Large Entity Declaration

Schedule A – Patents assigned to *Assignee*

APPLICATION NUMBER	FILING DATE	PATENT NUMBER	ISSUE DATE
12/232,496	2008-09-18	8649426	2014-02-11

PATENT
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CHANGE OF ENTITY STATUS PURSUANT TO 37 C.F.R. §1.27 (g)(2)

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

Sir:

This communication hereby notifies the United States Patent and Trademark Office that Small Entity status is no longer applicable to the patents identified in the attached Schedule A.

Respectfully submitted by:



Authorised Signatory*

Address of Signatory or Company*

__N. Harris Computer Corp.____
__1 Antares Drive, Suite 100____
__Ottawa Ontario K2E 8C4_____
_____
_____
_____
_____

____Todd Richardson _____
Print Name*

____Chief Financial Officer_____
Title* (Owner, Inventor, Assignee or US Attorney)

_____April 28, 2020_____
Date*

Please note that all fields* must be completed and the form signed by the authorised Owner, Inventor, Assignee or US Attorney.

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.
12/232,496	02/11/2014	8649426	25864-US	9197

23553 7590 01/22/2014

MARKS & CLERK
P.O. BOX 957
STATION B
OTTAWA, ON K1P 5S7
CANADA

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 1238 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):

Patrick White, Renfrew, CANADA;
Mojtaba Hosseini, Ottawa, CANADA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.V./

PTO/SB/08a (09-08)
Approved for use through 10/31/2008. 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 contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE
	Art Unit	~~2614~~ 2438
	Examiner Name	~~Unknown~~ Narciso Victoria
	Attorney Docket Number	373-05 US

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5430486		1995 ~~2005~~-07-04	FRASER et al.	
If you wish to add additional U.S. Patent citation information please click the Add button.						Add

Change(s) applied to document, /N.V./ 11/14/2013

U.S.PATENT APPLICATION PUBLICATIONS						Remove
Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					
If you wish to add additional U.S. Published Application citation information please click the Add button.						Add

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐
If you wish to add additional Foreign Patent Document citation information please click the Add button								Add

NON-PATENT LITERATURE DOCUMENTS			Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23553 7590 10/11/2013
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P.O. BOX 957
STATION B
OTTAWA, ON K1P 5S7
CANADA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

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.
12/232,496	09/18/2008	Patrick White	25864-US	9197

TITLE OF INVENTION: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	~~$290~~ 480	~~$300~~ 0	$0	~~$1180~~ 480	01/13/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
VICTORIA, NARCISO F	2438	375-240010

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 **MARKS & CLERK**
2 **Richard J. Mitchell**
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: **Magor Communications Corporation**

(B) RESIDENCE: (CITY and STATE OR COUNTRY): **Ottawa, ON CANADA**

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 _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ 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 **13-1717** (enclose an extra copy of this form).

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

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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 January 3, 2014

Typed or printed name Richard J. Mitchell Registration No. 34,519

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.

Electronic Patent Application Fee Transmittal

Application Number:	12232496
Filing Date:	18-Sep-2008
Title of Invention:	LOW LATENCY HIGH RESOLUTION VIDEO ENCODING
First Named Inventor/Applicant Name:	Patrick White
Filer:	Richard J. Mitchell/Carolynn Irvin
Attorney Docket Number:	25864-US

Filed as Small 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	2501	1	480	480
Publ. Fee- Early, Voluntary, or Normal	1504	1	0	0

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**480**

Electronic Acknowledgement Receipt	
EFS ID:	17809580
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	LOW LATENCY HIGH RESOLUTION VIDEO ENCODING
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	23553
Filer:	Richard J. Mitchell/Carolynn Irvin
Filer Authorized By:	Richard J. Mitchell
Attorney Docket Number:	25864-US
Receipt Date:	03-JAN-2014
Filing Date:	18-SEP-2008
Time Stamp:	10:37:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$480
RAM confirmation Number	10833
Deposit Account	131717
Authorized User	
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	Issue Fee Payment (PTO-85B)	IF.pdf	153746 76c216b7366e03e4c4e8058bf26db0ab21949aee	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32068 4af0caa9cc0cb4b38eedf77f11fd01deab5ea135	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	185814		

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.

<u>New Applications Under 35 U.S.C. 111</u>
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.

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

23553 7590 10/11/2013

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P.O. BOX 957
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OTTAWA, ON K1P 5S7
CANADA

EXAMINER
VICTORIA, NARCISO F

ART UNIT	PAPER NUMBER
2438	

DATE MAILED: 10/11/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/232,496	09/18/2008	Patrick White	25864-US	9197

TITLE OF INVENTION: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$890	$300	$0	$1190	01/13/2014

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:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

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. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23553 7590 10/11/2013
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STATION B
OTTAWA, ON K1P 5S7
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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

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.
12/232,496	09/18/2008	Patrick White	25864-US	9197

TITLE OF INVENTION: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$890	$300	$0	$1190	01/13/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
VICTORIA, NARCISO F	2438	375-240010

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 _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ 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)

❑ Applicant certifying micro entity status. See 37 CFR 1.29	NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27	NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.	NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/232,496	09/18/2008	Patrick White	25864-US	9197

23553 7590 10/11/2013

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OTTAWA, ON K1P 5S7
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EXAMINER	
VICTORIA, NARCISO F	
ART UNIT	PAPER NUMBER
2438	

DATE MAILED: 10/11/2013

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 897 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 897 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.

PTOL-85 (Rev. 02/11)

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.

Notices of Allowance and Fee(s) Due mailed between October 1, 2013 and December 31, 2013

(Addendum to PTOL-85)

If the "Notice of Allowance and Fee(s) Due" has a mailing date on or after October 1, 2013 and before January 1, 2014, the following information is applicable to this application.

If the issue fee is being timely paid on or after January 1, 2014, the amount due is the issue fee and publication fee in effect January 1, 2014. On January 1, 2014, the issue fees set forth in 37 CFR 1.18 decrease significantly and the publication fee set forth in 37 CFR 1.18(d)(1) decreases to $0.

If an issue fee or publication fee has been previously paid in this application, applicant is not entitled to a refund of the difference between the amount paid and the amount in effect on January 1, 2014.

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	12/232,496	WHITE ET AL.	
	Examiner	Art Unit	
	NARCISO VICTORIA	2438	

All participants (applicant, applicant's representative, PTO personnel):

(1) *NARCISO VICTORIA*. (3) *HETAL KUSHWANA (Representative 2)*.

(2) *RICHARD MITCHELL (Representative 1)*. (4)_____.

Date of Interview: *17 September 2013*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1,15 and 40*.

Identification of prior art discussed: *N/A*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Examiner initiated the interview, left voice message to representative 1 who was unavailable at that time, that application would be in condition for allowance should applicant agree to amend the claims by incorporating the limitations of claim 15 into independent claims 1 and 40. On 9/19/2013, received voice message from representative 2 who was covering for representative 1, indicating that applicant agreed to amend the claims as proposed by the examiner, authorizing examiner to prepare an Examiner's Amendment.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/N. V./ Examiner, Art Unit 2438	

Notice of Allowability	Application No. 12/232,496	Applicant(s) WHITE ET AL.	
	Examiner NARCISO VICTORIA	Art Unit 2438	AIA (First Inventor to File) Status No

-- 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 *10/15/2012*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-3,6-11,13,14,40 and 41*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   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. _____ .
      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.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ 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. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 1/14/2010
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date *9/17/2013* .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/N. V./
Examiner, Art Unit 2438

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 15, 2012 has been entered.

The text of those sections of Title 35 U.S. Code not included in this section can be found in the prior Office actions.

The prior Office actions are incorporated herein by reference, in particular the observations with respect to claim language and response to previously presented arguments.

Claims 1 and 40 have been amended; claim 15 has been cancelled; claims 4-5, 12, 16-39 and 42-43 have been previously cancelled.

Claims 1-43 renumbered as claims 1-13.

EXAMINER'S AMENDMENT

An Examiner's Amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this Examiner's Amendment was given in a communication with HETAL KUSHWANA, Registration # 58,187 on September 23, 2013.

The application has been amended as follows:

The Claims

1. (Currently Amended) A method of encoding in real time a video signal that is associated with a videoconference or telepresence session, the method comprising:

capturing a stream of video data comprising a series of sequential video frames;

separating the video frames into a plurality of frame segments, wherein each frame segment represents a part of a complete video frame;

encoding each frame segment independently and in parallel to generate parallel encoded data streams, one for each of the plurality of frame segments, each encoded data stream containing a sequence of frame segment instances each corresponding to a particular frame segment in the video frames, and each encoded data stream containing I-frame segment instances that carry complete information about a particular frame segment and P-frame segment instances that carry partial information about the particular frame segment, the partial information representing information that has changed relative to a previous frame segment instance in that encoded data stream, and wherein the encoding of the frame segments for each frame is performed such that when an instance of one of the frame segments within a particular frame is an I-frame segment

instance, at least one of the other frame segment instances in that particular frame is a P-frame segment instance, whereby in the respective parallel encoded data streams in any period of time when an I-frame segment instance is present in one of the parallel encoded data streams, a P-frame segment instance is present in at least one of the other parallel encoded data streams;

transmitting the parallel encoded data streams independently over a network to a receiver to permit the receiver to decode each frame segment and recombine the decoded frame segments from the different encoded data streams to reproduce an image;

wherein during transmission of I-frame segment instances of one of the frame segments, P-frame segment instances of all other frame segments are transmitted.

15. (Cancelled)

40. (Currently Amended) A video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:

a port for receiving a stream of video data comprising a series of sequential video frames;

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete video frame;

a plurality of video encoders arranged in parallel for independently encoding the respective frame segments to generate parallel encoded data streams, one for each of the plurality of frame segments, each encoded data stream containing I-frame segment instances that carry complete information about a particular frame segment and P-frame segment instances that carry partial information about a particular frame segment, the partial information representing information that has changed relative to a previous frame segment instance in that encoded data stream, and the video encoders being arranged to encode each frame segment such that when an instance of one of the frame segments within a particular frame is an I-frame segment instance, at least one of the other frame segment instances in that particular frame is a P- frame segment instance, whereby in the respective parallel encoded data streams in any period of time when an I-frame segment instance is present in one of the parallel encoded data streams, a P-frame segment instance is present in at least one of the other parallel encoded data streams; and

a transceiver for transmitting the parallel encoded data streams independently over a network to a receiver to permit the receiver to decode each frame segment and recombine the decoded frame segments to reproduce an image;

wherein during transmission of I-frame segment instances of one of the frame segments, P-frame segment instances of all other frame segments are transmitted.

Response to Arguments

Applicant's arguments filed October 15, 2012 have been fully considered and are persuasive.

Allowable Subject Matter

Claims 1-3, 6-11, 13-14, 40 and 41 are allowed over prior art of record.

Examiner's Statement of Reasons for Allowance

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

claims 1 and 40 are allowed in view of the Examiner's Amendment, specification, and for reasons argued by the applicant on pages 6-13 of the "Remarks", filed October 15, 2012, and dependent claims 2-3, 6-11, 13-14 and 41 depend upon one of the above-mentioned allowed claims and are therefore allowed by virtue of their dependency.

Bourne et al. (prior art on the record) discloses method of encoding video signals wherein video image segments are encoded at different quantization levels thus reducing transmission time of the video signals without sacrificing spatial image resolution. Also, the method enables reduced file size on the server and reduced time lag for first frame to be displayed, hence mitigating delay.

Schreier et al. (prior art on the record) discloses method and processor to encode and/or decode a video stream exploiting frame-level parallelism. Frames of the video stream are encoded and/or decoded using M processing units where

each processing unit processes one different frame at a time. Each processing unit writes the reconstructed frame to a frame buffer. A processing unit can start the encoding and/or decoding process once sufficient data of the previous reconstructed frame are available.

Claims 1-3, 6-11, 13-14, 40 and 41 are allowable since certain key features of the claimed invention are not taught or fairly suggested by the prior art, particularly the limitations "wherein the encoding of the frame segments for each frame is performed such that when an instance of one of the frame segments within a particular frame is an I-frame segment instance, at least one of the other frame segment instances in that particular frame is a P-frame segment instance, whereby in the respective parallel encoded data streams in any period of time when an I-frame segment instance is present in one of the parallel encoded data streams, a P-frame segment instance is present in at least one of the other parallel encoded data streams; wherein transmitting the parallel encoded data streams comprises transmitting P-frame segment instances of all the other frame segments during transmission of the I-frame segment instances of one of the frame segments" in combination with the rest of the limitations recited in the independent claims 1 and 40. None of the prior art of record, either taken by itself or in any combination, would have anticipated or made obvious the invention of the present application at or before the time it was filed.

Any comments considered necessary by applicant must be submitted no later than 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."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NARCISO VICTORIA whose telephone number is (571)270-7904. The examiner can normally be reached on Monday to Friday 9:00am - 5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Taghi Arani can be reached at (571)272-3787. 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). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NV/

/Taghi T. Arani/

Supervisory Patent Examiner, Art Unit 2438

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	12/232,496	WHITE ET AL.	
	Examiner	Art Unit	
	NARCISO VICTORIA	2438	

All participants (applicant, applicant's representative, PTO personnel):

(1) *NARCISO VICTORIA*. (3) *HETAL KUSHWANA (Representative 2)*.

(2) *RICHARD MITCHELL (Representative 1)*. (4)_____.

Date of Interview: *17 September 2013*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1,15 and 40*.

Identification of prior art discussed: *N/A*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Examiner initiated the interview, left voice message to representative 1 who was unavailable at that time, that application would be in condition for allowance should applicant agree to amend the claims by incorporating the limitations of claim 15 into independent claims 1 and 40. On 9/19/2013, received voice message from representative 2 who was covering for representative 1, indicating that applicant agreed to amend the claims as proposed by the examiner, authorizing examiner to prepare an Examiner's Amendment.

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☐ Attachment

/N. V./ Examiner, Art Unit 2438	

Notice of References Cited	Application/Control No. 12/232,496	Applicant(s)/Patent Under Reexamination WHITE ET AL.	
	Examiner NARCISO VICTORIA	Art Unit 2438	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	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	Lili Zhao et al. "A Dynamic Slice Control Scheme for Slice-Parallel Video Encoding." 19th IEEE International Conference on Image Processing (ICIP), pp. 713-716 (2012)
	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.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
375	240.01	9/23/2013	NV

SEARCH NOTES		
Search Notes	Date	Examiner
Updated limited search in class/subclass: 375/240.01, 386/200,111,68 using search terms segmenting video frames, parallel encoding, dividing, splitting	9/23/2013	NV
Interference search	9/23/2013	NV
NPL/Google/IEEE/STIC search	9/24/2013	NV
Consulted with Taghi Arani (SPE)	9/17/2013	NV

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	General interference and search of claims (USPGPUB, UPAD)	9/23/2013	NV
375	240.01 using search term ((encoding AND frame AND segment AND parallel).clm.)	9/23/2013	NV
386	200, 111, 68 using search term ((encoding AND frame AND segment AND parallel).clm.)	9/23/2013	NV

/NARCISO VICTORIA/ Examiner.Art Unit 2438	

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
Performed claim terms search:	(transmitting AND parallel AND encoded AND data AND streams AND independently).clm.	9/23/2013	NV
	(parallel AND encoded AND data AND streams AND frame AND segment AND instances).clm.	9/23/2013	NV
	(parallel AND encoded AND data AND streams AND frame AND segment).clm.	9/23/2013	NV
	(encoding AND frame AND segment AND parallel).clm.	9/23/2013	NV

/NARCISO VICTORIA/ Examiner.Art Unit 2438	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	**Art Unit**
	NARCISO VICTORIA	2438

CPC		
Symbol	**Type**	**Version**

CPC Combination Sets				
Symbol	**Type**	**Set**	**Ranking**	**Version**

/NARCISO VICTORIA/ Examiner.Art Unit 2438	9/24/2013	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	13	
/TAGHI ARANI/ Supervisory Patent Examiner.Art Unit 2438	09/25/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	**Art Unit**
	NARCISO VICTORIA	2438

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION												
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED							
375	240.01	H	0	4	N	7 / 12 (2006.01.01)								
CROSS REFERENCE(S)		H	0	4	N	11 / 02 (2006.01.01)								
		H	0	4	N	11 / 04 (2006.01.01)								
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)													
386	200													

/NARCISO VICTORIA/ Examiner.Art Unit 2438	9/24/2013	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	13	
/TAGHI ARANI/ Supervisory Patent Examiner.Art Unit 2438	09/25/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	**Art Unit**
	NARCISO VICTORIA	2438

☐ 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	1		17		33										
2	2		18		34										
3	3		19		35										
	4		20		36										
	5		21		37										
4	6		22		38										
5	7		23		39										
6	8		24	12	40										
7	9		25	13	41										
8	10		26		42										
9	11		27		43										
	12		28												
10	13		29												
11	14		30												
	15		31												
	16		32												

/NARCISO VICTORIA/ Examiner.Art Unit 2438	9/24/2013	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	13	
/TAGHI ARANI/ Supervisory Patent Examiner.Art Unit 2438	09/25/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S132	4492	(375/240.01).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/09/23 15:57
S133	169	(386/68).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/09/23 15:58
S134	7	(386/111).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/09/23 15:58
S135	1253	((segment$3 divid$3 split$4) near2 (frame)) and (parallel near2 (encod$3 decod$3 compress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/23 15:59
S136	53	S132 and S135	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/23 16:00
S137	0	S133 and S135	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/23 16:00
S138	0	S134 and S135	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/23 16:00

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S139	3923	(375/240.01).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/09/23 16:00
S140	4	(386/68).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/09/23 16:01
S141	0	(386/111).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/09/23 16:01
S142	6438	(encoding AND parallel).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:02
S143	436	(encoding AND segment AND parallel).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:02

S144	84	(encoding AND frame AND segment AND parallel).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:03
S145	5	S139 and S144	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:03
S146	0	S140 and S144	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:03
S147	1068	(parallel AND encoded AND data AND streams).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:04
S148	22	(parallel AND encoded AND data AND streams AND frame AND segment).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:05
S149	0	(parallel AND encoded AND data AND streams AND frame AND segment AND instances).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:05
S150	18	(transmitting AND parallel AND encoded AND data AND streams AND independently).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:06
S151	670	(386/200).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/09/23 16:18
S152	0	S151 and S144	US-PGPUB; USPAT; UPAD	OR	ON	2013/09/23 16:19

9/24/2013 12:37:48 PM
C:\Users\nvictoria\Documents\EAST\Workspaces\12232496.wsp

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (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 contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	12232496
Filing Date	2008-09-18
First Named Inventor	Patrick WHITE et al.
Art Unit	2614
Examiner Name	Unknown
Attorney Docket Number	373-05 US

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/N.V./	1	5057916		1991-10-15	KRAUSE et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/N.V./	1	20010026677	A1	2001-10-04	CHEN et al.	
/N.V./	2	20020114525	A1	2002-08-22	BOLLE et al.	
/N.V./	3	20050201471	A1	2005-09-15	HANNUKSELA et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
/N.V./	1	CA2483293	CA		2003-11-13	NOKIA CORPORATION		☐

EFS Web 2.1.16

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.V./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE et al.
	Art Unit	2614
	Examiner Name	Unknown
	Attorney Docket Number	373-05 US

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
/N.V./	1	ISA/CA, "International Search Report", dated December 16, 2009, pages 1 to 3	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Narciso Victoria/	Date Considered	09/30/2013

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.V./

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

✓	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	11/02/2011	05/09/2012	09/24/2013						
1	1	✓	✓	=						
2	2	✓	✓	=						
3	3	✓	✓	=						
	4	✓	-	-						
	5	✓	✓	-						
4	6	✓	✓	=						
5	7	✓	✓	=						
6	8	✓	✓	=						
7	9	✓	✓	=						
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9	11	✓	✓	=						
	12	✓	-	-						
10	13	✓	✓	=						
11	14	✓	✓	=						
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	33	✓	✓	-						
	34	✓	✓	-						
	35	✓	✓	-						
	36	✓	✓	-						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

✓	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	11/02/2011	05/09/2012	09/24/2013						
	37	✓	✓	-						
	38	✓	-	-						
	39	✓	-	-						
12	40	✓	✓	=						
13	41	✓	✓	=						
	42		✓	-						
	43		✓	-						

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. 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 12/232,496	Filing Date 09/18/2008	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	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 $310 ($155 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	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)		
	09/27/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 13	Minus	** 41	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***4	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)		
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						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.

LIE
/JEFFERY L. OLSEN/

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.**

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PLUS Search Results for S/N 12232496, Searched Tue Sep 24 13:26:28 EDT 2013

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

5982298 99
20130212342 99
3787833 97
3798610 97
3805248 97
3891982 97
3919474 97
4000510 97
4020502 97
4048615 97
4069511 97
4081797 97
4116444 97
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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.
12/232,496	09/18/2008	Patrick White	25864-US	9197

23553 7590 04/26/2013

MARKS & CLERK
P.O. BOX 957
STATION B
OTTAWA, ON K1P 5S7
CANADA

EXAMINER	
VICTORIA, NARCISO F	
ART UNIT	PAPER NUMBER
2438	

MAIL DATE	DELIVERY MODE
04/26/2013	PAPER

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.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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DATE: 04/26/2013

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P.O. BOX 957
STATION B
OTTAWA, ON K1P 5S7
CA

To: Applicant of Serial Number 12232496
Filed on 18-SEP-2008
(Art Unit 2438)

It is estimated that this application will receive an Office action in approximately 3 months. This is an estimate that is based on the current inventory level of applications filed in this art area and the current staffing levels in this Art Unit. The USPTO is dedicated to minimizing first action and total pendency, and we are targeting resources to help address backlogs in art areas with high new application filings. Thank you for your inquiry.

Customer Service Office in Technology Center: 2400

Phone Number: 571-272-2400
Central Fax Number: 571-273-8300

Applicant/Attorney Contact Information:

Phone Number:
Fax Number:

Agent's Docket No. 25864-US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	)	
WHITE, Patrick et al	)	Confirmation No.: **9197**
Serial No: **12/232,496**	)	Art Unit: **2438**
Filed: **18-September-2008**	)	Ex: **Victoria, Narciso F**

For: **LOW LATENCY HIGH RESOLUTION VICEO ENCODING**

April 16, 2013

STATUS REQUEST

Mail Stop Status Request
Commissioner for Patents
U.S. Patent and Trademark Office
Alexandria, Virginia 22313-1450

Sir:

Please could you advise when we can expect to receive further correspondence, in respect of our response filed in the USPTO on October 15, 2012, to the Office Action dated May 15, 2012.

Respectfully submitted,

BY:
Richard J. Mitchell
Reg. No. 34,519
Agent of Record

MARKS & CLERK
P. O. Box 957, Station B
Ottawa, Ontario Canada K1P 5S7
(613) 236-9561

Electronic Acknowledgement Receipt

EFS ID:	15554770
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	23553
Filer:	Richard J. Mitchell/Patricia Martin
Filer Authorized By:	Richard J. Mitchell
Attorney Docket Number:	25864-US
Receipt Date:	18-APR-2013
Filing Date:	18-SEP-2008
Time Stamp:	15:13:07
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	Request for status of Application	25864.pdf	40071 9e46912d075ed8d88ce4bd92ed726ecb18eab532	no	1

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:	
Total Files Size (in bytes):	40071

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: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (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 contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	12/232,496	Filing Date	2008-09-18	Docket Number (if applicable)	25864	Art Unit	2438
First Named Inventor	Patrick White			Examiner Name	Narciso F Victoria		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☒ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 131717

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Signature of Registered U.S. Patent Practitioner			
Signature	/rjmitchell34519/	Date (YYYY-MM-DD)	2012-10-15
Name	Richard J. Mitchell	Registration Number	34519

This collection of information is required by 37 CFR 1.114. 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.

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 the Freedom of Information Act requires disclosure of these records.

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 inspections 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.

PATENT

Agent's Docket No. 25864

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of **Patrick White**	)	
	)	Conf no. 9197
	)	
	)	
	)	
Serial No: **12/232,496**	)	Art Unit: 2438
	)	
Filed: **09/18/2008**		Examiner: VICTORIA, NARCISO F

Customer no. 23553

For: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

Oct 15, 2012

MAIL STOP RCE
Commissioner of Patent and Trademarks
P.O. Box 1450, Alexandria, Virginia 22313-1450

.

Submission under 37 CFR 114 (c)

Sir:

Pursuant to the Final action mailed May 15, 2012, the applicant respectfully submits the following amendments and remarks as a submission under 37 CFR 114 (c).

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method of encoding in real time a video signal that is associated with a videoconference or telepresence session, the method comprising:

capturing a stream of video data comprising a series of sequential video frames;

separating ~~each~~ the video frames into a plurality of frame segments, wherein each frame segment represents a part of a complete video frame;

encoding each frame segment independently and in parallel to generate parallel encoded data streams, one for each of the plurality of frame segments, each encoded data stream containing a sequence of frame segment instances each corresponding to a particular frame segment in the video frames, and ~~an~~ each encoded data stream containing I-frame segment instances that carry complete information about a particular frame segment and P-frame segment instances that carry partial information about ~~a~~ the particular frame segment, the partial information representing information that has changed relative to a previous frame segment instance in that encoded data stream, and wherein the encoding of ~~each~~ the frame segments for each frame is performed such that ~~the~~ when an instance of one of the frame segments within a particular frame is an I-frame segment instance ~~s~~at least one of the other frame segment instances in that particular frame is a P-frame segment instance, whereby in ~~each~~ the respective parallel encoded data streams ~~are offset relative to each other~~in any period of time when an I-frame segment instance is present in one of the parallel encoded data streams a P-frame segment instance is present in at least one of the other parallel encoded data streams; ~~and~~

transmitting the parallel encoded data streams independently over a network to a receiver to permit the receiver to decode each frame segment and recombine the decoded frame segments from the different encoded data streams to reproduce an image.

2. (Previously presented) A method according to claim 1, wherein the frame segments correspond to predetermined parts of the video frames.

3. (Previously presented) A method according to claim 1, wherein each frame segment corresponds to a different predetermined area of the video frames.

4. (Canceled)

5. (Canceled)

6. (Previously presented) A method according to claim 1, wherein the frame segments are uniformly sized geometric shapes.

7. (Original) A method according to claim 1, wherein at least one of frame segment size and shape is different for one of the frame segments compared to another of the frame segments.

8. (Previously presented) A method according to claim 1, wherein at least one of the frame segments comprises a plurality of predetermined non-contiguous areas of the video frames.

9. (Previously presented) A method according to claim 1, wherein the frame segments are determined in dependence upon external application data and indicative of the amount of motion that is expected in different areas of the video frames.

10. (Previously presented) A method according to claim 1, wherein the frame segments are determined in dependence upon external prior use data indicative of the amount of motion previously determined in different areas of the video frames.

11. (Currently amended) A method according to claim 1, wherein a period between regularly spaced I-frame segment instances for one of the frame segments is different than a period between regularly spaced I-frame segment instances for another of the frame segments.

12. (canceled)

13. (Previously presented) A method according to claim 1, wherein the frame segments are encoded in encoders having different encoding characteristics.

14. (Previously presented) A method according to claim 13, wherein at least one of the encoders has a bitrate that is greater than a bitrate of the other encoders.

15. (Currently amended) A method according to claim 1, wherein during the transmission of the I-frame segment instances of one of the frame segments P-frame segment instances of all the

other frame segments are transmitted.

Claims 16 to 39 are canceled

40. (Currently amended) A video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:

a port for receiving a stream of video data comprising a series of sequential video frames;

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete video frame;

a plurality of video encoders arranged in parallel for independently encoding the respective frame segments ~~in parallel~~ to generate parallel encoded data streams, one for each of the plurality of frame segments, each ~~an~~ encoded data stream containing I-frame segment instances that carry complete information about a particular frame segment and P-frame segment instances that carry partial information about a particular frame segment, the partial information representing information that has changed relative to a previous frame segment instance in that encoded data stream, and the video encoders being arranged to encode each frame segment such that when an instance of one of the frame segments within a particular frame is an I-frame segment instance at least one of the other frame segment instances in that particular frame is a P-frame segment instance, whereby in the respective parallel encoded data streams in any period of time when an I-frame segment instance is present in one of the parallel encoded data streams a P-frame segment instance is present in at least one of the other parallel encoded data streams~~the I-frame segments in each encoded data stream are offset relative to each other~~; and

a transceiver for transmitting the parallel encoded data streams ~~frame segments~~ independently over a network to a receiver to permit the receiver to decode each frame segment and recombine the decoded frame segments to reproduce an image.

41. (Previously presented) A video encoding system according to claim 40 comprising: a memory for storing predetermined data defining the frame segments, which correspond to predetermined parts of the video frames.

Claims 42 – 43 are canceled

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Remarks

The claims have been amended to clarify the invention in a manner consistent with the following comments.

There is a fundamental difference between the teachings of the present invention and the prior art as represented by Bourne and Schreier. Before discussing the claims and the prior art, it is helpful to have a clear understanding of this difference.

In the prior art as represented by Bourne and Schreier, a video stream consisting of a series of frames is separated into Intra-frames (I-frames) wherein complete information is transmitted about the frame, albeit in compressed form, and Predicted frames (P-frames), where only change information is transmitted. Decisions about whether a particular frame is to be transmitted as a P-frame or I-frame is made at the frame level. This results in high burst bandwidth when an I-frame is transmitted.

Bourne is only concerned with modifying the I-frame transmission:

> In accordance with the present invention, the first and second segments selected by segmentation element 220 for an intra-frame comprise a series of blocks or macroblocks of the intraframe (Bourne, paragraph [0023]). See also, claim 1 and abstract.

Bourne is not specifically concerned in P-frame encoding (see paragraph [0025]).

Bourne addresses the problem by segmenting an I-frame and sending different parts of the I-frame at different quantization levels. The fundamental point is that Bourne makes the decision

about whether a frame is an I-frame or a P-frame at the frame level, not at the segmentation level.

In accordance with an aspect of the present invention, the frames are first segmented and then encoded separately into I-frame segments and P-frame segments. This means that different parts of a particular video frame can be transmitted as I-frame segments and P-frame segments.

Consider a video frame where only the central part of the picture is changing rapidly:

In the prior art, a relatively large number of I-frames would be required even though the periphery of the frame is not changing at all. In accordance with the invention, since each frame segment is encoded separately, a decision as to which frame segment is a P-frame segment and I-frame segment is made at the frame segment level, which means that a particular video frame can when transmitted can include both P-frame segments and I-frame segments. Please see paragraph [0030], where in the example

> 10kB of P-frame data is transmitted for each frame and 20kB of I-frame data is transmitted for a same frame (paragraph [0030], emphasis added)

If you take a particular video frame, claim 1 calls for each video frame to be separated into a plurality of frame segments. Each frame segment is encoded separately. For example, in a particular video frame, the first encoder may encode one frame segment representing the top part and the second encoder may encode another frame segment representing the middle part. When the next video frame comes along, the top part of the new video frame is directed to the first encoder and the middle part to the second encoder and so on.

As there was potentially some confusion between different frame segments meaning frame segments from different parts of the same video frame (i.e. spatially separated) and frame segments from the same part of a subsequent video frame (i.e. temporally separated), the sequence of frame segments in the same encoded data stream representing the same part of different video frames have been referred to as frame segment instances. In the example, using the above language, the first encoder would produce a sequence of frame segment instances corresponding to the top part of the video frames and the second encoder would produce a sequence of frame segment instances corresponding to the middle part of the video frames. In any particular frame of the original video, the first encoder could be producing an I-frame segment instance while the second encoder could be producing a P-frame segment instance.

Claim 1 also includes the limitation that the I-frame segment instances and P-frame segment instances are offset such that an I-frame instance in one data stream corresponds to a P-frame instances in at least one other data stream. This arrangement reduces burst bandwidth because the I-frame segment instances consume considerably less bandwidth than the full I-frames would. Any particular video frame divided into say a central segment, which is encoded as an I-frame segment and a peripheral segment encoded as a P-frame segment, which is encoded in parallel with it, will occupy much less burst bandwidth than a complete I-frame whether it is transmitted as a plurality of I-frame segments or a single whole frame. For example, in accordance with the invention, if you have a sequence of video frames, the middle region of the first frame may be transmitted as an I-frame segment instance, with all the other regions transmitted as P-frame segment instances, and the top part of the next frame may be transmitted as an I-frame segment instances with all the other parts sent as P-frame segment instances and so

on. In this way the extra bandwidth required by the I-frame part is spread out over multiple claims so as to reduce the burst bandwidth even though the total amount of data may be the same. The I-frame data is in effect spread over multiple frames.

Returning to Bourne, we see that it is fundamental to his teaching that the I-frames are identified at the frame level, not at the segmentation level. Please also see the abstract:

> Encoding means identifies INTRA coded frames, and for such frames encodes the first segment image at a low quantisation level and the second image segment at a high quantisation level.

Moreover, Bourne is completely silent about P-frames. This is not surprising as the object of Bourne is to reduce the bandwidth of the more data intensive I-frames (see paragraph [0003]).

In the Final Action, the Examiner recognizes that Bourne does not disclose P-frames, but somehow combines Bourne with Schreier to allegedly show the combination as obvious.

However, Schreier's teaching is quite different. First, as noted in the response to the Final Action, Schreier's expressly teaches away from using slice parallelism:

> "One of the advantages of the proposed method and system of the invention enables deblocking-on-the-fly as whole frames are processed instead of slices." (emphasis added)

It is well established that a reference cannot render an invention obvious if the proposed modification would render it unsuitable for its intended purpose.

> "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make

the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)" MPEP 2143.01

Moreover, where the reference teaches away from a particular feature, this is a factor that should also be taken into account.

The Examiner appears to have ignored the fact that the Schreier teaches away from using slice-level parallelism.

Schreier teaches that an advantage can be achieved by processing whole frames in parallel. Thus, in Schreier, if you take a video stream already containing I-frames and P-frames, Schreier teaches that you can encode the frames in parallel and then recombine them into a serial stream (stream merging unit) for transmission to a receiver. In Schreier the video frames are transmitted as whole frames, not as frame segments. Schreier would therefore not address the high burst bandwidth problem associated with the transmission of I-frames that the invention seeks to avoid. Even though the processing of frames is done in parallel, the resulting whole frames are merged into an output stream, and a high bandwidth burst would occur when the I-frames are present.

In Schreier there is a sort of frame offsetting depending on how you construe the term resulting from the fact that the frames that are processed in parallel arrive in sequence, but as noted previously this is not the same as what happens in the invention. For example, in Figure 8 of Schreier, frame 2, which is a P-frame arrives after frame 1, which is an I-frame. Thus, if you process the whole frames, which arrive in sequence, in the manner described it inevitably follows that the whole P-frames are offset relative to the whole I-frames because a P-frame follows an I-

frame. This does nothing to reduce burst bandwidth because it is still necessary to transmit the entire contents of an I-frame in an I-frame slot.

The Examiner refers to the slice parallelism discussed by Schrier in the context of the prior art to Schreier. The slice parallelism concept, which Schreier expressly teaches away from, is illustrated in his prior art Figure 1B. According to Schreier, it is known in the art to take each frame and process portions of it separately and in parallel with separate processors (Slice A, processor 1; Slice B, processor 2).

However, the important thing to note is that in this case the whole frames are sliced up and each slice is processed in parallel as shown in Figure 1B. Unlike whole frames shown in Figure 8A, which arrive one after the other, and therefore cannot be processed completely in parallel, frame slices can only be obtained when a whole frame has been received. You have to have the frame available in order to slice it up. Therefore, if you processed the frame slices in the way that Schreier does, which would be contrary to the express teachings of Schreier anyway because Shreier teaches not to slice up the frames, the I-frame slices would be processed in parallel, and the P-frame slices would be processed in parallel (see Fig. 1B). It is unrealistic without using the benefit of the teachings of the invention to extrapolate from Fig. 8 and say that if you used frame slices as taught in the prior art you would end up with offset I-frame segments and P-frame segments because the slices of each I-frame and each P-frame, unlike whole frames, do not arrive in sequence. That is an over-simplistic extrapolation of Figure 8 and simply not the case. In slice-level parallelism, the slices of a particular type of frame are processed in parallel. All the slices processed in parallel are therefore inevitably of the same type. If the slices belong to an I-

frame, they will be I-frame slices, and if they belong to a P-frame they will be P-frame slices. This does not help solve the burst bandwidth problem.

Moreover, it is really not clear what the result of the application of the teachings of Schreier to Bourne would be. As noted, Bourne relates only to the processing of I-frames. Bourne teaches segmenting the I-frames and sending the segments in series. If arguendo, and this is not conceded, it were legitimate to take from Schreier a teaching of processing in parallel and apply it to Bourne, the result would be I-frame segments processed in parallel because Bourne only teaches segmenting I-frames. If you encoded the I-frame segments in Bourne in parallel, you would end up with the same amount of burst bandwidth as if you sent the whole frames because Bourne does allow for the possibility that different parts of the same video frame could be in I-frame format and P-frame format.

