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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
14/372,021	10250877	2486	9200

OC000000125758521

Correspondence Address/Fee Address Change

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14868
Patent Docketing
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TCL-1002
TTE Technology Inc. d/b/a TCL North America v. InterDigital, Inc. IPR2026-00417
AMAZON-1002
Amazon v. InterDigital, IPR2025-01505

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Philippe BORDES ; Pierre ANDRIVON ; Philippe SALMON

Filed : Herewith

For : Method and device for coding an image block, corresponding method and decoding device

PRELIMINARY AMENDMENT

Commissioner for Patents
MAIL STOP PCT
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

In the US national phase application of PCT/EP2013/050399 filed herewith, please file the following amendments and enter remarks as follows:

Amendments to the Title begin on page 2 of this paper.

Amendments to the Specification begin on page 3 of this paper.

Listing and Amendments to the Claims begin on page 4 of this paper.

Amendments to the Abstract begin on page 9 of this paper.

Remarks begin on page 10 of this paper.

Amendments to the Title

Please **amend** the title to read:

-- Method and device for coding an image block, corresponding decoding method and decoding device --

Amendments to the Specification

Please **add** the following paragraph at page 1, line 3:

-- This application claims the benefit, under 35 U.S.C. § 365 of International Application PCT/EP2013/050399 , filed January 10, 2013, which was published in accordance with PCT Article 21(2) on July 18, 2013 in English and which claims the benefit of French patent application No. 1250334, filed January 13, 2012. --

Listing and Amendments to the Claims

This listing of claims will replace the claims that were published in the PCT Application:

1. (currently amended) ~~Decoding~~ A decoding method of a binary stream to reconstruct a current block of a current image from ~~at least one reference block of~~ a reference image reconstructed at a different size from the size of said current image comprising ~~the steps of~~:

- resampling said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- motion compensating ~~(10)~~ ~~the~~ a reference block of said resampled reconstructed reference image with at least one interpolation filter composed of a horizontal motion compensation interpolation filter and a vertical motion compensation interpolation filter,
- decoding ~~(12)~~, for the current block, a residue block, and
- reconstructing ~~(14)~~ the current block from said residue block and from said motion compensated reference block,

~~said method being characterized in that~~ ~~the motion compensation step is~~ wherein resampling and motion compensating are performed jointly by applying a vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter ~~at a resampling step of said reference block by applying to said reference block said at least one interpolation filter which depends on the size of said reference image and of the size of said current image~~.

2. (cancelled)

3. (cancelled)

4. (currently amended) ~~Decoding~~ The decoding method according to claim 1 ~~claim 3~~, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said decoding method further comprises a decoding step of said filtering coefficients.

5. (currently amended) ~~Decoding~~ The decoding method according to claim 1 ~~one of claims 1 to 4~~, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

6. (currently amended) ~~Coding~~ A coding method of a current block of a current image from ~~at least one reference block of~~ a reference image reconstructed at a different size from the size of said current image comprising ~~the steps of~~:

- resampling said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- motion compensating ~~(20)~~ ~~the~~ a reference block of said resampled reconstructed reference image with at least one interpolation filter composed of a horizontal motion compensation interpolation filter and a vertical motion compensation interpolation filter,
- calculating ~~(22)~~, for the current block, a residue block from said current block and from said motion compensated reference block, and
- coding ~~(24)~~ the residue block in a binary stream,

~~said method being characterized in that~~ ~~the~~ ~~motion compensation step is~~ wherein resampling and motion compensating are performed jointly by applying a vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter ~~at a resampling step of said reference block by applying to said reference block said at least one~~

~~interpolation filter which depends on the size of said reference image and on the size of said current image~~.

7. (cancelled)
8. (cancelled)

9. (currently amended) ~~Coding~~ The coding method according to claim 6 ~~claim 8~~, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said coding method further comprises a coding step of said filtering coefficients.

