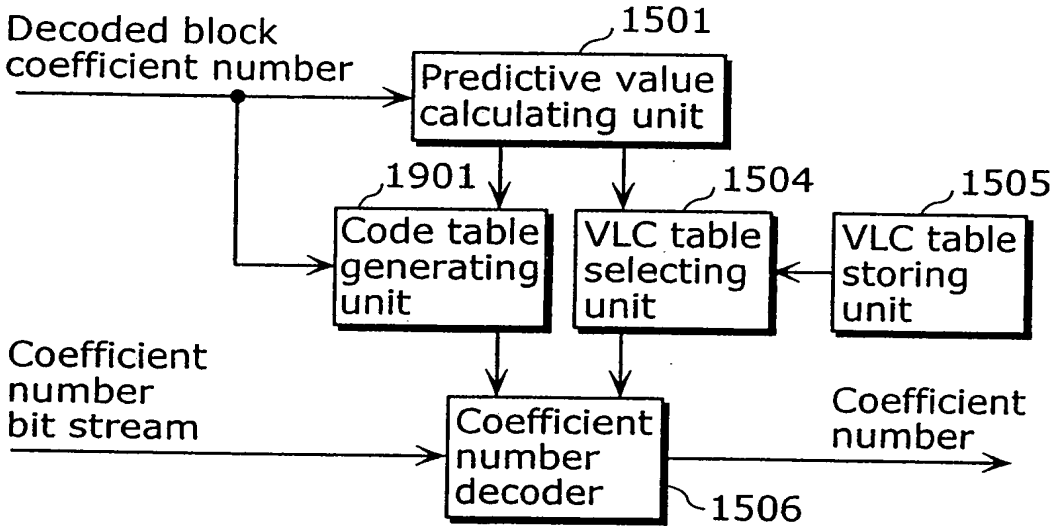
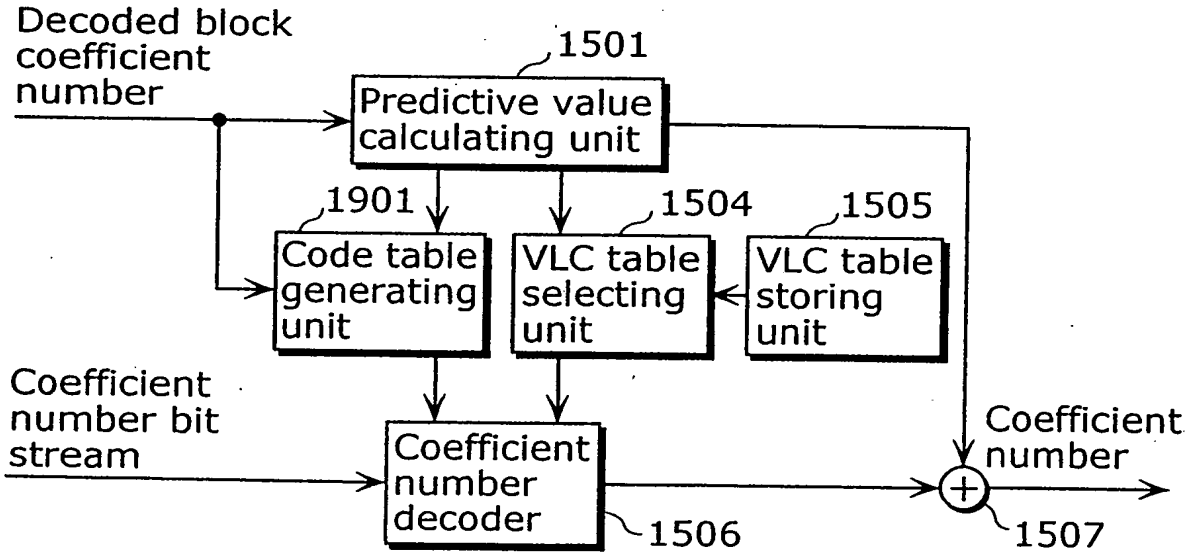