The purpose of the claim amendments is to bring out these significant differences over the prior art more clearly.

Claim 1 calls for parallel encoded data streams, each containing a sequence of frame segments instances corresponding to a particular frame segment in the video frame. Thus, you might have a first encoded data stream corresponding to the top part of the video frame and a second encoded data stream corresponding to the second part of the image.

Each encoded data stream has to contain I-frame segment instances and P-frame segment instances. That is not true of Bourne because he only discloses segmenting I-frames. Following the teachings of Bourne, there would be no reason to segment the P-frames, but even if there were all the segments of the same type would be processed in parallel.

Both Bourne and Schreier fail to teach transmitting the encoded data streams independently over a network for recombination at the receiver (see paragraph [0028]). It is this fact coupled with the offsetting of the P-frame segments and I-frame segments as noted that results in the reduction in Burst bandwidth. Typically, the encoded data streams would be sent as parallel TCP streams over the Internet so if the parallel frame segment instances in the different data streams were all of the same type, as you would expect following the teachings of Schreier on slice parallelism, the data bursts would all appear at the same time, thus overloading the network.

Claim 15 relates specifically to the case where in any given frame one frame segment if encoded in I-frame format and all the other frame segments are encoded in P-frame format. For example, the middle region could be in I-frame format, in which case all the other segments of the same frame would have to be in P-frame format. This arrangement is not suggested by the prior art.

Similar reasoning applies to independent claim 40 and will not be repeated.

Reconsideration and allowance are therefore respectfully requested.

Respectfully submitted,



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12/232,496
Art Unit: 2438
Submission under 37 CFR 114 (c)

K1P 5S7
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PTO/SB/22 (09-11)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) 25864-US
Application Number 12/232,496	Filed 18-Sep-2008
For LOW LATENCY HIGH RESOLUTION VIDEO ENCODING	
Art Unit 2438	Examiner NARCISSO F VICTORIA

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$150	$75	$
☑ Two months (37 CFR 1.17(a)(2))	$560	$280	$ 280
☐ Three months (37 CFR 1.17(a)(3))	$1270	$635	$
☐ Four months (37 CFR 1.17(a)(4))	$1980	$990	$
☐ Five months (37 CFR 1.17(a)(5))	$2690	$1345	$

☑ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

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

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I am the

☐ applicant/inventor.

☐ 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).

☑ attorney or agent of record. Registration Number 34519

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

/rjmitchell34519/	14-October-2012
Signature	Date
Richard J. Mitchell	613-236-9561
Typed or printed name	Telephone Number

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 than one signature is required, see below.

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Electronic Patent Application Fee Transmittal

Application Number:	12232496
Filing Date:	18-Sep-2008
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Filer:	Richard J. Mitchell
Attorney Docket Number:	25864-US

Filed as Small 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:				
Extension-of-Time:				
Extension - 2 months with $0 paid	2252	1	285	285

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	2801	1	465	465
		Total in USD ($)		**750**

Electronic Acknowledgement Receipt

EFS ID:	13990488
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	23553
Filer:	Richard J. Mitchell
Filer Authorized By:	
Attorney Docket Number:	25864-US
Receipt Date:	15-OCT-2012
Filing Date:	18-SEP-2008
Time Stamp:	19:23:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$750
RAM confirmation Number	7177
Deposit Account	131717
Authorized User	
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)	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	25864RCE.pdf	697438 e8eb42cfa2ce2a03c5edf1f829ca96adf18c7b1d	no	3
Warnings:					
Information:					
2	Amendment Submitted/Entered with Filing of CPA/RCE	25864subamd.pdf	84396 a071f04f50b8a5209068cc45aded04baaf23bace	no	1
Warnings:					
Information:					
3	Claims	25864subclms.pdf	93587 862c4c1ef3ff21784785603f2c71f1c69d02aeba	no	4
Warnings:					
Information:					
4	Applicant Arguments/Remarks Made in an Amendment	25864subrem.pdf	117629 11ae277650b5167cba3717aa4e33388f36cf3410	no	9
Warnings:					
Information:					
5	Extension of Time	25864EofT.pdf	287816 cf3075c7b5f8b9ea6b4d8bb062c939d051eba72e	no	2
Warnings:					
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6	Fee Worksheet (SB06)	fee-info.pdf	31769 3c9006a612f745d741cc24720ceba28ba24520f7	no	2
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New International Application Filed with the USPTO as a Receiving Office
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PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/232,496	09/18/2008	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ 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))	14 minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 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 10/15/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 14	Minus	** 41	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	* 2	Minus	***4	=	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	

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	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.

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Legal Instrument Examiner:
/PEGGY YARBOROUGH/

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/232,496	09/18/2008	Patrick White	25864-US	9197

23553 7590 09/18/2012

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VICTORIA, NARCISO F	
ART UNIT	PAPER NUMBER
2438	

MAIL DATE	DELIVERY MODE
09/18/2012	PAPER

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.

Advisory Action Before the Filing of an Appeal Brief	**Application No.** *12/232,496*	**Applicant(s)** WHITE ET AL.
	Examiner NARCISO VICTORIA	**Art Unit** 2438

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

THE REPLY FILED 15 August 2012 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;

(2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☒ The period for reply expires *3* months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☐ will not be entered, or (b) ☒ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

9. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: (see Continuation below).

12. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____

13. ☐ Other: _____.

STATUS OF CLAIMS

14. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: None.
Claim(s) objected to: None.
Claim(s) rejected: 1-3, 5-11, 13-15, 30-37 and 40-43.
Claim(s) withdrawn from consideration: .

/Taghi T. Arani/ Supervisory Patent Examiner, Art Unit 2438	/N. V./ Examiner, Art Unit 2438

Continutation of 11:

1. Applicant's arguments filed August 15, 2012 have been fully considered but are not persuasive.

2. On pages 2-3 of the "Remarks" filed August 12, 2012, Applicant argues "The prior art does not show parallel encoding of frame segments as claimed in claim 1. Bourne discloses the encoding of frame segments sequentially. Schreier discloses the encoding of frames, not frame segments."

In response, the Examiner respectfully disagrees. Bourne discloses frame segmentation (Bourne: para. [0019]), and while Bourne does not disclose parallel encoding, the secondary reference Schreier teaches that this feature of the instant invention is already known (Schreier: para. [0024]: "Another level of parallelization is slice-level parallelism. Each frame is divided into two or more slices. Common video standards enable one to independently encode or decode the slices of a frame.") Clearly, combining the disclosure of Bourne with the teachings of Schreier would render the limitation "encoding each frame segment independently and in parallel" obvious. And in response to Applicant's argument that there is no suggestion to combine the references, the Examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, based on the above explanation, the combination of teachings between Bourne and Schreier is efficient and proper.

On page 3 of the "Remarks", Applicant further argues "The prior art fails to disclose 'encoding data streams (plural) over a network' wherein the data streams are defined in claim 1, namely multiple data streams each containing I-frame segments and P-frame segments that are encoded in parallel."

In response, the Examiner submits that the limitation "encoding data streams over a network" is nowhere to be found in the claims. It appears that the relevant claim limitation being argued by the Applicant is "transmitting the encoded data streams over a network." If this is the case, the Examiner maintains that the combined teachings of Bourne and Schreier render this claim obvious since the claim language only requires transmitting multiple data streams over the network without claiming any time element or manner of transmission. In other words, Bourne disclosing "transmission of images at various data rates" (para. [0004]) would simply read on this limitation immaterial of whether the transmission of the data streams is done sequentially or in parallel.

On pages 4-8 of the "Remarks", the Applicant's arguments are directed to the limitation "wherein the encoding of each frame segment is performed such that the I-frame segments in each encoded data stream are offset relative to each other." The Applicant argues that this limitation is not taught by Bourne and Schreier.

In response, the Examiner respectfully disagrees. As admitted by the Applicant on page 6 (last paragraph) of the "Remarks", the teachings of Schreier could be reasonably interpreted to read on the argued limitation. And in response to Applicant's arguments that the claim has to be given reasonable interpretation, the Examiner respectfully submits that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

On page 7, "the different bit rates of the encoders" being argued by the Applicant simply reads on Bourne's disclosure "transmission of images at various data rates" (para. [0004]).

On page 8, in reference to Applicant's arguments about "the processors having different performance characteristics", it is unclear which specific limitations are being referred to by the Applicant.

In view of the above, the Examiner respectfully believes that the rejection of the claims should be maintained at this time.

Ex.1002
CISCO SYSTEMS, INC. / Page 74 of 306

OK TO ENTER: /N.V./ 09/11/2012

12/232,496
Art Unit: 2438
Response to Final action mailed 05/15/2012

PATENT

Agent's Docket No. 25864

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of **Patrick White**	)	
	)	Conf no. 9197
	)	
	)	
	)	
Serial No: **12/232,496**	)	Art Unit: 2438
	)	
Filed: **09/18/2008**		Examiner: VICTORIA, NARCISO F

Customer no. 23553

For: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

Aug 15, 2012

Mail Stop AF
Commissioner of Patent and Trademarks
P.O. Box 1450, Alexandria, Virginia 22313-1450

RESPONSE TO OFFICE ACTION MAILED 11/08/2011

Sir:

Pursuant to the Final action mailed May 15, 2012, the applicant respectfully submits the following remarks.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Consulted Young Lee (375)	9/11/2012	NV
Consulted Thanhnga Truong	9/10/2012	NV

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/NARCISO VICTORIA/ Examiner.Art Unit 2438	

PATENT

Agent's Docket No. 25864

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of **Patrick White**	)	
	)	Conf no. 9197
	)	
	)	
	)	
Serial No: **12/232,496**	)	Art Unit: 2438
	)	
Filed: **09/18/2008**		Examiner: VICTORIA, NARCISO F

Customer no. 23553

For: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

Aug 15, 2012

Mail Stop AF
Commissioner of Patent and Trademarks
P.O. Box 1450, Alexandria, Virginia 22313-1450

RESPONSE TO OFFICE ACTION MAILED 11/08/2011

Sir:

Pursuant to the Final action mailed May 15, 2012, the applicant respectfully submits the following remarks.

Remarks

The applicant notes with appreciation that the Examiner considers that the previous response addressed the rejections under 35 US 112 and the outstanding formality objections.

It is noted that the Examiner has rejected claim under 35USC 103 over Bourne et al. in view of the new reference Schreier, which the Examiner has cited to show the parallel encoding of frames.

The Examiner asserts that all the claimed elements are present in the prior art. However, the applicant respectfully traverses for the reasons explained below.

In addition, the Examiner alleges that the "combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention". Again, the applicant respectfully traverses. The invention, and in particular, the novel concept of processing the frame segments in parallel, and offsetting the I-frame segments results in a considerable reduction in burst bandwidth as explained in more detail below. Such a reduction in burst bandwidth is not predicted in the prior art.

The prior art does not show parallel encoding of frame segments as claimed in claim 1. Bourne discloses the encoding of frame segments sequentially. Schreier discloses the encoding of frames, not frame segments. This is made clear by the passage in paragraph [0071] of Schreier, which reads as follows:

> "One of the advantages of the proposed method and system of the invention enables deblocking-on-the-fly as whole frames are processed instead of slices." (emphasis added)

It is well established that a reference cannot render an invention obvious if the proposed modification would render it unsuitable for its intended purpose.

> "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)" MPEP 2143.01

Here modifying Schreier to process frame segments would be directly contrary to its teachings, which is that there is a speed advantage in processing whole frames as distinct from separately processing "slices" of frames.

Contrary to the Examiner's assertion, the invention does not yield results predictable from the prior art. The object of the present invention, as explained in the previous response, is to reduce the burst bandwidth resulting from the fact that the I-frames carry a lot of data, so each time an I-frame is transmitted the instantaneous bandwidth is very large. By splitting the I-frames in particular into segments, processing the segments in parallel and offsetting the I-frame segments in the respective data streams, as more particularly set forth in claim 1, the burst bandwidth is reduced because each I-frame segment carries considerably less data than a full I-frame and the data in a full I-frame is distributed over different streams at different times.

The prior art fails to disclose

> encoding data streams (plural) over a network

wherein the data streams are as defined in claim 1, namely multiple data streams each containing I-frame segments and P-frames segments that are encoded in parallel.

More particularly claim 1 includes the limitation:

> encoding each frame segment independently and in parallel to general for each of the plurality of segments an encoded data stream containing I-frame segments and P-frame segments

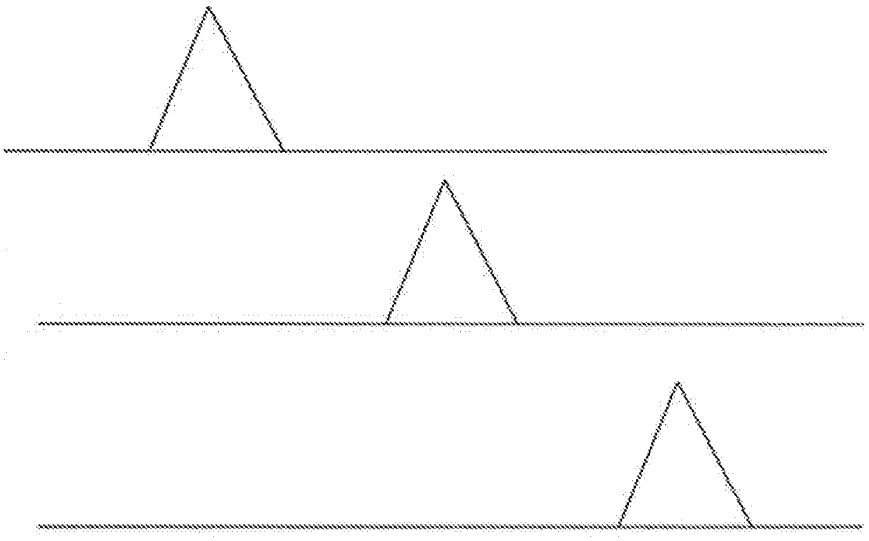
Thus, in accordance with the invention as claimed each frame segment within the frame results in a data stream that is transmitted over a network.

Significantly, claim 1 also contains the limitation that the I-frame segments in each encoded data stream are offset relative to each other. This is an important aspect of the invention in order to achieve reduction in burst bandwidth.

Claim 1 contains the limitation

> wherein the encoding of each frame segment is performed such that the I-frame segments in each encoded data stream are offset relative to each other.

This is illustrated in the diagram below.



The horizontal lines represent each data stream corresponding to the frame segments, and the triangles represent the I-frame segments. The I-frame segments in each encoded stream are offset relative to each other. This results in a considerable reduction in burst bandwidth relative to the prior art because the I-frame segments, which contain the most data, are distributed in time. Instead of their being a large data burst when an I-frame is transmitted, each I-frame is broken up into segments which are distributed in time over the data stream, and as a result the burst bandwidth is reduced.

Contrary to the Examiner's assertion, Schreier fails to teach this feature. The Examiner refers to Figure 8 in which the I-frames appear in a single sequential stream, wherein frames are processed in parallel and then recombined for transmission by the stream merging unit 112.

Paragraph [0088] states that the stream merging unit 112 assembles the output streams into "at least one output stream". There is no discussion of how the merging unit could produce more

than one stream, and certainly no discussion of the merging unit producing multiple streams corresponding to frame segments for transmission over the network.

Since Schreier does not disclose I-frame segments, it is not meaningful to say that the I-frame segments are in each data stream are offset relative to each other because in claim 1 the I-frame segments are defined as parts of an I-frame, and there are no I-frame segments in Schreier, only whole frames.

The full relevant clause in claim 1 reads:

> encoding each frame segment independently and in parallel to generate for each of the plurality of segments an encoded data stream containing I-frame segments that carry complete information about a particular frame segment and P-frame segments that carry partial information about a particular frame segment, the partial information representing information that has changed relative to a previous frame segment, and wherein the encoding of each frame segment is performed such that the I-frame segments in each encoded data stream are offset relative to each other

Of course the whole I-frames in Schreier are displaced in time because the frames follow each other sequentially and the idea of having I-frames and P-frames is that you intersperse the I-frames with P-frames, which only represent the changes from the preceding I-frame, so as to reduce the amount of data to be transmitted. So in a sense you could say that a following I-frame is offset relative to its preceding I-frame within the same data stream. However, the claim has to be given a reasonable interpretation with a mind willing to understand, and in the context of the claim language, this is not what is meant. The claim language refers to the different segments of

an I-frame in the different data streams being offset, which is quite different from what is shown in Schreier.

As noted above, Schreier clearly teaches that each whole frame is processed at a time (para [0071]). If *arguendo*, and the applicants do not admit this assumption follows from Schreier, the I-frames were processed as segments in parallel, following the teaching of Shreier, each I-frame segment would be processed at the same time because it would be necessary to reconstitute the whole frame at the same time for transmission in its proper sequence of frames.

Another way of looking at it is to say that if you applied the teachings of Schreier to Bourne, which the applicants do not admit is an obvious thing to do, you would have to break each frame in Figure 8 of Schreier into segments. For example, FRAME 1, which is an I-frame would be broken into FRAME 1(a) and FRAME 1 (b), but since Schreier expressly states that the frames are processed as a whole, not in slices, (paragraph [0071]), FRAME 1(a) and FRAME (1b) would be processed by processor P1 in area designed FRAME 1 and so on. The segments of a frame would not be offset in different data streams as more particularly set forth in claim 1.

It is by breaking the I-frames into segments, processing the segments in parallel, and offsetting the resulting I-frame segments in the different data streams that the unpredicted result of significant reduction in burst bandwidth is achieved.

Another significant feature of the invention reflected in claim 14 is that the bit rate of one of the encoders is different from the bit rate of the other encoders. This result in significant improvement in encoding efficiency. With regard to claim 14, the Examiner points to Figure 9 and paragraph [0037], but the applicants are unable to find any reference to differing bit rates for

the different encoders. Schreier is silent with regard to bit rate, and one would normally assume that the encoders were operating at the same bit rate.

Similar arguments apply mutatis mutandis to claim 40, and will not be repeated in the interests of brevity.

With regard to claim 30, the prior art does not teach alone or in combination encoding frame segments as more particularly defined in the claim in parallel. As noted, Schreier expressly teaches away from processing frame segments in parallel (paragraph [0071]) and cannot therefore be used to support an argument that it would be obvious to process the frame segments of Bourne in parallel.

With regard to the processors having different performance characteristics, there is no teaching in Schreier that the performance characteristics of the encoders are different. The Examiner has referred to the passage in paragraph [00667], which states that the encoder P1 can start when a full frame is received or when only portions of the frame are available. All this is saying is that the encoder P1 in one embodiment does not necessary have to wait until the full frame is received before it starts processing. This statement does not relate in anyway to the performance characteristics of processor P1. The specification does not say that the processors P2 and P3 are any different.

Similar arguments apply to claim 42 and will not be repeated.

Reconsideration and allowance are therefore respectfully requested.

Respectfully submitted,



Richard J. Mitchell
Registration No. 34519
Agent of Record

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Electronic Acknowledgement Receipt

EFS ID:	13502623
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	23553
Filer:	Richard J. Mitchell/Patricia Martin
Filer Authorized By:	Richard J. Mitchell
Attorney Docket Number:	25864-US
Receipt Date:	15-AUG-2012
Filing Date:	18-SEP-2008
Time Stamp:	14:26:47
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	Amendment After Final	25864R.pdf	25962 4f1392854f385fd1ba2aef4929752a6f774ce fc4	no	1

Warnings:	
Information:	

2	Applicant Arguments/Remarks Made in an Amendment	25864REM.pdf	277447 9a97a2ec603085ef47ef47c5881a753294562a68	no	8
Warnings:					
Information:					
			Total Files Size (in bytes):	303409	

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/232,496	09/18/2008	Patrick White	25864-US	9197

23553 7590 05/15/2012

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P.O. BOX 957
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OTTAWA, ON K1P 5S7
CANADA

EXAMINER	
VICTORIA, NARCISO F	
ART UNIT	PAPER NUMBER
2438	

MAIL DATE	DELIVERY MODE
05/15/2012	PAPER

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.

Office Action Summary	Application No.	Applicant(s)	
	12/232,496	WHITE ET AL.	
	Examiner	Art Unit	
	NARCISO VICTORIA	2438	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 February 2012*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-3,5-11,13-15,30-37 and 40-43* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-3, 5-11, 13-15, 30-37 and 40-43* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *08 February 2012* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ 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:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

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)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to the communication filed on 2/08/2012. Claims 1-3, 5-11, 13-15, 30-37 and 40-43 are pending of which claims 1, 30, 40 and 42 are independent and the remainder dependent. Applicant amended independent claims 1, 30 and 40 and dependent claims 2-3, 5-11, 13-15, 31-37 and 41, cancelling claims 4, 12, 16-29 and 38-39, adding new claims 42-43 .

Drawings

2. The replacement drawings for Figures 1 and 2 were received on 2/08/2012. These drawings are acceptable.

Response to Amendments and Arguments

3. Applicant's amendments sufficiently addressed the objections of claims 4 and 33 by canceling claim 4 and correcting the minor informality in claim 33, the objections now withdrawn.

4. Applicant's amendments sufficiently addressed the rejections of claims 16, 30 and 41 under 35 U.S.C. § 112, second paragraph, by canceling claim 16 and changing the claim language of claims 30 and 41, the rejections now withdrawn.

5. Applicant's arguments with respect to the rejection of claims 1-3, 5-11, 13-15, 30-37 and 40-41 have been fully considered but are moot in view of the new ground(s) of

rejection necessitated by the amendments. In addition, the references Hong and Yajima being argued on pages 10-11 of the "Remarks" filed 2/08/2012 are no longer applied in the rejections in this Office action.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the Examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicants are advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the Examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

7. Claims 1-3, 5-11, 13-15, 30-37 and 40-43 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bourne et al. (EP 1 227 684 A2; hereinafter referred to as "Bourne") in view of Schreier et al. (US 2008/0152014; hereinafter Schreier).

As per claim **1**, Bourne discloses **a method ~~for~~ of encoding in real time a video signal that is associated with ~~one of~~ a videoconference ~~and a~~or telepresence session** (§ [0004]: real time transmission of images)**, the method comprising:**

capturing a stream of video data ~~and providing video signal data in dependence thereon~~ comprising a series of sequential video frames (§ [0019]: input video signal 210)**;**

separating ~~the video signal data~~ each video frame into a plurality of frame segments, wherein each frame segment represents a part of a complete video frame (§ [0019]: segmentation element 220 divides the input signal 210 into a plurality of image segments 230; in this disclosure, the initial I-frame is segmented into at least two identical segments and encoded at different quantization levels, followed by the P-frame segments) **~~the segments identical from one video frame to another subsequent video frame within a same video signal data~~;**

transmitting the encoded ~~segment~~ data streams over a network (§ [0020]: "The encoded digital video signal is transmitted via a communication network such as an air interface…")**.**

Bourne does not explicitly disclose but Schreier discloses:

encoding each frame segment independently and in parallel to ~~result~~ generate for each of the plurality of ~~in encoded~~ segments an encoded data stream containing I-frame segments that carry complete information about a particular frame segment and P-frame segments that carry partial information about a

particular frame segment (§ [0036], [0073]; fig. 9: “divider circuit configured to divide an input video stream into a plurality of single frames and a plurality of encoding units coupled to the divider. Each of the plurality of encoding units is configured to receive at least one of the plurality of single frames”; [0073]…“each of the M processors […] can encode a single frame (intra or predicted)…”)**, the partial information representing information that has changed relative to a previous frame segment** (§ [0073]; Fig. 9: a predicted ("P") frame)**, and wherein the encoding of each frame segment is performed such that ~~both~~ the I-frame segments~~s~~ and ~~P frames are generated~~ in each encoded data stream are offset relative to each other** (§ [0037]; see fig. 8, frame sequence I, P, P, P, I, P and fig. 10, elements 164, 122, 124 and 126) ~~**for a given segment and allowing for independent reconstruction of segments at a distant end.**~~

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 1.

As per claim **2**, Bourne in view of Schreier discloses **a method according to claim 1, wherein the frame segments ~~are~~ correspond to predetermined ~~absent a~~**

~~**prior step of analyzing video frames of the video signal data**~~ **parts of the video frames** (Bourne: page. 6, lines 20-21: i.e., predetermining that INTRA frame should be divided into two segments)**.**

As per claim **3**, Bourne in view of Schreier discloses **a method according to claim 1, wherein each frame segment ~~comprises data relating~~ corresponds to a different predetermined area of the video frames ~~of the video signal data~~** (Bourne: § [0011]: as in MPEG-4, wherein the background scenery of a video image and foreground objects of greater interests can be sent as separate VOs)**.**

4. (Canceled)

As per claim **5**, Bourne in view of Schreier discloses **a method according to claim 1.**

Bourne does not explicitly disclose but Schreier discloses:

wherein ~~transmitting the encoded segmented data comprises transmitting~~ the I-frame of one of the frame segments and ~~transmitting~~ at least one P-frame of another of the frame segments are transmitted during a same overlapping period of time (§ [0063]: as suggested in the disclosure "encoder P2 can start the encoding process when only portions of the frame are available")**.**

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in

their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 5.

As per claim **6**, Bourne in view of Schreier discloses **a method according to claim 1, wherein the frame segments are uniformly sized geometric shapes (**Bourne: Figure 3: element 230: input video divided into uniformly sized geometric figures, i.e., squares or rectangular shapes)**.**

As per claim **7**, Bourne in view of Schreier **a method according to claim 1, wherein at least one of frame segment size and shape is different for one of the frame segments compared to another of the frame segments** (Bourne: Figure 3: element 230: input video divided into uniformly sized geometric figures which may not be perfectly identical)**.**

As per claim **8**, Bourne in view of Schreier **a method according to claim 1, wherein at least one of the frame segments comprises ~~data relating to~~ a plurality of predetermined non-contiguous areas of the video frames ~~of the video signal data~~** (Bourne: § [0011]: as in background scenery of a video image and foreground objects of greater interests)**.**

As per claim **9**, Bourne in view of Schreier discloses **a method according to claim 1, wherein the ~~video signal data is separated into~~ frame segments ~~in~~ are determined in dependence upon external application data~~, the application data external to the video signal data~~ and indicative of the amount of motion that is expected in different areas of the video frames~~ of the video signal data~~** (Bourne: § [0024]: as in motion compensation in P-frames)**.**

As per claim **10**, Bourne in view of Schreier discloses **a method according to claim 1, wherein ~~separating the video signal data into~~ the frame segments ~~is performed~~ are determined in dependence upon external prior use data~~, the prior use data external to the video signal data and~~ indicative of the amount of motion ~~determined~~ previously determined in different areas of the video frames~~ of a different video signal data~~** (Bourne: § [0024]: "subsequent video frames will be transmitted with better spatial quality for the object(s) of interest, because they benefit from a low distortion rendition of the object from which a prediction is made…")**.**

As per claim **11**, Bourne in view of Schreier discloses **a method according to claim 1, wherein a period between regularly spaced I-frames for one of the frame segments is different than a period between regularly spaced I-frames for another of the frame segments** (Bourne: § [0019]: input video signal comprises GOP's that may come in different sizes, as is known in the art)**.**

12. (Canceled)

As per claim **13**, Bourne in view of Schreier discloses **a method according to claim 1.**

Bourne does not explicitly disclose but Schreier discloses:

wherein ~~encoding each~~ the frame segments are ~~independently comprises allotting each different segment to a different encoder of a plurality of encoders~~ encoded in encoders having different encoding characteristics (§ [0037]; fig. 9: e.g., as a function of the controller controlling the encoding units)**.**

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 13.

As per claim **14**, Bourne in view of Schreier discloses **a method according to claim 13.**

Bourne does not explicitly disclose but Schreier discloses:

wherein at least one ~~encoder of the plurality~~ of <u>the</u> encoders has a bitrate that is greater than a bitrate of the other encoders ~~of the plurality of encoders~~ (§ [0037]; fig. 9: e.g., as a function of the controller controlling the encoding units)**.**

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 13.

As per claim **15**, Bourne in view of Schreier discloses **a method according to claim 1, wherein ~~transmitting the encoded segmented data comprises transmitting~~ <u>during</u> the <u>transmission of the</u> I-frame of one of the <u>frame</u> segments ~~and during transmission thereof transmitting other than I frames~~ <u>P-frames of</u> ~~of all~~ <u>all the</u> other <u>frame</u> segments <u>are transmitted</u>** (Bourne: § [0025]: intra-frame (I-frame) is encoded first (in a video sequence, I-frame is encoded and transmitted first), then subsequent frames to the I-frames are encoded as predicted frames (P-frames))**.**

Claims 16 to 29 are canceled.

As per claim **30**, Bourne discloses **a method for encoding in real time a video signal that is associated with ~~one of~~ a videoconference ~~and a~~ or telepresence session, the method comprising:**

capturing a ~~sequence~~ stream of video ~~frame~~ data comprising a series of sequential video frames (§ [0019]: input video signal 210)**~~, the sequence of video frame data comprising at least a portion of the video signal~~;**

~~dividing~~ separating each video frame into a plurality of frame segments wherein each frame segment represents a part of a complete video frame (§ [0019]: segmentation element 220 divides the input signal 210 into a plurality of image segments 230; in this disclosure, the initial I-frame is segmented into at least two identical segments and encoded at different quantization levels, followed by the P-frame segments) **~~comprising a first segment that contains at least a threshold amount of motion during the session and including a second segment that contains less than the threshold amount of motion during the session~~;**

transmitting ~~via a communications network the I frame relating to the first segment and after a delay sufficient for reducing the data burst rate transmitting via the communications network the I frame relating to the second segment, so as to transmit the first and second segments in a fashion for reducing the data burst rate resulting therefrom~~ the encoded data streams over a network (§ [0020]: "The encoded digital video signal is transmitted via a communication network such as an air interface…")**.**

Bourne does not explicitly disclose but Schreier discloses:

encoding ~~the first segment and encoding~~ each frame segment independently ~~the second segment, such~~ and in parallel to generate for each of the plurality of frame segments an encoded data stream carrying ~~that both~~ I-frame segments that carry complete information about a frame segment and, ~~s~~ and P-frame segments that carry partial information about a frame segment(§ [0036], [0073]; fig. 9: "divider circuit configured to divide an input video stream into a plurality of single frames and a plurality of encoding units coupled to the divider. Each of the plurality of encoding units is configured to receive at least one of the plurality of single frames"; [0073]…"each of the M processors […] can encode a single frame (intra or predicted)…")~~,s~~ **the partial information representing information that has changed relative to a previous frame segment** (§ [0073]; Fig. 9: a predicted ("P") frame)**, and wherein the frame segments are encoded with encoders having different performance characteristics** (fig. 10, elements 122, 124 and 126; § [0067]: encoder P1 can start with the encoding process when only portions of the frame are available. The other encoders each start after another period of 1T as shown in FIG. 8) ~~are generated for each of the first and second segment~~.

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 30.

As per claim **31**, Bourne in view Schreier discloses **a method according to claim 30, wherein the frame segments ~~are predetermined absent a prior step of analyzing~~ correspond to predetermined parts of the video frames ~~of the sequence &video frame data~~** (Bourne: page. 6, lines 20-21: i.e., predetermining that INTRA frame should be divided into two segments)**.**

As per claim **32**, Bourne in view Schreier discloses **a method according to claim 30, wherein each frame segment ~~comprises data relating~~ corresponds to a different predetermined area of the video frames ~~of the sequence of video frame data~~** (Bourne: § [0011]: a known feature of MPEG-4, wherein the background scenery of a video image and foreground objects of greater interests can be sent as separate VOs)**.**

As per claim **33**, Bourne in view Schreier discloses **a method according to claim 30.**

Bourne does not explicitly disclose but Schreier discloses:

wherein the rate of I-frame generation for ~~the first~~ one of the frame segments is more frequent than the rate of I-frame generation for another of the

~~second~~ **frame segments** (§ [0037]; fig. 9: e.g., as a function of the controller controlling the encoding units)**.**

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 13.

As per claim **34**, Bourne in view Schreier discloses **a method according to claim 30, wherein the frame segments ~~of the plurality of segments~~ correspond to ~~are~~ predetermined ~~fixed~~ uniformly sized geometric shapes** (Bourne: Figure 3: element 230: input video divided into uniformly sized geometric figures, i.e., squares or rectangular shapes)**.**

As per claim **35**, Bourne in view Schreier discloses **a method according to claim 30, wherein ~~at least one of~~ the size ~~and~~ or shape of ~~the first~~ one frame segment is different ~~compared to the~~ from the size or shape of another ~~second~~ frame segment** (Bourne: § [0019]: input video signal comprises GOP's that may come in different sizes, as is known in the art)**..**

As per claim **36**, Bourne in view Schreier discloses **a method according to claim 30, wherein ~~at least one of the first segment and the second segment comprises data relating~~ frame segments correspond to a plurality of predetermined non-contiguous areas of the video frames~~ of the sequence of video frame data~~** (Bourne: § [0011]: as in differentiating background scenery of a video image and foreground objects of greater interests)**.**

As per claim **37**, Bourne in view Schreier discloses **a method according to claim 30, wherein ~~each video frame is divided into the plurality~~ the frame segments are determined in dependence upon external application data~~, the application data external to the sequence of video frame data and~~ relating to at least one of user preferences and historical data indicative of an amount of motion ~~that~~ in different areas of the video frames** (Bourne: § [0024]: as in motion compensation in P-frames)**.**

Claims 38 and 39 are canceled.

As per claim **40**, Bourne discloses **a video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:**

a port for receiving ~~a video signal comprising frame data, the frame data divisible into a~~ a stream of video data comprising a series of sequential video

frames (§ [0019]: port to receive input video signal 210) ~~**plurality of different predetermined segments**~~**;**

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete video frame (§ [0019]: segmentation element 220 divides the input signal 210 into a plurality of image segments 230; in this disclosure, the initial I-frame is segmented into at least two identical segments and encoded at different quantization levels, followed by the P-frame segments)**;**

a transceiver for ~~providing~~ transmitting the encoded frame segments ~~onto~~ over a network (§ [0020]: "The encoded digital video signal is transmitted via a communication network such as an air interface…")**.**

Bourne does not explicitly disclose but Schreier discloses:

a plurality of video encoders arranged in parallel ~~each one~~ for independently encoding ~~independently a different one of~~ the respective ~~predetermined~~ frame segments in parallel to generate for each of the plurality of segments an encoded data stream containing I-frame segments that carry complete information about a particular frame segment and P-frame segments that carry partial information about a particular frame segment (§ [0036], [0073]; fig. 9: "divider circuit configured to divide an input video stream into a plurality of single frames and a plurality of encoding units coupled to the divider. Each of the plurality of encoding units is configured to receive at least one of the plurality of single frames"; [0073]…"each of the M processors […] can encode a single frame (intra or

predicted)…”)**, the partial information representing information that has changed relative to a previous frame segment** (§ [0073]; Fig. 9: a predicted ("P")**, and the video encoders being arranged to encode each frame segment such that the I-frame segments in each encoded data stream are offset relative to each other** (§ [0037]; see fig. 8, frame sequence I, P, P, P, I, P and fig. 10, elements 164, 122, 124 and 126).

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 40.

As per claim **41**, Bourne in view of Schreier discloses a **video encoding system according to claim 40 comprising: a memory for storing ~~of~~ predetermined data ~~indicative of for each of the plurality of different segments a region of an image that forms part thereof~~ defining the frame segments, which correspond to predetermined parts of the video frames** (Bourne: Figure 3, necessary part of video communication system)**.**

As per claim **42**, Bourne discloses a **video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:**

a port for receiving a stream of video data comprising a series of sequential video frames (§ [0019]: port to receive input video signal 210)**;**

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete video frame (§ [0019]: segmentation element 220 divides the input signal 210 into a plurality of image segments 230; in this disclosure, the initial I-frame is segmented into at least two identical segments and encoded at different quantization levels, followed by the P-frame segments)**;**

transmitting the encoded data streams over a network (§ [0020]: "The encoded digital video signal is transmitted via a communication network such as an air interface…")**.**

Bourne does not explicitly disclose but Schreier discloses:

a plurality of video encoders arranged in parallel for independently encoding the respective frame segments in parallel to generate for each of the plurality of frame segments an encoded data stream carrying I-frame segments that carry complete information about a frame segment and P-frame segments that carry partial information about a frame segment (§ [0036], [0073]; fig. 9: "divider circuit configured to divide an input video stream into a plurality of single frames and a plurality of encoding units coupled to the divider. Each of the plurality of encoding units

is configured to receive at least one of the plurality of single frames"; [0073]…"each of the M processors […] can encode a single frame (intra or predicted)…")**, the partial information representing information that has changed relative to a previous frame segment** (§ [0073]; Fig. 9: a predicted ("P"))**, and wherein the frame segments are encoded with encoders having different performance characteristics** (fig. 10, elements 122, 124 and 126; § [0067]: encoder P1 can start with the encoding process when only portions of the frame are available. The other encoders each start after another period of 1T as shown in FIG. 8)**.**

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bourne and Schreier to obtain the invention as specified in claim 42.