10. (currently amended) ~~Coding~~ The coding method according to claim 6 ~~one of claims 6 to 9~~, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

11. (currently amended) ~~Decoding~~ A decoding device ~~(DECOD)~~ of a binary stream to reconstruct a current block of a current image from ~~at least one reference block of~~ a reference image reconstructed at a different size from the size of said current image comprising:

- a module configured to resample said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- ~~means~~ a module configured to motion compensate ~~(PRED)~~ the reference block with at least one interpolation filter,
- ~~means~~ a module configured to decode ~~(DEC, ITQ)~~, for the current block, a residue block, and
- ~~means~~ a module configured to reconstruct ~~(ADD3)~~ the current block from said residue block and from said motion compensated reference block,

~~the decoding device being characterized in that~~ wherein the module configured to resample and the module configured to motion compensate are one and the same module which is configured to perform jointly resampling

and motion compensating by applying a vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter ~~motion compensation means perform jointly with the motion compensation a resampling of said reference block by applying to said reference block said at least one interpolation filter which depends on the size of said reference image and on the size of said current image~~.

12. (cancelled)

13. (currently amended) ~~Coding~~ A coding device ~~(ENC)~~ of a current block of a current image from ~~at least one reference block of~~ a reference image reconstructed at a different size from the size of said current image comprising:

- a module configured to resample said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- ~~means~~ a module configured to motion compensate ~~(PRED)~~ the reference block with at least one interpolation filter,
- ~~means~~ a module configured to calculate ~~(ADD1)~~, for the current block, a residue block from said current block and from said motion compensated reference block, and
- ~~means~~ a module configured to code ~~(TQ, COD)~~ the residue block,

~~the coding device being characterized in that~~ the module configured to resample and the module configured to motion compensate are one and the same module which is configured to perform jointly resampling and motion compensating by applying a vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter ~~motion compensation means perform jointly with the motion compensation a resampling of said reference block by applying to said reference block said at~~

~~least one interpolation filter which depends on the size of said reference image and on the size of said current image~~.

14. (cancelled)

15. (new) The decoding device according to claim 11, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said decoding device further comprises a module configured to decode said filtering coefficients.

16. (new) The decoding device according to claim 11, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

17. (new) The coding device according to claim 13, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said coding device further comprises a module configured to code said filtering coefficients.

18. (new) The coding device according to claim 13, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

Amendments to the Abstract

Please **amend** the following Abstract to this application.

--A method is described for reconstructing a current block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image. The method comprises the steps:

- motion compensate ~~(10)~~ the reference block with at least one interpolation filter that depends on the size of said reference image and on the size of said current image,
- decode ~~(12)~~, for the current block, a residue block, and
- reconstruct ~~(14)~~ the current block from the residue block and from the motion compensated reference block.

Remarks

The specification has been amended to include a reference to the priority applications.

Claims 1, 4-6, 9-11 and 13 are currently amended to remove multiple dependencies and reference indicia; in order to meet the requirements of the United States Patent and Trademark Office. Claims 2-3, 7-8, 12 and 14 are cancelled. New claims 15-18 are added. They corresponds to the method claims 4-5 and 9-10.

To meet the requirements of the United States, the Abstract (as originally filed in the published PCT application) has been amended to remove reference indicia.

No fee is believed to have been incurred by virtue of this amendment. However if a fee is incurred on the basis of this amendment, please charge such fee against deposit account 07-0832.

Respectfully submitted,
Philippe BORDES
Pierre ANDRIVON
Philippe SALMON

/Patricia A. Verlangieri ; Reg. No. 42,201/

Patricia A. Verlangieri
Attorney for Applicant
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609/734-6867

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Date: July 8, 2014

PTO/AIA/14 (08-12)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PF120006
	Application Number	
Title of Invention	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

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☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
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Inventor 3 Remove

Legal Name

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PF120006
	Application Number	
Title of Invention	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Philippe		SALMON	

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Postal Code	35250	**Country** i	FR

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Application Information:

Title of the Invention	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE		
Attorney Docket Number	PF120006	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	7

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PF120006
	Application Number	
Title of Invention	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE	

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Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)

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Remove			
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Priority Claimed
PCT/EP2013/050399	WO	2013-01-10	◉ Yes ○ No
Remove			
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Priority Claimed
1250334	FR	2012-01-13	◉ Yes ○ No

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PF120006
	Application Number	
Title of Invention	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE	

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In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

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Applicant 1

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○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest

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Name of the Deceased or Legally Incapacitated Inventor :	
If the Assignee is an Organization check here. ☒	
Organization Name	THOMSON LICENSING

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PF120006
	Application Number	
Title of Invention	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE	

Email Address	

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Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications

Signature	/Patricia A. Verlangieri; Reg. No. 42,201/			Date (YYYY-MM-DD)	2014-07-08
First Name	Patricia	Last Name	VERLANGIERI	Registration Number	42201

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Sheet 1 of 2

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Application Number	
Filing Date	
First Named Inventor	Philippe BORDES etal
Art Unit	
Examiner Name	
Attorney Docket Number	PF120006-US-PCT

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		EP - EP1209916	05-29-2002	HITACHI LTD		

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Sheet 2 of 2

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Application Number	
Filing Date	
First Named Inventor	Philippe BORDES et al
Art Unit	
Examiner Name	
Attorney Docket Number	PF120006-US-PCT

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		DAVIES et al: "Resolution switching for coding efficiency and error resilience", (Joint collaborative team on video coding of ISO/IEC JTC1/SC29/WG11 AND ITU-T SG16); 15 July 2011	
		LI ETAL: "AHG18: Comments on the implementations of resolution adaption on HEVC", 7 JCT-VC Meeting (Joint Collaborative Team on Video Coding of ISO/IEC ...), 8 Nov. 2011	
		LEE ETAL: "Hybrid resolution switching method for low bit rate video coding", Image Processing, 2007, ICIP 2007, IEEE Intl Conf on IEEE, 1 September 2007, pages VI-73	
		WIEGAND ETAL: "WD3: Working draft 3 of high-efficiency video coding", no. JCTVC-E603, 29 March 2011, pps. 1-160	
		WITTMANN ETAL: "Separable adaptive interpolation filter for video coding", Image processing, 2008. 15TH IEEE Intl Conf, IEEE, 12 October 2008, pages 2500-2503	
		HAN ETAL: "Joint optimization of the motion estimation module and the Up/Down scaler in transcoders", IEEE transactions on circuits and systems for video technology, vol. 15, n° 10, 1 October 2005, pages 1303-1313	
		Schwarz ETAL: "Overview of the scalable video coding extension of the H.264/AVC standard", IEEE transactions on circuits and systems for video technology, vol. 17, n°9, 1 September 2007, pages 1103-1120	
		COPY OF SEARCH REPORT DATED FEBRUARY 8, 2013	

Examiner Signature		Date Considered	

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1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

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PF120006

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/050399

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N7/26 H04N7/36 H04N7/46 H04N19/00
ADD.

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)
H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X /	SANG HEON LEE ET AL: "Hybrid Resolution Switching Method for Low Bit Rate Video Coding", IMAGE PROCESSING, 2007. ICIP 2007. IEEE INTERNATIONAL CONFERENCE ON, IEEE, PI, 1 September 2007 (2007-09-01), pages VI-73, XP031158265, ISBN: 978-1-4244-1436-9 abstract figures 1, 2 section 2. "RESOLUTION SWITCHING METHOD" section e section 3. "HR INTER-FRAME PREDICTION " -----	1-14
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[X] 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

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 January 2013	08/02/2013

Name and mailing address of the ISA/	Authorized officer
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Form PCT/ISA/210 (second sheet) (April 2005)

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1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/050399