Fig. 22B



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Fig. 23A

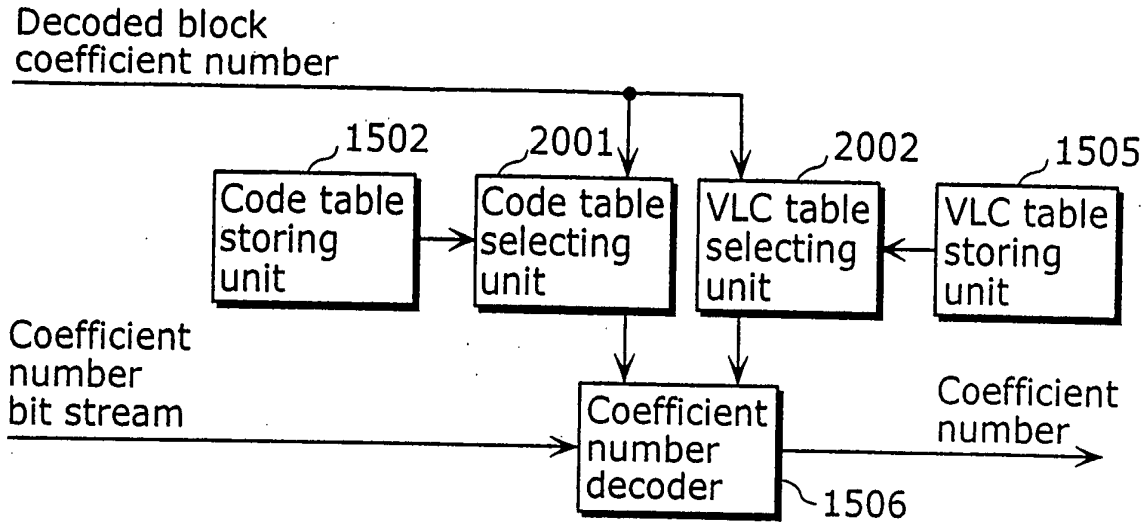
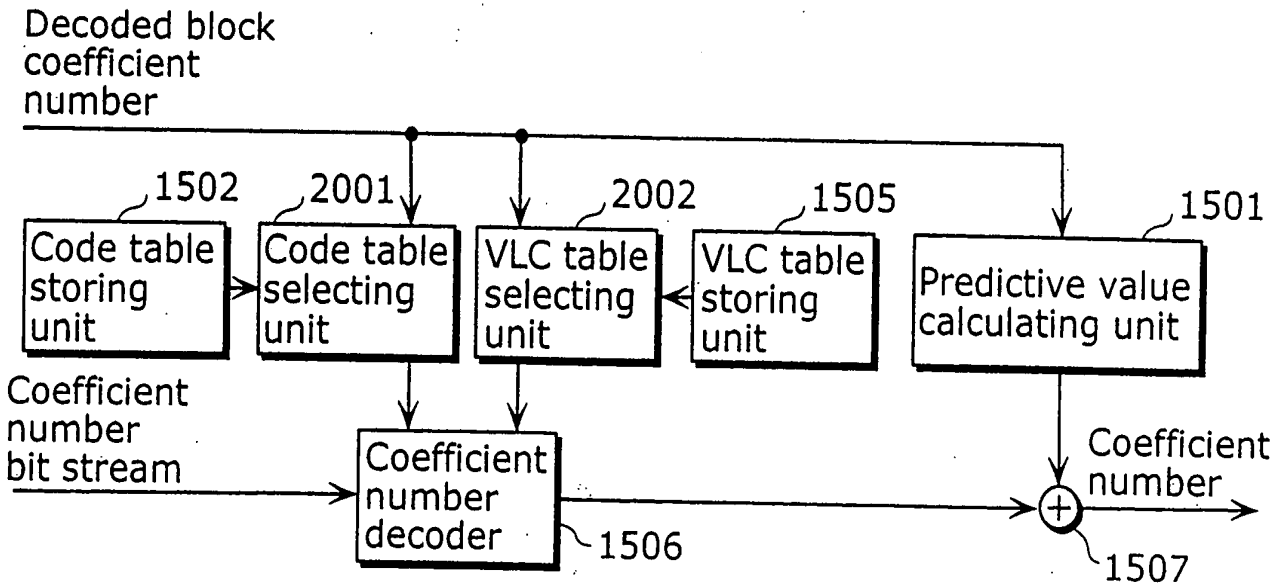


Fig. 23B