As per claim **43**, Bourne in view of Schreier discloses **a video encoding system according to claim 42 further comprising: a memory for storing predetermined data defining the frame segments** (Bourne: Figure 3, necessary part of video communication system)**.**

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NARCISO VICTORIA whose telephone number is (571)270-7904. The examiner can normally be reached on Monday to Friday 10:00am - 4:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Taghi Arani can be reached on (571)272-3787. 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). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NV/
/Taghi T. Arani/
Supervisory Patent Examiner, Art Unit 2438

Notice of References Cited	Application/Control No. 12/232,496	Applicant(s)/Patent Under Reexamination WHITE ET AL.	
	Examiner NARCISO VICTORIA	Art Unit 2438	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2008/0152014 A1	06-2008	Schreier et al.	375/240.21
	B	US-			
	C	US-			
	D	US-			
	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.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

✓	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	11/02/2011	05/09/2012							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	-							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	-							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
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	30	✓	✓							
	31	✓	✓							
	32	✓	✓							
	33	✓	✓							
	34	✓	✓							
	35	✓	✓							
	36	✓	✓							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

✓	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	11/02/2011	05/09/2012							
	37	✓	✓							
	38	✓	-							
	39	✓	-							
	40	✓	✓							
	41	✓	✓							
	42		✓							
	43		✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

SEARCHED			
Class	Subclass	Date	Examiner
375	240.01	5/04/2012	NV

SEARCH NOTES		
Search Notes	Date	Examiner
Performed limited search in class/subclass: 375/240.01; 386/68,111 using search terms: parallel encoding, independent encoding, telepresence, teleconference, videoconference, segmenting, dividing, duplicating, copying, image, video, picture, frame, GOP, order	5/04-07/2012	NV
Consulted PE Geepy Pe (AU 2488 - 375 mentor)	5/02/2012	NV

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/NARCISO VICTORIA/ Examiner.Art Unit 2438	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S79	3248	(375/240.01).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2012/05/04 15:53
S80	160	(386/68).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2012/05/04 15:54
S81	5	(386/111).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2012/05/04 15:54
S82	6870	(parallel near2 encod$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 15:55
S83	4920	(encod$3 near3 independently)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 15:55
S84	12828	(telepresence or video$1conference or teleconference)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 15:56
S85	10	S82 and S83 and S84	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 15:56
S86	1	(reduc$3 near2 delay) same transmit$4 same GOP with order	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 16:03
S87	38	(reduc$3 near2 delay) same3 transmit$4 same3 GOP same3 order	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 16:04
S88	32	S82 and S84	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 16:04
S89	62	S83 and S84	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 16:05
S90	108	S79 and S82	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 16:05

S91	0	S80 and S82	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 16:05
S92	0	S81 and S82	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/04 16:05
S93	1439	(divid$3 near2 frame) with segment	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 12:47
S94	9773	(encod$3 near3 parallel)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 12:47
S95	3729	(real$1time near3 video) same3 (compression)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 12:48
S96	1	S93 and S94 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 12:48
S97	0	S93 same3 S94 same3 S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 12:49
S98	28	S93 and S94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 12:49
S99	24993	(real$1time near3 video)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:11
S100	1	S93 and S94 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:11
S101	2	S93 and S94 and S99	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:12
S102	36550	(real$1time near3 video) or video$1conferenc$3 or telepresence	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:13
S103	2	S93 and S94 and S102	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:14
S104	42622	(real$1time near3 video) or video$1conferenc$3 or telepresence or (live near2 stream$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:16
S105	2	S93 and S94 and S104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2012/05/07 13:16

			IBM_TDB			
S106	0	(P near2 frame) same3 (I near2 grame) same3 offset	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:54
S107	1587	(P near2 frame) same3 (I near2 frame) same3 offset	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:54
S108	51	S95 and S107	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 13:56
S109	2	("5057916").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2012/05/07 14:32
S110	795	(processing video signals).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2012/05/07 14:57
S111	2	"0428160.6"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2012/05/07 14:57
S112	2	116534/1996	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 15:20
S113	116	"116534"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 15:22
S114	31	S113 and (parallel)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 15:22
S115	2	S113 and (parallel near2 encoding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 15:22
S116	124	S94 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/05/07 15:39

5/9/2012 4:33:47 PM
C:\Users\nvictoria\Documents\EAST\Workspaces\12232496.wsp

PATENT

Agent's Docket No. 25864

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of **Patrick White**	)	
	)	Conf no. 9197
	)	
	)	
	)	
Serial No: **12/232,496**	)	Art Unit: 2438
	)	
Filed: **09/18/2008**		Examiner: VICTORIA, NARCISO F

Customer no. 23553

For: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

Feb 7, 2012

Commissioner of Patent and Trademarks
P.O. Box 1450, Alexandria, Virginia 22313-1450

.

RESPONSE TO OFFICE ACTION MAILED 11/08/2011

Sir:

Pursuant to the office action mailed November 8, 2011, the applicant respectfully submits the following amendments and remarks.

In the drawings

Please replace the sheets containing Figures 1 and 2 by the new sheets submitted herewith.

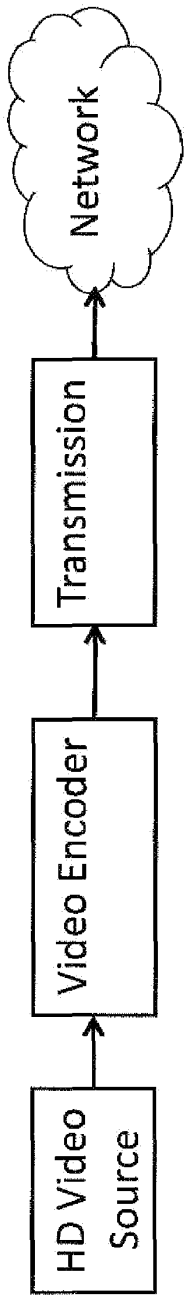


Figure 1
PRIOR ART

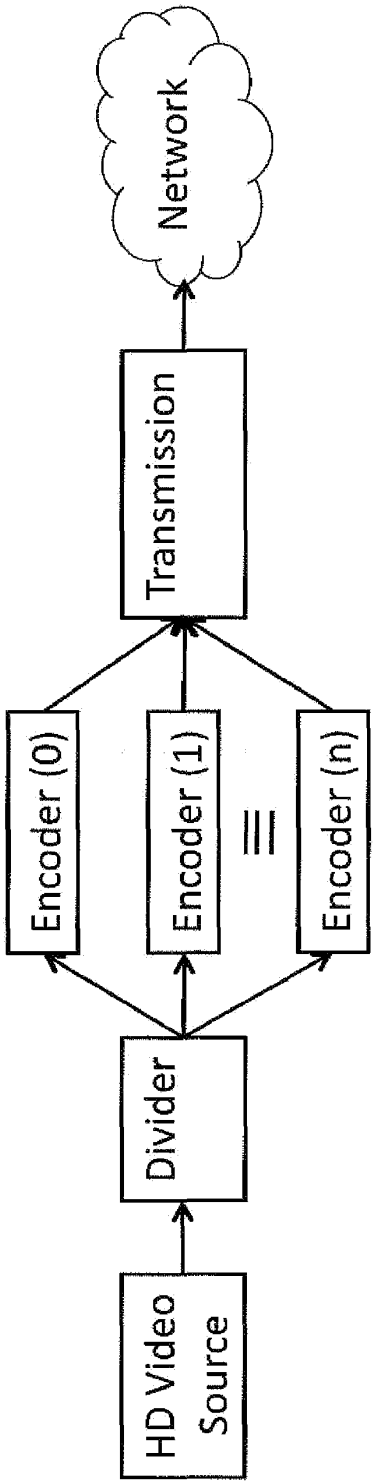


Figure 3

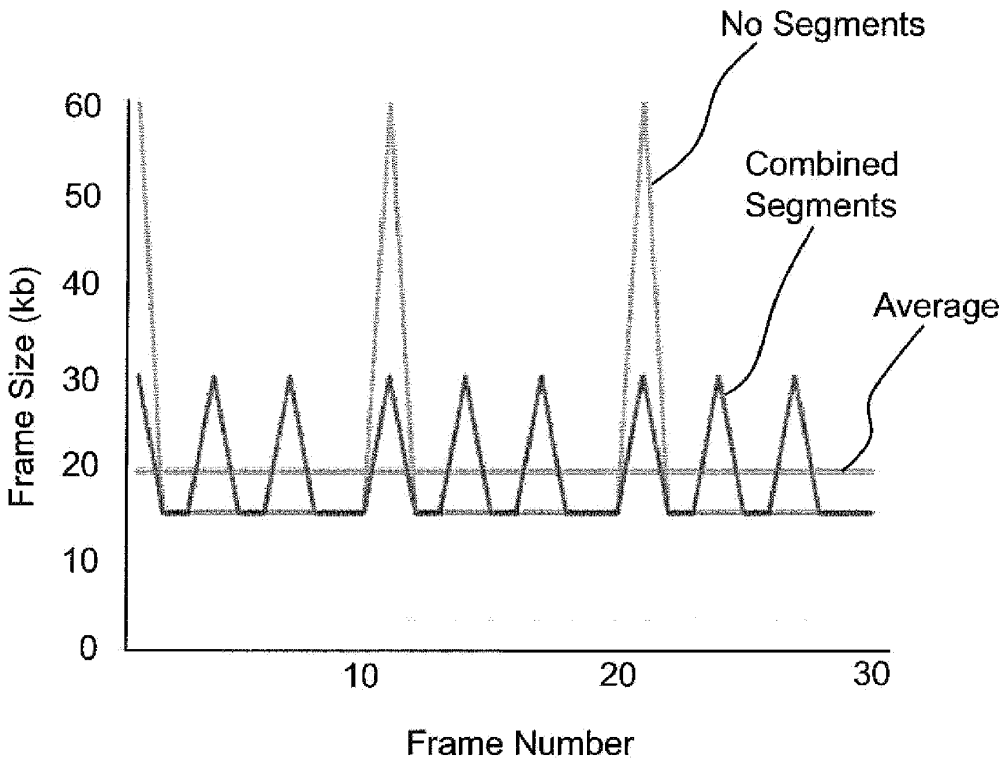


Figure 2

PRIOR ART

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method ~~for~~ of encoding in real time a video signal that is associated with ~~one of~~ a videoconference ~~and a~~or telepresence session, the method comprising:

capturing a stream of video data ~~and providing video signal data in dependence thereon~~comprising a series of sequential video frames;

separating ~~the video signal data~~each video frame into a plurality of frame segments, wherein each frame segment represents a part of a complete video frame~~the segments identical from one video frame to another subsequent video frame within a same video signal data~~;

encoding each frame segment independently and in parallel to ~~result~~ generate for each of the plurality of ~~in encoded~~ segments an encoded data stream containing I-frame segments that carry complete information about a particular frame segment and P-frame segments that carry partial information about a particular frame segment, the partial information representing information that has changed relative to a previous frame segment, and wherein the encoding of each frame segment is performed such that ~~both~~ the I-frame segments~~s~~ ~~and P-frames are generated~~in each encoded data stream are offset relative to each other ~~for a given segment and allowing for independent reconstruction of segments at a distant end~~; and~~,~~

transmitting the encoded ~~segment~~ data streams over a network.

2. (Currently amended) A method according to claim 1, wherein the frame segments ~~are~~ correspond to predetermined ~~absent a prior step of analyzing video frames of the video signal data~~parts of the video frames.

3. (Currently amended) A method according to claim 1, wherein each frame segment ~~comprises data relating~~corresponds to a different predetermined area of the video frames ~~of the video signal data~~.

4. (Canceled)

5. (Currently amended) A method according to claim 1, wherein ~~transmitting the encoded segmented data comprises transmitting~~ the I-frame of one of the frame segments and ~~transmitting~~

at least one P-frame of another of the frame segments are transmitted during a same overlapping period of time.

6. (Currently amended) A method according to claim 1, wherein the frame segments are uniformly sized geometric shapes.

7. A method according to claim 1, wherein at least one of frame segment size and shape is different for one of the frame segments compared to another of the frame segments.

8. (Currently amended) A method according to claim 1, wherein at least one of the frame segments comprises ~~data relating to~~ a plurality of predetermined non-contiguous areas of the video frames ~~of the video signal data~~.

9. (Currently amended) A method according to claim 1, wherein the ~~video signal data is separated into~~frame segments ~~in~~ are determined in dependence upon external application data ~~, the application data external to the video signal data~~ and indicative of the amount of motion that is expected in different areas of the video frames ~~of the video signal data~~.

10. (Currently amended) A method according to claim 1, wherein ~~separating the video signal data into~~the frame segments ~~is performed~~are determined in dependence upon external prior use data~~, the prior use data external to the video signal data and~~ indicative of the amount of motion ~~determined~~ previously determined in different areas of the video frames ~~of a different video signal data~~.

11. (Currently amended) A method according to claim 1, wherein a period between regularly spaced I-frames for one of the frame segments is different than a period between regularly spaced I-frames for another of the frame segments.

12. (canceled)

13. (Currently amended) A method according to claim 1, wherein ~~encoding each~~the -frame segments are ~~independently comprises allotting each different segment to a different encoder of a plurality of encoders~~ encoded in encoders having different encoding characteristics. ~~.~~

14. (Currently amended) A method according to claim 13, wherein at least one ~~encoder of the plurality~~ of the encoders has a bitrate that is greater than a bitrate of the other encoders ~~of the~~

~~plurality of encoders~~.

15. (Currently amended) A method according to claim 1, wherein ~~transmitting the encoded segmented data comprises transmitting~~ during the transmission of the ~~-~~I-frame of one of the frame segments ~~and during transmission thereof transmitting other than I-frames~~P-frames of ~~of all~~ all the other frame segments are transmitted.

Claims 16 to 29 are canceled.

30. (Currently amended) A method for encoding in real time a video signal that is associated with ~~one of~~ a videoconference ~~and a~~or telepresence session, the method comprising:

capturing a ~~sequence~~ stream of video ~~frame~~ data comprising a series of sequential video frames~~, the sequence of video frame data comprising at least a portion of the video signal~~;

~~dividing~~ separating each video frame into a plurality of frame segments wherein each frame segment represents a part of a complete video frame~~comprising a first segment that contains at least a threshold amount of motion during the session and including a second segment that contains less then the threshold amount of motion during the session~~;

encoding ~~the first segment and encoding~~each frame segment independently ~~the second segment, such~~and in parallel to generate for each of the plurality of frame segments an encoded data stream carrying ~~that both~~ I-frame segments that carry complete information about a frame segment and~~s~~ and P-frame segments that carry partial information about a frame segment,~~s~~ ~~-~~the partial information representing information that has changed relative to a previous frame segment, and wherein the frame segments are encoded with encoders having different performance characteristics~~are generated for each of the first and second segment~~; and

transmitting ~~via a communications network the I-frame relating to the first segment and after a delay sufficient for reducing the data burst rate transmitting via the communications network the I-frame relating to the second segment, so as to transmit the first and second segments in a fashion for reducing the data burst rate resulting therefrom~~the encoded data streams over a network.

31. (Currently amended) A method according to claim 30, wherein the frame segments ~~are predetermined absent a prior step of analyzing~~correspond to predetermined parts of the ~~-~~video

frames ~~of the sequence of video frame data~~.

32. (Currently amended) A method according to claim 30, wherein each frame segment ~~comprises data relating~~ corresponds to a different predetermined area of the video frames ~~of the sequence of video frame data~~.

33. (Currently amended) A method according to claim 30, wherein the rate of I-frame generation for ~~the first~~one of the frame segments is more frequent than the rate of I-frame generation for another of the ~~second~~ frame segments.

34. (Currently amended) A method according to claim 30, wherein the frame segments ~~of the plurality of segments~~correspond to ~~are~~ predetermined ~~fixed~~ uniformly sized geometric shapes.

35. (Currently amended) A method according to claim 30, wherein ~~at least one of~~ the size ~~and~~ or shape of ~~the first~~one frame segment is different ~~compared to the~~from the size or shape of another ~~second~~frame segment.

36. (Currently amended) A method according to claim 30, wherein ~~at least one of the first segment and the second segment comprises data relating~~frame segments correspond to a plurality of predetermined non-contiguous areas of the video frames ~~of the sequence of video frame data~~.

37. (Currently amended) A method according to claim 30, wherein ~~each video frame is divided into the plurality~~the frame segments are determined in dependence upon external application data~~, the application data external to the sequence of video frame data and~~ relating to at least one of user preferences and historical data indicative of an amount of motion ~~that~~ in different areas of the video frames.

Claims 38 and 39 are canceled

40. (Currently amended) A video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:

a port for receiving ~~a video signal comprising frame data, the frame data divisible into a~~a stream of video data comprising a series of sequential video frames ~~plurality of different~~

~~predetermined segments~~;

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete video frame;

a plurality of video encoders arranged in parallel ~~each one~~ for independently encoding ~~independently a different one of~~ the respective ~~predetermined~~ frame segments in parallel to generate for each of the plurality of segments an encoded data stream containing I-frame segments that carry complete information about a particular frame segment and P-frame segments that carry partial information about a particular frame segment, the partial information representing information that has changed relative to a previous frame segment, and the video encoders being arranged to encode each frame segment such that the I-frame segments in each encoded data stream are offset relative to each other; and~~,~~

a transceiver for ~~providing~~ transmitting the encoded frame segments ~~onto~~ over a network.

41. (Currently amended) A video encoding system according to claim 40 comprising: a memory for storing ~~of~~ predetermined data ~~indicative of for each of the plurality of different segments a region of an image that forms part thereof~~defining the frame segments, which correspond to predetermined parts of the video frames.

42.(New) A video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:

a port for receiving a stream of video data comprising a series of sequential video frames;

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete video frame;

a plurality of video encoders arranged in parallel for independently encoding the respective frame segments in parallel to generate for each of the plurality of frame segments an encoded data stream carrying I-frame segments that carry complete information about a frame segment and P-frame segments that carry partial information about a frame segment, the partial information representing information that has changed relative to a previous frame segment, and wherein the frame segments are encoded with encoders having different performance

characteristics; and

transmitting the encoded data streams over a network.

43.(New) A video encoding system according to claim 42 further comprising: a memory for storing predetermined data defining the frame segments.

Remarks

The applicants have labeled Figures 1 and 2 as prior art as requested by the Examiner.

Claim 4 has been canceled and claim 33 has been corrected.

Claim 16 has been canceled. The term sufficient has been removed from claim 30 as part of the amendment.

Claim 1 has been amended to make it clear that each frame segment is encoded in parallel into series of I-frames and P-frames, and that the I frames are encoded in such a way that they are offset from each other (see page 9, paragraph [0029]). In this way the amount of burst bandwidth can be reduced because instead of sending a single I-frame for a complete frame, the complete frame is sent as a series of I-frame segments, each of which contains less data than the single I-frame. As the I-frame segments constituting the complete frame are not sent at the same time, the burst bandwidth is reduced relative to the situation where a single complete I-frame is sent for a frame of video. Moreover, even though sequential frames may contain parts that move, sequential segments may not. For example, in the case of a teleconference, the border area may remain static for a long period of time, meaning that fewer I-frames will be required, thus still further reducing the burst bandwidth.

Claim 1 is now clearly distinguished from Bourne, wherein the macroblocks or segments are encoded sequentially in the codec 250. There is no disclosure in Bourne of parallel encoding of frame segments.

With regard to former claim 4, which relates to this feature, the Examiner alleges that this is obvious over Bourne in view of Hong. However, it is noted that Bourne does not disclose the

Ex.1002
CISCO SYSTEMS, INC. / Page 127 of 306

parallel encoding of frame segments; thus a combination of Bourne and Hong would not result in the invention claimed. Moreover, the fact that Hong discloses smoothing streaming video does not suggest offsetting I-frames of frame segments forming part of a frame as specifically claimed in claim 1. Hong is completely silent with regard to offsetting I-frames of different frame segments formed from the same frame. Paragraph [0013] referred to by the Examiner is a discussion of the prior art to Hong, which according to Hong, suggests smoothing and streaming I frames, P freames and B frames based on a group of pictures without any indication of how this smoothing takes place. There is certainly no suggestion of the specific limitation in claim 1 relating to the offsetting of I-frame segments within a frame.

Hong addresses the problem of burst characteristics of an MPEG coded video signal by smoothing out the stream pattern in the packetizing process. There is nothing to suggest encoding the segments of Bourne in parallel and offsetting the I-frames as specifically claimed in claim 1.

Yajima in Figure 17 discloses a series of parallel arithmetic encoders, but there is no disclosure of the separately encoding frame segments in parallel and offsetting the I-Frames.

Claim 30 has been amended to specify that the encoders operate in parallel and have different performance characteristics (see original claim 39). The Examiner rejected former claim 39 over Bourne in view of Hong and Yajima because Yajmia discloses parallel encoders. However, Yajima fails to disclose that the encoders have different performance characteristics such that the frame segments can be encoded at different rates depending on their properties. This is important because it enables one to take advantage of the fact that different parts of an image behave differently. For example, in the case of a teleconference the only movement is likely to be in the

center of the screen. Most of the time the border areas will remain static, so these can be coded at different rates from the middle of the screen, thus saving bandwidth. Absent any teaching or suggestion that the encoders should have different performance characteristics, an assertion that this is obvious is merely an unsupported conclusory statement. On the contrary, in Yajima it would be expected that the encoders would be the same as they are processing similar data streams.

Reconsideration and allowance are therefore respectfully requested.

Respectfully submitted,



Richard J. Mitchell
Registration No. 34519
Agent of Record

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(613) 236-9561

Ex.1002
CISCO SYSTEMS, INC. / Page 129 of 306

Electronic Acknowledgement Receipt

EFS ID:	12024597
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	23553
Filer:	Richard J. Mitchell
Filer Authorized By:	
Attorney Docket Number:	25864-US
Receipt Date:	08-FEB-2012
Filing Date:	18-SEP-2008
Time Stamp:	10:05:07
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	Amendment/Req. Reconsideration-After Non-Final Reject	25864amd.pdf	83070 70dbd5d22fdd2db0cc80aa0db640e2d57246c90a	no	1

Warnings:	
Information:	

2	Drawings-only black and white line drawings	25864DRW.pdf	619633 cd0adc8092079fbf42f20a24fa7c98c13269a892	no	3
Warnings:					
Information:					
3	Claims	25864clms.pdf	101150 434b5893ff6e4a83699aeb08d1ea60d245a35ca7	no	6
Warnings:					
Information:					
4	Applicant Arguments/Remarks Made in an Amendment	25864rem.pdf	90642 83a24840096cdd5674ffff05f09338620d3938b1	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	894495		

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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.

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.

PATENT

Agent's Docket No. 25864

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of **Patrick White**	)	
	)	Conf no. 9197
	)	
	)	
	)	
Serial No: **12/232,496**	)	Art Unit: 2438
	)	
Filed: **09/18/2008**		Examiner: VICTORIA, NARCISO F

Customer no. 23553

For: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

Feb 8, 2012

Commissioner of Patent and Trademarks
P.O. Box 1450, Alexandria, Virginia 22313-1450

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SUPPLEMENTARY RESPONSE TO OFFICE ACTION MAILED 11/08/2011

Sir:

Pursuant to the response submitted Feb 8, 2012, the applicant respectfully submits the following corrected claim set as it has been noticed that the response was non-compliant due to a missing status designator in claim 7.

The attached set of claims has been corrected. Please substitute this set for the set previously submitted.

Reconsideration and allowance are therefore respectfully requested.

Supplementary Response
Respectfully submitted,



Richard J. Mitchell
Registration No. 34519
Agent of Record

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Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method ~~for~~ of encoding in real time a video signal that is associated with ~~one of~~ a videoconference ~~and a~~or telepresence session, the method comprising:

capturing a stream of video data ~~and providing video signal data in dependence thereon~~comprising a series of sequential video frames;

separating ~~the video signal data~~each video frame into a plurality of frame segments, wherein each frame segment represents a part of a complete video frame~~the segments identical from one video frame to another subsequent video frame within a same video signal data~~;

encoding each frame segment independently and in parallel to ~~result~~ generate for each of the plurality of ~~in encoded~~ segments an encoded data stream containing I-frame segments that carry complete information about a particular frame segment and P-frame segments that carry partial information about a particular frame segment, the partial information representing information that has changed relative to a previous frame segment, and wherein the encoding of each frame segment is performed such that ~~both~~ the I-frame segments~~s and P-frames are generated~~in each encoded data stream are offset relative to each other ~~for a given segment and allowing for independent reconstruction of segments at a distant end~~; and~~,~~

transmitting the encoded ~~segment~~ data streams over a network.

2. (Currently amended) A method according to claim 1, wherein the frame segments ~~are~~ correspond to predetermined ~~absent a prior step of analyzing video frames of the video signal data~~parts of the video frames.

3. (Currently amended) A method according to claim 1, wherein each frame segment ~~comprises data relating~~corresponds to a different predetermined area of the video frames ~~of the video signal data~~.

4. (Canceled)

5. (Currently amended) A method according to claim 1, wherein ~~transmitting the encoded segmented data comprises transmitting~~ the I-frame of one of the frame segments and ~~transmitting~~

at least one P-frame of another of the frame segments are transmitted during a same overlapping period of time.

6. (Currently amended) A method according to claim 1, wherein the frame segments are uniformly sized geometric shapes.

7. (Currently amended) A method according to claim 1, wherein at least one of frame segment size and shape is different for one of the frame segments compared to another of the frame segments.

8. (Currently amended) A method according to claim 1, wherein at least one of the frame segments comprises ~~data relating to~~ a plurality of predetermined non-contiguous areas of the video frames ~~of the video signal data~~.

9. (Currently amended) A method according to claim 1, wherein the ~~video signal data is separated into~~frame segments ~~in~~ are determined in dependence upon external application data ~~, the application data external to the video signal data~~ and indicative of the amount of motion that is expected in different areas of the video frames ~~of the video signal data~~.

10. (Currently amended) A method according to claim 1, wherein ~~separating the video signal data into~~the frame segments ~~is performed~~are determined in dependence upon external prior use data ~~, the prior use data external to the video signal data and~~ indicative of the amount of motion ~~determined~~ previously determined in different areas of the video frames ~~of a different video signal data~~.

11. (Currently amended) A method according to claim 1, wherein a period between regularly spaced I-frames for one of the frame segments is different than a period between regularly spaced I-frames for another of the frame segments.

12. (canceled)

13. (Currently amended) A method according to claim 1, wherein ~~encoding each~~the frame segments are ~~independently comprises allotting each different segment to a different encoder of a plurality of encoders~~ encoded in encoders having different encoding characteristics. ~~.~~

14. (Currently amended) A method according to claim 13, wherein at least one ~~encoder of the plurality~~ of the encoders has a bitrate that is greater than a bitrate of the other encoders ~~of the~~

~~plurality of encoders~~.

15. (Currently amended) A method according to claim 1, wherein ~~transmitting the encoded segmented data comprises transmitting~~ during the transmission of the I-frame of one of the frame segments ~~and during transmission thereof transmitting other than I-frames~~P-frames of ~~of all~~ all the other frame segments are transmitted.

Claims 16 to 29 are canceled.

30. (Currently amended) A method for encoding in real time a video signal that is associated with ~~one of~~ a videoconference ~~and a~~or telepresence session, the method comprising:

capturing a ~~sequence~~ stream of video ~~frame~~ data comprising a series of sequential video frames~~, the sequence of video frame data comprising at least a portion of the video signal~~;

~~dividing~~ separating each video frame into a plurality of frame segments wherein each frame segment represents a part of a complete video frame~~comprising a first segment that contains at least a threshold amount of motion during the session and including a second segment that contains less then the threshold amount of motion during the session~~;

encoding ~~the first segment and encoding~~each frame segment independently ~~the second segment, such~~and in parallel to generate for each of the plurality of frame segments an encoded data stream carrying ~~that both~~ I-frame segments that carry complete information about a frame segment and~~s~~ and P-frame segments that carry partial information about a frame segment,~~s~~ the partial information representing information that has changed relative to a previous frame segment, and wherein the frame segments are encoded with encoders having different performance characteristics~~are generated for each of the first and second segment~~; and

transmitting ~~via a communications network the I-frame relating to the first segment and after a delay sufficient for reducing the data burst rate transmitting via the communications network the I-frame relating to the second segment, so as to transmit the first and second segments in a fashion for reducing the data burst rate resulting therefrom~~the encoded data streams over a network.

31. (Currently amended) A method according to claim 30, wherein the frame segments ~~are predetermined absent a prior step of analyzing~~correspond to predetermined parts of the video frames ~~of the sequence of video frame data~~.

32. (Currently amended) A method according to claim 30, wherein each frame segment ~~comprises data relating~~ corresponds to a different predetermined area of the video frames ~~of the sequence of video frame data~~.

33. (Currently amended) A method according to claim 30, wherein the rate of I-frame generation for ~~the first~~one of the frame segments is more frequent than the rate of I-frame generation for another of the ~~second~~ frame segments.

34. (Currently amended) A method according to claim 30, wherein the frame segments ~~of the plurality of segments~~correspond to ~~are~~ predetermined ~~fixed~~ uniformly sized geometric shapes.

35. (Currently amended) A method according to claim 30, wherein ~~at least one of~~ the size ~~and~~ or shape of ~~the first~~one frame segment is different ~~compared to the~~from the size or shape of another ~~second~~frame segment.

36. (Currently amended) A method according to claim 30, wherein ~~at least one of the first segment and the second segment comprises data relating~~frame segments correspond to a plurality of predetermined non-contiguous areas of the video frames ~~of the sequence of video frame data~~.

37. (Currently amended) A method according to claim 30, wherein ~~each video frame is divided into the plurality~~the frame segments are determined in dependence upon external application data~~, the application data external to the sequence of video frame data and~~ relating to at least one of user preferences and historical data indicative of an amount of motion ~~that~~ in different areas of the video frames.

Claims 38 and 39 are canceled

40. (Currently amended) A video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:

a port for receiving ~~a video signal comprising frame data, the frame data divisible into a~~a stream of video data comprising a series of sequential video frames ~~plurality of different predetermined segments~~;

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete

video frame;

a plurality of video encoders arranged in parallel ~~each one~~ for independently encoding ~~independently a different one of~~ the respective ~~predetermined~~ frame segments in parallel to generate for each of the plurality of segments an encoded data stream containing I-frame segments that carry complete information about a particular frame segment and P-frame segments that carry partial information about a particular frame segment, the partial information representing information that has changed relative to a previous frame segment, and the video encoders being arranged to encode each frame segment such that the I-frame segments in each encoded data stream are offset relative to each other; and~~,~~

a transceiver for ~~providing~~ transmitting the encoded frame segments ~~onto~~ over a network.

41. (Currently amended) A video encoding system according to claim 40 comprising: a memory for storing ~~of~~ predetermined data ~~indicative of for each of the plurality of different segments a region of an image that forms part thereof~~defining the frame segments, which correspond to predetermined parts of the video frames.

42.(New) A video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:

a port for receiving a stream of video data comprising a series of sequential video frames;

a divider for dividing the stream of video data into a series of substreams of data corresponding to frame segments, wherein each frame segment represents a part of a complete video frame;

a plurality of video encoders arranged in parallel for independently encoding the respective frame segments in parallel to generate for each of the plurality of frame segments an encoded data stream carrying I-frame segments that carry complete information about a frame segment and P-frame segments that carry partial information about a frame segment, the partial information representing information that has changed relative to a previous frame segment, and wherein the frame segments are encoded with encoders having different performance characteristics; and

transmitting the encoded data streams over a network.

43.(New) A video encoding system according to claim 42 further comprising: a memory for storing predetermined data defining the frame segments.

Electronic Acknowledgement Receipt

EFS ID:	12032171
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	23553
Filer:	Richard J. Mitchell
Filer Authorized By:	
Attorney Docket Number:	25864-US
Receipt Date:	08-FEB-2012
Filing Date:	18-SEP-2008
Time Stamp:	17:20:26
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	Supplemental Response or Supplemental Amendment	25864corrsupp.pdf	86352 171f96b1f5f4f1e76c77f4ef1f6c04a0d614cf0b	no	2

Warnings:	
Information:	

2	Claims	25864corrclms.pdf	99422 0b25d097da1ac5d595ecbbe1ce4f873270aefec0	no	5
Warnings:					
Information:					
			Total Files Size (in bytes):	185774	

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.

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
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/232,496	Filing Date 09/18/2008	☐ To be Mailed

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ 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

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT	02/08/2012	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 41	= 0	X $30 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $125 =	0	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	0	OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT	02/08/2012	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 41	= 0	X $30 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0	X $125 =	0	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	0	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:
/YOLANDA CHADWICK/

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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/232,496	09/18/2008	Patrick White	25864-US	9197

23553 7590 11/08/2011

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EXAMINER	
VICTORIA, NARCISO F	
ART UNIT	PAPER NUMBER
2438	

MAIL DATE	DELIVERY MODE
11/08/2011	PAPER

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.

Office Action Summary	Application No.	Applicant(s)	
	12/232,496	WHITE ET AL.	
	Examiner	Art Unit	
	NARCISO VICTORIA	2438	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-41* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-41* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *27 October 2008* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ 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:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

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)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/27/2008; 1/14/2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the Application filed on 9/28/2008.

2. Claims 1-41 have been examined and are pending.

Information Disclosure Statement

3. The Information Disclosure Statements (IDS) submitted on 10/27/2008 and on 1/14/2010 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the IDS statements have been considered by the Examiner.

Drawings

4. Figures 1 and 2 of the replacement drawings received on 10/27/2008 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled “Replacement Sheet” in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

5. Claims 4 and 33 are objected to because of the following informalities:

on line 4 of claim 4, the claim ends with a colon (":") vice a period;

on line 2 of claim 33, "segments" needs to be changed to --segment--.

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 16, 30 and 44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. Regarding claim 16, on line 7, the limitation "with encoding other of the segments" appears to be at least grammatically incorrect and does not convey a clear meaning. To advance prosecution, the Examiner will interpret this limitation as "with encoding of the other segments."

9. The term "sufficient" in claim 30 (line 11) is a relative term which renders the claim indefinite. The term "sufficient" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

10. Regarding claim 41, on lines 2-3, the limitation "indicative of for each of the plurality of different segments a region of an image that forms part thereof" appears to be at least grammatically incorrect and does not convey a clear meaning. To advance prosecution, the Examiner will interpret this limitation as "indicative of ~~for~~ each of the plurality of different segments <u>of</u> a region of an image that forms part thereof."

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1-3, 6-11 and 15 are rejected under 35 U.S.C. § 102(b) as being anticipated by Bourne et al. (EP 1 227 684 A2; hereinafter referred to as "Bourne").

As per claim **1**, Bourne discloses **a method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session** (para. [0004]: real time transmission of images)**, the method comprising:**

capturing video data and providing video signal data in dependence thereon (para. [0019]: input video signal 210)**;**

separating the video signal data into segments, the segments identical from one video frame to another subsequent video frame within a same video signal data (para. [0019]: segmentation element 220 divides the input signal 210 into a

plurality of image segments 230; in this disclosure, the initial I-frame is segmented into at least two identical segments and encoded at different quantization levels, followed by the P-frame segments)**;**

encoding each segment independently (Para. [0025]: intra-frame (I-frame) is encoded first (in a video sequence, I-frame is encoded and transmitted first), then subsequent frames to the I-frames are encoded as predicted frames (P-frames)) **to result in encoded segment data such that both I-frames and P-frames are generated** (para. [0024]: "subsequent video frames will be transmitted with better spatial quality for the object(s) of interest (I-frame)....from which a prediction is made (P-frame)…") **for a given segment and allowing for independent reconstruction of segments at a distant end** (para. [0020]: "receiver unit…whereupon it is decoded using well known techniques…")**; and,**

transmitting the encoded segment data (para. [0020]: "The encoded digital video signal is transmitted via a communication network such as an air interface…")**.**

As per claim **2**, Bourne discloses **a method according to claim 1, wherein the segments are predetermined absent a prior step of analyzing video frames of the video signal data** (page. 6, lines 20-21: i.e., predetermining that INTRA frame should be divided into two segments)**.**

As per claim **3**, Bourne discloses **a method according to claim 1, wherein each segment comprises data relating to a different predetermined area of the**

video frames of the video signal data (para. [0011]: as in MPEG-4, wherein the background scenery of a video image and foreground objects of greater interests can be sent as separate VOs)**.**

As per claim **6**, Bourne discloses **a method according to claim 1, wherein the segments are uniformly sized geometric shapes** (Figure 3: element 230: input video divided into uniformly sized geometric figures, i.e., squares or rectangular shapes)**.**

As per claim **7**, Bourne discloses **a method according to claim 1, wherein at least one of segment size and shape is different for one of the segments compared to another of the segments** (Figure 3: element 230: input video divided into uniformly sized geometric figures which may not be perfectly identical)**.**

As per claim **8**, Bourne discloses **a method according to claim 1, wherein at least one of the segments comprises data relating to a plurality of predetermined non-contiguous areas of the video frames of the video signal data** (para. [0011]: as in background scenery of a video image and foreground objects of greater interests)**.**

As per claim **9**, Bourne discloses **a method according to claim 1, wherein the video signal data is separated into segments in dependence upon application data, the application data external to the video signal data and indicative of the**

amount of motion that is expected in different areas of the video frames of the video signal data (para. [0024]: as in motion compensation in P-frames)**.**

As per claim **10**, Bourne discloses **a method according to claim 1, wherein separating the video signal data into segments is performed in dependence upon prior use data, the prior use data external to the video signal data and indicative of the amount of motion determined previously in different areas of the video frames of a different video signal data** (Para. [0024]: "subsequent video frames will be transmitted with better spatial quality for the object(s) of interest, because they benefit from a low distortion rendition of the object from which a prediction is made…")**.**

As per claim **11**, Bourne discloses **a method according to claim 1, wherein a period between regularly spaced I-frames for one of the segments is different than a period between regularly spaced I-frames for another of the segments** (para. [0019]: input video signal comprises GOP's that may come in different sizes, as is known in the art).