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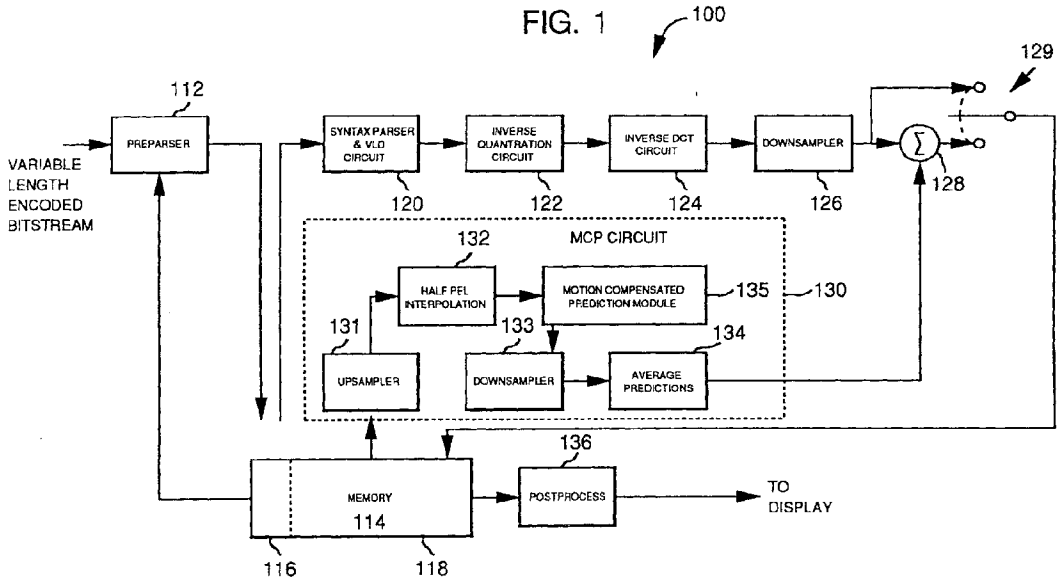
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(54) Digital video decoder for decoding digital high definition and/or digital standard definition television signals

(57) Methods and apparatus for reducing the complexity of decoder circuitry and video decoder memory requirements are disclosed. The described video decoders are capable of decoding HDTV pictures at approximately the resolution of standard definition television pictures and can be used to decode HDTV and/or SDTV pictures. The described video decoder may be used as part of a picture-in-picture decoder circuit for providing picture-in-picture capability without providing multiple full resolution video decoders. The reduction in decoder circuit complexity is achieved through the use of a plurality of data reduction techniques including the use of a preparser, downsampling, and truncating pixel values.

FIG. 1



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Description

Field of the Invention

[0001] The present invention is directed to video decoders and, more particularly, to methods and apparatus for implementing video decoders that are capable of decoding high definition television ("HDTV") signals and/or standard definition television ("SDTV") signals.

Background of the Invention

[0002] The use of digital, as opposed to analog signals, for television broadcasts and the transmission of other types of video and audio signals has been proposed as a way of allowing improved picture quality and more efficient use of spectral bandwidth over that currently possible using analog NTSC television signals.

[0003] The International Standards Organization has set a standard for video data compression for generating a compressed digital data stream that is expected to be used for digital television. This standard is referred to as the ISO MPEG (International Standards Organization - Moving Picture Experts Group) ("MPEG") standard. In accordance with the MPEG standard, video data is encoded using discrete cosine transform encoding and is arranged into variable length encoded data packets for transmission.

[0004] One version of the MPEG standard, MPEG-2, is described in the International Standards Organization - Moving Picture Experts Group, Drafts of Recommendation H.262, ISO/IEC 13818-1 and 13818-2 titled "Information Technology - Generic Coding Of Moving Pictures and Associated Audio" (hereinafter "the November 1993 ISO-MPEG Committee draft") hereby expressly incorporated by reference. Any references made in this patent application to MPEG video data is to be understood to refer to video data that complies with MPEG-2 standards as defined in the November 1993 ISO-MPEG Committee drafts.