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Fig. 24A

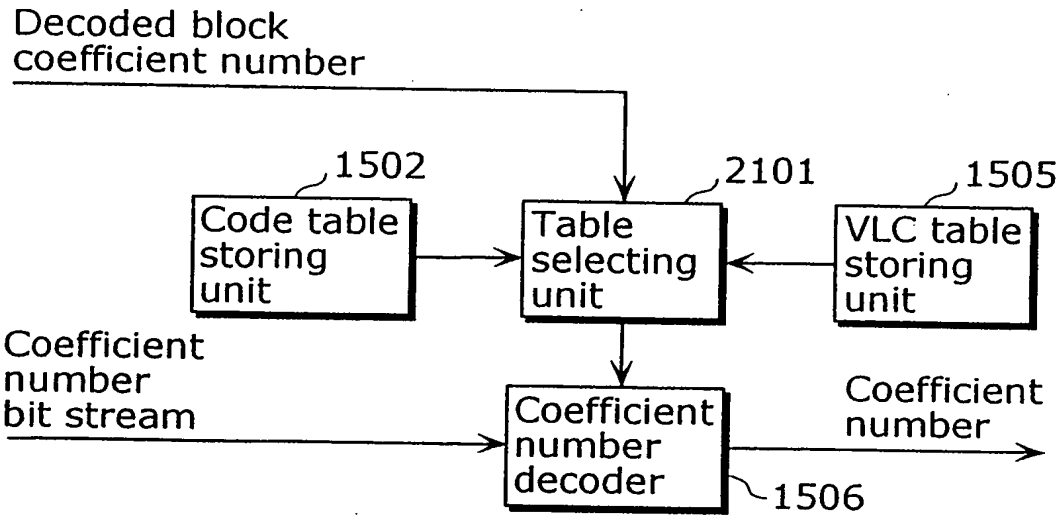
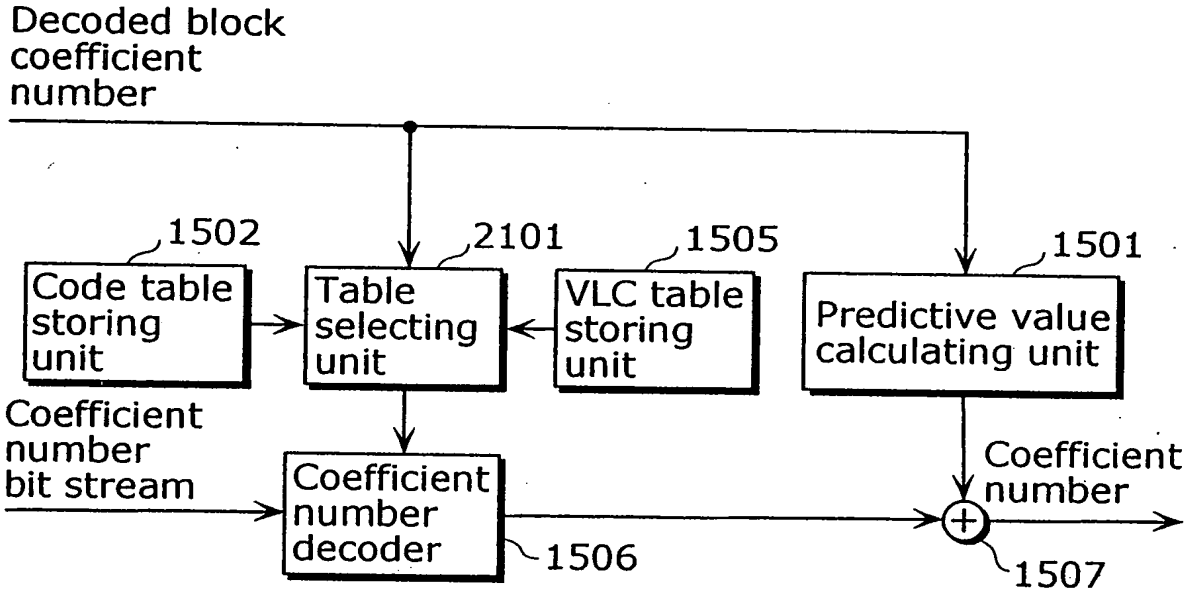
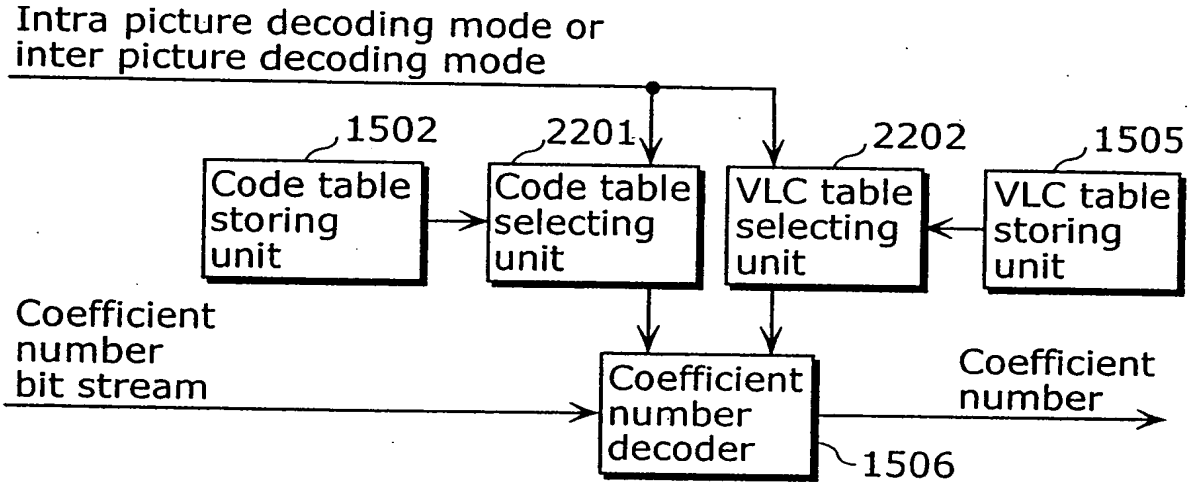