As per claim **15**, Bourne discloses **a method according to claim 1, wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments and during transmission thereof transmitting other than I-frames of all other segments** (Para. [0025]: intra-frame (I-frame) is encoded first (in a

video sequence, I-frame is encoded and transmitted first), then subsequent frames to the I-frames are encoded as predicted frames (P-frames)).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the Examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicants are advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the Examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

14. Claims 4-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bourne as applied to claim 1 above, and further in view of Hong et al. (US 2006/0161676; hereinafter referred to as "Hong").

As per claim **4**, Bourne discloses **a method according to claim 1.**

Bourne does not explicitly disclose:

"**wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments with a delay relative to transmitting the I-frame of another of the segments, so as to reduce the maximum data burst rate:**"

However, Hong discloses method of performing smoothing and streaming based on a group of pictures (GOP) in order to reduce loss and delay due to burst characteristics of multimedia streaming data (Hong: para. [0013]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Bourne and incorporate Hong to meet the preceding limitation not explicitly disclosed by Bourne. The motivation is to reduce loss and delay due to burst characteristics of transmitting multimedia (Hong: Para. [0013]).

As per claim **5**, Bourne discloses **a method according to claim 1.**

Bourne does not explicitly disclose:

"**wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments and transmitting at least one P- frame of another of the segments during a same overlapping period of time.**"

However, Hong discloses method of performing smoothing and streaming based on a group of pictures (GOP) in order to reduce loss and delay due to burst characteristics of multimedia streaming data (Hong: para. [0013]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Bourne and incorporate Hong to meet the

preceding limitation not explicitly disclosed by Bourne. The motivation is to reduce loss and delay due to burst characteristics of transmitting multimedia (Hong: Para. [0013]).

14. Claims 12-14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bourne as applied to claim 1 above, and further in view of Yajima (US 5,809,176; hereinafter referred to as "Yajima").

As per claim **12**, Bourne discloses **a method according to claim 1.**

Bourne does not explicitly disclose:

"**wherein encoding each segment independently comprises encoding at least some of the segments in parallel with encoding other of the segments.**"

However, Yajima discloses the idea of parallel encoding (see at least Yajima: col. 11, lines 47-49: "Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…").

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and incorporate Yajima's idea of parallel encoding. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

As per claim **13**, Bourne discloses **a method according to claim 1.**

Bourne does not explicitly disclose:

"**wherein encoding each segment independently comprises allotting each different segment to a different encoder of a plurality of encoders.**"

However, Yajima discloses the idea of parallel encoding (see at least Yajima: col. 11, lines 47-49: “Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…”).

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and incorporate Yajima's to meet the preceding limitation not explicitly disclosed by Bourne. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

As per claim **14**, Bourne discloses **a method according to claim 13.**

Bourne does not explicitly disclose:

“**wherein at least one encoder of the plurality of encoders has a bitrate that is greater than a bitrate of the other encoders of the plurality of encoders.**”

However, Yajima discloses the idea of parallel encoding (see at least Yajima: col. 11, lines 47-49: “Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…”).

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and incorporate Yajima's to meet the preceding limitation not explicitly disclosed by Bourne. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

14. Claims 16-19, 24-29 and 40-41 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bourne in view of Yajima.

As per claim **16**, Bourne discloses **a method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session** (para. [0004]: real time transmission of images)**, the method comprising:**

capturing a sequence of video frame data, the sequence of video frame data comprising at least a portion of the video signal (para. [0019]: input video signal 210)**;**

dividing each frame into a plurality of segments (para. [0019]: segmentation element 220 divides the input signal 210 into a plurality of image segments 230)**;**

encoding the segments independently of one another (Para. [0025]: intra-frame (I-frame) is encoded first (in a video sequence, I-frame is encoded and transmitted first), then subsequent frames to the I-frames are encoded as predicted frames (P-frames))**; and,**

transmitting via a communications network the encoded segments (para. [0020]: "The encoded digital video signal is transmitted via a communication network such as an air interface…")**, such that transmission of some segments is offset in time from transmission of other segments** (para. [0024]: "quick first image communication time is provided …due to the reduced amount of data to be transmitted…")**.**

Bourne does not explicitly disclose:

"**and at least some of the segments encoded in parallel with encoding other of the segments.**"

However, Yajima discloses the idea of parallel encoding (see at least Yajima: col. 11, lines 47-49: “Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…”).

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and incorporate Yajima's idea of parallel encoding. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

As per claim **17**, Bourne in view of Yajima discloses **a method according to claim 16, wherein the segments are predetermined absent a prior step of analyzing video frames of the sequence of video frame data** (Bourne: page. 6, lines 20-21: i.e., predetermining that INTRA frame should be divided into two segments)**.**

As per claim **18**, Bourne in view of Yajima discloses **a method according to claim 16, wherein each segment comprises data relating to a different predetermined area of the video frames of the sequence of video frame data** (para. [0011]: a known feature of MPEG-4, wherein the background scenery of a video image and foreground objects of greater interests can be sent as separate VOs)**.**

As per claim **19**, Bourne in view of Yajima discloses **a method according to claim 16, wherein encoding the segments independently of one another comprises generating both I-frames and P-frames for each one of the plurality of**

segments, so as to support independent reconstruction of the segments at a distant end (Bourne: Para. [0025]: intra-frame (I-frame) is encoded first (in a video sequence, I-frame is encoded and transmitted first), then subsequent frames to the I-frames are encoded as predicted frames (P-frames)); para. [0020]: "receiver unit…whereupon it is decoded using well known techniques…")**.**

As per claim **24**, Bourne in view of Yajima discloses **a method according to claim 16, wherein the segments of the plurality of segments represent image data of uniformly sized geometric shapes** (Bourne: Figure 3: element 230: input video divided into uniformly sized geometric figures, i.e., squares or rectangular shapes)**.**

As per claim **25**, Bourne in view of Yajima discloses **a method according to claim 16, wherein at least one of the segments of the plurality of segments comprises data relating to a plurality of predetermined non-contiguous areas of the video frames of the sequence of video frame data** (Bourne: para. [0011]: as in background scenery of a video image and foreground objects of greater interests)**.**

As per claim **26**, Bourne in view of Yajima discloses **a method according to claim 16, wherein each video flame is divided into segments in dependence upon application data, the application data external to the sequence of video flame data and indicative of the amount of motion that is expected in different areas of the video flames** (Bourne: para. [0024]: as in motion compensation in P-frames)**.**

As per claim **27**, Bourne in view of Yajima discloses **a method according to claim 26, wherein the application data comprises prior use data, the prior use data indicative of the amount of motion determined a previous communication session** (Bourne: para. [0024]: as in motion compensation in P-frames)**.**

As per claim **28**, Bourne in view of Yajima discloses **a method according to claim 16.**

Bourne does not explicitly disclose:

"**wherein encoding the segments independently comprises allotting each different segment to a different encoder of a plurality of encoders.**"

However, Yajima discloses the idea of parallel encoding (see at least Yajima: col. 11, lines 47-49: "Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…").

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and incorporate Yajima's idea of parallel encoding. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

As per claim **29**, Bourne in view of Yajima discloses **a method according to claim 28.**

Bourne does not explicitly disclose:

"**wherein at least one encoder of the plurality of encoders has different processing performance characteristics than a bitrate of the other encoders of the plurality of encoders.**"

However, Yajima discloses the idea of parallel encoding (see at least Yajima: col. 11, lines 47-49: "Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…").

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and incorporate Yajima's idea of parallel encoding. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

As per claim **40**, Bourne discloses **a video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session** (para. [0004]: real time transmission of images)**, the system comprising:**

a port for receiving a video signal comprising frame data, the frame data divisible into a plurality of different predetermined segments (para. [0019]: segmentation element 220 divides the input signal 210 into a plurality of image segments 230)**; and,**

a transceiver for providing encoded segments onto a network (para. [0020]: "The encoded digital video signal is transmitted via a communication network such as an air interface…")**.**

Bourne does not explicitly disclose:

"**a plurality of video encoders each one for encoding independently a different one of the predetermined segments.**"

However, Yajima discloses the idea of parallel encoding comprising multiple encoders (see at least Yajima: col. 11, lines 47-49: "Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…").

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and incorporate Yajima's such that the system is further comprising a plurality of video encoders each one for encoding independently a different one of the predetermined segments. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

As per claim **41**, Bourne in view of Yajima discloses **a video encoding system according to claim 40 comprising:**

a memory for storing of predetermined data indicative of for each of the plurality of different segments a region of an image that forms part thereof (Bourne: Figure 3, necessary part of video communication system)**.**

14. Claims 20-23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bourne in view of Yajima as applied to claim 19 above, and further in view of Hong.

As per claim **20**, Bourne in view of Yajima discloses **a method according to claim 19.**

Bourne in view of Yajima does not explicitly disclose:

"**wherein transmitting the encoded segments comprises transmitting the I-frame of one of the segments with a delay relative to transmitting the I-frame of another of the segments, so as to reduce the data burst rate.**"

However, Hong discloses method of performing smoothing and streaming based on a group of pictures (GOP) in order to reduce loss and delay due to burst characteristics of multimedia streaming data (Hong: para. [0013]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Bourne and Yajima and further incorporate Hong to meet the preceding limitation not explicitly disclosed by Bourne and Yajima. The motivation is to reduce loss and delay due to burst characteristics of transmitting multimedia (Hong: Para. [0013]).

As per claim **21**, Bourne in view of Yajima discloses **a method according to claim 19.**

Bourne in view of Yajima does not explicitly disclose:

"**wherein transmitting the encoded segments comprises transmitting the I-frame of one of the segments and transmitting the P-frame of another of the segments during a same overlapping period of time.**"

However, Hong discloses method of performing smoothing and streaming based on a group of pictures (GOP) in order to reduce loss and delay due to burst characteristics of multimedia streaming data (Hong: para. [0013]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Bourne and Yajima and further incorporate Hong to meet the preceding limitation not explicitly disclosed by Bourne and Yajima. The motivation is to reduce loss and delay due to burst characteristics of transmitting multimedia (Hong: Para. [0013]).

As per claim **22**, Bourne in view of Yajima and Hong discloses **a method according to claim 21, wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments and during transmission thereof transmitting other than I-frames of all other segments** (Bourne: Para. [0025]: intra-frame (I-frame) is encoded first (in a video sequence, I-frame is encoded and transmitted first), then subsequent frames to the I-frames are encoded as predicted frames (P-frames))**.**

As per claim **23**, Bourne in view of Yajima discloses **a method according to claim 19.**

Bourne in view of Yajima does not explicitly disclose:

"**wherein a period between regularly spaced I-flames for one of the segments is different than a period between regularly spaced I-frames for another of the segments.**"

However, Hong discloses method of performing smoothing and streaming based on a group of pictures (GOP) in order to reduce loss and delay due to burst characteristics of multimedia streaming data (Hong: para. [0013]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Bourne and Yajima and further incorporate Hong to meet the preceding limitation not explicitly disclosed by Bourne and Yajima. The motivation is to reduce loss and delay due to burst characteristics of transmitting multimedia (Hong: Para. [0013]).

14. Claims 30-37 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bourne in view of Hong.

As per claim **30**, Bourne discloses **a method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session** (para. [0004]: real time transmission of images)**, the method comprising:**

capturing a sequence of video frame data, the sequence of video frame data comprising at least a portion of the video signal (para. [0019]: input video signal 210)**;**

dividing each frame into a plurality of segments (para. [0019]: segmentation element 220 divides the input signal 210 into a plurality of image segments 230)

comprising a first segment that contains at least a threshold amount of motion during the session and including a second segment that contains less then the threshold amount of motion during the session;

encoding the first segment and encoding independently the second segment, such that both I-frames and P-frames are generated for each of the first and second segment (Para. [0025]: intra-frame (I-frame) is encoded first (in a video sequence, I-frame is encoded and transmitted first), then subsequent frames to the I-frames are encoded as predicted frames (P-frames))**;**

transmitting via a communications network the I-frame relating to the first segment (Para. [0025]: intra-frame (I-frame) is encoded first (in a video sequence, I-frame is encoded and transmitted first).

Bourne does not explicitly disclose

"**and after a delay sufficient for reducing the data burst rate transmitting via the communications network the I-frame relating to the second segment, so as to transmit the first and second segments in a fashion for reducing the data burst rate resulting therefrom."**

However, Hong discloses method of performing smoothing and streaming based on a group of pictures (GOP) in order to reduce loss and delay due to burst characteristics of multimedia streaming data (Hong: para. [0013]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Bourne and incorporate Hong to meet the

preceding limitation not explicitly disclosed by Bourne. The motivation is to reduce loss and delay due to burst characteristics of transmitting multimedia (Hong: Para. [0013]).

As per claim **31**, Bourne in view of Hong discloses **a method according to claim 30, wherein the segments are predetermined absent a prior step of analyzing video frames of the sequence of video frame data** (Bourne: page. 6, lines 20-21: i.e., predetermining that INTRA frame should be divided into two segments)**.**

As per claim **32**, Bourne in view of Hong discloses **a method according to claim 30, wherein each segment comprises data relating to a different predetermined area of the video frames of the sequence of video frame data** (para. [0011]: a known feature of MPEG-4, wherein the background scenery of a video image and foreground objects of greater interests can be sent as separate VOs)**.**

As per claim **33**, Bourne in view of Hong discloses **a method according to claim 30.**

Bourne does not explicitly disclose:

"**wherein the rate of I-frame generation for the first segments is more frequent than the rate of I-frame generation for the second segment.**"

However, Hong discloses method of performing smoothing and streaming based on a group of pictures (GOP) in order to reduce loss and delay due to burst characteristics of multimedia streaming data (Hong: para. [0013]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Bourne and incorporate Hong to meet the preceding limitation not explicitly disclosed by Bourne. The motivation is to reduce loss and delay due to burst characteristics of transmitting multimedia (Hong: Para. [0013]).

As per claim **34**, Bourne in view of Hong discloses **a method according to claim 30, wherein the segments of the plurality of segments are predetermined fixed uniformly sized geometric shapes** (Bourne: Figure 3: element 230: input video divided into uniformly sized geometric figures, i.e., squares or rectangular shapes)**.**

As per claim **35**, Bourne in view of Hong discloses **a method according to claim 30, wherein at least one of the size and shape of the first segment is different compared to the second segment** (para. [0019]: input video signal comprises GOP's that may come in different sizes, as is known in the art)**.**

As per claim **36**, Bourne in view of Hong discloses **a method according to claim 30, wherein at least one of the first segment and the second segment comprises data relating to a plurality of predetermined non-contiguous areas of the video frames of the sequence of video frame data** (Bourne: para. [0011]: as in differentiating background scenery of a video image and foreground objects of greater interests)**.**

As per claim **37**, Bourne in view of Hong discloses **a method according to claim 30, wherein each video frame is divided into the plurality segments in dependence upon application data, the application data external to the sequence of video frame data and relating to at least one of user preferences and historical data indicative of an amount of motion that in different areas of the video frames** (Bourne: para. [0024]: as in motion compensation in P-frames)**.**

14. Claims 38-39 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bourne in view of Hong and further in view of Yajima.

As per claim **38**, Bourne in view of Hong discloses **a method according to claim 30.**

Bourne in view of Hong does not explicitly disclose:

"wherein encoding the first segment and encoding independently the second segment comprises allotting the first segment to a first encoder of a plurality of different encoders and allotting the second segment to a second different encoder of the plurality of encoders."

However, Yajima discloses the idea of parallel encoding comprising multiple encoders (see at least Yajima: col. 11, lines 47-49: "Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…").

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and Hong and further incorporate Yajima

to meet the preceding limitation not explicitly disclosed by Bourne and Hong. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

As per claim **39**, Bourne in view of Hong and Yajima discloses **a method according to claim 38.**

Bourne in view of Hong does not explicitly disclose:

"**wherein the first encoder has different performance characteristics than the second different encoder.**"

However, Yajima discloses the idea of parallel encoding comprising multiple encoders (see at least Yajima: col. 11, lines 47-49: "Arithmetic encoder system 2 of the present embodiment divides image data 100 into four bit planes which are encoded in parallel…").

Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify Bourne and Hong and further incorporate Yajima to meet the preceding limitation not explicitly disclosed by Bourne and Hong. The motivation is to increase the speed of encoding (Yajima: col. 11, line 50).

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure:

Mohsenian (US 2006/0239343) - this reference discloses method and system for parallel processing video data.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NARCISO VICTORIA whose telephone number is (571)270-7904. The examiner can normally be reached on Monday to Friday 10:00am - 6:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Taghi Arani can be reached on (571)272-3787. 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). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NV/

/Taghi T. Arani/

Supervisory Patent Examiner, Art Unit 2438

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	H	US-			
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	J	US-			
	K	US-			
	L	US-			
	M	US-			

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	P					
	Q					
	R					
	S					
	T					

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*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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	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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(54) Encoding of video signals

(57) A video communication system has an encoder (250) arranged to encode a digital video image signal at different quantisation levels. A segmentation arrangement (220) of the system divides the digital video signal into first and second image segments. Encoding means identifies INTRA coded frames, and for such frames encodes the first image segment at a low quantisation level and the second image segment at a high quantisation level. In this way, the first and the second segments may be transmitted over a network as a single encoded signal (260) having both low and high quantisation levels.

The first image segment provides a high spatial resolution for objects of interest to a user, coupled with a quick first image display time. Therefore, there is a significant reduction in the transmission time without sacrificing the spatial image resolution of the object(s) of interest.

The invention may comprise part of a security camera, or a mobile radio unit, such as a mobile phone, a portable or mobile PMR radio, a personal digital assistant, a laptop computer or a wirelessly networked PC.

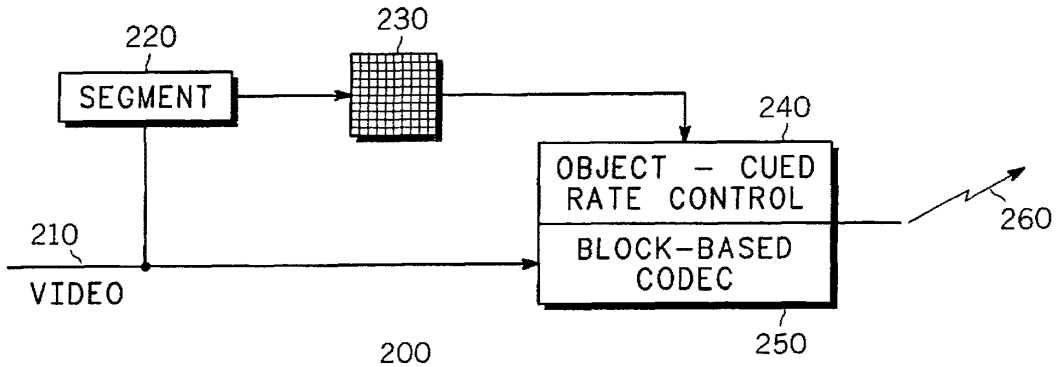


FIG. 3

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Description

Field of the Invention

[0001] This invention relates to video communication systems and particularly, but not exclusively, to digital video image encoding techniques.

Background of the Invention

[0002] It is frequently necessary to transmit images following an internally or externally generated trigger event. This may typically occur in a security surveillance application, where the trigger event is an alarm.

[0003] For example, in systems using ITU H.263 [ITU-T Recommendation, H.263, "Video Coding for Low Bit Rate Communication"] video compression, the first frame of a video sequence is transmitted as intra-coded information. This is followed by more concisely transmitted frames of inter-coded information, these frames being transmitted faster than the first frame. Bandwidth is a valuable commodity in low bandwidth transmission systems and the intra-coded frame frequently contains a large amount of data and, as a consequence, takes a long time to transmit.

[0004] In the context of the present invention, and the indications of the advantages of the present invention over the known art, the expression "video transmission" is used to encompass various video techniques. These typically involve real-time, or near real-time, transmission of images at various data rates. However, the video techniques concerned may for example also include video that is streamed, or encoded for storage with the ability to be viewed later.

[0005] Referring to FIG. 1 there is shown a prior art video communication system 5 employing a block-based codec such as the well-known H.263 set of coding tools. A video signal 10 is provided to a block-based codec 30, which processes the video signal 10 and provides an encoded output signal 40. A rate control element 20 controls the frame rate of the block-based codec 30, thus determining the data bandwidth of the encoded output signal 40.

[0006] Therefore, the designer of video communication sequences is left with a dilemma: the intra-frame can be sent with low compression to give a good spatial resolution. However, this takes a long time to transmit.

[0007] Alternatively, the image can be transmitted with a high degree of compression. However, as such, the resulting image may have a poor spatial resolution, image detail may be of too poor a quality to be recognisable to the recipient, and the perceived image quality will be poor. This makes it difficult to extract information from the image just when the user needs it the most, such as after a trigger due to an alarm or other event.

[0008] For the first image to be received and displayed at the decoder, a compromise is frequently adopted between the spatial resolution of the image and the communication delay. This however leads to sub-optimal system performance. For example, a first high compression image may be transmitted with a low delay and the detail filled in with later inter-frames. This however, leads to a time delay whilst the image builds up to an acceptable spatial resolution for the user.

[0009] The MPEG-4 standard will provide tools that use alpha maps to individually encode video objects and their shape. In the MPEG-4 standard, the video object is defined as a particular 2-D object in the scene. The video object is an entity in the bitstream that the user can access and manipulate.

[0010] Referring now to FIG. 2, there is shown a prior art video communication system employing the MPEG-4 object-based codec. With the MPEG-4 system, a video image comprises a number of video objects (VOs) created using alpha-maps. A first VO is provided by a video signal 110 and an associated alpha-map 100. Similarly, second and third VOs are provided by video signals 130 and 150, with their associated alpha-maps 120 and 140 respectively.

[0011] With this system, the background scenery of a video image and foreground objects of greater interest can be sent as separate VOs. MPEG-4 coding tools 160 and multiplexing tools 170 allow different VOs to be encoded at different bit rates. Therefore, a low bit-rate could be specified for a VO containing background scenery and a higher bit rate employed for a VO containing foreground objects.

[0012] However, MPEG-4's object-based functionalities, including the use of alpha-maps, are targeted at higher data rate systems (typically > 64 Kbps), because each video object shape has to be encoded and transmitted to the receiver. This represents an unacceptable overhead when used in narrowband video communication systems.

[0013] Other object-based video coding schemes, (such as that described by H. Luo et al., "Statistical model based video segmentation and its application to very low bit rate video coding", IEEE International Conference on Image Processing, Chicago, October 1998), do not address the delay of the first intra-frame. However, as explained above, this is crucial in event-triggered transmission over narrowband communication channels.

[0014] There is thus a need to provide a video communication system, a video communication unit and methods of encoding/decoding video data where the abovementioned disadvantages may be alleviated.

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Statement of Invention

[0015] In accordance with a first aspect of the present invention there is provided a video communication unit, as claimed in claim 1. In accordance with a second aspect of the present invention there is provided a method of encoding a digital video image signal, as claimed in claim 3.

Brief Description of the Drawings

[0016] A video communication system, video communication unit and methods of encoding/decoding video data incorporating the present invention will now be described, by way of example only, with reference to the accompanying drawings. In the drawings:

FIG.s 1 and 2 show block diagrams of prior art video communication systems; and
FIG. 3 shows a block diagram of a video communication system in accordance with the present invention.

Description of a Preferred Embodiment

[0017] In the preferred embodiment of this invention, a block-based video coding framework such as ITU H.263 is used. The H.263 standard does not envisage object based encoding, as was described earlier with reference to the MPEG4 standard.

[0018] In the encoder, the compression ratio within a frame of fixed pixel size and image content is primarily determined by how coarsely quantised the coefficients of the discrete cosine transform (DCT) transformed pixel blocks are. The higher the quantisation level, the coarser the image, and vice-versa.

[0019] Referring to FIG. 3, a video communication system using an object-cued codec is shown. An input video signal 210 to be encoded is provided to a block-based codec 250, whereupon it is encoded and transmitted as an encoded digital video signal 260 in a manner to be further described below. The input video signal 210 is also provided to a segmentation element 220, which divides the input signal 210 into a plurality of image segments 230. This information is used to control an object-cued rate control element 240, which is coupled to control the compression parameters of the block-based codec 250.

[0020] The encoded digital video signal 260 is transmitted via a communication network such as an air interface (not shown) to a receiver unit (not shown) whereupon it is decoded using well-known techniques. The communication network is preferably a low bandwidth network, with an average baud rate typically of less than 64 kbps.

[0021] The image segmentation performed by the segmentation element 220 is used to define objects of interest. The segment(s) containing objects of interest in a first Intra-coded frame can be transmitted with finer quantisation, rather than transmitting the first-intra frame using the same quantisation level for the whole frame. The quantisation level will be varied accordingly, such that the objects of interest are coded with fine (low level) quantisation and those of less interest, such as the image background, are coded using coarse (high level) quantisation. The process of segmenting an image is itself well known in the art, and is described in detail in GB patent applications GB 9914384.4 and GB 9912082.6.

[0022] Each single image frame in a video stream is often referred to as a 'picture' or a 'scene'.

[0023] In accordance with the present invention, the first and second segments selected by segmentation element 220 for an intra-frame comprise a series of blocks or macroblocks of the intraframe. Thus the first segment comprises all the blocks or macroblocks of the intraframe that contain any part of the object or objects of interest of that intraframe. The second segment comprises the blocks or macroblocks that do not contain any part of the object or objects of interest. This way of identifying a part of the intraframe for particular encoding differs fundamentally from the various pre-defined video objects that are employed in the MPEG4 codec.

[0024] In this way, high spatial resolution is provided, for the object(s) of interest. Furthermore, a quick first image communication time is provided at the decoder's display, due to the reduced amount of data to be transmitted. In addition, subsequent video frames will be transmitted with better spatial quality for the object(s) of interest, because they benefit from a low distortion rendition of the object from which a prediction is made, since the first frame has high spatial resolution.

[0025] After the initial intra-frame the majority of the available bandwidth will continue to be allocated to the object (s) of interest to maintain good spatial resolution. The background's spatial resolution will only improve when the available bandwidth permits. In reality this might be, for example, when the object(s) of interest are stationary. The high frame update rate and/or the high spatial resolution for the object(s) of interest can therefore be maintained when transmitted over a limited bandwidth system. These encoding methods, for subsequent inter-frame encoding of the image sequence, are described in detail in GB patent applications GB 9914384.4 and GB 9912082.6.

[0026] The transmission times for the video signal 210 can be estimated using a simple linear scaling between the

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proportion of the image using a low Q (Quantisation) value and the proportion using a high Q value.

[0027] Consider an example image sequence containing a person about to enter a building. A typical proportion of the image covered by the person could be 13%. This is the proportion of the video signal that will be transmitted with a low Q value.

[0028] In practice, the number of bits required to encode an object of interest will also depend on the detail within the object and on the extra bits required in the encoder's syntax to signal changes in quantisation. Since objects of interest are usually more detailed than the background, this may result in a figure slightly higher than 13%.

Table 1:

Transmission times using CIF and QCIF formats			
Image Size	How image is transmitted	Est. time for 1st frame transmission @19.2 kb/s	transmission time, expressed as % of time used for transmission without using invention
QCIF	Q=1	16.05 sec	18% (82% reduction)
QCIF	13% as Q=1, 87% as Q=31	2.83 sec	
QCIF	Q=6	4.94 sec	28% (72% reduction)
QCIF	13% as Q=6, 87% as Q=31	1.38sec	
CIF	Q=1	44.75 sec	18% (82% reduction)
CIF	13% as Q=1, 87% as Q=31	8.20 sec	
CIF	Q=6	15.11 sec	19% (71% reduction)
CIF	13% as Q=6, 87% as Q=31	4.34 sec	

[0029] Table 1 shows the results of using this invention with well-known 'Common Intermediate Format' (CIF) and 'Quarter Common Intermediate Format' (QCIF) video formats.

[0030] As can be seen from Table 1, there is a significant reduction in transmission time without sacrificing the spatial image resolution of the object(s) of interest. It is also worth noting that with this example it would be quicker to transmit a hybrid CIF image rather than a comparable fixed Q QCIF image. Note that Q=1 is the lowest quantiser value permitted by H.263, Q=31 is the highest and Q=6 is a commonly employed quantiser value.

[0031] Another example of this technique for frame 20 of the ISO MPEG-4 test sequence "Hall Monitor" at 20 Kbits/sec (with object of interest = 7.07% of frame), gives the following results:

(i) Coding the object with Q=6 and the background with Q=31 gives a reduction of 62% in transmission time compared to coding the whole frame at Q=6.

(ii) Coding the object with Q=12 (another common quantisation value in many low bit rate video applications) and background at Q=31 gives a transmission time substantially equivalent to that required when coding the whole frame at the coarse quantisation of Q=25.

[0032] It is also possible to simultaneously provide improved object rendition and reduced transmission time. For instance, coding the object with Q=6 and the background with Q=31 still provides a 35% reduction in the time required to transmit, compared to transmission of the whole frame with Q=12.

[0033] The video communication system, video communication unit and methods of encoding/decoding video data described above that use this invention provide a significant reduction in the transmission time, without sacrificing the spatial image resolution of the object(s) of interest.

[0034] The 'segmentation' of the present invention usually refers only to segmenting frames of the video sequence, rather than the whole sequence itself. So this segmentation is a 'spatial' segmentation, rather than a spatio/temporal segmentation. Although this is often the case, under certain circumstances we may also want to allow the entire sequence to be segmented temporally as well. This is important for actions based on scene changes or new video shots,

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which may also involve the sending of new INTRA frames.

[0035] The present invention may be employed for example in a mobile radio device. Examples of such devices are mobile 'phones, portable or mobile 'PMR' radios, personal digital assistants, lap-top computers and PCs that are wirelessly networked. All of these devices may need to transit frames of video, for example from a built-in camera. The present invention may also be used in a fixed device that is wirelessly linked, for example a security camera that uses a low bandwidth radio link. Because the radio link to and from these devices may be of low or varying bandwidth, and may be error prone, the present invention offers particular advantages when used to transmit video over this radio link.

[0036] This invention is also advantageous for video streaming applications where video files are stored on a server, as it enables a reduced file size on the server and a reduced time lag for the first frame to be displayed to a user.

[0037] Furthermore, in some systems, the first frame of a video stream may be decoded instantaneously but there are frame 'skips' for the frames that follow. In other words, the delay is after the first frame. In these cases, the reduced intra-frame data size mitigates this delay.

[0038] In addition, it is within the contemplation of the invention that the segmented image(s) of the INTRA coded frames may be a single image, encoded at a single quantisation level. Alternatively, the segmented image may include a series of image segments encoded at any or all of their respective quantisation level(s).

[0039] It will be appreciated that alternative embodiments to that described above are possible. For example, in addition to the implementation using a compliant H.263 data stream, this invention can also be used with other low bit-rate video communication methods. The invention may be used with a variety of video communication systems designed for operation at different transmission rates, including existing standards such as ITU H.261 and MPEG-1, MPEG-2 or MPEG-4 standards.

[0040] Also, it will be appreciated that intra-frames are not limited to the first frame of a video stream or file. Intra-frames may also be used periodically in subsequent frames.

[0041] Furthermore, the relative size and number of objects of interest may differ from the examples given above. Similarly, the quantisation levels chosen above are by way of example only, and it will be appreciated that various quantisation levels may be utilised in the present invention. Similarly, the precise arrangements of the communication network, including the baud rate, may differ from the example given above.

[0042] In summary, a video communication unit has been provided for transmitting a digital video image signal. The unit includes segmentation means arranged to divide the digital video image signal into at least a first and a second image segment; encoding means arranged to identify INTRA coded frames and, for said frames, to encode the first image segment at a first quantisation level and to encode the second image segment at a second quantisation level; communication means coupled to the encoding means for transmitting a single encoded digital video signal comprising the first and the second image segments over a communication network.

[0043] In addition, a video communication system has been provided including the above video communication unit and further including a reception unit arranged to receive the encoded digital video signal from the communication means via the communication network, the reception unit including decoding means arranged to decode the encoded digital video signal.

[0044] Furthermore, a method of encoding a digital video image signal has been provided comprising the steps of segmenting the digital video image signal into at least a first and a second image segment; identifying INTRA coded frames; encoding, for said frames, the first image segment at a first quantisation level; encoding, for said frames, the second image segment at a second quantisation level; and transmitting a single encoded digital video signal that includes the first and the second image segments over a communication network.

[0045] A method of transmitting video data has also been provided including the above steps of encoding a digital video image signal and further including the steps of:

receiving the single encoded digital video signal at a remote location via the communication network; and
decoding the single encoded digital video signal.

[0046] Finally, a mobile radio device comprising a video communication unit in accordance with the aforementioned description(s), where the communication network comprising at least one radio link has been provided.

[0047] Thus a video communication system, video communication unit and methods of encoding/decoding video data have been provided, in which the aforementioned disadvantages with the prior art have been substantially alleviated.

Claims

1. A video communication unit (200) for transmitting a digital video image signal (210), the unit comprising:

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segmentation means (220) arranged to divide the digital video image signal (210) into at least a first and a second image segment;

encoding means (240) arranged to identify INTRA coded frames and, for said INTRA coded frames, to encode the first image segment at a first quantisation level and to encode the second image segment at a second quantisation level; and

communication means (250) coupled to the encoding means (240) for transmitting a single encoded digital video signal (260) comprising the first and the second image segments over a communication network.

2. A video communication system, comprising the video communication unit (200) of claim 1 and further comprising a reception unit arranged to receive the encoded digital video signal (260) from the communication means (250) via the communication network, the reception unit including decoding means arranged to decode the encoded digital video signal.

3. A method of encoding a digital video image signal comprising the steps of:

segmenting (220) the digital video image signal into at least a first and a second image segment;
identifying INTRA coded frames;
encoding (240), for said INTRA coded frames, the first image segment at a first quantisation level;
encoding (240), for said INTRA coded frames, the second image segment at a second quantisation level; and
transmitting (250) a single encoded digital video signal (260) comprising the first and the second image segments over a communication network.

4. A method of transmitting video data comprising the method of claim 3 and the further steps of:

receiving the single encoded digital video signal (260) at a remote location via the communication network; and
decoding the single encoded digital video signal.

5. The system, unit or method of any preceding claim wherein the quantisation level applied to the first image segment is less than the quantisation level applied to the second image segment, such that the first image segment, when decoded, has a greater spatial resolution than that of the second image segment.

6. The system, unit or method of claim 5, wherein the first image segment pertains to at least one object of greater user interest than the object or objects of the second image segment.

7. The system, unit or method of any preceding claim, wherein the first image segment and/or second image segment of said INTRA coded frames include a series of image segments encoded at their respective quantisation level(s).

8. The system, unit or method of any preceding claim, wherein the communication network is a low bandwidth network, preferably less than 64 kilobits per second.

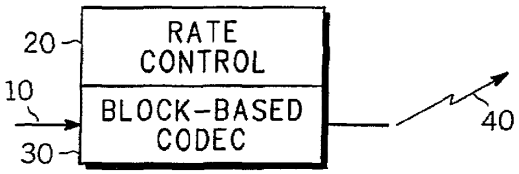
9. The system, unit or method of any previous claim, wherein the first segment comprises all the blocks of an INTRA coded frame that contain any portion of the at least one object of interest.

10. The system, unit or method of any previous claim, wherein the second segment comprises all the blocks of an INTRA coded frame that do not contain any portion of the at least one object of interest.

11. A mobile radio device comprising a video communication unit in accordance with any of claims 1 or 5-10, the communication network comprising at least one radio link, the mobile radio device being a mobile phone, a portable or mobile PMR radio, a personal digital assistant, a lap-top computer or a wirelessly networked PC.