Fig. 24B



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Fig. 25



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Fig. 26A

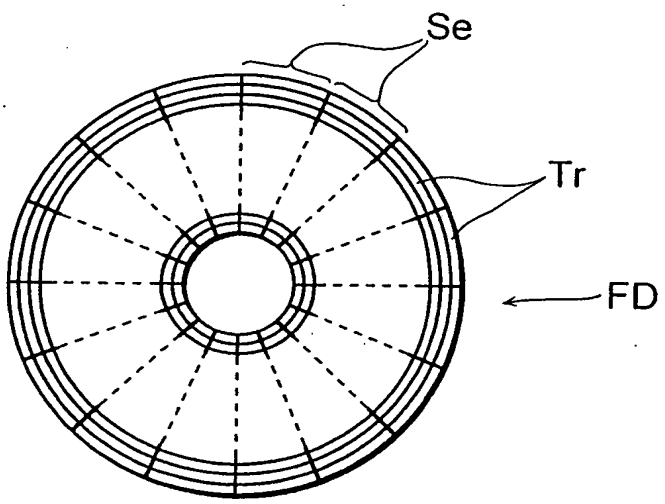


Fig. 26B

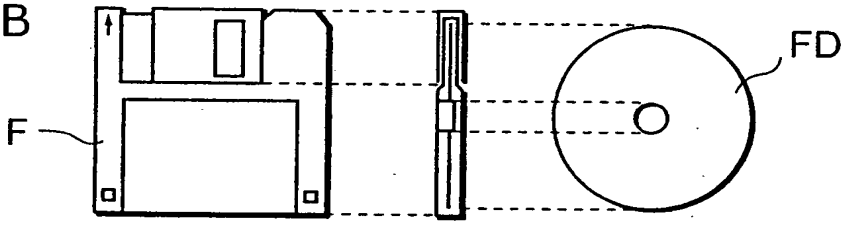
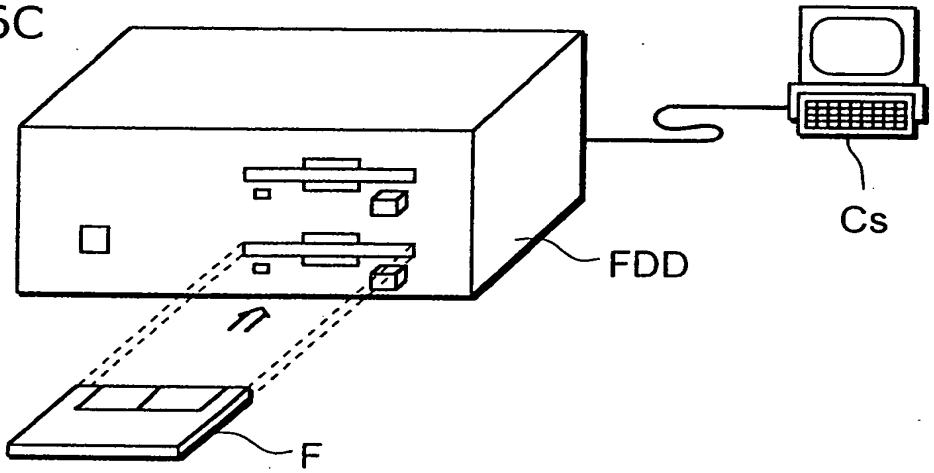
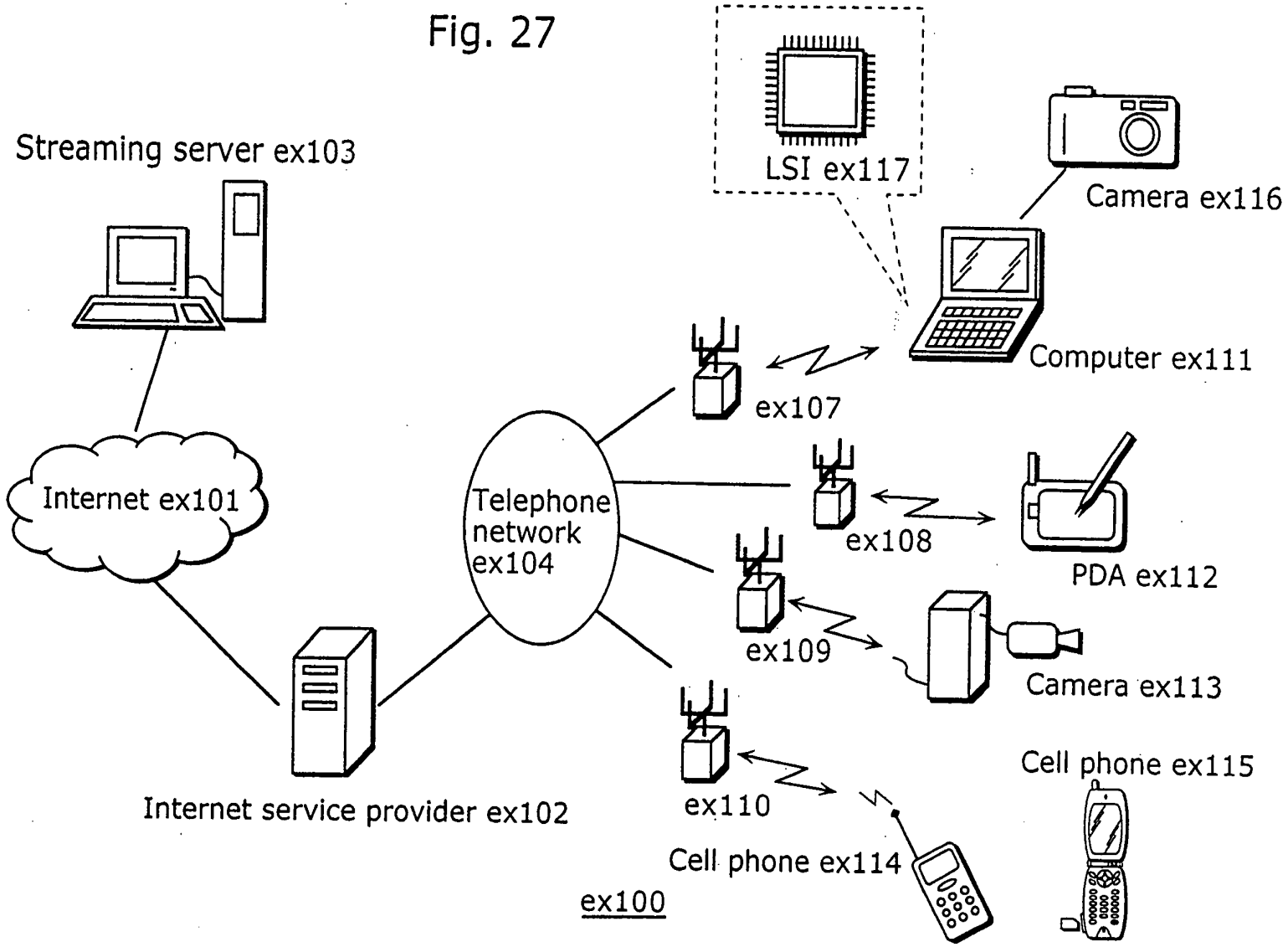


Fig. 26C



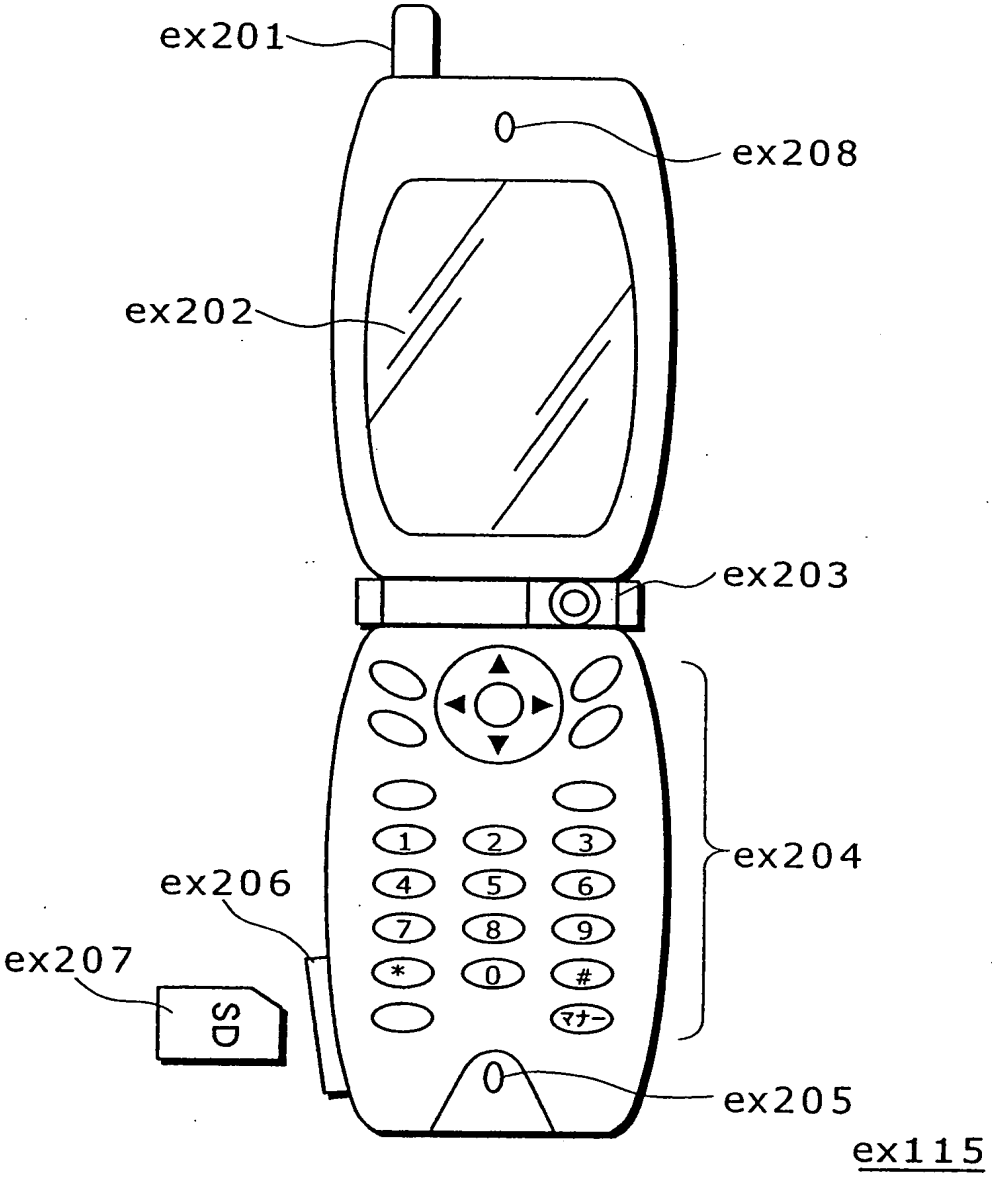
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Fig. 27



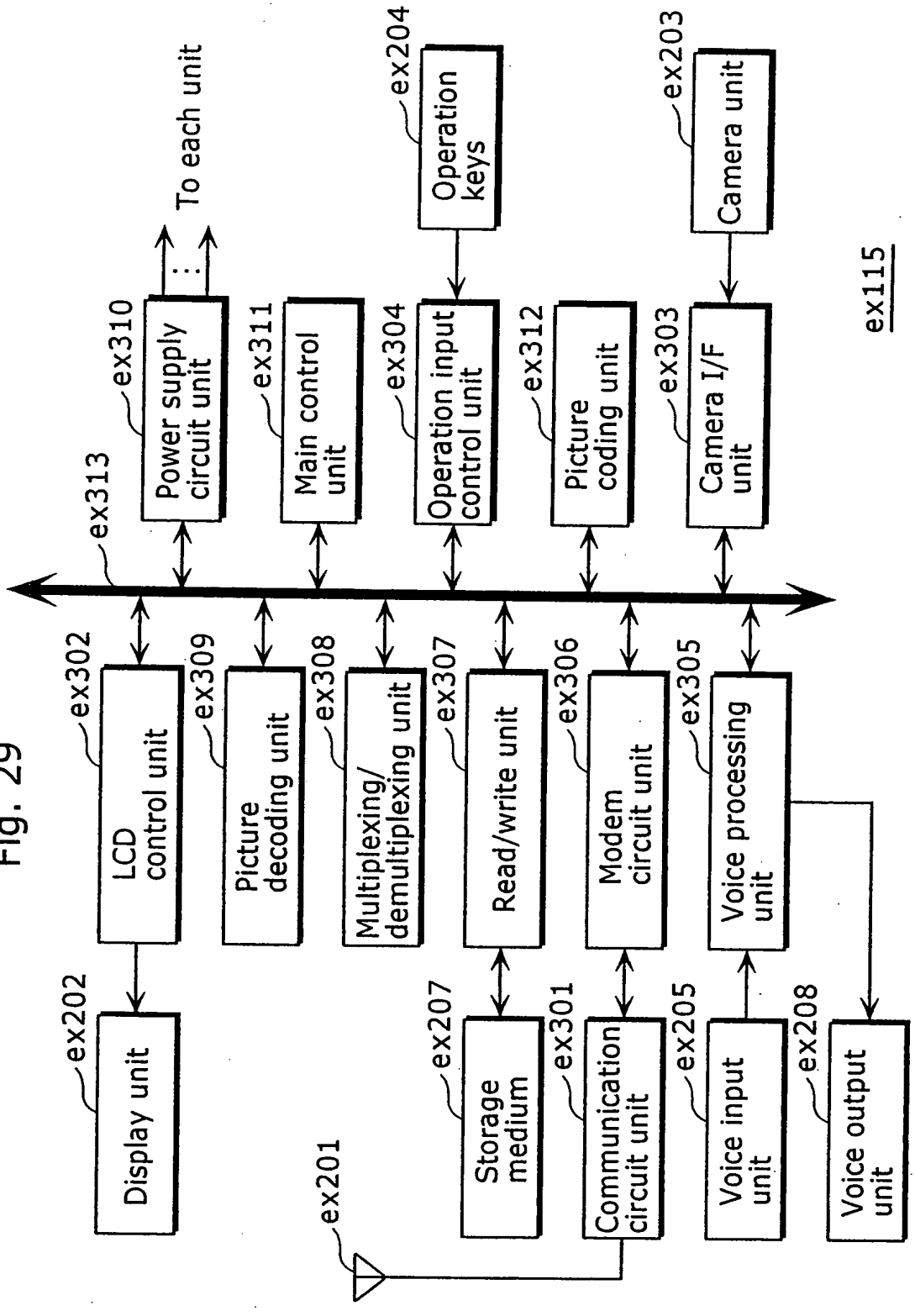
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Fig. 28