12. A security camera comprising a video communication unit in accordance with any of claims 1 or 5-10, the communication network comprising a radio link to the security camera.

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FIG. 1
-PRIOR ART-

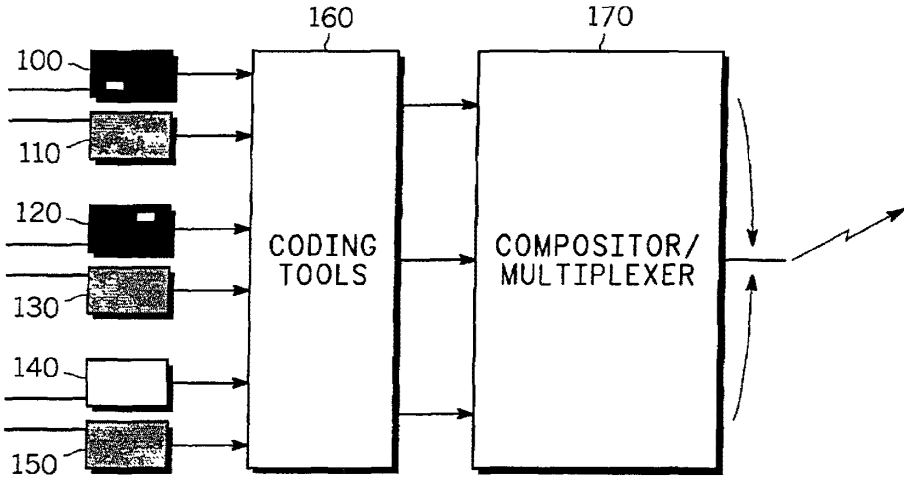
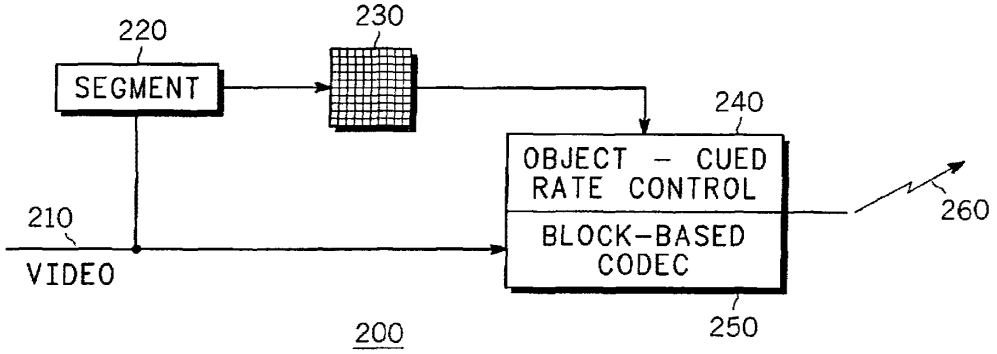


FIG. 2
-PRIOR ART-



200

FIG. 3

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.V./

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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Examiner Name	~~Unknown~~ Narciso Victoria
Attorney Docket Number	373-05 US

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/N.V./	1	5057916		1991-10-15	KRAUSE et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/N.V./	1	20010026677	A1	2001-10-04	CHEN et al.	
/N.V./	2	20020114525	A1	2002-08-22	BOLLE et al.	
/N.V./	3	20050201471	A1	2005-09-15	HANNUKSELA et al.	

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
/N.V./	1	CA2483293	CA		2003-11-13	NOKIA CORPORATION		☐

EFS Web 2.1.16 /Narciso Victoria/ 11/02/2011

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S17	1	12/232496	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 09:23
S18	10	US-5057916-$.DID. OR US-20010026677-$.DID. OR US-20020114525-$.DID. OR US-20050201471-$.DID. OR US-2483293-$.DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:28
S19	2	US-5430486-$.DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:28
S20	38	(Magor).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:32
S21	213	((Patrick near2 White) or (Mojtaba near2 Hosseini)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:33
S22	0	(separating video signal data into segments).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/02 12:34
S23	1	(separating video signal data).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/02 12:34

S24	0	(encoding each segment independently).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/02 12:35
S25	0	(encoding each segment).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/02 12:35
S26	8	(signal data dependence).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/02 12:36
S27	5	(independent reconstruction).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/02 12:36
S28	1	(videoconference telepresence).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/02 12:37
S29	3044	(375/240.01).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/02 12:37
S30	165	(386/68,111).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/02 12:38
S31	0	(358/105,135).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/02 12:38

S32	0	(358/105).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/02 12:38
S33	6565	(parallel near2 encod$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:39
S34	4634	(encod$3 near3 independently)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:40
S35	277	S33 and S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:40
S36	11	S29 and S35	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:40
S37	0	S30 and S35	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:41
S38	1	(parallel near2 encod$3) with (video$1conference tele$1presence)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:46
S39	1	(parallel near2 encod$3) same (video $1conference tele $1presence)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:46

S40	26	(parallel near2 encod$3) and (video$1conference tele$1presence)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:46
S41	0	(independent near2 reconstruct$3) with (video near2 segment$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:48
S42	0	(independent near2 reconstruct$3) same (video near2 segment$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:49
S43	0	(independent near2 reconstruct$3) same (video near2 segment$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/02 12:49
S44	18	(independent near2 reconstruct$3) and (video near2 segment$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 12:49
S45	138	(parallel near2 encod$3) and (low near2 latency)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 13:57
S46	11	(HaiVision).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 14:16
S47	11	(HaiVision).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/02 16:18

S48	2	("5057916").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/03 10:03
S49	42	("4873575" | "4937668").PN. OR ("5057916").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/11/03 10:03
S50	2	("20020114525").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/03 11:14
S51	233	(telepresence).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:26
S52	6568	(parallel near2 encod$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:26
S53	0	S51 and S52	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:26
S54	1881	(telepresence or video $1conference or teleconference).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:27
S55	0	S52 and S54	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:27
S56	958	(separat$3 or divid$3) with (video near2 signal) same identical	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:28

S57	1	S54 and S56	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:28
S58	26	(telepresence or video $1conference or teleconference) with (low near2 latency)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:29
S59	1	S56 and S58	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:29
S60	29	video same divider same encoder same network	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 11:36
S61	0	("9914384.4").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/03 12:41
S62	3	("9914384").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/03 12:41
S63	32441	(segment$3 near2 image)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 12:48
S64	669	(segment$3 near2 image) same identical	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 12:48

S65	36	(segment$3 near2 image) same identical same encod$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 12:49
S66	4	(segment$3 near2 image) same identical same encod$3 same parallel	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 12:49
S67	0	(segment$3 near2 image) same (paralle near2 encod$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 12:53
S68	36	((segment$3 divid$3) near2 image) same (parallel near2 encod$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 12:54
S69	43	(telepresence or video $1conference or teleconference) with ((segment$3 divid$3 duplicat$3 cop$4) near2 (image video picture))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 13:48
S70	20	(telepresence or video $1conference or teleconference) with (multi point control unit)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/03 14:11
S71	3049	(375/240.01).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/11/03 18:27
S72	1	S71 and (telepresence or video$1conference or teleconference) with ((segment$3 divid$3 duplicat$3 cop$4) near2 (image video picture))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/03 18:27

S73	252	(encoding video signals). ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/03 18:39
S74	3	(encoding video signals). ti. AND (motorola.As.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/03 18:40
S75	48	(david near2 bourne).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/04 09:12
S76	33	delay with transmit$4 with GOP	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/04 11:02
S77	4	delay with transmit$4 with GOP with order	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/04 11:02
S78	1	(reduc$3 near2 delay) with transmit$4 with GOP with order	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/11/04 11:12

11/4/2011 4:01:32 PM
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Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	12232496
Filing Date	2008-09-18
First Named Inventor	Patrick WHITE
Art Unit	~~2614~~ 2438
Examiner Name	~~Unknown~~ Narciso Victoria
Attorney Docket Number	373-05 US

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/N.V./	1	5430486		2005-07-04	FRASER et al.	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1							☐

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE
	Art Unit	~~2614~~ 2438
	Examiner Name	~~Unknown~~ Narciso Victoria
	Attorney Docket Number	373-05 US

	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/Narciso Victoria/	Date Considered	11/02/2011

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.V./

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

SEARCHED			
Class	Subclass	Date	Examiner
375	240.01	11/02/2011	NV

SEARCH NOTES		
Search Notes	Date	Examiner
Performed limited search in class/subclass: 375/240.01; 386/68,111 using search terms: parallel encoding, independent encoding, telepresence, teleconference, videoconference, segmenting, dividing, duplicating, copying, image, video, picture, frame, GOP, order	11/02-04/2011	NV
Inventor/Assignee/Claim-double patenting search	11/02/2011	NV
Consulted PE Dave Czekaj (375)	11/02/2011	NV

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/NARCISO VICTORIA/ Examiner.Art Unit 2438	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12232496	WHITE ET AL.
	Examiner	Art Unit
	NARCISO VICTORIA	2438

✓	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	11/02/2011								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
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	32	✓								
	33	✓								
	34	✓								
	35	✓								
	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	Art Unit
	NARCISO VICTORIA	2438

✓	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	11/02/2011								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								

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BIB DATA SHEET

CONFIRMATION NO. 9197

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/232,496	09/18/2008	375	2438	25864-US

APPLICANTS
Patrick White, Renfrew, CANADA;
Mojtaba Hosseini, Ottawa, CANADA;

** CONTINUING DATA ********** No NV

** FOREIGN APPLICATIONS ********** No NV

** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** ** SMALL ENTITY **
10/06/2008

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /NARCISO F VICTORIA/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CANADA	3	41	4

ADDRESS
MARKS & CLERK
P.O. BOX 957
STATION B
OTTAWA, ON K1P 5S7
CANADA

TITLE
Low latency high resolution video encoding

FILING FEE RECEIVED		
1145	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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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/232,496	09/18/2008	Patrick White	25864-US

CONFIRMATION NO. 9197

23553
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P.O. BOX 957
STATION B
OTTAWA, ON K1P 5S7
CANADA

POA ACCEPTANCE LETTER

OC000000046934529

Date Mailed: 04/05/2011

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/30/2011.

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.

/sleutchit/

Office of Data Management, 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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/232,496	09/18/2008	Patrick White	373-05 US

CONFIRMATION NO. 9197

25319
FREEDMAN & ASSOCIATES
55 Murray Street
Suite 230
Ottawa, ON K1N 5M3
CANADA

POWER OF ATTORNEY NOTICE

OC000000046934491

Date Mailed: 04/05/2011

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/30/2011.

- 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).

/sleutchit/

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

PTO/SB/81 (01-09)
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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	12/232,496
Filing Date	September 18, 2008
First Named Inventor	WHITE, Patrick
Title	LOW LATENCY HIGH RESOLUTION...
Art Unit	2482
Examiner Name	BANKS HAROLD, MARSHA DENISE
Attorney Docket Number	25864-US

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith: **23553**

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified application 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/Inventor.

OR

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____.

SIGNATURE of Applicant or Assignee of Record

Signature		Date	March 18, 2011
Name	Dan Rusheleau	Telephone	(613) 686-1731
Title and Company	MAGOR COMMUNICATIONS CORPORATION		

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 than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

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.**

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25864-US

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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Patrick White et al.

Application No./Patent No.: 12/232,496 Filed/Issue Date: September 18, 2008

Titled: LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

MAGOR COMMUNICATIONS CORPORATION , a Corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. [X] 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. [X] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Patrick White et al. To: Magor Communications Corporation

The document was recorded in the United States Patent and Trademark Office at
Reel 021738, Frame 0965, or for which a copy thereof is attached.

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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(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.

_____ March 18, 2011
Signature Date

Dan Rushelrau CTO
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.**

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Electronic Acknowledgement Receipt

EFS ID:	9768994
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	25319
Filer:	Richard J. Mitchell/Carolynn Irvin
Filer Authorized By:	Richard J. Mitchell
Attorney Docket Number:	373-05 US
Receipt Date:	30-MAR-2011
Filing Date:	18-SEP-2008
Time Stamp:	09:49:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	PofAx.pdf	2678703 12fc227c074a89a0d570751f4e2de142f1ca5b56	no	2

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/232,496	09/18/2008	Patrick White	373-05 US

CONFIRMATION NO. 9197

25319
FREEDMAN & ASSOCIATES
117 CENTREPOINTE DRIVE
SUITE 350
NEPEAN, ONTARIO, K2G 5X3
CANADA

PUBLICATION NOTICE



Title: Low latency high resolution video encoding

Publication No.US-2010-0067571-A1
Publication Date:03/18/2010

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/.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Application Number	12232496
Filing Date	2008-09-18
First Named Inventor	Patrick WHITE et al.
Art Unit	2614
Examiner Name	Unknown
Attorney Docket Number	373-05 US

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5057916		1991-10-15	KRAUSE et al.	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20010026677	A1	2001-10-04	CHEN et al.	
	2	20020114525	A1	2002-08-22	BOLLE et al.	
	3	20050201471	A1	2005-09-15	HANNUKSELA et al.	

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	1	CA2483293	CA		2003-11-13	NOKIA CORPORATION		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE et al.
	Art Unit	2614
	Examiner Name	Unknown
	Attorney Docket Number	373-05 US

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	1	ISA/CA, "International Search Report", dated December 16, 2009, pages 1 to 3	☐

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Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE et al.
	Art Unit	2614
	Examiner Name	Unknown
	Attorney Docket Number	373-05 US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the 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 information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ 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, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Mark Robert Weir, Reg.#54949/	Date (YYYY-MM-DD)	2010-01-14
Name/Print	Mark Robert WEIR	Registration Number	54949

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(11) CA 2 483 293 (13) A1

(40) 13.11.2003
(43) 13.11.2003

(12)

(21) 2 483 293

(22) 28.04.2003

(51) Int. Cl.7: H04N 7/50

(85) 25.10.2004

(86) PCT/FI03/000331

(87) WO03/094530

(30) 20020810 FI 29.04.2002

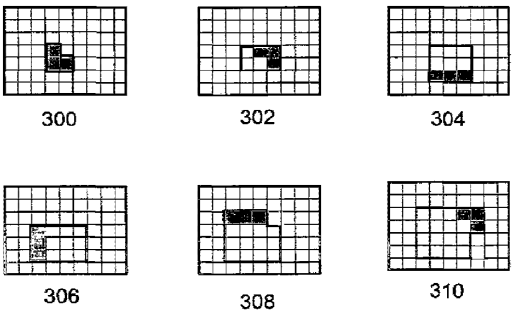
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(72) WANG, YE-KUI (FI).
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(74) SIM & MCBURNEY

(54) POINTS A ACCES DIRECT DANS LE CODAGE VIDEO
(54) RANDOM ACCESS POINTS IN VIDEO ENCODING

(57)
A method of encoding/decoding a video sequence, which is composed of video frames. In the method, at least one video frame is divided into a set of coding blocks, and at least one of the coding blocks is encoded by intra- coding. Then a first reliable region that comprises at least one intra-coded coding block is determined, and the first reliable region in the video sequence is encoded such that creation of an information dependency between the first reliable region and coding blocks outside the first reliable region is prevented.



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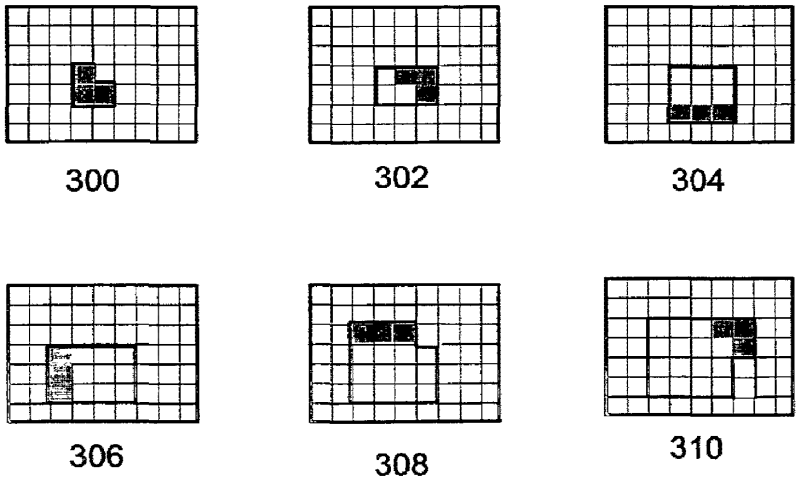
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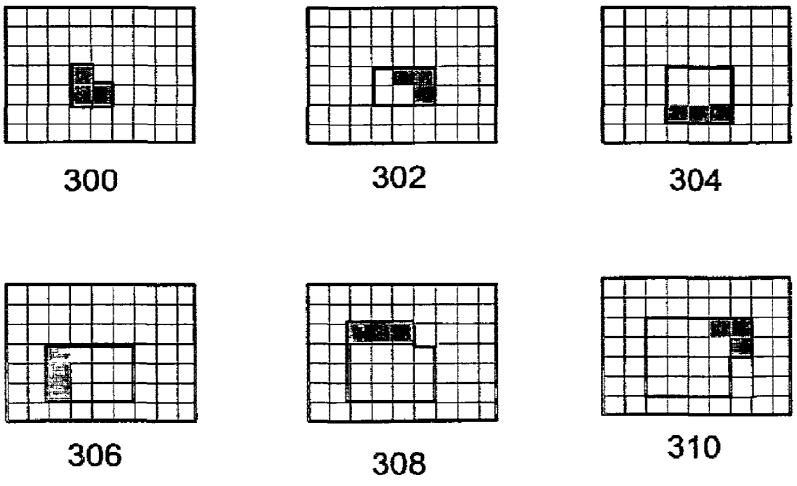
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RANDOM ACCESS POINTS IN VIDEO ENCODING

FIELD OF THE INVENTION

The invention relates to video coding, particularly to encoding of random access points into a video sequence.

BACKGROUND OF THE INVENTION

Video files are composed of a plurality of still image frames, which are shown rapidly in succession as a video sequence (typically 15 to 30 frames per second) to create an idea of a moving image. Image frames typically comprise a plurality of stationary background objects defined by image information that remains substantially the same, and few moving objects defined by image information that changes somewhat. In such a case, the image information comprised by the image frames to be shown in succession is typically very similar, i.e. consecutive image frames comprise much redundancy. More particularly, the redundancy comprised by video files is dividable into spatial, temporal and spectral redundancy. Spatial redundancy represents the mutual correlation between adjacent image pixels; temporal redundancy represents the change in given image objects in following frames, and spectral redundancy the correlation between different colour components within one image frame.

Several video coding methods utilize the above-described temporal redundancy of consecutive image frames. In this case, so-called motion-compensated temporal prediction is used, wherein the contents of some (typically most) image frames in a video sequence are predicted from the other frames in the sequence by tracking the changes in given objects or areas in the image frames between consecutive image frames. A video sequence comprises compressed image frames, whose image information is determined without using motion-compensated temporal prediction. Such frames are called INTRA or I frames. Similarly, motion-compensated image frames comprised by a video sequence and predicted from previous image frames are called INTER or P frames (Predicted). Typically, at least one I frame and possibly one or more previously coded P frames are used in the determination of the image information of P frames. If a frame is lost, frames depending thereon can no longer be correctly decoded.

For example, JVT is a video coding standard that utilizes motion-compensated temporal prediction. JVT is the current project of the joint video team (JVT) of ISO/IEC Motion Picture Experts Group (MPEG) and ITU-T (International Telecommunications Union, Telecommunications Standardization Sector) Video Coding Experts Group (VCEG). It is inherited from H.26L, a project of the ITU-T VCEG.

In JVT/H.26L, images are coded using luminance and two colour difference (chrominance) components (Y, CB and CR). The chrominance components are each sampled at half resolution along both co-ordinate axes compared to the luminance component.

Each coded image, as well as the corresponding coded bit stream, is arranged in a hierarchical structure with four layers being, from top to bottom, a picture layer, a picture segment layer, a macroblock (MB) layer and a block layer. The picture segment layer can be either a group of blocks layer or a slice layer.

Data for each slice consists of a slice header followed by data for macroblocks (MBs). The slices define regions within a coded image. Each region is a number of MBs in a normal scanning order. There are no prediction dependencies across slice boundaries within the same coded image. However, temporal prediction can generally cross slice boundaries. Slices can be decoded independently from the rest of the image data. Consequently, slices improve error resilience in packet-lossy networks.

Each slice is divided into MBs. An MB relates to 16 x 16 pixels of luminance data and the spatially corresponding 8 x 8 pixels of chrominance data.

In the JVT/H.26L, a Video Coding Layer (VCL), which provides the core high-compression representation of the video picture content, and a Network Adaptation Layer (NAL), which packages that representation for delivery over a particular type of network, have been conceptually separated. The JVT/H.26L video coder is based on block-based motion-compensated hybrid transform coding. As with prior standards, only the decoding process is precisely specified to enable interoperability, while the processes for capturing, pre-processing, encoding, post-processing, and rendering are all left out of scope to allow flexibility in implementations. However, JVT/H.26L contains a number of new features that enable it to achieve a significant improvement in coding efficiency relative to prior standard designs.

JVT/H.26L is capable of utilizing a recently developed method called reference picture selection. Reference picture selection is a coding technique where the reference picture for motion compensation can be selected among multiple pictures stored in the reference picture buffer. Reference picture selection in JVT/H.26L allows selection of reference picture per macroblock. Reference picture selection can be used to improve compression efficiency and error resiliency.

Because of the motion compensation technique used in video coding, random access points have to be encoded in the video sequence to allow scanning of the video from an arbitrary point. Depending on the application used to scan the video sequence, a desirable time span between random access points in a video stream would be an order of 0,5 – 10 seconds. Coding of an intra frame has been a conventional solution for coding of random access points. However, as the above-mentioned reference picture selection technique allows referencing to frames prior to an intra frame, an intra frame as such is not a sufficient condition for a random access point. Furthermore, encoding of frequent intra frames in the video sequence requires more codec processing capacity and consumes more bandwidth.

Gradual decoder refresh refers to "dirty" random access, where previously coded but possibly non-received data is referred to and correct picture content is recovered gradually in more than one coded picture. In general, the gradual recovering of picture content provided by the gradual decoder refresh random access method is considered a desirable feature in JVT/H.26L video coding. The basic idea of the gradual decoder refresh is to encode a part of the macroblocks of the frames as intra-coded. When the decoder starts decoding at a random point, reference frames for motion compensation are unknown to the decoder, and they are initialised to mid-level grey, for example. The decoder can reconstruct intra-coded macroblocks, but inter-coded macroblocks referring to unknown areas in the motion compensation process cannot be reconstructed correctly. As the cumulative number of intra-coded macroblocks increases gradually frame by frame, a complete reconstructed picture may finally be obtained. However, this implementation involves several problems.

Due to reference picture selection, a macroblock in the reference frame may be referred to in the motion compensation process, which resides outside the region of reliably decodable intra-coded macroblocks.

In the JVT/H.26L, loop filtering is applied across each 4x4 block boundary to fade out abrupt borderlines. Thus, reliable areas may be affected by incorrectly reconstructed pixels in neighbouring macroblocks.

In the motion compensation process, referred non-integer pixel positions are interpolated from pixel values using multi-tap filter(s). In the current JVT codec design, half-pixel positions are interpolated using a six-tap filter. Thus, incorrectly reconstructed pixels may be used to interpolate a referred non-integer pixel position residing inside but close to the border of the reliably decodable area.

When the decoder starts the decoding of the frames, it assumes all intra-coded macroblocks to be reliable. However, all the aforementioned processes have the effect that the grey image information of the neighbouring macroblocks will intermingle with the reliably decodable image information of the intra-coded macroblocks. This causes an error that will propagate spatio-temporally when the decoding progresses from a frame to another.

BRIEF DESCRIPTION OF THE INVENTION

The object of the invention is thus to provide a method and an apparatus for implementing the method to alleviate at least some of the above problems. The objects of the invention are achieved by a method, video encoder, video decoder and computer software, that are characterized in what is disclosed in the independent claims.

The preferred embodiments of the invention are disclosed in the dependent claims.

The invention is based on identifying the complications underlying the implementation of gradual decoder refresh method. According to the invention, a video sequence, which is composed of video frames, is encoded, wherein the encoding method comprises dividing at least one video frame into a set of coding blocks, and encoding at least one of said coding blocks by intra-coding. Then a first reliable region that comprises at least one intra-coded coding block is determined, and said first reliable region is encoded in said video sequence such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

According to a preferred embodiment, the decoder can then use said reliable region as a random access point when accessing the video sequence from an arbitrary point.

According to a preferred embodiment, said information dependencies are prevented by turning off loop filtering at the borders of said reliable region.

According to a preferred embodiment, said information dependencies are prevented by referring only to the coding blocks of said reliable region, when applying motion compensated prediction.

According to a preferred embodiment, said information dependencies are prevented by disabling interpolation of fractional pixel values at the borders of said reliable region.

According to a preferred embodiment, said reliable region is encoded into a video sequence as a sub-picture.

The invention provides several advantages. The mechanism can be used to provide random access points in coded video stream while simultaneously updating a part of picture area reliably without full intra macroblock coverage of the area. A further advantage of the invention is that it stops spatio-temporal propagation of transmission errors. A yet further advantage is that the invention allows unequal error protection and transport prioritisation to improve received visual quality and to shape traffic according to the subjective priority of different parts video data. Another advantage of the invention is that it enables to avoid entire intra frames in conversational applications to minimize the end-to-end delay and to improve received visual quality. Furthermore, the method can be used to code masked scene transitions, such as wipes.

BRIEF DESCRIPTION OF THE FIGURES

In the following, the invention will be described in detail in connection with preferred embodiments with reference to the accompanying drawings, in which

Figure 1 shows the conceptual structure of the JVT/H.26L design;

Figure 2 shows a preferred embodiment of a growing reliable region;

Figure 3 shows an example procedure of adding macroblocks into a reliable region according to a certain refresh pattern;

Figure 4 shows a picture to be encoded in relation to macroblocks defined for video encoding;

Figure 5 shows a principal drawing of video coding slices formed for the picture of Fig. 4 according to the sub-picture implementation;

Figure 6 shows a block diagram of a mobile communication device according to the preferred embodiment of the invention; and

Figure 7 shows a video communication system, wherein the invention is applicable.

DETAILED DESCRIPTION OF THE INVENTION

The invention is applicable to all video coding methods using region-based motion-compensated temporal prediction. The invention is particularly applicable to different low bit rate video codings typically used in limited-band telecommunication systems. These include for instance ITU-T standards H.263 and H.26L (later possibly H.264), which is currently being standardized. In these systems, the invention is applicable for instance in mobile stations, allowing

The following is an exemplary illustration of the invention using the JVT/H.26L video coding as an example. The JVT/H.26L will be described to a detailed level considered satisfactory for understanding the invention and its preferred embodiments. For a more detailed description of the implementation of JVT/H.26L, a reference is made to the document: Joint Video Team (JVT) of ISO/IEC MPEG and ITU-T VCEG, DRAFT ISO/IEC 14496-10:2002 (E) "*JVT Working draft 2, Release 7*".

The conceptual structure of the JVT/H.26L design will be described referring to Fig. 1. In the JVT/H.26L, a Video Coding Layer (VCL), which provides the core high-compression representation of the video picture content, and a Network Adaptation Layer (NAL), which packages that representation for delivery over a particular type of network, have been conceptually separated.

The main task of the VCL is to code video data in an efficient manner. However, as has been discussed in the foregoing, errors adversely affect efficiently coded data and so some awareness of possible errors is included. The VCL is able to interrupt the predictive coding chain and to take measures to compensate for the occurrence and propagation of errors. There are several ways in which this can be done: interrupting the temporal prediction chain by introducing INTRA-frames and INTRA-MBs; interrupting

spatial error propagation by introducing a slice concept; and introducing a variable length code which can be decoded independently, for example without adaptive arithmetic coding over frames.

The output of VCL is a stream of coded macroblocks where each macroblock appears as a unitary piece of data. Data Partitioning Layer (DPL) re-arranges the symbols in such a way that all symbols of one data type (e.g. DC coefficients, macroblock headers, motion vectors) that belong to a single slice are collected in one coded bit-stream. Symbols having approximately equal subjective and/or syntactical importance in decoding are grouped into one partition.

NAL provides the ability to customize the format of the VCL or DPL data for delivery over a variety of networks. The NAL design can either receive data partitions or slices from the Video Coding and Data Partition Layers depending on the chosen network-adaptation strategy. Data partitioning allows transmission of subjectively and syntactically more important data separately from less important data. Decoders may be unable to decode the less important data without reception of the more important data. Means to protect the more important data better than the less important data can be applied while transmitting the bit-stream over an error-prone network.

The output of the NAL can then be inserted into different transport formats. The video data can be stored in file format for future scanning. It can be encapsulated according to ITU-T H.223 multiplexing format as well. As regards the RTP transport format, the RTP transport stream does not include picture layer or picture headers at all. Instead, data that has conventionally belonged to picture and sequence layer are primarily transmitted out of band. A number of combinations of such data can be transmitted, and each transmitted combination is called a parameter set and enumerated. A parameter set in use is then identified in the transmitted slice header.

Next, encoding of a gradual decoder refresh period according to a preferred embodiment will be explained. The encoder starts the operation by deciding the first frame of a decoder refresh period according to external signals, such as configuration parameters in a standalone encoder or intra update request in a real-time video communication system. The encoder may also analyse the contents of the uncompressed pictures and decide to code a gradual decoder refresh as a response to a masked scene transition, for example.

The encoder decides the length of the gradual decoder refresh period based on external indications, such as configuration parameters in a standalone encoder, or on internal deduction as a response to a masked scene transition, for example. The encoder may also adjust the expected length of the scene transition during the coding of transition based on rate control needs, for example.

A term "reliable region" is used to indicate the area of a picture that is correctly reconstructed when the decoding is started from the beginning of the gradual decoder refresh period. The reliable region preferably consists of macroblocks that are adjacent to each other. Each picture in the gradual decoder refresh period has its own reliable region. Each macroblock residing in the reliable region in one picture belongs to the reliable region in the subsequent stored pictures (in coding order) of the gradual decoder refresh period. Thus, the reliable region at least stays the same or preferably grows from picture to picture (in coding order).

The shape of the reliable region should not be limited by any other constraint than the macroblocks should adjacent to each other. For the coding/decoding purposes, the simplest form of a reliable region is a solid rectangle of macroblocks. According to a preferred embodiment, the reliable region is a solid rectangle of macroblocks that is expanded with an incomplete one-macroblock-wide/tall column/row of macroblocks along one of the four sides of the rectangle.

According to another preferred embodiment, the reliable region is an arbitrary but solid area of macroblocks. According to yet another preferred embodiment, a reliable region is a hollow rectangle of macroblocks with one rectangular hole, which can be used in box-in type of gradual decoder refresh. According to a further preferred embodiment, a reliable region is a hollow rectangle of macroblocks with a hole defined similarly to the reliable region of the preferred implementation of the invention. Reliable regions can even reside mutually inside each other such that, for instance, two reliable regions are grown in a spiral motion.

Accordingly, the definition of hollow reliable regions can be generalized so that there is more than one hole in the region.

The invention can also be generalized so that there is more than one reliable region in one picture. In this case, any reliable region can be used to predict a block in a reliable region of a subsequent frame. Moreover, the

refresh periods can be overlapped so that reliable regions of different periods are nested in the pictures within the overlapping period. A reliable region may also change place or shrink from one coded picture to the next one. Such behaviour may be reasonable due to global motion, like camera panorama, or rate control, for example.

A gradual decoder refresh pattern defines clearly in which order the macroblocks are added to the reliable region. For example, in a wipe-down, the macroblocks could be inserted to the reliable region in raster scan order. The encoder decides the type of the gradual decoder refresh pattern. There may be pre-defined default patterns specified in the coding specification/standard and known both in the encoder and in the decoder in advance. There may also be such refresh patterns that are signalled from the encoder to the decoder as a part of coded video bit stream. The encoder signals the selected refresh type to the decoder. Signalling can be done either as in-band signalling or out-band signalling.

An embodiment of a growing reliable region can be illustrated by referring to Fig. 2. In Fig. 2, the small rectangles indicate macroblocks, and the 9 x 11 block of small rectangles represent a picture frame 200 - 208. Thick macroblock edges surround the reliable region in each frame. Mid-gray macroblocks indicate the growth of the reliable region. The picture frames 200 – 208 are shown in temporal order.

The frame 200 includes a reliable region of 3 x 3 macroblocks. In the next frame 202, the reliable region is expanded along all four sides of the previous region, resulting in a reliable region of 5 x 5 macroblocks. The similar procedure, which can be called a box-out refresh pattern, will be applied in following frames 204 – 208. In the frame 208, the reliable region is expanded to cover the whole frame area, i.e. all macroblocks of the frame. Thick edges, which denote the spatial borders of reliable regions, are preferably macroblock borders.

The encoder decides the number of macroblocks to be added to the reliable region in the current frame to be coded. The decision can be based on pre-defined refresh rate or it can be adjusted according to prevailing network conditions, for example. The chosen number of macroblocks is primarily selected according to the gradual decoder refresh pattern. The macroblocks inserted into the first reliable region of the first frame of gradual decoder refresh period are intra-coded.

According to a preferred embodiment, as a compromise of flexibility and complexity, the evolution of the shape of an reliable region can be limited such that at the beginning, an reliable region is a solid rectangle of macroblock(s). The region can be expanded by inserting macroblocks in definite order along one of the four sides of the rectangle. Once the reliable region becomes a rectangle again, another side of the rectangle can be picked as the subject for macroblock insertion. The expansion rate may be of zero macroblocks as well.

For the subsequent frames of the gradual decoder refresh period, the encoder proceeds as follows: The newly chosen macroblocks are inserted into the reliable region of the current frame. The macroblocks in the reliable region are coded using macroblock mode selection and motion compensation procedure. However, in the motion compensation procedure the motion vector search range is limited so that a motion vector can only refer to pixels that are within a reliable region in an earlier frame in the gradual decoder refresh period.

The reconstruction of reliable region must not depend on reconstructed pixel values falling outside the reliable region. Consequently, this results in some coding constraints. For example, loop filtering and fractional pixel interpolation from pixel values outside the reliable region must be disabled. Breaking such coding dependencies can be signalled in the coded data, and a similar operation can then be done when decoding the data. For example, a boundary where loop filtering must be turned off can be signalled in coded data. Alternatively, the encoder can avoid generating such coded data that refers to unreliable regions. For example, motion vectors can be restricted so that no pixels in unreliable regions are used in motion interpolation.

If there are several at least partly simultaneous reliable regions during a refresh period, the macroblocks inserted into the first reliable region of the first frame of gradual decoder refresh period are intra-coded. Then the subsequent reliable regions can refer to the macroblocks of another reliable regions such that they can be inter-coded, if necessary. Due to reference picture selection, the temporal order of reliable regions referring to each other is not limited. However, the similar coding constraints, as regards to loop filtering and fractional pixel interpolation from pixel values outside the reliable region, as stated above, also apply when referring to another reliable region.

Additionally, the encoding and decoding scan order of macroblocks is preferably changed so that the reliable region is coded/decoded first in raster scan order. After that, the remaining macroblocks not included in the reliable region are coded/decoded in raster scan order. The boundaries of the reliable region are treated as slice boundaries. Consequently, no in-slice prediction can happen across the boundaries of the reliable region.

It is also possible to apply a coding method, wherein a reliable region is defined but not all of aforementioned coding constraints are applied. In this method, macroblocks of an entire picture are coded in normal order (i.e., in raster scan order if no scattered slices or similar coding techniques are in use). Consequently, the coded data of reliable and leftover regions (i.e. macroblocks not belonging to reliable region) are interleaved with each other. Moreover, some of the coded parameters of the reliable region of a picture are dependent on the coded parameters of the leftover region. Examples of such coded parameters include motion vectors close to the border of the reliable region. These motion vectors are predicted from the neighbouring motion vectors in the leftover region. However, the coding constraints regarding loop filtering and fractional pixel interpolation from pixel values outside the reliable region still apply. The method can be called an IREG-D method, wherein IREG stands for isolated region and D indicates the dependency between some of the coded parameters of the isolated region and the leftover region.

Consequently, the coding method of a reliable region disclosed above, wherein all the coding constraints are applied, can be called an IREG-I coding technique. In the IREG-I method, the macroblocks of the reliable region are coded first and the rest of the macroblocks are coded after that. Consequently, the reliable region forms a separable part of coded data from the coded data of the leftover region. The letter I of the abbreviation IREG-I indicates the independency of the coding parameters between the isolated region and the leftover region. The method can preferably be applied by using a so-called sub-picture. The preferred embodiment of applying sub-picture will be described later more in detail.

Next, the decoding procedure according to a preferred embodiment will be described. It is to be noted that the decoding procedure of a video sequence is independent of the encoding procedure. Thus, for the decoding purposes it is only required that the video sequence to be decoded includes

certain properties characterised by the invention. The decodable video sequence is thus not limited by the above-described encoding method.