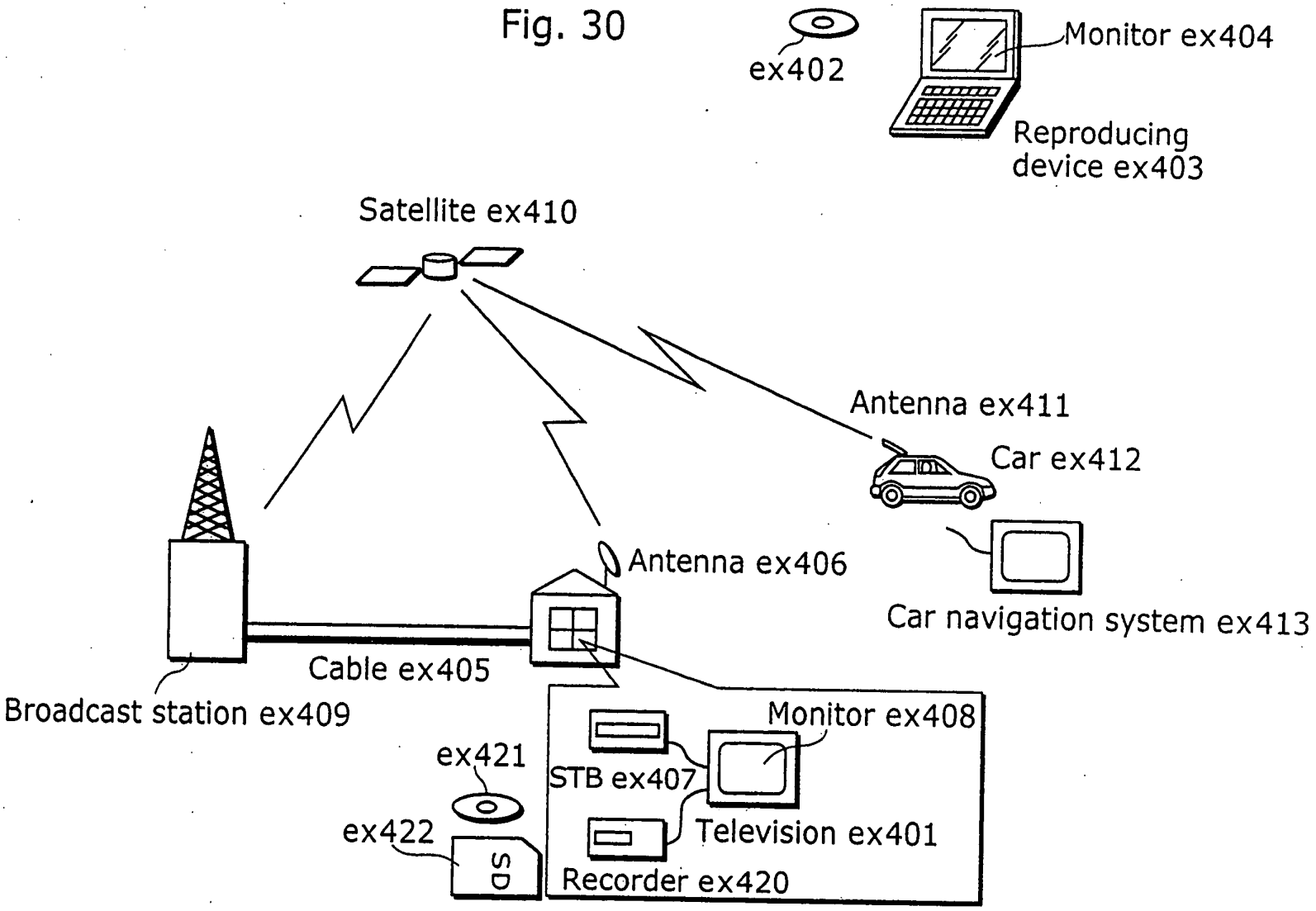
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Fig. 29



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Fig. 30



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Rev. 5/30/01

Effective March 1998

DECLARATION AND POWER OF ATTORNEY FOR U.S. PATENT APPLICATION

( ) Original ( ) Supplemental ( ) Substitute (X) PCT ( ) Design

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Title: PICTURE CODING METHOD AND PICTURE DECODING METHOD

of which is described and claimed in:
( ) the attached specification, or
( ) the specification in the application Serial No. _____ filed _____;
and with amendments through _____ (if applicable), or
(X) the specification in International Application No. PCT/JP03/03794, filed on March 27, 2003, and as amended on _____ (if applicable).

I hereby state that I have reviewed and understand the content of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge my duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim priority benefits under Title 35, United States Code, §119 (and §172 if this application is for a Design) of any application(s) for patent or inventor's certificate listed below and have also identified below any application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NO.	DATE OF FILING	PRIORITY CLAIMED
Japan	2002-112665	April 15, 2002	Yes

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

APPLICATION SERIAL NO.	U.S. FILING DATE	STATUS: PATENTED, PENDING, ABANDONED

And I hereby appoint Michael R. Davis, Reg. No. 25,134; Matthew M. Jacob, Reg. No. 25,154; Warren M. Cheek, Jr., Reg. No. 33,367; Nils Pedersen, Reg. No. 33,145; Charles R. Watts, Reg. No. 33,142; and Michael S. Huppert, Reg. No. 40,268, who together constitute the firm of WENDEROTH, LIND & PONACK, L.L.P., as well as any other attorneys and agents associated with Customer No. 000513, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith.