When the decoder receives a parameter set signalled with the video sequence, the decoder checks whether it indicates the use of reliable regions. If the signalled parameter set indicates the use of IREG-I, the decoder starts the decoding of a new picture or continues the decoding of the current picture.

If decoding of a new picture is started, the decoder checks if a new reliable region is established. When a new reliable region is established, the previous shape, size, and location of the reliable regions are reset. When the decoding of a new picture is started, the shape, size, and location of the reliable regions are updated according to the received parameters.

Once the shape, size, and location of the reliable regions are up to date, the macroblock address of the first macroblock of the slice identifies which reliable region the slice belongs to or if the slice belongs to the leftover region. The reliable regions of a picture are decoded first.

Loop filtering of each macroblock is limited such that the neighbouring macroblock are checked whether they belong to a different region (i.e. one belongs to the reliable region and the other belongs to the leftover region, or they belong to different reliable regions). If any of the neighbouring macroblocks belongs to a different region, then the corresponding macroblock border is filtered as if it were on the picture boundary. Furthermore, intra prediction from areas outside the reliable region being decoded is advantageously not applied.

If the signalled parameter set indicates the use of IREG-D, the decoder decodes a slice the same way as in the case of IREG-I, which was described above, except for the macroblock location decision. The spatial macroblock order is normal, and a slice may contain macroblocks from many reliable regions and from the leftover region at the same time. A major difference is that intra prediction and motion vector prediction may happen across region boundaries. However, the coding constraints regarding loop filtering and fractional pixel interpolation from pixel values outside the reliable region still apply.

According to a preferred embodiment, the changes required by the aforementioned procedure can be accomplished by adding some new parameters to be signalled in connection with the coded video sequence. The parameters can be signalled before the video scanning session or they can be

transmitted or updated during the video scanning session. For instance, the following parameters could be added to the parameter set:

1. Type of Isolated Region (TIR). Identifies whether and which type of isolated regions is in use.

None: No isolated region is used. Thus, the macroblocks are coded according to normal coding.

IREG-D: Normal bitstream order version of isolated regions is used.

IREG-I: Isolated bitstream order version of isolated regions is used.

2. Number of Simultaneous Isolated Regions (NSIR). Signals how many isolated regions exist at the same time within a picture. The value is limited by profile and level. Each initial isolated region is uniquely identified with a running number, starting from 0 or 1, for instance. The identifier is referred to as the IREG ID. For each IREG ID, the following parameters are conveyed:

3. Shape Evolution Type of Isolated Regions. The locations, shapes, and variation order of isolated regions are defined by this parameter. The following values are proposed:

Raster scan: The first macroblock of the isolated region is the top-left one of the picture. The isolated region grows in raster scan order.

Reverse raster scan: The first macroblock of the isolated region is the bottom-right one of the picture. The isolated region grows in reverse raster scan order.

Wipe right: The first macroblock of the isolated region is the top-left one of the picture. The isolated region grows from top to bottom. The next macroblock after the bottom macroblock of a column is the top macroblock of the column on the right side of the previous column.

Wipe left: The first macroblock of the isolated region is the bottom-right one of the picture. The isolated region grows from bottom to top. The next macroblock after the top macroblock of a column is the bottom macroblock of the column on the left side of the previous column.

Box out clockwise: The first macroblock of the isolated region is preferably not restricted. The isolated region grows clockwise around the previously defined isolated region.

Box out counter-clockwise: This is similar to above, but the isolated region grows counter-clockwise.

Pre-defined free-form: This parameter value is accompanied with a list of macroblock numbers that define the location, shape, and growth order of the isolated region. These pre-defined free-forms are preferably communicated to the decoder in forehand during the video scanning session. The macroblocks are numbered in raster scan order starting from the macroblock on the top-left corner of the picture, which has number 0. Notice that the shape of the isolated region has to follow the restrictions given earlier.

Pre-defined static rectangle: This parameter value signals that the isolated region stays the same within the IREG GOP. The value is associated with the top-left corner of the isolated region as well as the width and the height of the isolated region. Also these pre-defined values are preferably communicated to the decoder in forehand during the video scanning session.

Dynamic rectangle: This parameter is present only when IREG-I is in use. This region variation mode is used for sub-picture coding. Note that herein the isolated region in any frame is a rectangle. No location, shape, or growth order of the isolated region is defined in the parameter set, but similar parameters are included in the slice header.

4. Growth Rate of Isolated Region (GRIR). This parameter defines how many macroblocks per each picture are added to the isolated region referred to in the description of the previous parameters. There is also a specific parameter value indicating a varying growth rate. If a varying growth rate is indicated in the parameter set, the actual growth rate per frame is indicated in the slice header.

Constant rate of N (N>=1) macroblocks: The isolated region grows by N macroblocks per each picture.

Pre-defined rate: This parameter value is associated with a set of values $\{a_1, a_2, \ldots, a_N\}$, each defining the number of macroblocks to be added to the isolated region in one picture. N equals to the number of pictures in the IREG period, and a_1 is the initial size of the isolated region in macroblocks.

Varying rate: Growth rate indicated by Growth Rate of Isolated Region (GRIR) in slice header.

An example procedure of inserting macroblocks into a reliable region according to a certain refresh pattern can be illustrated by referring to Fig. 3. Fig. 3 shows the first few picture frames (300 –310) of a growing reliable region, which has the shape evolution type defined as "Box out clockwise" and constant growth rate (GRIR) of three macroblocks. The first

frame 300 has a L-shaped reliable region (according to "Box out clockwise" shape) consisting of three macroblocks. The next three marcoblocks are added to the reliable region in the next frame 302. The shape evolution type controls the places of new macroblocks, resulting in a reliable region of 3 x 2 macroblock. The procedure is continued in each frame 304 – 310 by adding three new macroblocks along the outline of the reliable region in clockwise manner.

As was described earlier, the design of the JVT/H.26L allows the customisation of the video coding layer (VCL) or data partitioning layer (DPL) data format for delivery over a variety of networks. Data partitioning allows transmission of subjectively and syntactically more important data separately from less important data. Decoders may be unable to decode the less important data without reception of the more important data. When using, for example, the RTP transport format, the RTP transport stream does not include picture layer or picture headers at all. Instead, this data, conventionally belonged to picture and sequence layer, are transmitted out of band. A number of combinations of such data can be transmitted, and each transmitted combination is called a parameter set and enumerated. A parameter set in use is then identified in the transmitted slice header.

Therefore, according to a preferred embodiment, the following conditional parameters can be added to the slice header preferably before reference picture selection parameters:

1. Sequence Number of the Isolated Region (SNIR). This parameter is present if the parameter set indicates the use of isolated regions. Value 0 indicates that sequence number (SNIRb) is deduced from the latest transmitted SNIR value SNIRa, the corresponding picture number Pna, and the current picture number PNb as follows: SNIRb = PNb – Pna + SNIRa, where the arithmetic between picture numbers takes care of possible wrap-overs. Value 1 indicates a start of a new reliable region and is transmitted at least once per each IREG period. Values greater than 0 indicate the sequence number explicitly and can be used to improve error resiliency.

2. Shape Change of Isolated Region (SCIR). This parameter is present if the parameter set indicates a varying growth rate of the isolated region or if the shape evolution type of the isolated region is dynamic rectangle. Value 0 means that the growth rate or the shape, size, and location of the rectangular isolated region are the same as in any other slice of the

same picture. Value 1 indicates GRIR and IRIR are the same as in the previous stored and transmitted picture. Value 2 indicates that either GRIR or IRIR follows. GRIR and IRIR are repeated for each isolated region of the picture.

3. Growth Rate of Isolated Region (GRIR). This parameter is present only if the parameter set indicates a varying growth rate of the isolated region. The parameter signals the number of macroblocks added to the isolated region compared to the isolated region of the previous stored frame in coding order.

4. Information about Rectangular Isolated Region (IRIR). This group of parameters is present if the shape evolution type of the isolated region is dynamic rectangle. The following four codewords follow:

Left: The coordinate of the left-most macroblock in the isolated region (in macroblocks). The left-most macroblock column of the picture is assigned value zero.

Top: The coordinate of the top-most macroblock in the isolated region (in macroblocks). The top-most macroblock row of the picture is assigned value zero.

Width: The width of the isolated region. The codewords are assigned as follows:

Symbol no	UVLC code	Explanation
0	1	Guess = (RightMost - Left) / 2 + 1, where RightMost is the column address of the right-most macroblock of the picture and / stands for division by truncation. For example, for a QCIF picture and Left equal to 3, Width becomes (10-3)/2+1 = 4.
1	001	Guess + 1
2	011	Guess – 1
3	00001	Guess + 2
4	00011	Guess – 2
..	..	...

Height: The height of the sub-picture. The codewords are assigned similarly to Width.

For the more detailed description of JVT video codec parameter sets, a reference is made to ISO/IEC documents "VCEG-N52" and VCEG-N72r1",

Next, the decoding procedure according to a preferred embodiment will be described. For the sake of illustration, it is presumed herein that the parameter set signalled with the video sequence (either in-band or out-band) includes at least some of the parameters disclosed above. It is, however, to be noted that the above parameters are merely examples of how the desired properties can be achieved. It is apparent for a man skilled in the art that an implementation reaching the same results can be carried out in numerous ways using different set of parameters.

When the decoder receives a parameter set signalled with the video sequence, the decoder checks whether it indicates the use of reliable regions. If the signalled parameter set indicates the use of IREG-I, the decoder decodes a slice as follows:

If the picture number of the slice to be decoded is different from the picture number of the previously decoded slice, or if the temporal reference of the slice to be decoded is different from the temporal reference of the previously decoded slice, decoding of a new picture is started. Otherwise, decoding of the current picture is continued.

If decoding of a new picture is started, the decoder checks if a new reliable region is established. If any of the reliable-region-related parameters of the parameter set have been changed, the decoder infers the start of a new reliable region. Similarly, if SNIR is 1, the decoder deduces the start of a new reliable region. When a new reliable region is established, the previous shape, size, and location of the reliable regions are reset. If the decoding of a new picture is started, the shape, size, and location of the reliable regions are updated (one reliable region at a time) as follows:

If the shape evolution type of the reliable region is non-rectangular and if the growth rate is constant, the shape, size, and location of the reliable region are calculated as if the constant number of macroblocks were added to the zero-sized reliable region SNIR times.

If the shape evolution type of the reliable region is non-rectangular and if the growth rate is pre-defined, SNIR indicates the number of macroblocks a_{SNIR} to be added to the corresponding reliable region of the previous stored and transmitted picture.

If a pre-defined freeform type of the reliable region is in use but the growth rate is signaled for each picture separately, the shape and size of the reliable region is formed by adding GRIR macroblocks in the pre-defined order to the reliable region of the previous stored and transmitted picture.

If the shape evolution type is pre-defined static rectangle, its size, shape, and location are indicated in the parameter set. If the shape evolution type is dynamic rectangle, the size, shape, and location of the rectangular reliable region is indicated in the slice header. Once the shape, size, and location of the reliable regions are up to date, the macroblock address of the first macroblock of the slice identifies which reliable region the slice belongs to or if the slice belongs to the leftover region. The reliable regions of a picture are decoded first.

Before decoding the coded data of a macroblock, its spatial location is calculated. The spatial macroblock order is normal (either using raster or scattered scan order), but macroblock positions falling outside the currently decoded reliable or leftover region are skipped.

Loop filtering of each macroblock is limited as follows: If the neighbouring macroblock to its left belongs to a different region (i.e. one belongs to the reliable region and the other belongs to the leftover region, or they belong to different reliable regions), then the macroblock is filtered as if it were on the left picture boundary. If its above neighbouring macroblock belongs to a different region, then the macroblock is filtered as if it were at the top macroblock row of the picture.

Furthermore, intra prediction from areas outside the reliable region being decoded is advantageously not applied.

If the signalled parameter set indicates the use of IREG-D, the decoder decodes a slice the same way as in the case of IREG-I, which was described above, except for the macroblock location decision. The spatial macroblock order is normal, and a slice may contain macroblocks from many reliable regions and from the leftover region at the same time. A major difference is that intra prediction and motion vector prediction may happen across region boundaries. However, the coding constraints regarding loop filtering and fractional pixel interpolation from pixel values outside the reliable region still apply.

A preferred embodiment of the IREG-I method may be implemented in connection with a so-called sub-picture, which has been

proposed to the JVT/ H.26L. A sub-picture can be generated by adding a sub-picture coding layer between picture and slice layers. The sub-picture coding layer forms so-called sub-pictures (SP), which are typically rectangular foreground region SPs (FR SPs), except for the so-called background region (BR) SP. The BR SP consists of the picture area not falling to any of the rectangular SPs. The foreground region SPs of a picture are coded before the background region SP. Macroblocks within a SP are coded in scan-order. The SPs do not overlap, i.e. the entire encoded picture consists of all SPs. According to this embodiment of the invention, a sub-picture can be used as an reliable region. The shape and the size of the sub-picture can be controlled by the aforementioned parameters, for instance.

Fig. 4 shows a picture 400 to be encoded in relation to macroblocks (MBs) defined for video encoding. The picture comprises an object that is considered as a foreground object. A rectangular foreground region sub-picture (FR SP) 402 has been drawn around the foreground object along the MB borders. Surrounding the foreground object 402, the picture also has a background. The portion of the background that surrounds the FR SP 402 is referred to as the background region sub-picture 404 (BR SP). Notice that also part of the background may belong to the FR SP 402, as is the case here. Fig. 4 also shows the MBs assigned in ascending order numbered as 0 to 79 where the first MB (0) is at the left-hand side upper corner and numbering grows to the right and continues after each row from the left of the next row.

Fig. 5 shows a principal drawing of video coding slices formed for the picture of Fig. 4 according to the sub-picture implementation. The picture is segmented into video coding slices using a slice size of 5 macroblocks. The segmentation is started from the most important FR SP and the BR SP is segmented into slices after all the FR SPs (in Fig. 4 and 5 only one FR SP is present). The slices are given running slice numbers starting from 0. Notice that slice 0 occupies 3 MBs from the first row within the FR SP and then 2 MBs of the second row within the FR SP, and particularly that the last slice of the FR SP is closed before the BR SP is encoded. The MBs in the BR SP are then segmented into slices in the scan-order so that each slice but the last one is generally composed of the maximum number of MBs allowed for one slice. The slices simply skip over each FR SP. Larger slices generally result in smaller amount of redundancy required to encode a picture.

According to a preferred embodiment, the sub-picture-based gradual decoder refresh method can be implemented such that the reliable region is coded as the foreground sub-picture. Preferably, the independent sub-picture coding mode is used so that loop filtering is turned off across the exterior boundary of the foreground sub-picture. The shape and position of the foreground sub-picture within the whole picture should not be restricted by any other constraints than that the macroblocks belonging to the sub-picture should be adjacent to each other.

In addition to providing random access points for the decoder, the invention can be applied also to improve the error resilience of video transmission. The method disclosed above can be used as an error-aware encoding method with pre-determined intra macroblock update pattern. The number of updated macroblocks per frame algorithms can change according to selected conditions but the order of updated macroblocks remains the same. The method can also be used so that some macroblocks in the reliable region are never updated in intra mode. Accordingly, the technique falls into the category of adaptive intra macroblock update.

The usage of isolated regions for loss aware intra update can be applied in a very straightforward manner such that isolated regions are used continuously from where the first isolated region starts. Since the very first frame of a sequence is entirely intra-coded, the first isolated region starts preferably from the second coded frame. The encoder can select a proper growth rate according to the picture size and the assumed packet loss rate. Generally, a good growth rate (i.e. the refresh rate) is equivalent to the loss rate of macroblocks. For example, if the packet loss rate is 20%, a growth rate of 80 macroblocks is proper.

The coding of reliable regions is performed as disclosed above, but for the leftover regions, the pixels in leftover regions are replicated by the spatially corresponding pixels in the previous reconstructed frame. That is, a macroblock in the leftover region will be coded as if the content keeps unchanged from the previous frame.

In the decoder side, partially updated images during the period can be viewed if this is considered visually pleasing.

The embodiment has the advantages that the end-to-end transmission delay is dropped remarkably compared to intra frame coding. Because of the constant quantization parameter, a stable picture quality can

be obtained while keeping low bit-rate fluctuation. A more stable image quality is generally considered less annoying. Moreover, spatio-temporal error concealment can be applied if there are losses.

Many kinds of refresh patterns, such as different kinds of wipes and boxing, can be used. Especially, if a box-out refresh pattern is used, the central picture part will be displayed first. From the region-of-interest point of view, the central part is often more important.

As a result of avoiding intra frames, end-users perceive that the responded pictures are displayed faster after the refresh request. In addition, end-users perceive a shorter drop in picture rate.

The procedure according to above-mentioned embodiments provides several advantages. If compared to conventional encoding of random access points, wherein an intra frame starts an independently decodable group of pictures (GOP), the invention has, inter alia, the benefit that the invention enables updating an predefined picture area reliably without full intra macroblock coverage of the area. The area is updated gradually during many coded pictures. Reliable regions in a previous picture can be used as a motion compensation reference for a reliable region in a subsequent picture. The choice of the macroblock mode for each macroblock in a reliable region can be made using rate-distortion optimisation. Thus, the invention enables coding of a reliable region optimally from rate-distortion point of view.

This property of the invention may be especially useful in sequences, which undergo relatively steady global motion, such as camera pans to any direction. In such a case, an area that was close to a picture border in a first frame moves closer to the middle of the picture in the next frame. If the area in the first frame can be intra-coded and need not be intra-coded again in the next frame.

Furthermore, the instantaneous bit-rate of the coded stream has smoother fluctuations. This helps to avoid buffer overflows, may reduce the needed size of the pre-decoder buffer, and is likely to reduce the end-to-end transmission delay.

For error-prone transmission, a certain number of macroblocks per picture are coded in intra mode anyway. The invention enables reusing these macroblocks for random access purposes, too.

If at least a part of the intra frame is lost or corrupted, the receiving decoder has few means to detect if it should use spatial or spatio-temporal

error concealment. A straightforward choice is to use spatial error concealment, as the spatially neighbouring areas were intra-coded. However, spatio-temporal error propagation might have resulted into better concealment result. This phenomenon can be avoided if the method according to the invention is applied, i.e. only a part of the picture is updated in intra mode at a time.

Conversational video applications refer to video telephony, video conferencing, and other similar applications. This family of applications is characterized by the goal to minimize the end-to-end delay. Conversational applications can operate in various networks, such as ISDN (see ITU-T Recommendation H.320), PSTN (ITU-T H.324), fixed IP networks (ITU-T H.323), and packet-switched mobile networks (3GPP TS 26.235). Typically, at least one link in the network has a limited maximum throughput bit-rate. While some networks, such as ISDN, provide a low transmission error rate, others, such as the Internet and mobile networks, are relatively susceptible to transmission errors.

In conversational applications, the aim is to keep the video bit-rate relatively constant due to the target to minimize the end-to-end delay and to the fact of having a fixed maximum throughput. As intra-coding is typically more costly in bit-rate point of view compared to inter-coding, intra-coding of entire an frame at a time should be avoided.

A decoder expects a refresh of the image at the beginning of the sequence and as a response of an intra picture update request. In the method according to the invention, instead of an entire intra picture, a gradual decoder refresh period can be signalled and coded. Partially updated images during the period can be viewed if desired, which may be visually pleasing.

Using gradual decoder refresh instead of entire intra pictures smoothes out fluctuations in bit-rate and reduces the end-to-end transmission delay. End-users perceive that a picture is displayed faster in the initialization of the session. A receiving terminal requests the far-end encoder for an intra picture update if the received picture is too corrupted. In such a case, end-users perceive a shorter drop in picture rate when the invention is used.

Compared to gradual quantization refinement and gradual resolution refinement, the method provides a more stable image quality as a response to intra picture update request, which is generally considered less annoying.

A major advantage of the invention is that it stops completely the spatio-temporal error propagation. This characteristic has not been available earlier in complex coding schemes, such as the JVT design, with reference picture selection, loop filtering, and fractional pixel interpolation.

Thus, the disclosed method can be used as an error-aware encoding method with pre-determined reliable macroblock update pattern. Note that the number of updated macroblocks per frame in the pre-determined pattern algorithms can change according to selected conditions but the order of updated macroblocks remains the same. Consequently, the method has two simultaneous benefits: while stopping error propagation by intra coding, it also provides a possibility for perfect random access.

The method allows transmitting reliable regions with a better error protection than other regions. Thus, the method outperforms conventional coding with an intra update method where this kind of transport prioritisation is not possible. The reliable region can be protected better than the rest of the coded data against transmission errors. In practice, more redundancy, such as forward error coding, can be applied to reliable regions. Alternatively, reliable regions can be sent through a channel that has better quality of service (QoS) guarantees than the channel used for normal video data transmission. In unicast streaming, when a server is requested to start streaming from a gradual random access position, it does not need to transmit non-reliable areas (background sub-pictures) at all.

Many types of video material, such as news, movies trailers, and music videos, contain frequent scene cuts. Sometimes scene cuts are abrupt, but in many cases, transitions, such as fades or wipes, are applied. Coding of a scene transition is often a challenging problem from compression efficiency point of view, because motion compensation may not be a powerful enough method to represent the changes between pictures in the transition.

Scene transitions can be categorised, for example, to abrupt, masked, faded, and hybrid scene transitions. Abrupt transitions are such that there is no transition period and no picture where the contents of the two subsequent scenes are present at the same time. Masked transitions are such that the second scene spatially uncovers from the first scene in gradual manner. All pictures are displayed at full intensity. Coding of a masked scene transition typically involves at least one intra frame. Examples of masked scene transitions include box-in, box-out, wipes, splits, and dissolve. Faded

transitions are such that the pictures of the two scenes are laid on top of each other in semi-transparent manner, and the transparency of the pictures at the top gradually changes in the transition period. Examples of faded transitions include a normal cross-fade and fade through (from and to) black. Hybrid scene transitions are a combination of masked and faded transitions.

The method according to the invention also provides benefits when applying to scene transitions, especially to masked scene transitions. Thereby, a transition can be accessed randomly without coding a full intra picture. When sub-picture-based gradual decoder refresh is in use and when a transition is accessed randomly, the coded data of the first scene of the transition need not be transmitted, decoded, and displayed. Furthermore, a masked scene transition can be coded on purpose to obtain less fluctuations in the coded video bit-rate than if abrupt scene changes were used.

The above describes a method of coding gradual decoder refresh random access points into a video sequence. In concrete terms, this is performed in a video encoder, which may be a video encoder known *per se*. The video encoder used could be for instance a video encoder according to the ITU-T recommendations H.263 or H.26L, which, in accordance with the invention, is arranged to determine a first reliable region that comprises at least one intra-coded coding block, and to encode said first reliable region in said video sequence such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

Correspondingly, decoding takes place in a video encoder, which may be a video decoder known *per se*. The video decoder used could be for instance a low bit rate video decoder according to the ITU-T recommendations H.263 or H.26L, which, in accordance with the invention, is arranged to receive information that determines a first reliable region of the video sequence, the reliable region comprising at least one intra-coded coding block, and to decode said first reliable region from said video sequence such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

The different parts of video-based telecommunication systems, particularly terminals, may comprise properties to enable bi-directional transfer of multimedia files, i.e. transfer and reception of files. This allows the encoder

and decoder to be implemented as a video codec comprising the functionalities of both an encoder and a decoder.

It is to be noted that the functional elements of the invention in the above video encoder, video decoder and terminal can be implemented preferably as software, hardware or a combination of the two. The coding and decoding methods of the invention are particularly well suited to be implemented as computer software comprising computer-readable commands for carrying out the functional steps of the invention. The encoder and decoder can preferably be implemented as a software code stored on storage means and executable by a computer-like device, such as a personal computer (PC) or a mobile station, for achieving the coding/decoding functionalities with said device.

Fig. 6 shows a block diagram of a mobile communication device MS according to the preferred embodiment of the invention. In the mobile communication device, a Master Control Unit MCU controls blocks responsible for the mobile communication device's various functions: a Random Access Memory RAM, a Radio Frequency part RF, a Read Only Memory ROM, video codec CODEC and a User Interface UI. The user interface comprises a keyboard KB, a display DP, a speaker SP and a microphone MF. The MCU is a microprocessor, or in alternative embodiments, some other kind of processor, for example a Digital Signal Processor. Advantageously, the operating instructions of the MCU have been stored previously in the ROM memory. In accordance with its instructions (i.e. a computer program), the MCU uses the RF block for transmitting and receiving data over a radio path. The video codec may be either hardware based or fully or partly software based, in which case the CODEC comprises computer programs for controlling the MCU to perform video encoding and decoding functions as required. The MCU uses the RAM as its working memory. The mobile communication device can capture motion video by the video camera, encode and packetise the motion video using the MCU, the RAM and CODEC based software. The RF block is then used exchange encoded video with other parties.

Figure 7 shows video communication system 70 comprising a plurality of mobile communication devices MS, a mobile telecommunications network 71, the Internet 72, a video server 73 and a fixed PC connected to the

Internet. The video server has a video encoder and can provide on-demand video streams such as weather forecasts or news.

The preferred embodiment of the invention is based on a region-based coding scheme.

The invention can also be implemented as a video signal comprising a video sequence, the video sequence being composed of video frames, wherein at least one video frame is divided into a set of coding blocks and at least one of said coding blocks is encoded by intra-coding. The video signal further comprises information that determines a first reliable region of the video sequence, the reliable region comprising at least one intra-coded coding block, and information for decoding said first reliable region from said video sequence such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented. The video signal can be a real-time transmitted signal or it can be stored on a computer-readable carrier using a media, like a mass memory or a playback video disk.

It is obvious to a person skilled in the art that as technology advances, the basic idea of the invention can be implemented in a variety of ways. The invention and its embodiments are thus not limited to the above examples, but may vary within the claims.

The Swedish Patent Office
PCT International Application

CLAIMS

1. A method of encoding a video sequence, the video sequence being composed of video frames, the method comprising

dividing at least one video frame into a set of coding blocks,

encoding at least one of said coding blocks by intra-coding,

determining a first reliable region that comprises at least one intra-coded coding block, **characterized** by

predicting a subsequent coding block of said reliable region from a reliable region of a previous video frame, and

encoding said first reliable region including said subsequent coding block in said video sequence such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

2. A method as claimed in claim 1, **characterized** by

preventing said information dependency by turning off loop filtering at the borders of said reliable region.

3. A method as claimed in claim 1 or 2, **characterized** by

preventing said information dependency by referring only to the coding blocks of said reliable region, when applying motion compensated prediction.

4. A method as claimed in any one of the preceding claims, **characterized** by

preventing said information dependency by disabling motion interpolation of pixel values at the borders of said reliable region.

5. A method as claimed in any one of the preceding claims, **characterized** by

encoding said reliable region into a video sequence as a sub-picture.

6. A method as claimed in any one of the preceding claims, **characterized** by

encoding the coding blocks of said reliable region first in raster scan order, and

encoding thereafter the coding blocks outside said first reliable region in raster scan order.

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7. A method as claimed in any one of the preceding claims, **characterized** by

encoding a plurality of reliable regions in the same video frame.

8. A method as claimed in any one of the preceding claims, **characterized** by

encoding at least one reliable region into a non-rectangular shape.

9. A method as claimed in any one of the preceding claims, **characterized** by

encoding in said video sequence parameters for decoding said video sequence, said parameters including at least one of following:

- a parameter defining a type of the reliable region;
- a parameter defining a number of simultaneous reliable regions;
- a parameter defining a shape evolution type of the reliable region;
- a parameter defining a growth rate of the reliable region.

10. A method as claimed in claim 9, **characterized** by

said parameter defining a shape evolution type of the reliable region being defined by at least one of the following parameter values: raster scan, reverse raster scan, wipe right, wipe left, box-out clockwise, box-out counter-clockwise, pre-defined free-form, pre-defined static rectangle, dynamic rectangle.

11. A method as claimed in claim 9 or 10, **characterized** by

encoding at least one of the parameters in a slice header, said slice being composed of at least one coding block.

12. A video encoder for encoding a video sequence, the video sequence being composed of video frames, the encoder being arranged to

divide at least one video frame into a set of coding blocks,

encode at least one of said coding blocks by intra-coding,

determine a first reliable region that comprises at least one intra-coded coding block, **characterized** in that the encoder being further arranged to

predicting a subsequent coding block of said reliable region from a reliable region of a previous video frame, and to

encode said first reliable region including said subsequent coding block in said video sequence such that creation of an information dependency

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between said first reliable region and coding blocks outside said first reliable region is prevented.

13. Computer software stored on a computer-readable carrier for encoding a video sequence, the video sequence being composed of video frames the computer software comprising

software means for dividing at least one video frame into a set of coding blocks,

software means for encoding at least one of said coding blocks by intra-coding,

software means for determining a first reliable region that comprises at least one intra-coded coding block, **characterized** in that the computer software further comprising

software means for predicting a subsequent coding block of said reliable region from a reliable region of a previous video frame, and

software means for encoding said first reliable region in said video sequence such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

14. The use of a sub-picture in encoding a video sequence, the video sequence being composed of video frames, wherein at least one video frame is divided into a set of coding blocks, at least one of said coding blocks is encoded by intra-coding, a sub-picture is determined as a first reliable region that comprises at least one intra-coded coding block, a subsequent coding block of said reliable region is predicted from a reliable region of a previous video frame, and said sub-picture including said subsequent coding block as the first reliable region is encoded in said video sequence such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

15. A method of decoding a video sequence, the video sequence being composed of video frames, wherein at least one video frame is divided into a set of coding blocks and at least one of said coding blocks is encoded by intra-coding, **characterized** by

receiving information that determines a first reliable region of the video sequence and a shape evolution type of the reliable region, the reliable region comprising at least one intra-coded coding block, and

decoding said first reliable region from said video sequence according to the shape evolution type such that creation of an information depend-

ency between said first reliable region and coding blocks outside said first reliable region is prevented.

16. A method as claimed in claim 15, **characterized** by

preventing said information dependency by turning off loop filtering at the borders of said reliable region.

17. A method as claimed in claim 15 or 16, **characterized** by

preventing said information dependency by referring only to the coding blocks of said reliable region, when applying motion compensated prediction.

18. A method as claimed in any one of the claims 15 - 17, **characterized** by

preventing said information dependency by disabling motion interpolation of pixel values at the borders of said reliable region.

19. A method as claimed in any one of the claims 15 - 18, **characterized** by

decoding the coding blocks of said reliable region first in raster scan order, and

decoding thereafter the coding blocks outside said first reliable region in raster scan order.

20. A method as claimed in any one of the claims 15 - 19, **characterized** by

decoding said video sequence according to parameters, which, in addition to the shape evolution type, include at least one of following:

- a parameter defining a type of the reliable region;
- a parameter defining a number of simultaneous reliable regions;
- a parameter defining a growth rate of the reliable region.

21. A method as claimed in any one of the claims 15 - 20, **characterized** by

said parameter defining a shape evolution type of the reliable region being defined by at least one of the following parameter values: raster scan, reverse raster scan, wipe right, wipe left, box-out clockwise, box-out counter-clockwise, pre-defined free-form, pre-defined static rectangle, dynamic rectangle.

22. A decoder for decoding a video sequence, the video sequence being composed of video frames, wherein at least one video frame is divided

into a set of coding blocks and at least one of said coding blocks is encoded by intra-coding, **characterized** in that the decoder is arranged to

receive information that determines a first reliable region of the video sequence and a shape evolution type of the reliable region, the reliable region comprising at least one intra-coded coding block, and to

decode said first reliable region from said video sequence according to the shape evolution type such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

23. Computer software stored on a computer-readable carrier for decoding a video sequence, the video sequence being composed of video frames, wherein at least one video frame is divided into a set of coding blocks and at least one of said coding blocks is encoded by intra-coding, **characterized** in that the computer software comprises

software means for receiving information that determines a first reliable region of the video sequence and a shape evolution type of the reliable region, the reliable region comprising at least one intra-coded coding block, and

software means for decoding said first reliable region from said video sequence according to the shape evolution type such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

24. A video signal comprising a video sequence, the video sequence being composed of video frames, wherein at least one video frame is divided into a set of coding blocks and at least one of said coding blocks is encoded by intra-coding, **characterized** in that the video signal further comprises information that determines a first reliable region of the video sequence and a shape evolution type of the reliable region, the reliable region comprising at least one intra-coded coding block, and information for decoding said first reliable region from said video sequence according to the shape evolution type such that creation of an information dependency between said first reliable region and coding blocks outside said first reliable region is prevented.

25. A terminal for decoding a video sequence, **characterized** in that the terminal comprises a decoder according to claim 22.

AMENDED SHEET

26. A network element of a telecommunication network for encoding a video sequence, **characterized** in that the network element comprises an encoder according to claim 12.