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I hereby authorize the U.S. attorneys and agents named herein to accept and follow instructions from _____, as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and myself. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by me.

Direct Correspondence to Customer No:	Direct Telephone Calls to:
000513 PATENT TRADEMARK OFFICE	WENDEROTH, LIND & PONACK, L.L.P. 2033 "K" Street, N.W., Suite 800 Washington, D.C. 20006-1021 Phone:(202) 721-8200 Fax:(202) 721-8250

Full Name of Fourth Inventor	FAMILY NAME ABE	FIRST GIVEN NAME Kiyofumi	SECOND GIVEN NAME
Residence & Citizenship	CITY Kadoma-shi	STATE OR COUNTRY Japan	COUNTRY OF CITIZENSHIP Japan
Post Office Address	ADDRESS 16-1-213, Miyamae-cho, Kadoma-shi, Osaka, Japan	CITY STATE OR COUNTRY	ZIP CODE 571-0074

Full Name of Second Inventor	FAMILY NAME KADONO	FIRST GIVEN NAME Shinya	SECOND GIVEN NAME
Residence & Citizenship	CITY Nishinomiya-shi	STATE OR COUNTRY Japan	COUNTRY OF CITIZENSHIP Japan
Post Office Address	ADDRESS 7-25-204, Koshienguchi 1-chome, Nishinomiya-shi, Hyogo, Japan	CITY STATE OR COUNTRY	ZIP CODE 663-8113

Full Name of First Inventor	FAMILY NAME KONDO	FIRST GIVEN NAME Satoshi	SECOND GIVEN NAME
Residence & Citizenship	CITY Yawata-shi	STATE OR COUNTRY Japan	COUNTRY OF CITIZENSHIP Japan
Post Office Address	ADDRESS 7-17, Otokoyamashigetu, Yawata-shi, Kyoto, Japan	CITY STATE OR COUNTRY	ZIP CODE 614-8361

Full Name of Third Inventor	FAMILY NAME HAGAI	FIRST GIVEN NAME Makoto	SECOND GIVEN NAME
Residence & Citizenship	CITY Moriguchi-shi	STATE OR COUNTRY Japan	COUNTRY OF CITIZENSHIP Japan
Post Office Address	ADDRESS 22-402, Oedaminami-machi 8-chome, Moriguchi-shi, Osaka, Japan	CITY STATE OR COUNTRY	ZIP CODE 570-0051

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Hisense v. VideoLabs
IPR2025-01329

I further declare that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1st Inventor Kiyofumi Abe Date October 8, 2003

2nd Inventor Tomoyuki Kadowaki Date October 8, 2003

3rd Inventor Satoshi Fudo Date October 8, 2003

4th Inventor Makoto Nagai Date October 8, 2003

5th Inventor _____ Date _____

6th Inventor _____ Date _____

7th Inventor _____ Date _____

8th Inventor _____ Date _____

9th Inventor _____ Date _____

10th Inventor _____ Date _____

The above application may be more particularly identified as follows:

U.S. Application Serial No. _____ Filing Date December 8, 2003

Applicant Reference Number FP03001 Atty Docket No. 2003-1467A

Title of Invention _____

_____

Hisense Ex. 1002, p. 571
Hisense v. VideoLabs
IPR2025-01329

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :

Kiyofumi ABE et al. :

Serial No. NEW :

Filed October 26, 2007 : Attorney Docket No. 2007_1865

PICTURE CODING METHOD AND
PICTURE DECODING METHOD
(Rule 1.53(b) Continuation of Serial No. 11/453,078, Filed June 15, 2006)

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

THE COMMISSIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEES FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

Sir:

Pursuant to the provisions of 37 CFR 1.56, 1.97 and 1.98, Applicants request consideration of the references listed on attached form PTO-1449 and any additional information identified below in paragraph 3. A legible copy of each reference listed on the Form PTO-1449 is enclosed, except a copy is not provided for:

[] each U.S. Patent and U.S. Patent application publication;

[] each reference previously cited in the international application PCT/_____; and/or

[X] each reference previously cited in prior parent Application Serial No. 11/453,078 and in grandparent Application Serial No. 10/479,831.

1a. [X] This Information Disclosure Statement is submitted:

within three months of the filing date (or of entry into the National Stage) of the above-entitled application, **or**

before the mailing of a first Office Action on the merits or the mailing of a first Office Action after the filing of an RCE,

and thus no certification and/or fee is required.

1b. [] This Information Disclosure Statement is submitted

after the events of above paragraph 1a and prior to the mailing date of a final Office Action or a Notice of Allowance or an action which otherwise closes prosecution in the application, and thus:

(1) [] the certification of paragraph 2 below is provided, **or**

(2) [] the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

1c. [] This Information Disclosure Statement is submitted:

after the mailing date of a final Office Action or Notice of Allowance or action which otherwise closes prosecution in the application, and prior to payment of the issue fee, and thus:

the certification of paragraph 2 below is provided, and

the fee of $180.00 specified in 37 CFR 1.17(p) is enclosed.

2. It is hereby certified

a. [] that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Statement, or

b. [] that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the Statement.

3. [] Consideration of the following list of additional information (including any copending or abandoned U.S. application, prior uses and/or sales, etc.) is requested.

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4. For each non-English language reference listed on the attached form PTO-1449, reference is made to:

   a. [] a full or partial English language translation submitted herewith,

   b. [X] a foreign patent office search report (in the English language) was submitted with grandparent Application Serial No. 10/479,831 and cited in parent Application Serial No. 11/453,078,

   c. [] the concise explanation contained in the specification of the present application at page,

   d. [] the concise explanation set forth in the attached English language abstract,

   e. [] the concise explanation set forth below or on a separate sheet attached to the reference:

5. [X] A Supplemental European Search Report citing one or more of the references was submitted with grandparent Application Serial No. 10/479,831 and cited in parent Application Serial No. 11/453,078.