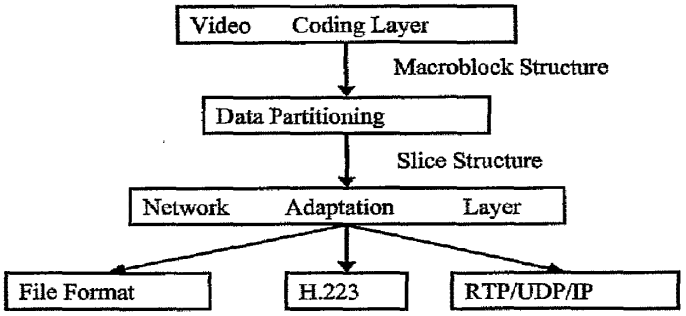


Fig. 1

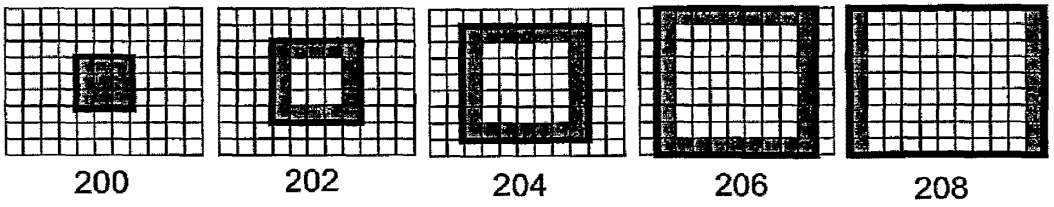


Fig. 2

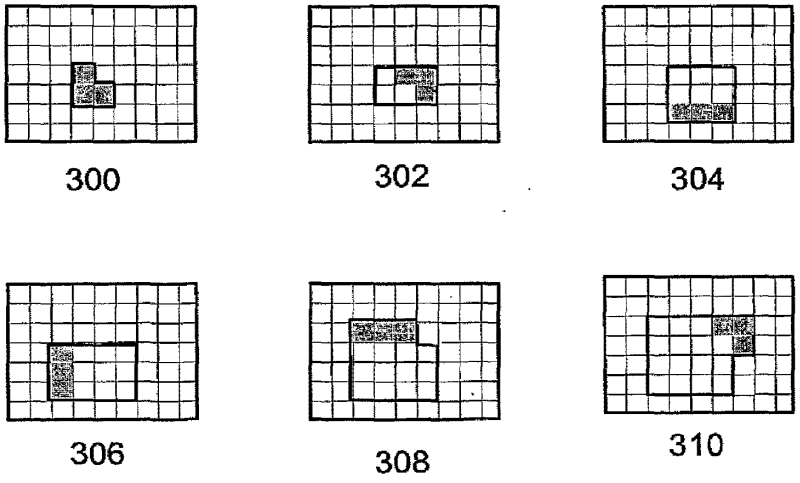


Fig. 3

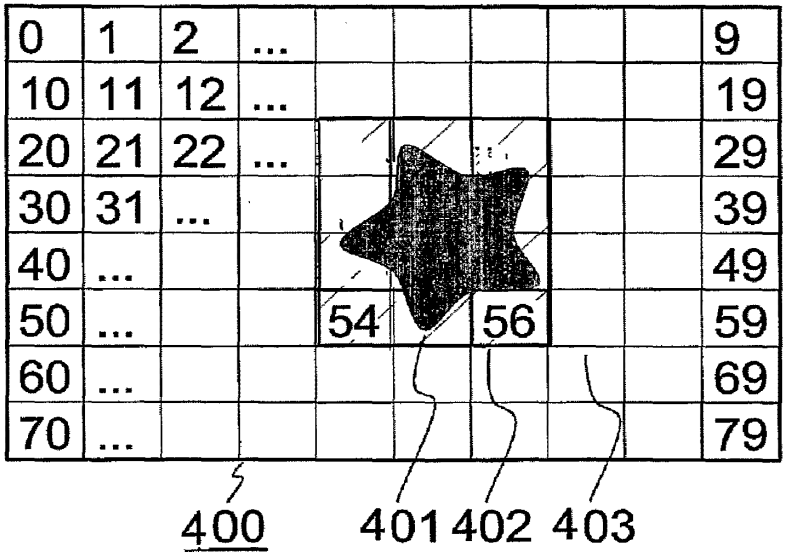

0 1 2 ... 9
10 11 12 ... 19
20 21 22 ... 29
30 31 ... 39
40 ... 49
50 ... 54 56 59
60 ... 69
70 ... 79
400
401
402
403

Fig. 4

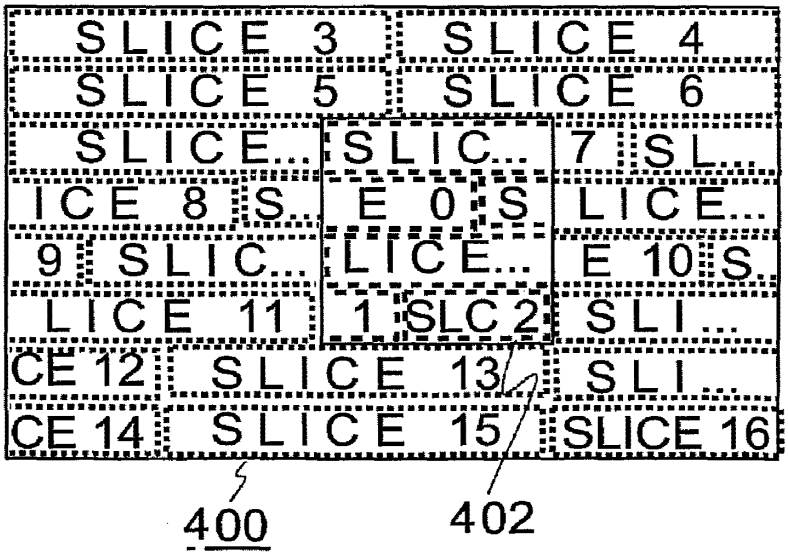

SLICE 3
SLICE 4
SLICE 5
SLICE 6
SLICE...
SLIC...
7
SL...
ICE 8
S...
E 0
S
LICE...
9
SLIC...
LICE...
E 10
S.
LICE 11
1
SLC 2
SLI...
CE 12
SLICE 13
SLI...
CE 14
SLICE 15
SLICE 16
400
402

Fig. 5

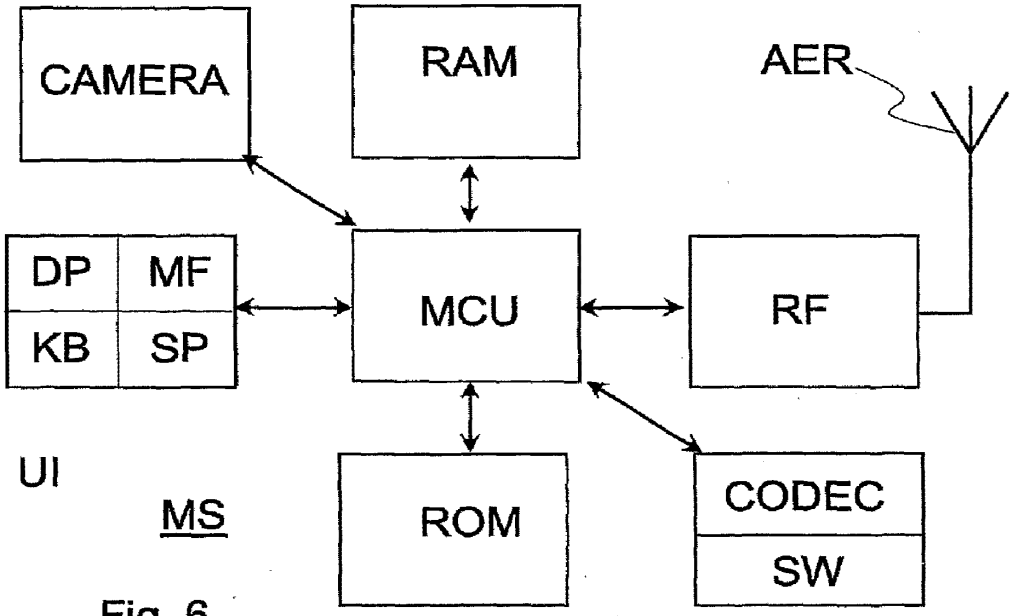

CAMERA
RAM
AER
DP
MF
KB
SP
MCU
RF
UI
MS
ROM
CODEC
SW

Fig. 6

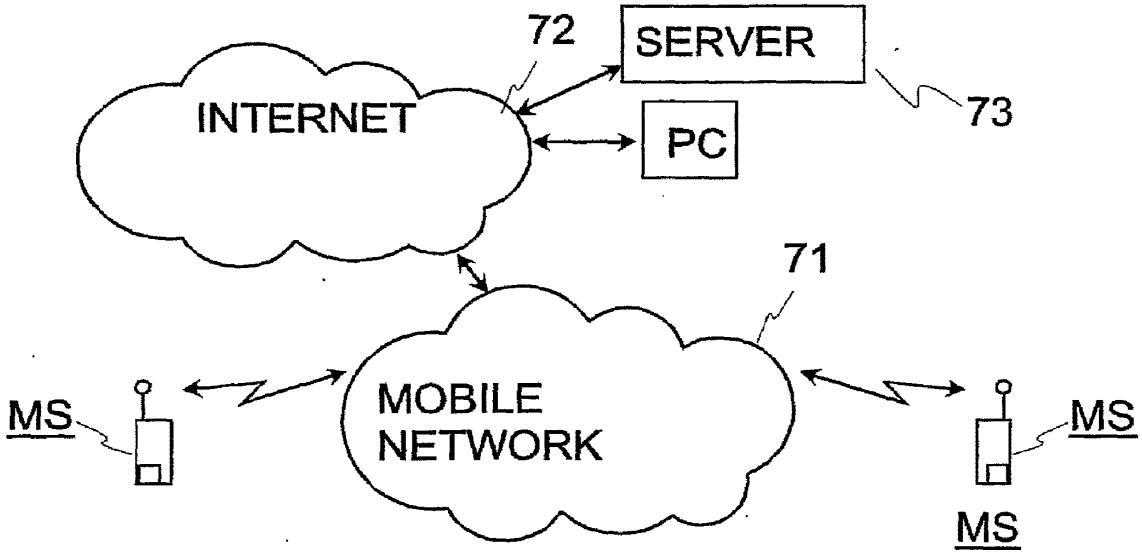

72
SERVER
INTERNET
73
PC
71
MS
MOBILE
NETWORK
MS
MS
70

Fig. 7

PATENT COOPERATION TREATY
PCT
INTERNATIONAL SEARCH REPORT
(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
373-05 PCT		
International application No. PCT/CA2009/001297	International filing date *(day/month/year)* 18 September 2009 (18-09-2009)	(Earliest) Priority date *(day/month/year)* 18 September 2008 (18-09-2008)

Applicant

MAGOR COMMUNICATIONS CORPORATION ET AL

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of :

[X] the international application in the language in which it was filed

[ ] a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a))

c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box II).

3. [ ] **Unity of invention is lacking** (See Box III).

4. With regard to the **title**,

[X] the text is approved as submitted by the applicant.

[ ] the text has been established by this Authority to read as follows :

5. With regard to the **abstract**,

[X] the text is approved as submitted by the applicant

[ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. The figure of the **drawings** to be published with the abstract is Figure No. **3**

[X] as suggested by the applicant

[ ] as selected by this authority, because the applicant failed to suggest a figure

[ ] as selected by this Authority, because this figure better characterizes the invention

b. [ ] none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2009/001297

A. CLASSIFICATION OF SUBJECT MATTER
IPC : ***H04N-7/50*** **(2006.01)**; ***H04N-7/15*** **(2006.01)**

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: H04N-7/50 (2006.01); H04N-7/15 (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of data base, and, where practicable, search terms used) :

Databases : Delphion, West, USPTO, Espacenet, Canadian Patent Database
Keywords : video conferencing; telepresence session; frame segments/divisions/slices; real-time video; smoothing peak bitrates; limiting data bursts; decoding latency; delay slice transmission; parallel encoding; talking heads; motion comparison

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5057916 (KRAUSE et al.) 15 October 1991 (15.10.1991), abstract; figs. 4-5; col. 3, line 64 - col. 4, line 36; col. 4, line 64 - col. 5, line 49;	1-10, 15, 40, 41
Y	CA 2483293 (WANG et al.) 13 November 2003 (13.11.2003), abstract; figs 4-5; page 19, lines 12-35; page 21, lines 11-31; page 22, lines 7-36	1-10, 15, 40, 41
Y	US 20020114525 (BOLLE et al.) 22 August 2002 (22.08.2002), abstract; figs. 7A, 10; paras [0029 - 0031] and [0078]	7-10, 41
A	US 20010026677 (CHEN et al.) 4 October 2001 (04.10.2001), abstract; claims 1-2; fig. 10; paras [0005], [0022 - 0024] and [0026]	1-41
A	US 20050201471 (HANNUKSELA et al.) 15 September 2005 (15.09.2005), abstract; fig. 4; paras [0011 - 0012], [0023] and [0068]	1-41

[ ] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel, or cannot be considered to involve an inventive step, when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 December 2009 (09-12-2009)	16 December 2009 (16-12-2009)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No. 001-819-953-2476	Authorized officer Terry Cartile 819- 997-2951

Patent Document Cited in the Search Report		Publication Date (dd.mm.yyyy)	Patent Family Members	Publication Date(s) (dd.mm.yyyy)
Y	US 5057916	15.10.1991	NO 0914318 A0	04.11.1991
			JP 04286489 A2	12.10.1992
			IE 913490 A1	20.05.1992
			EP 0485798 A2	20.05.1992
			CA 2053392	17.05.1992
			AU 8788891 A1	21.05.1992
Y	CA 2483293	13.11.2003	WO 03/094530 A1	13.11.2003
			US 7302001	27.11.2007
			KR 6065740 A	14.06.2006
			JP 2006505153 T2	09.02.2006
			FI 20020810 A0	29.04.2002
			EP 1500280 A1	26.01.2005
			CN 1774934 A	17.05.2006
			BR 0309713 A	15.02.2005
			AU 3229800 AA	17.11.2003
Y	US 20020114525	22.08.2002	None	
A	US 20010026677	04.10.2001	WO 02/32146 A1	18.04.2002
			US 7046910	16.05.2006
			TW 0545064 B	01.08.2003
			ES 2223941 T3	01.03.2005
			EP 1323314 A1	02.07.2003
			DE 60104013 C0	29.07.2004
			CN 1164106 C	25.08.2004
			CA 2286448	20.05.2000
			AU 0224342 A5	22.04.2002
			AT 0270021 E	15.07.2004
A	US 20050201471	15.09.2005	ZA 0606634 A	28.11.2007
			WO 05/079070 A1	25.08.2005
			SG 0153870 A1	29.07.2009
			RU 6128854 A	20.03.2008
			KR 6116245 A	14.11.2006
			JP 2007522749 T2	09.08.2007
			EP 1714490 A1	25.10.2006
			CN 1934865 A	21.03.2007
			CA 2556120	28.08.2005
			BR 0507925 A	17.07.2007
			AU 5212996 AA	25.08.2005

Electronic Acknowledgement Receipt

EFS ID:	6807770
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	25319
Filer:	Mark Robert Weir/Doreen Salter
Filer Authorized By:	Mark Robert Weir
Attorney Docket Number:	373-05 US
Receipt Date:	14-JAN-2010
Filing Date:	18-SEP-2008
Time Stamp:	09:52:44
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	Transmittal Letter	transmittal.pdf	25249 f3da51cda3154f31364d257afee28a6395446807	no	1

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Filed (SB/08)	PTO_SB_08a.pdf	105857 e949dd0ff27e3dbe0233ba324a8af5742bea2cfb	no	3
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	CA2483293.pdf	1770283 c1d7bba850b7dc1ad3293073f66862a9dce884c1	no	39
Warnings:					
Information:					
4	NPL Documents	ISR.pdf	110449 208166816892d2ac4bc7ca1fff5781120a037e67	no	3
Warnings:					
Information:					
			Total Files Size (in bytes):	2011838	

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

Application No:	12/232,496	Confirmation No.:	9197
Inventors:	Patrick WHITE et al.		
Filed:	09/18/2008		
TC/A.U.:	2614		
Examiner:	Unknown		
Docket No.:	373-05 US		
Title:	**LOW LATENCY HIGH RESOLUTION VIDEO ENCODING**		
Customer No.:	25319		

January 14, 2010

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
U.S.A.

Information Disclosure Statement
- Under 37 CFR 1.97(e)(1)

Sir:

Applicant submits herewith an Information Disclosure Statement (Form PTO/SB/08a) listing US cited references, a foreign patent reference, and a non-patent document (International Search Report) listed therein.

The documents listed in the IDS were cited in the International Search Report (enclosed) mailed **December 16, 2009**, from the Canadian Intellectual Property Office in the corresponding PCT application not more than three months prior to the filing of this statement.

Respectfully submitted,

/Mark Robert Weir, Reg.#54949/
Mark Robert Weir

Freedman & Associates
117 Centrepointe Drive, Suite 350
Nepean, Ontario K2G 5X3
CANADA

Tel: (613) 274-7272
Fax: (613) 274-7414
Email: info@freedmanandassociates.ca

Enclosures: copy of Form PTO/SB/08a
copy of foreign patent reference
copy of non-patent document (International Search Report)

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/232,496	09/18/2008	2614	1145	373-05 US	41	4

CONFIRMATION NO. 9197

UPDATED FILING RECEIPT

25319
FREEDMAN & ASSOCIATES
117 CENTREPOINTE DRIVE
SUITE 350
NEPEAN, ONTARIO, K2G 5X3
CANADA



Date Mailed: 11/03/2008

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 submit a written request for a Filing Receipt Correction. 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)

Patrick White, Renfrew, CANADA;
Mojtaba Hosseini, Ottawa, CANADA;

Assignment For Published Patent Application

Magor Communications Corporation, Ottawa, CANADA

Power of Attorney: The patent practitioners associated with Customer Number 25319

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted: 10/06/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/232,496**

Projected Publication Date: 03/18/2010

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **

Title

Low latency high resolution video encoding

Preliminary Class

348

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of: WHITE et al.

Our File No.: 373-05 US

Application No.: 12/232,496

Group Art Unit: 2614

Filed: September 18, 2008

Examiner: Unknown

Title: Low Latency High Resolution Video Encoding

Conf. No.: 9197

Customer No.: 25319

October 27, 2008

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
U.S.A.

Response to Notice to File Corrected Application Papers

Sir:

In response to the Notice to File Corrected Application Papers mailed October 9, 2008, please find enclosed the following document:

- Replacement formal drawings Figures 1 - 5 (4 sheets). The drawings are replaced in compliance with 37 CFR 1.84 and 37 CFR 1.121(d).

Please charge any fees or credit overpayment to Deposit Account No: 50-1142.

Respectfully submitted,

/Mark Robert Weir, Reg.#54949/
Mark Robert Weir

Freedman & Associates
117 Centrepointe Drive, Suite 350
Nepean, Ontario K2G 5X3
CANADA

Tel: (613) 274-7272
Fax: (613) 274-7414
Email: info@freedmanandassociates.ca

Enclosures: Replacement formal drawings Figures 1-5 (4 sheets)

/ds

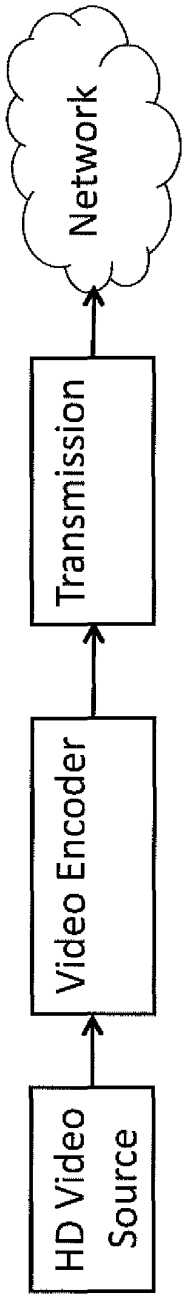


Figure 1

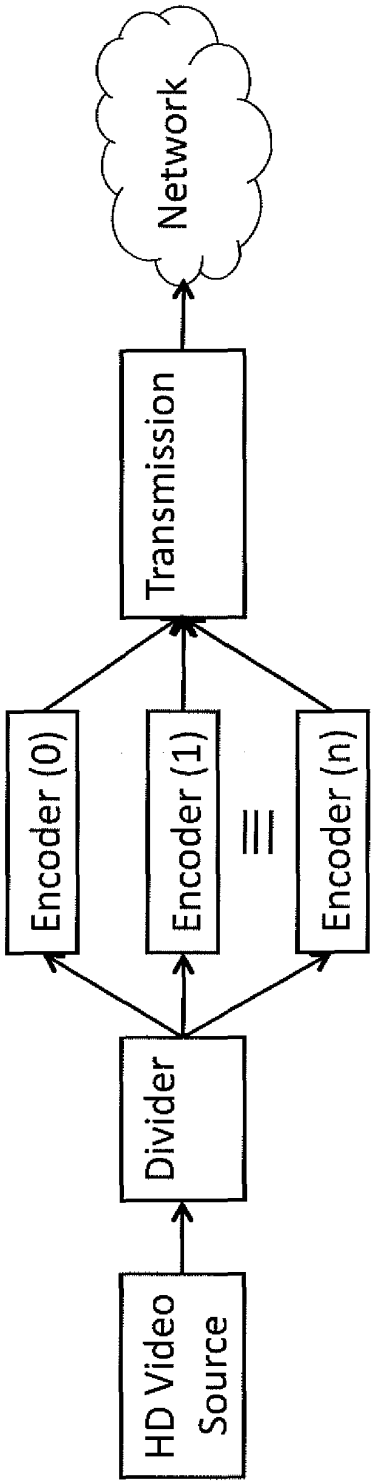


Figure 3

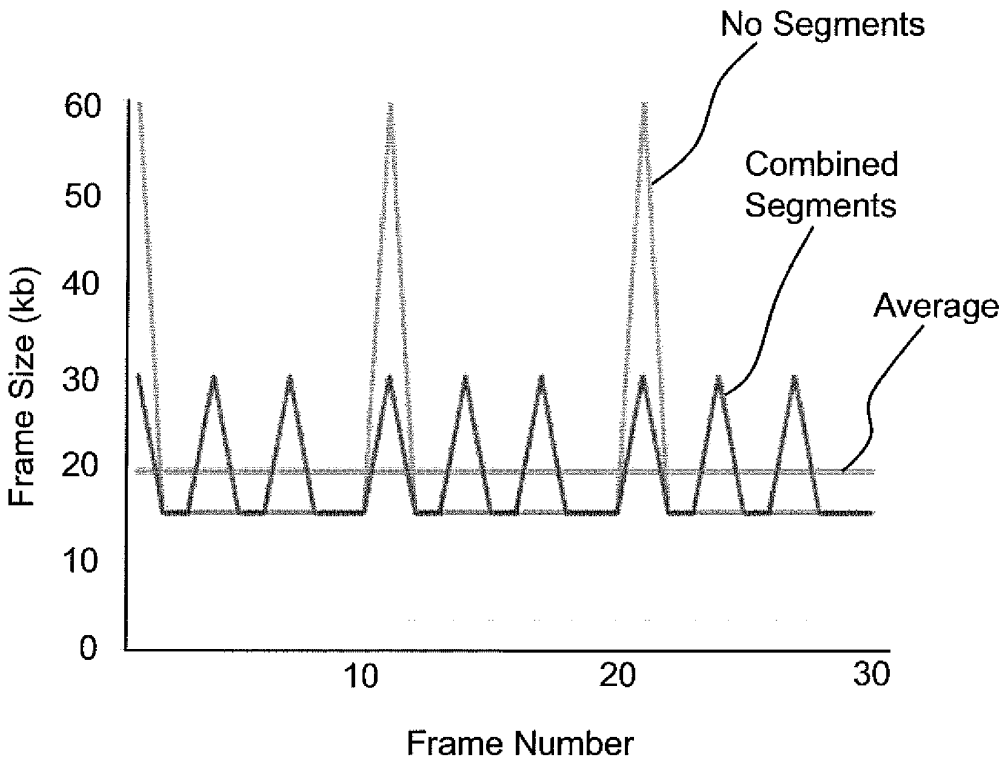

No Segments
Combined Segments
Average
60
50
40
30
20
10
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Frame Size (kb)
10
20
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Frame Number

Figure 2

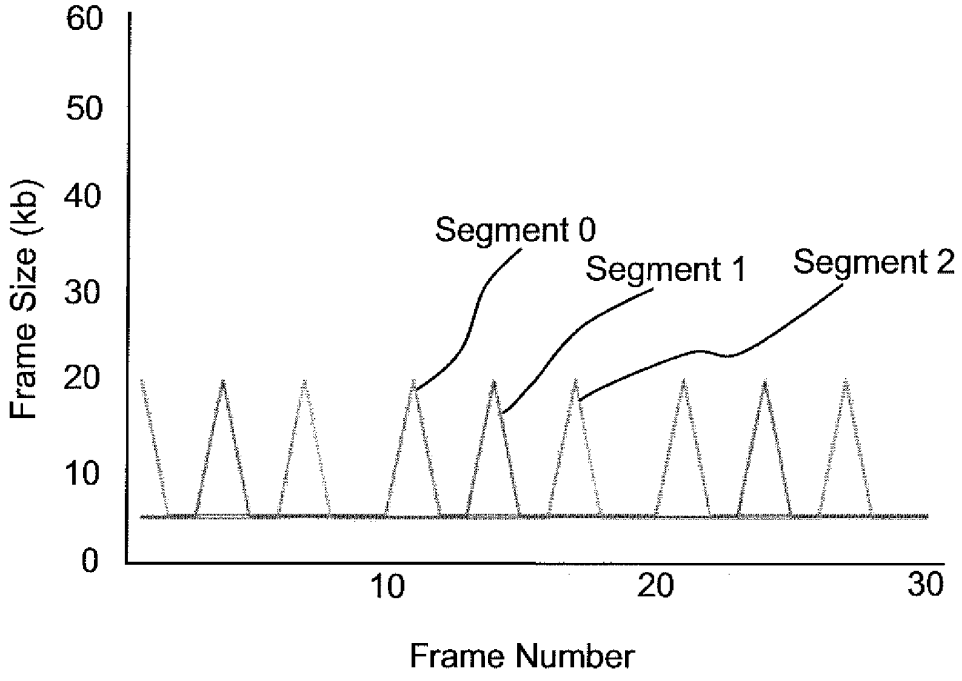

60
50
40
30
20
10
0
Frame Size (kb)
Segment 0
Segment 1
Segment 2
10
20
30
Frame Number

Figure 4

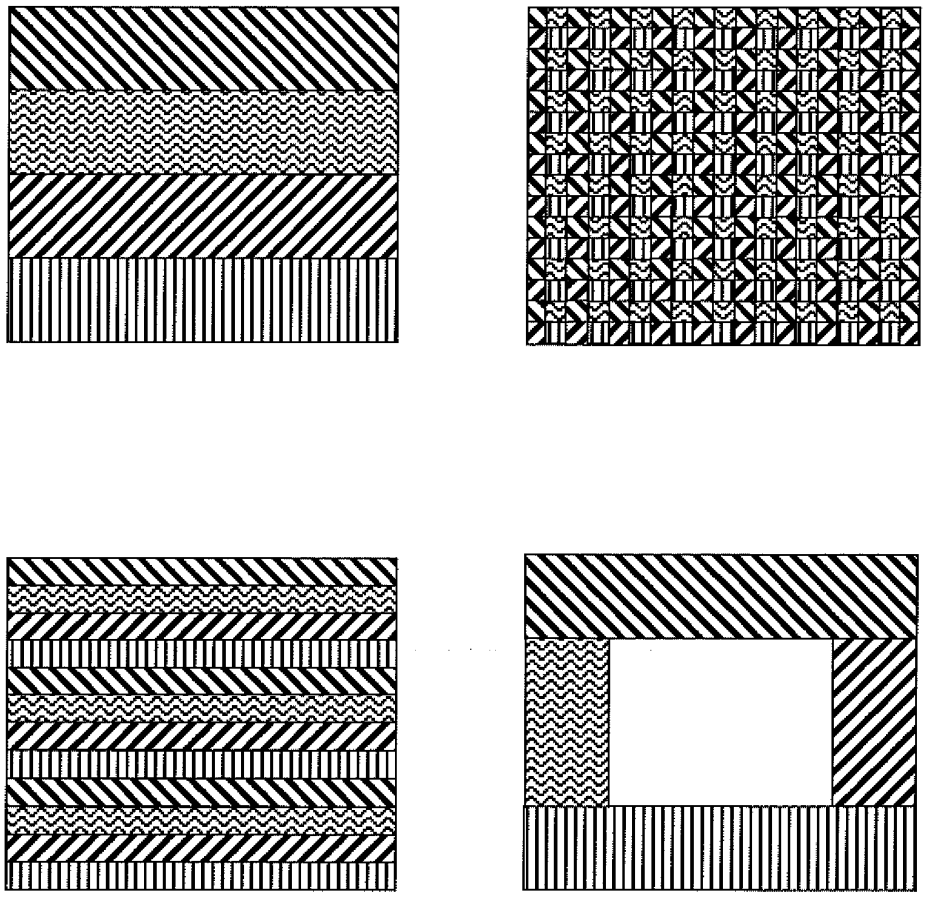


Figure 5

Electronic Acknowledgement Receipt

EFS ID:	4177893
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	25319
Filer:	Mark Robert Weir/Doreen Salter
Filer Authorized By:	Mark Robert Weir
Attorney Docket Number:	373-05 US
Receipt Date:	27-OCT-2008
Filing Date:	18-SEP-2008
Time Stamp:	09:59:30
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	Applicant Response to Pre-Exam Formalities Notice	letter.pdf	21921 63be038db4caf8c47e15deb1ac004bf0a0ce91d3	no	1

Warnings:	
Information:	

2	Drawings-only black and white line drawings	drawings.pdf	69889 eb1712c6e6d207422ec7d3072fbef9ca74bac546	no	4
Warnings:					
Information:					
			Total Files Size (in bytes):	91810	

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 Patent Application of: WHITE et al.

Our File No.: 373-05 US

Application No.: 12/232,496

Group Art Unit: 2614

Filed: September 18, 2008

Examiner: Unknown

Title: Low Latency High Resolution Video Encoding

Conf. No.: 9197

Customer No.: 25319

October 27, 2008

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
U.S.A.

Information Disclosure Statement
- Under 37 CFR 1.97(e)(1)

Sir:

Applicant submits herewith an Information Disclosure Statement (Form PTO/SB/08a) listing one (1) US cited reference for the Examiner's review.

The document listed in the IDS is being filed within three months of the filing date of the instant application and as such no fee is required.

Respectfully submitted,

/Mark Robert Weir, Reg.#54949/
Mark Robert Weir

Freedman & Associates
117 Centrepointe Drive, Suite 350
Nepean, Ontario K2G 5X3
CANADA

Tel: (613) 274-7272
Fax: (613) 274-7414
Email: info@freedmanandassociates.ca

Enclosure: Copy of Form PTO/SB/08a

/ds

Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (09-08)
Approved for use through 10/31/2008. 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 contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE
	Art Unit	2614
	Examiner Name	Unknown
	Attorney Docket Number	373-05 US

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5430486		2005-07-04	FRASER et al.	
If you wish to add additional U.S. Patent citation information please click the Add button.						Add

U.S.PATENT APPLICATION PUBLICATIONS						Remove
Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					
If you wish to add additional U.S. Published Application citation information please click the Add button.						Add

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐
If you wish to add additional Foreign Patent Document citation information please click the Add button								Add

NON-PATENT LITERATURE DOCUMENTS			Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE
	Art Unit	2614
	Examiner Name	Unknown
	Attorney Docket Number	373-05 US

	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12232496
	Filing Date	2008-09-18
	First Named Inventor	Patrick WHITE
	Art Unit	2614
	Examiner Name	Unknown
	Attorney Docket Number	373-05 US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the 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 information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ 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, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Mark Robert Weir, Reg.#54949/	Date (YYYY-MM-DD)	2008-10-27
Name/Print	Mark Robert Weir	Registration Number	54,949

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

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 the Freedom of Information Act requires disclosure of these record s.

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 inspections 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 Acknowledgement Receipt

EFS ID:	4179104
Application Number:	12232496
International Application Number:	
Confirmation Number:	9197
Title of Invention:	Low latency high resolution video encoding
First Named Inventor/Applicant Name:	Patrick White
Customer Number:	25319
Filer:	Mark Robert Weir/Doreen Salter
Filer Authorized By:	Mark Robert Weir
Attorney Docket Number:	373-05 US
Receipt Date:	27-OCT-2008
Filing Date:	18-SEP-2008
Time Stamp:	12:44:38
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	Information Disclosure Statement Letter	transmittal_ltr.pdf	20163 c6b641adab6e05b972cb991fb01484ea8bb72f38	no	1

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Filed (SB/08)	IDS_Form__SB_08a.pdf	607685 deb4176a44d5730bdff3df7c3158ef2fff7dc7da	no	4
Warnings:					
Information:					
		Total Files Size (in bytes):	627848		

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 NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/232,496	09/18/2008	2614	1145	373-05 US	41	4

CONFIRMATION NO. 9197

25319
FREEDMAN & ASSOCIATES
117 CENTREPOINTE DRIVE
SUITE 350
NEPEAN, ONTARIO, K2G 5X3
CANADA

FILING RECEIPT



Date Mailed: 10/09/2008

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 submit a written request for a Filing Receipt Correction. 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)

Patrick White, Renfrew, CANADA;
Mojtaba Hosseini, Ottawa, CANADA;

Assignment For Published Patent Application

Magor Communications Corporation, Ottawa, CANADA

Power of Attorney: The patent practitioners associated with Customer Number 25319

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted: 10/06/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/232,496**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **

Title

Low latency high resolution video encoding

Preliminary Class

348

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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
12/232,496	09/18/2008	Patrick White	373-05 US

CONFIRMATION NO. 9197

25319
FREEDMAN & ASSOCIATES
117 CENTREPOINTE DRIVE
SUITE 350
NEPEAN, ONTARIO, K2G 5X3
CANADA

FORMALITIES LETTER

OC000000032478852

Date Mailed: 10/09/2008

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given TWO MONTHS from the date of this Notice within which to correct the informalities indicated below. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
  - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 1,3.
  - Numbers, letters, and reference characters on the drawings must measure at least 0.32 cm (1/8 inch) in height. See Figure(s) 1,4.
  - The drawings submitted to the Office are not electronically reproducible because portions of figures 5A-5D are missing and/or blurry.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/wjsale/

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

15949 U.S. PTO
091808

U.S. PTO
12/232496
09/18/2008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

Utility Patent Application Transmittal

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No: 373-05 US Date: September 18, 2008
First Inventor: Patrick WHITE
Title: Low Latency High Resolution Video Encoding

Application Elements:

1. ☒ Fee Calculation (see Box 14)
2. ☒ Applicant claims small entity status.
3. ☒ Specification — Total Pages - **20**
   - Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☒ Drawing(s) - (5 Figures) — Total Sheets - **3**
5. ☒ Oath or Declaration — Total Pages - **1**
   a. ☒ Newly executed (original or copy)
   b. ☐ Unexecuted
   c. ☐ Copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional with Box 12 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).

Accompanying Application Parts:

6. ☒ Application Data Sheet (ADS)
7. ☐ Assignment Papers (cover sheet & document(s))
8. ☐ Information Disclosure Statement (IDS)/PTO-1449 Copies of IDS Citations ☐
9. ☐ Preliminary Amendment
10. ☒ Return Receipt Postcard *(Should be specifically itemized)*
11. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*

12. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

of prior Application No. filed

Prior application information: Examiner: Group Art Unit:

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5c, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon which a portion has been inadvertently omitted from the submitted application parts.

13. CORRESPONDENCE ADDRESS:

Customer Number: **25319**
Freedman & Associates
117 Centrepointe Drive, Suite 350
Nepean, Ontario
K2G 5X3 CANADA
Tel: (613) 274-7272
Fax: (613) 274-7414
Agent: Gordon Freedman, Registration No. 41,553

14. **FEE CALCULATION:**

☒ Applicant Claims Small Entity Status

					AMOUNT
1. **BASIC FILING FEE**					
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee ($)		
1011	310.00	2011	155.00		**$155.00**
2. **SEARCH FEE**					
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee ($)		
1111	510.00	2111	255.00		**$255.00**
3. **EXAMINATION FEE**					
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee (S)		
1311	210.00	2311	105.00		**$105.00**
4. **EXTRA CLAIM FEES**			Extra Claims	Fee From Below	
Total Claims	41 - 20 =		21	x $25 =	**$525.00**
Independent Claims	4 - 3 =		1	x $105 =	**$105.00**
Multiple Dependent				$** =	
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee ($)		
1202	50.00	2202	25.00		
1201	210.00	2201	105.00		
5. **OTHER**					
Fee Code – 8021	Fee ($) - 40.00	Recording Patent Assignment			
				TOTAL	**$1,145.00**

15. ☒ **The Commissioner is hereby authorized to charge all fees in Box 14 above to Deposit Account 50-1142.**

16. ☒ **The Commissioner is hereby authorized to charge any additional fees required or credit any overpayment to Deposit Account No. 50-1142.**

Submitted By

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

Utility Patent Application Transmittal

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No: 373-05 US Date: September 18, 2008
First Inventor: Patrick WHITE
Title: Low Latency High Resolution Video Encoding

Application Elements:

1. ☒ Fee Calculation (see Box 14)
2. ☒ Applicant claims small entity status.
3. ☒ Specification — Total Pages - **20**
   - Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☒ Drawing(s) - (5 Figures) — Total Sheets - **3**
5. ☒ Oath or Declaration — Total Pages - **1**
   a. ☒ Newly executed (original or copy)
   b. ☐ Unexecuted
   c. ☐ Copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional with Box 12 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).

Accompanying Application Parts:

6. ☒ Application Data Sheet (ADS)
7. ☐ Assignment Papers (cover sheet & document(s))
8. ☐ Information Disclosure Statement (IDS)/PTO-1449 Copies of IDS Citations ☐
9. ☐ Preliminary Amendment
10. ☒ Return Receipt Postcard *(Should be specifically itemized)*
11. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*

12. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

of prior Application No. filed

Prior application information: Examiner: Group Art Unit:

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5c, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon which a portion has been inadvertently omitted from the submitted application parts.

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14. **FEE CALCULATION:**

☒ Applicant Claims Small Entity Status

					AMOUNT
1. **BASIC FILING FEE**					
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee ($)		
1011	310.00	2011	155.00		**$155.00**
2. **SEARCH FEE**					
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee ($)		
1111	510.00	2111	255.00		**$255.00**
3. **EXAMINATION FEE**					
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee (S)		
1311	210.00	2311	105.00		**$105.00**
4. **EXTRA CLAIM FEES**			Extra Claims	Fee From Below	
Total Claims	41 - 20 =		21	x $25 =	**$525.00**
Independent Claims	4 - 3 =		1	x $105 =	**$105.00**
Multiple Dependent				$** =	
Large Entity		Small Entity			
Fee Code	Fee ($)	Fee Code	Fee ($)		
1202	50.00	2202	25.00		
1201	210.00	2201	105.00		
5. **OTHER**					
Fee Code – 8021	Fee ($) - 40.00	Recording Patent Assignment			
				TOTAL	**$1,145.00**

15. ☒ **The Commissioner is hereby authorized to charge all fees in Box 14 above to Deposit Account 50-1142.**

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Application Data Sheet

Application Information

Application Type::	Regular
Subject Matter::	Utility
Suggested Classification::	
Suggested Group Art Unit::	
CD-ROM or CD-R?::	None
Title::	Low Latency High Resolution Video Encoding
Attorney Docket Number::	373-05 US
Request for Early Publication?::	N/A
Request for Non-Publication?::	N/A
Suggested Drawing Figure::	N/A
Total Drawing Sheets::	3
Small Entity::	Yes
Petition Included?::	No
Secrecy Order in Parent Appln?::	No

Applicant Information

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Representative Customer Number::		**25319**

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LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

FIELD OF THE INVENTION

[001] The invention relates generally to videoconferencing and more particularly to low-latency high-resolution videoconferencing and telepresence applications.

BACKGROUND OF THE INVENTION

[002] Throughout history various systems have been employed for communicating messages over short distances. Optical telegraphs such as for instance smoke signals, beacons and semephore networks date back to ancient times. Of course, such systems require a direct line of sight between the communicating parties and are effective only over relatively short distances. With the emergence of the electrical telegraph in the 1800's the transmission of communication signals between two parties, even over great distances, became far more practical and cost effective. More recently, with the development of two-way radio communication systems and analog or digital telephone networks, it has become more-or-less a routine matter to communicate with one or more parties that are located virtually anywhere in the world.

[003] Unfortunately, most current systems that support communication over large distances are somewhat limited in that they do not include a visual-communication component. This results in the disadvantage that visual cues including body language, facial expressions and gestures are not conveyed between the communicating parties. Such visual cues are an important and often unconcious aspect of communication between humans. Without these familiar visual cues it is more difficult for one to interpret accurately another person's reactions, moods and sincerity.

[004] This limitation is well recognized, and since at least the 1960's there has been an ongoing effort to develop practical ways of including a visual-communication component in addition to audio communication between parties. In fact, this goal has been achieved, with varying degrees of success, using videoconferencing technology and videophones. A videoconference is a set of interactive telecommunication technologies

which allow two or more locations to interact via two-way simultaneous video and audio transmissions. The core technology used in a videoconference system is digital compression of audio and video streams in real time. The other components of a videoconference system include: video input i.e. a video camera or webcam; video output i.e. a computer monitor, television or projector; audio input i.e. microphones; audio output i.e. usually loudspeakers associated with the display device or telephone; data transfer i.e. analog or digital telephone network, LAN or Internet.

[005] Simple analog videoconferences could be established as early as the invention of the television. Such videoconferencing systems consisted of two closed-circuit television systems connected via cable, radiofrequency links, or mobile links. Attempts at using normal telephony networks to transmit slow-scan video, such as the first systems developed by AT&T, failed mostly due to the poor picture quality and the lack of efficient video compression techniques. It was only in the 1980s that digital telephony transmission networks became possible, such as ISDN, assuring a minimum bit rate (usually 128 kilobits/s) for compressed video and audio transmission. Finally, in the 1990s, IP (Internet Protocol) based videoconferencing became possible, and more efficient video compression technologies were developed, permitting desktop, or personal computer (PC)-based videoconferencing.

[006] It is worth noting at this point that businesses and individuals have been slow to adopt IP-based videoconferencing despite the many advantages, even as high-speed Internet service has become more widely available at a reasonable cost. This failure is due at least in part to the typically uncomfortable experience that is associated with IP-based videoconferencing. In particular, often the video component is of poor quality and "choppy" or not precisely synchronized with the audio component of the communication. Rather than enhancing communication, the video component may actually provide false visual cues and even disorient or nauseate those that are party to the communication. Of course, wider adoption is likely to occur when the video-component is improved sufficiently to provide more natural motion and life-like representation of the communicating parties. Accordingly, each incremental improvement in the encoding and

transmission of video data is an important step toward achieving widespread adoption of videoconferencing.

[007] A more recent development, which is related closely to videoconferencing, is telepresence. Telepresence refers to a set of technologies which allow a person to feel as if they were present, to give the appearance that they were present, or to have an effect, at a location other than their true location. A good telepresence strategy puts the human factors first, focusing on visual collaboration solutions that closely replicate the brain's innate preferences for interpersonal communications, separating from the unnatural "talking heads" experience of traditional videoconferencing. These cues include life–size participants, fluid motion, accurate flesh tones and the appearance of true eye contact. In many telepresence applications there is an implicit requirement for high-resolution video content.

[008] A major obstacle to the widespread adoption of videoconferencing and telepresence is the need to transmit consistently and in real time a large amount of video data between two or more remote locations via a communications network. As a result, video encoding techniques are used to reduce the amount of video data that are transmitted. For instance, MPEG algorithms compress data to form small data sets that can be transmitted easily and then decompressed. MPEG achieves its high compression rate by representing only the changes from one frame to another, instead of each entire frame. The video information is then encoded using a technique called Discrete Cosine Transform (DCT). For example, in a scene in which a person walks past a stationary background, only the moving region will need to be represented, either using motion compensation or as refreshed image data or as a combination of the two, depending on which representation requires fewer bits to adequately represent the picture. The parts of the scene that are not changing need not be sent repeatedly. MPEG uses a type of lossy compression, since some data is removed, but the diminishment of data is generally imperceptible to the human eye.

[009] The three major picture – or frame - types found in typical video compression designs are Intra coded pictures (I-frames), Predicted pictures (P-frames), and Bi-

predictive pictures (B-frames). However, for a real-time video communication only Intra (I-frames) and Predictive (P-frames) are considered. In a motion sequence, individual frames of pictures are grouped together (called a group of pictures, or GOP) and played back so that the viewer registers the video's spatial motion. Also called a keyframe, an I-frame is a single frame of digital content that the encoder examines independent of the frames that precede it; the I-frame stores all of the data needed to display that frame. Typically, I-frames are interspersed with P-frames in a compressed video. The more I-frames that are contained, the better quality the video will be; however, I-frames contain the most amount of data and therefore increase network traffic load. P-frames follow I-frames and contain only the data that have changed from the preceding I-frame (such as color or content changes). Because of this, P-frames depend on the I-frames to fill in most of the data. In essence, each frame of video is analyzed to determine regions with motion and regions that are static. When P-frames are sent, they contain data that has changed for the entire frame. Similarly, each I-frame contains data for the entire frame. Thus, both the peak and average network load is relatively high.

[0010] Modern video encoding techniques work extremely well, and are capable of achieving compression ratios in the range of 200:1 to 500:1. Unfortunately, this type of encoding is computationally very expensive and requires extremely powerful processing capabilities at the transmitting end. Dedicated videoconferencing and telepresence systems, which are cost prohibitive in most instances, do have sufficient processing capabilities and are effective for encoding high resolution video in real time. On the other hand, PC-based videoconferencing systems seldom have sufficient processing capabilities to handle video encoding operations in real time. For instance, using a modern computer with four 2-GHz cpu cores to encode high resolution video (1920 x 1080 pixel at 30 fps) introduces an unacceptable latency of 200ms. Of note, the processing power that is required to decode the encoded video at the receiving end is considerably less.

[0011] Another problem that is associated with modern video encoding techniques is the high peak/average data bursts caused by sending the I-frame via the communication network. Data bursts occur initially when the videoconference begins and also at

intervals throughout the videoconference. The increased network traffic can result in delays in receiving the I-frame data at the receiving end, leading to choppy video and/or packet loss. Decreasing the frequency of I-frame transmission does not decrease the peak data burst issues, and additionally degrades video quality.

[0012] It would be advantageous to provide a method and system that overcomes at least some of the above-mentioned limitations of the prior art.

SUMMARY OF EMBODIMENTS OF THE INVENTION

[0013] According to an aspect of the instant invention there is provided a method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the method comprising: capturing video data and providing video signal data in dependence thereon; separating the video signal data into segments, the segments identical from one video frame to another subsequent video frame within a same video signal data; encoding each segment independently to result in encoded segment data such that both I-frames and P-frames are generated for a given segment and allowing for independent reconstruction of segments at a distant end; and, transmitting the encoded segment data.

[0014] According to an aspect of the instant invention there is provided a method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the method comprising: capturing a sequence of video frame data, the sequence of video frame data comprising at least a portion of the video signal; dividing each frame into a plurality of segments; encoding the segments independently of one another and at least some of the segments encoded in parallel with encoding other of the segments; and, transmitting via a communications network the encoded segments, such that transmission of some segments is offset in time from transmission of other segments.

[0015] According to an aspect of the instant invention there is provided a method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the method comprising: capturing a sequence of video frame data,

the sequence of video frame data comprising at least a portion of the video signal; dividing each frame into a plurality of segments comprising a first segment that contains at least a threshold amount of motion during the session and including a second segment that contains less then the threshold amount of motion during the session; encoding the first segment and encoding independently the second segment, such that both I-frames and P-frames are generated for each of the first and second segment; transmitting via a communications network the I-frame relating to the first segment and after a delay sufficient for reducing the data burst rate transmitting via the communications network the I-frame relating to the second segment, so as to transmit the first and second segments in a fashion for reducing the data burst rate resulting therefrom.

[0016] According to an aspect of the instant invention there is provided a video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising: a port for receiving a video signal comprising frame data, the frame data divisible into a plurality of different predetermined segments; a plurality of video encoders each one for encoding independently a different one of the predetermined segments; and, a transceiver for providing encoded segments onto a network.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Exemplary embodiments of the invention will now be described in conjunction with the following drawings, in which:

[0018] Fig. 1 is a simplified flow diagram showing prior art video encoding;

[0019] Fig. 2 is a plot showing frame size vs. frame number for prior art video encoding;

[0020] Fig. 3 is a simplified flow diagram showing video encoding according to an embodiment of the instant invention;

[0021] Fig. 4 is a plot showing frame size vs. frame number for video encoding according to an embodiment of the instant invention; and,

[0022] Figs. 5a-d illustrate diagrammatically four variations on dividing a frame into segments.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0023] The following description is presented to enable a person skilled in the art to make and use the invention, and is provided in the context of a particular application and its requirements. Various modifications to the disclosed embodiments will be readily apparent to those skilled in the art, and the general principles defined herein may be applied to other embodiments and applications without departing from the scope of the invention. Thus, the present invention is not intended to be limited to the embodiments disclosed, but is to be accorded the widest scope consistent with the principles and features disclosed herein.

[0024] Referring to Figure 1, shown is a simplified flow diagram for encoding high-resolution video according to the prior art. Raw high-resolution video signal is provided from a HD (High Definition) video source to a video encoder. The video encoder then encodes the video signal according to a predetermined encoding technique. The encoded video signal is provided to a transmitter for transmission via the network. As is shown in Figure 1, in the prior art approach to high-resolution video encoding and transmission the entire high-resolution frame is processed by the encoder and passed to the network for transmission. The delay between capture and the end of encoding of an entire frame can be significant for a high-resolution frame, such as for instance on the order of 100s of milliseconds.

[0025] Referring now to Figure 2, it is apparent that for the prior art approach to video encoding the peak to average bit rate ratio of the video bitstream is very high, due to large I-frames, which causes large bursts of traffic on the network and often results in packet loss. Peak data bursts, shown at 21 occur periodically as I-frames are transmitted at frame intervals. The average bit rate 22 is shown as a horizontal line. Though the average bit rate 22 is relatively low, it would take the entire time between one databurst 21a and a subsequent databurst 21b for all of the databurst data and intervening data to be

transmitted at the average bit rate; thus, a significant latency results from the databursts 21 unless the available bandwidth is sufficiently high. Even when the available bandwidth is sufficient to accommodate the data burst bandwidth, then the databursts contribute to a latency of the video transmission since the data is still transmitted serially via a network interface. As was discussed supra, each I-frame contains data for the entire frame, and each P-frame contains data that has changed for the entire frame.

[0026] Despite some drawbacks, prior art video encoding techniques are quite suitable for a number of applications. In particular, encoding video in this manner is done for broadcast video applications, video on demand applications and DVD video storage applications, to name just a few examples. In such applications the encoding is performed ahead of time such that processing requirements are not a significant limiting factor. Furthermore, in transmission applications the video data is buffered prior to playback so as to alleviate the problems that are related to high peak data bursts onto the network. It is well known in the art that buffering of data will compensate for any effects of data bursts and the network in dedicated transmission based systems such as broadcast or DVD. Much has been done to evaluate buffering and buffer sizes for use in IP networks. In each of these, video data flows in a single direction from a source to a destination. These strategies are effective for non-interactive applications, but, unfortunately, are not suitable for real-time video conferencing applications.

[0027] Referring now to Figure 3, shown is a simplified flow diagram for video encoding according to an embodiment of the instant invention. Raw high-resolution video signal is provided from a HD video source to a divider. The divider then divides each frame of the video signal into a plurality of segments. Each segment is encoded independently using a separate encoder, optionally in execution on separate CPUs. The encoded video data for each region is provided to a transmitter, and subsequently transmitted via the network.

[0028] For example, raw high resolution video signal is divided into a plurality of segments, in the form of 12 rectangular segments - 4 horizontal bands and 3 vertical columns, each of which is processed, compressed and transmitted independently to the receiving end. At the receiving end, each segment is decoded and the decoded segments

are recombined to reproduce an image approximating the original signal. Encoding the different segments in parallel reduces latency, for instance approximately 50 ms is required for encoding compared to 100s of ms. Further, encoding the segments independently reduces data burst onto the network.

[0029] By way of an illustrative example, if an encoder A requires X milliseconds to encode a full High Resolution frame, then N segments are finished encoding in approximately (X/N) milliseconds, thereby reducing latency by a factor on the order of N. Additionally, since each segment is encoded separately, the I-frame occurrence of each segment is preferably offset from other segments, such that each segment's I-frame occurs when at least another segment produces a P-frame, thereby reducing the overall peak to average data burst onto the network and likely reducing the packet loss. This is shown diagrammatically in Figure 4, where the I-frames for segment (0), segment (1) and segment (2) are offset one from another.

[0030] Each signal shown in Fig. 4 has a P-frame size of approximately 5kB and an I-frame size of approximately 20kB. Thus, for the three segment example shown, 10kB of P-frame data is transmitted for each frame and 20kB of I-frame data is transmitted for a same frame resulting in 30kB of frame data. This is shown in Fig. 2 at 24. As is seen from Fig. 2, the burst data bit rate is significantly reduced over the prior art while maintaining a similar average data rate and a similar video transmission encoding quality. Of course, using more segments allows for further increased data bit rate averaging until a number of segments is selected such that encoding efficiency is greatly reduced affecting the data rate.

[0031] Further optionally, each segment's encoded target bit rate is set independently so segments deemed more important by application can be assigned higher bit rates.

[0032] Referring now to Figure 5, division of a High Resolution frame into independently encoded segments optionally takes many forms. A straightforward approach is to segment each image into a series of rectangular segments aligned in rows and columns within each original image. Using this approach, it is relatively straightforward to provide a number of segments either small or large. Four possible

other approaches are shown by way of specific and non-limiting examples.

[0033] In Figure 5a the frame is divided into a plurality of horizontal bands. Figure 5a shows each band as a different segment, and each segment being of a same size. Optionally, two or more contiguous or non-contiguous bands combine to form a single segment. Further optionally, some of the segments are of different size.

[0034] In Figure 5b each segment is a down sample representation of the image by factor of 4. Of course, optionally another down sampling factor is used.

[0035] In Figure 5c the frame is divided into even and odd lines where one segment consists of all even lines and another segment consists of all odd lines.

[0036] In Figure 5d the frame is divided into windows of flexible size. In the specific and non-limiting example that is illustrated, the frame is divided into upper and lower horizontal bands of equal size, left and right vertical bands of equal size extending between the horizontal bands, and a central rectangular window.

[0037] Optionally, the frame division process is a combination of the methods described with reference to Figures 5a-d.

[0038] The methods and systems according to embodiments of the instant invention, as described above, exploit the fact that videoconference video images typically are relatively static as a whole. For instance, panning and/or rapid scene changes are rare occurrences in videoconferencing applications. For this reason, the background portion of the frame is approximately constant. This information is very useful to a video encoder that is specialized for videoconferencing applications. In particular, it is known in advance that large areas of each frame are likely or even very likely to be the same as in the previous frame. Thus, the video encoder does not need to determine this fact in an analytical manner for each and every frame, at a rate of 24 to 60 frames per second. Rather, it is necessary only for the video encoder to process the image to determine the regions of movement. Optionally, the rate at which I-frames are sent out is reduced relative to that of general purpose video encoding. This is because, unlike movies and broadcast television, there is a low probability in videoconferencing that the video signal

will include a scene change, panning motion, or other type of change that requires a new I-frame to be sent.

[0039] In addition, dividing the frame into a plurality of segments takes advantage of the knowledge that large areas of each frame are likely or even very likely to be the same as in the previous frame. In particular, each segment is encoded independently of each other segment. If for a particular segment it is determined that the change relative to the same segment of the previous frame exceeds a threshold value, then an I-frame for that segment only is sent. Some or all of the other segments of the same frame may require only a P-frame. In fact, those frames that are outside of a region that is occupied by a videoconference participant may require I-frames only at very long intervals, whilst those segments that contain a portion of the face of the participant require more frequent I-frames. Overall, this approach tends to reduce both the burst and average data traffic onto the network and reduces latency, since I-frames are sent only for individual segments rather than for the entire frame, and the I-frames for different segments are offset and/or sent at different intervals of time.

[0040] In a simple application the segments are defined as geometric shapes such as rectangles or squares. Optionally, the segments are defined based upon knowledge that is provided for, or determined on the basis of usage of, a particular videoconferencing or telepresence system. For instance, if it is expected that a single participant will be seated centrally within the video frame then an acceptable strategy for dividing the frame may be the one that is illustrated in Figure 5d, wherein the central rectangle is located over the portion of the frame that contains the participants face. Thus, the horizontal and vertical segments define portions of the frame that are expected to contain less motion. The central rectangle can further be assigned to an encoder with a high bitrate, whist the remaining segments are allotted lower bitrates. Alternatively, the central rectangle may be encoded using one processor of a dual core processor and the other processor of the dual core processor may encode all of the remaining segments. Optionally, some of the segments are not processed every frame.

[0041] The segments are optionally irregular and/or non-contiguous. Further optionally, the segments are determined dynamically and change throughout the course of one or more videoconference sessions.

[0042] Numerous other embodiments may be envisaged without departing from the spirit or scope of the invention.

Claims

What is claimed is:

1. A method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the method comprising:

capturing video data and providing video signal data in dependence thereon;

separating the video signal data into segments, the segments identical from one video frame to another subsequent video frame within a same video signal data;

encoding each segment independently to result in encoded segment data such that both I-frames and P-frames are generated for a given segment and allowing for independent reconstruction of segments at a distant end; and,

transmitting the encoded segment data.

2. A method according to claim 1, wherein the segments are predetermined absent a prior step of analyzing video frames of the video signal data.

3. A method according to claim 1, wherein each segment comprises data relating to a different predetermined area of the video frames of the video signal data.

4. A method according to claim 1, wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments with a delay relative to transmitting the I-frame of another of the segments, so as to reduce the maximum data burst rate.

5. A method according to claim 1, wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments and transmitting at least one P-frame of another of the segments during a same overlapping period of time.

6. A method according to claim 1, wherein the segments are uniformly sized geometric shapes.

7. A method according to claim 1, wherein at least one of segment size and shape is different for one of the segments compared to another of the segments.

8. A method according to claim 1, wherein at least one of the segments comprises data relating to a plurality of predetermined non-contiguous areas of the video frames of the video signal data.

9. A method according to claim 1, wherein the video signal data is separated into segments in dependence upon application data, the application data external to the video signal data and indicative of the amount of motion that is expected in different areas of the video frames of the video signal data.

10. A method according to claim 1, wherein separating the video signal data into segments is performed in dependence upon prior use data, the prior use data external to the video signal data and indicative of the amount of motion determined previously in different areas of the video frames of a different video signal data.

11. A method according to claim 1, wherein a period between regularly spaced I-frames for one of the segments is different than a period between regularly spaced I-frames for another of the segments.

12. A method according to claim 1, wherein encoding each segment independently comprises encoding at least some of the segments in parallel with encoding other of the segments.

13. A method according to claim 1, wherein encoding each segment independently comprises allotting each different segment to a different encoder of a plurality of encoders.

14. A method according to claim 13, wherein at least one encoder of the plurality of encoders has a bitrate that is greater than a bitrate of the other encoders of the plurality of encoders.

15. A method according to claim 1, wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments and during transmission thereof transmitting other than I-frames of all other segments.

16. A method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the method comprising:

capturing a sequence of video frame data, the sequence of video frame data comprising at least a portion of the video signal;

dividing each frame into a plurality of segments;

encoding the segments independently of one another and at least some of the segments encoded in parallel with encoding other of the segments; and,

transmitting via a communications network the encoded segments, such that transmission of some segments is offset in time from transmission of other segments.

17. A method according to claim 16, wherein the segments are predetermined absent a prior step of analyzing video frames of the sequence of video frame data.

18. A method according to claim 16, wherein each segment comprises data relating to a different predetermined area of the video frames of the sequence of video frame data.

19. A method according to claim 16, wherein encoding the segments independently of one another comprises generating both I-frames and P-frames for each one of the plurality of segments, so as to support independent reconstruction of the segments at a distant end.

20. A method according to claim 19, wherein transmitting the encoded segments comprises transmitting the I-frame of one of the segments with a delay relative to transmitting the I-frame of another of the segments, so as to reduce the data burst rate.

21. A method according to claim 19, wherein transmitting the encoded segments comprises transmitting the I-frame of one of the segments and transmitting the P-frame of another of the segments during a same overlapping period of time.

22. A method according to claim 21, wherein transmitting the encoded segmented data comprises transmitting the I-frame of one of the segments and during transmission thereof transmitting other than I-frames of all other segments.

23. A method according to claim 19, wherein a period between regularly spaced I-frames for one of the segments is different than a period between regularly spaced I-frames for another of the segments.

24. A method according to claim 16, wherein the segments of the plurality of segments represent image data of uniformly sized geometric shapes.

25. A method according to claim 16, wherein at least one of the segments of the plurality of segments comprises data relating to a plurality of predetermined non-contiguous areas of the video frames of the sequence of video frame data.

26. A method according to claim 16, wherein each video frame is divided into segments in dependence upon application data, the application data external to the sequence of video frame data and indicative of the amount of motion that is expected in different areas of the video frames.

27. A method according to claim 26, wherein the application data comprises prior use data, the prior use data indicative of the amount of motion determined a previous communication session.

28. A method according to claim 16, wherein encoding the segments independently comprises allotting each different segment to a different encoder of a plurality of encoders.

29. A method according to claim 28, wherein at least one encoder of the plurality of encoders has different processing performance characteristics than a bitrate of the other encoders of the plurality of encoders.

30. A method for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the method comprising:

capturing a sequence of video frame data, the sequence of video frame data comprising at least a portion of the video signal;

dividing each frame into a plurality of segments comprising a first segment that contains at least a threshold amount of motion during the session and including a second segment that contains less then the threshold amount of motion during the session;

encoding the first segment and encoding independently the second segment, such that both I-frames and P-frames are generated for each of the first and second segment;

transmitting via a communications network the I-frame relating to the first segment and after a delay sufficient for reducing the data burst rate transmitting via the communications network the I-frame relating to the second segment, so as to transmit the first and second segments in a fashion for reducing the data burst rate resulting therefrom.

31. A method according to claim 30, wherein the segments are predetermined absent a prior step of analyzing video frames of the sequence of video frame data.

32. A method according to claim 30, wherein each segment comprises data relating to a different predetermined area of the video frames of the sequence of video frame data.

33. A method according to claim 30, wherein the rate of I-frame generation for the first segments is more frequent than the rate of I-frame generation for the second segment.

34. A method according to claim 30, wherein the segments of the plurality of segments are predetermined fixed uniformly sized geometric shapes.

35. A method according to claim 30, wherein at least one of the size and shape of the first segment is different compared to the second segment.

36. A method according to claim 30, wherein at least one of the first segment and the second segment comprises data relating to a plurality of predetermined non-contiguous areas of the video frames of the sequence of video frame data.

37. A method according to claim 30, wherein each video frame is divided into the plurality segments in dependence upon application data, the application data external to the sequence of video frame data and relating to at least one of user preferences and historical data indicative of an amount of motion that in different areas of the video frames.

38. A method according to claim 30, wherein encoding the first segment and encoding independently the second segment comprises allotting the first segment to a first encoder of a plurality of different encoders and allotting the second segment to a second different encoder of the plurality of encoders.

39. A method according to claim 38, wherein the first encoder has different performance characteristics than the second different encoder.

40. A video encoding system for encoding in real time a video signal that is associated with one of a videoconference and a telepresence session, the system comprising:

a port for receiving a video signal comprising frame data, the frame data divisible into a plurality of different predetermined segments;

a plurality of video encoders each one for encoding independently a different one of the predetermined segments; and,

a transceiver for providing encoded segments onto a network.

41. A video encoding system according to claim 40 comprising:
a memory for storing of predetermined data indicative of for each of the plurality of different segments a region of an image that forms part thereof.

ABSTRACT

Video data that is associated with a videoconference or a telepresence session is captured and a video signal relating thereto is provided. The video signal is divided into segments, which are identical from one video frame to another subsequent video frame within the video signal. Each segment is encoded independently, to result in encoded segment data such that both I-frames and P-frames are generated for a given segment, so as to support independent reconstruction of segments at a distant end. The encoded segment data is transmitted subsequently to the distant end.

Ex.1002
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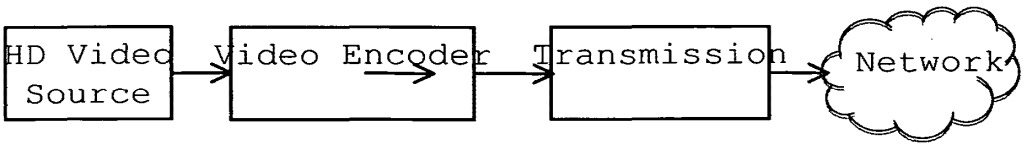


Figure 1

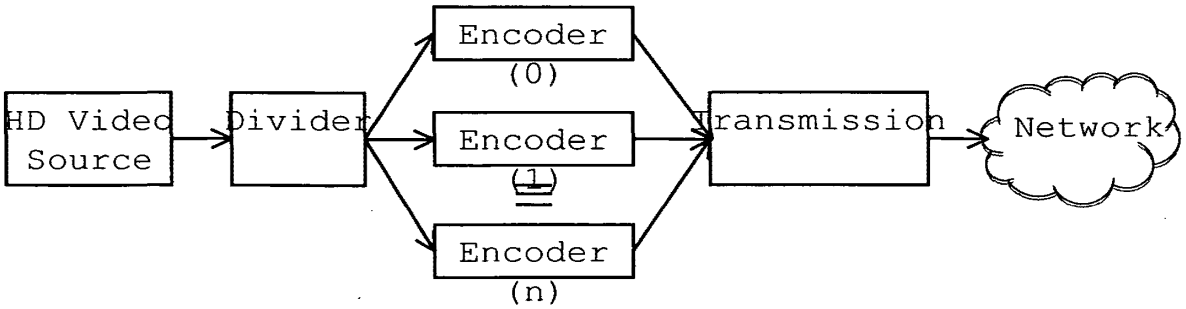


Figure 3

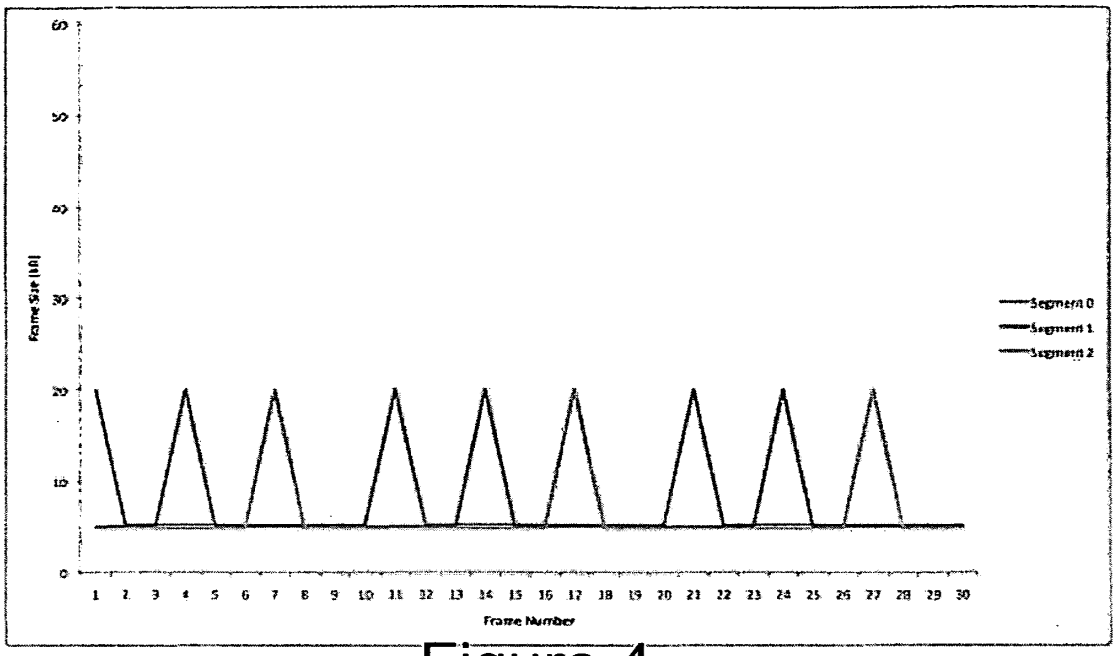


Figure 4

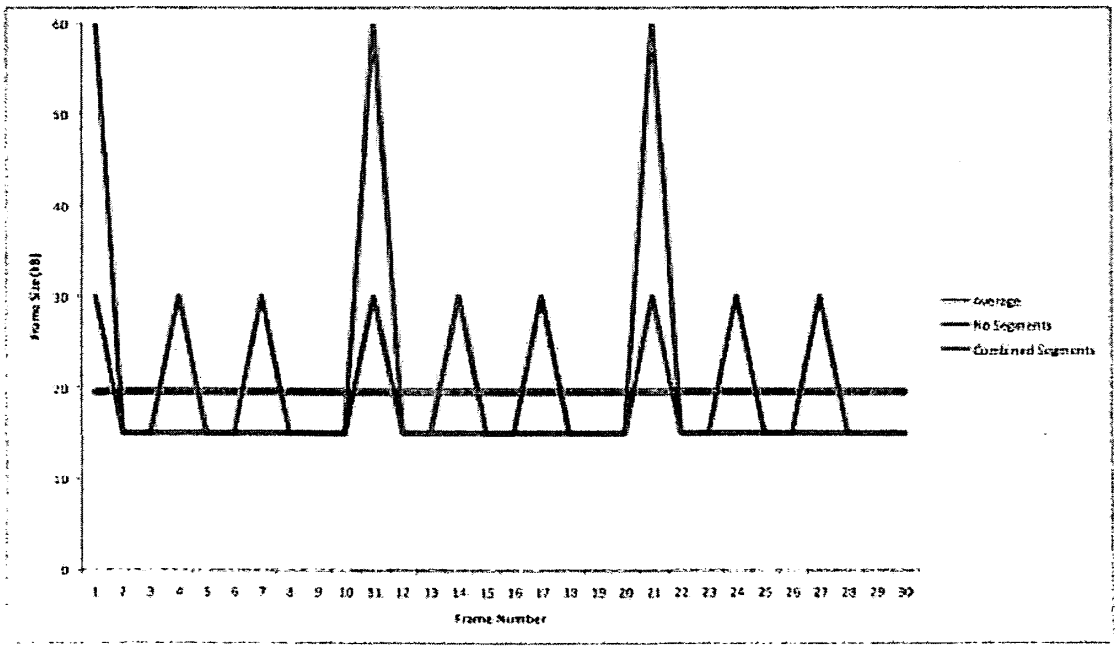


Figure 2

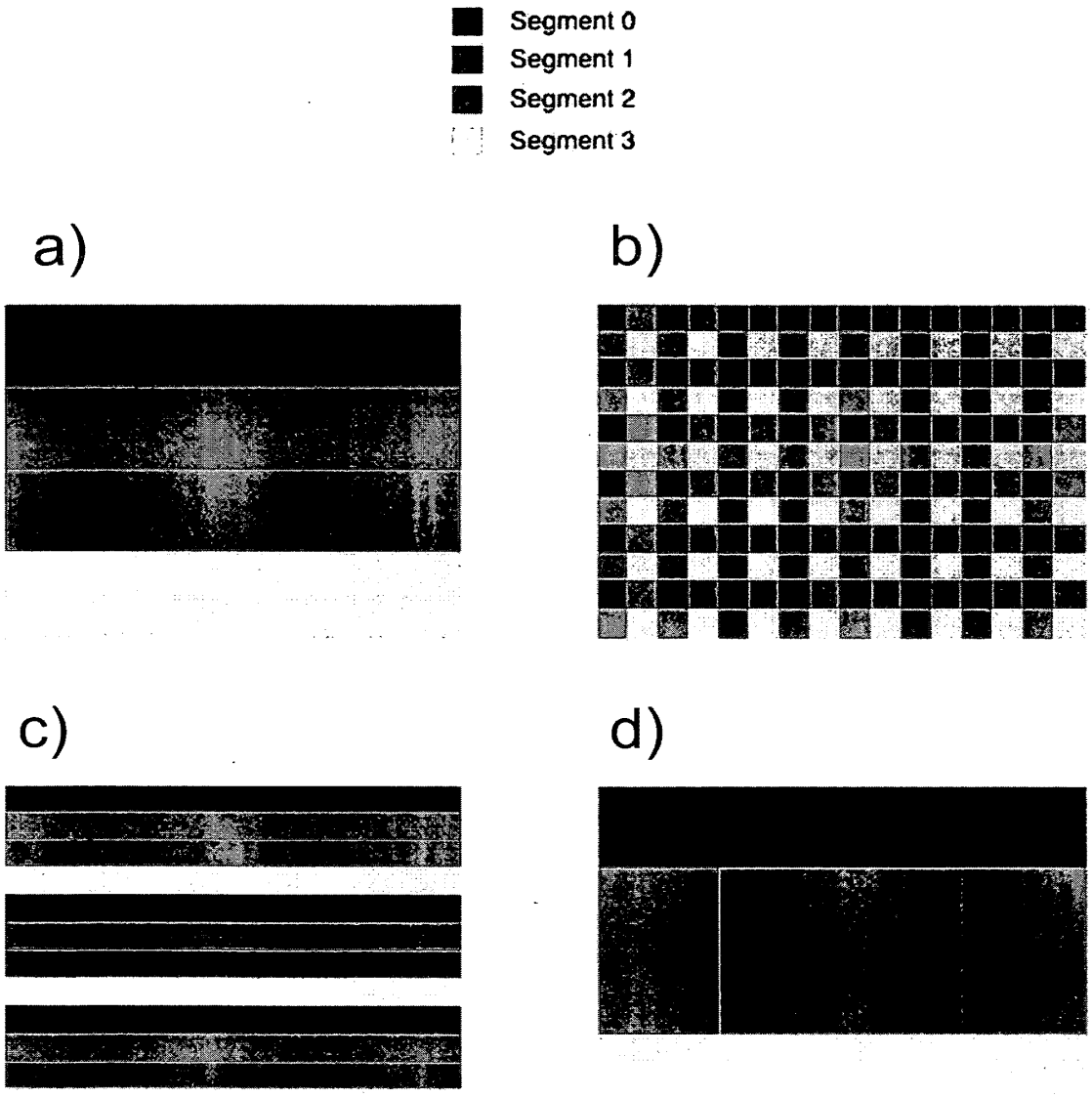


Figure 5

COMBINED DECLARATION & POWER OF ATTORNEY FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)		Attorney Docket Number	373-05 US
		First Named Inventor	Patrick WHITE
		COMPLETE IF KNOWN	
☒ Declaration Submitted With Initial Filing	OR ☐ Declaration Submitted After Initial Filing (37 CFR 1.16(e) Required)	Application Number	New Filing
		Filing Date	
		Group Art Unit	
		Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

LOW LATENCY HIGH RESOLUTION VIDEO ENCODING

the specification of which

☒ is attached hereto OR

☐ as filed on (MM/DD/YYYY) _____ as United States Application Number _____or PCT International Application Number _____and was amended on (MM/DD/YYYY)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365 (b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? Yes	No

☐ Additional foreign application numbers are listed on a supplementary priority data sheet (PTO/SB/02B) attached hereto:

COMBINED DECLARATION & POWER OF ATTORNEY- Utility or Design Patent Application	Attorney Docket No. 373-05 US

I hereby appoint Practitioners at Customer Number **25319**

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.

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Nepean, Ontario, K2G 5X3 Canada
Tel: 613-274-7272
Fax: 613-274-7414

I hereby declare that all statements made herein of my own knowledge are true and that all statements were made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful 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 wilful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any]) Patrick		Family Name or Surname WHITE	
Inventor's Signature		Date 08 - 29 - 2008	
Residence: City Renfrew	State Ontario	Country Canada	Citizenship Canadian
Mailing Address 35a Canaan Road			
City Renfrew	State Ontario	ZIP K7V 3Z4	Country Canada

NAME OF SECOND INVENTOR:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any]) Mojtaba		Family Name or Surname HOSSEINI	
Inventor's Signature		Date Aug 29th, 2008	
Residence: City Ottawa	State Ontario	Country Canada	Citizenship Canadian
Mailing Address 616-1300 Richmond Road			
City Ottawa	State Ontario	ZIP K2B 8L2	Country Canada

NAME OF THIRD INVENTOR:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any])		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address			
City	State	ZIP	Country

☐ Additional Inventors are being named on the supplemental Additional Inventors sheet PTO/SB/02A attached hereto.

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PATENT APPLICATION SERIAL NO._____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

09/19/2008 DENMANU1 00000013 501142 12232496

01 FC:2011 155.00 DA
02 FC:2111 255.00 DA
03 FC:2311 105.00 DA
04 FC:2201 105.00 DA
05 FC:2202 525.00 DA

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002- 489-267/69033

PTO/SB/06 (10-07)
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PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number: 12-232-496

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), (l), 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))	41 minus 20 =	* 21	X $25 =	525	OR	X $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	X $105 =	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	1145		TOTAL	

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	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
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.

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