6. [] Statement Under 37 CFR 1.704(d)

Each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign Patent Office in a counterpart application, and this communication was not received by any individual designated in §1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Respectfully submitted,

Kiyofumi ABE et al.

By _____

Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/ra
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
October 26, 2007

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INFORMATION DISCLOSURE STATEMENT

FORM PTO 1449 (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: October 25, 2007

ATTY DOCKET NO.	SERIAL NO.
2007_1865	NEW

APPLICANT: Kiyofumi ABE et al.

FILING DATE	GROUP
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA	6,292,588	9/2001	Shen et al.			
	AB	6,473,459	10/2002	Sugano et al.			
	AC	6,020,923	2/2000	Hosaka et al.			
	AD	5,500,678	3/1996	Puri			
	AE	5,563,593	10/1996	Puri			
	AF	5,512,952	4/1996	Iwamura			
	AG	6,625,211	9/2003	Etoh et al.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	AH	5-347710	12/1993	JP				
	AI	6-232765	8/1994	JP				
	AJ	7-107492	4/1995	JP				
	AK	10-191324	7/1998	JP				
	AL	4-100390	4/1992	JP				
	AM	4-223773	8/1992	JP				
	AN	0 876 058	11/1998	EP				

OTHER DOCUMENT(S) (*Including Author, Title, Date, Pertinent Pages, Etc.*)

	AO	RICHARDSON, I. E.G., entitled "H.264/MPEG-4 PART 10 WHITE PAPER, VARIABLE-LENGTH CODING", MPEG-4 PART 10 WHITE PAPER, October 17, 2002 (XP002258064).
	AP	BJONTEGAARD, G., entitled "IMPROVED LOW COMPLEXITY ENTROPY CODING FOR TRANSFORM COEFFICIENTS", Joint Video Team (JVT) of ISO/IEC MPEG & ITU-T VCEG (ISO/IEC JTC1/SC29/WG11 and ITU-T SG16 Q6), XX, XX, January 29, 2002 (XP002257294).
	AQ	HARTUNG, F., et al., entitled "IMPROVED ENCODING OF DCT COEFFICIENTS FOR LOW BIT-RATE VIDEO CODING USING MULTIPLE VLC TABLES", Image Processing, 1999. ICIP 99. Proceedings. 1999 International Conference of Kobe, Japan 24-28 Oct. 1999, Piscataway, NJ, USA, IEEE, US, October 24, 1999, pages 51-55, (XP010368953).

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of form with next communication to applicant.

Sheet 2 of 2

INFORMATION DISCLOSURE STATEMENT

FORM PTO 1449 (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(*Use several sheets if necessary*)

Date Submitted to PTO: October 26, 2007

ATTY DOCKET NO.	SERIAL NO.
2007_1865	NEW

APPLICANT
Kiyofumi ABE et al.

FILING DATE	GROUP
October 26, 2007	2624

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA	6,658,157	12/2003	Satoh et al.			
	AB	6,449,395	9/2002	Kobayashi Yoshikazu			
	AC	6,292,588	9/2001	Shen et al.			
	AD	5,777,679	7/1998	Cheney et al.			
	AE	5,740,283	4/1998	Meeker, G. William			
	AF	5,576,765	11/1996	Cheney et al.			
	AG	5,510,841	4/1996	Iwamura, Ryuichi			
	AH	5,821,887	10/1998	Zhu, Chunrong			
	AI	5,668,599	9/1997	Cheney et al.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	AJ							
	AK							
	AL							
	AM							
	AN							

OTHER DOCUMENT(S) (*Including Author, Title, Date, Pertinent Pages, Etc.*)

	AO	
	AP	
	AQ	

EXAMINER	DATE CONSIDERED

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of form with next communication to applicant.*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :

Kiyofumi ABE et al. :

Serial No. NEW :

Filed October 26, 2007 : Attorney Docket No. 2007_1865

PICTURE CODING METHOD AND
PICTURE DECODING METHOD
(Rule 1.53(b) Continuation
of Serial No. 11/453,078,
Filed June 15, 2006)

CLAIM OF PRIORITY UNDER 35 USC 119

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

THE COMMISSIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEES FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

Sir:

Applicants in the above-entitled application hereby claim the date of priority under the International Convention of Japanese Patent Application No. 2002-112665, filed April 15, 2002, as acknowledged in the Declaration of this application.

A certified copy of said Japanese Patent Application is of record in grandparent Application Serial No. 10/479,831, filed December 8, 2003.

Respectfully submitted,

Kiyofumi ABE et al.

By _____
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/ra
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
October 26, 2007

PATENT APPLICATION SERIAL NO._____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

10/29/2007 CNGUYEN2 00000007 11976758

01 FC:1011	310.00 OP
02 FC:1111	510.00 OP
03 FC:1311	210.00 OP
04 FC:1081	260.00 OP

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002- 489-267/69033

PTO/SB/06 (10-07)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 11976758

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	$155		N/A	$310
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	$255		N/A	$510
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	$105		N/A	$210
TOTAL CLAIMS (37 CFR 1.16(i))	2 minus 20 =	*	X $25 =		OR	X $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	X $105 =			X $210 =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).		$130			$260	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			$185			$370	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1030

APPLICATION AS AMENDED – PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $25 =		OR	X $50 =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $105 =		OR	X $210 =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					$185		OR	$370	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $25 =		OR	X $50 =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $105 =		OR	X $210 =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					$185		OR	$370	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Hisense Ex. 1002, p. 579
Hisense v. VideoLabs
IPR2025-01329

PTO/SB/06 (07-06)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/976,758	10/26/2007	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	10/26/2007	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 2	Minus	** 20	= 0	X $ =		OR	X $50=	0
	Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $ =		OR	X $210=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LYNN NELSON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.