[0005] MPEG video data may be used to support either high definition television ("HDTV"), wherein the video frames are of higher resolution than those used in present NTSC signals, or what will be referred to as standard definition television ("SDTV"), e.g., television which has approximately the same resolution per frame as the existing analog NTSC standard. Because HDTV, which includes the proposed United States Advanced Television Standard ("US ATV"), provides higher resolution than SDTV, more data is required to represent a HDTV frame than is required to represent a SDTV frame. Accordingly, it is possible to transmit multiple SDTV signals in the same bandwidth required to support a single HDTV signal.

[0006] MPEG Main Profile at Main Level ("MP@ML") specifies various requirements for an MPEG compliant standard definition television signal and associated decoding equipment. MP@ML allows pictures as large as 720x576 pels for a total of 414,720 pels per picture. The proposed standard for US ATV allows for pictures as large as 1920 X 1080 pels for a total of 2,073,600 pels per picture.

[0007] Because of the relatively large amount of data required to represent each frame of a HDTV picture, HDTV decoders must support much higher data rates than SDTV decoders. The additional memory required by a HDTV decoder, as compared to a standard SDTV decoder, and the increased complexity associated with the inverse DCT circuit and other components of a HDTV decoder can make a HDTV decoder considerably more expensive than an SDTV decoder.

[0008] In fact, the cost of memory alone may make a HDTV set incorporating a HDTV decoder prohibitively expensive for some consumers. It is expected that a fully MPEG compliant video decoder for HDTV will require a minimum of 10 MB of RAM for frame storage with a practical HDTV decoder probably requiring about 16 MB of relatively expensive Synchronous DRAM.

[0009] Accordingly, there is a need for a method and apparatus that permits: (1) a simplification of the complexity of the circuitry required to implement a HDTV decoder, (2) a reduction in the amount of memory required to implement a HDTV decoder circuit, and (3) a single decoder that is capable of decoding both SDTV and HDTV signals. Furthermore, it is desirable that the cost of such a decoder be low enough that it is in a range that would be acceptable to most consumers, e.g., approximately the cost of a SDTV decoder.

[0010] While various proposals call for transmitting only US ATV signals it has also been suggested that some digital SDTV signals be broadcast. Various combinations of broadcasting HDTV and SDTV signals are possible with multiple SDTV shows being broadcast during a particular time of the day and a single HDTV broadcast being transmitted in the same bandwidth used for the SDTV signals at a different time of the day.

[0011] Thus, in order to remain compatible with both HDTV and SDTV broadcasts, there would be value in a television receiver include a video decoder capable of decoding both HDTV and SDTV signals and furthermore, that such a video decoder be capable of being implemented at a relatively low cost.

[0012] In addition, there is a need for a method and apparatus for implementing picture-in-picture capability in a digital television without incurring the cost of multiple full resolution decoders. In known analog picture-in-picture systems, during picture-in-picture operation, and full resolution decoder is normally used to decode the TV signal used to produce a main picture and a second full resolution decoder is used to decode the television signal which is used to provide the second picture displayed within a small area of the main picture.

Summary of the Present Invention

[0013] The present invention is directed to video de-

coders and, more particularly, to methods and apparatus for implementing video decoders that are capable of decoding high definition television ("HDTV") signals and/or standard definition compressed video signals.

[0014] In particular the present invention is directed to a plurality of methods and apparatus for reducing the complexity of digital video decoder circuitry and for reducing video decoder memory requirements.

[0015] A HDTV decoder capable of decoding HDTV signals at less than full HDTV resolution, e.g., at approximately SDTV resolution and/or decoding SDTV signals is described. It is expected that as a result of the various data reduction features and circuit simplifications of the present invention a combined HDTV/SDTV decoder that outputs pictures at approximately SDTV resolution can be built at approximately 130% of the cost of a digital SDTV decoder.

[0016] In accordance with one embodiment of the present invention the described reduced resolution HDTV video decoders are used as part of a picture-in-picture decoder circuit for providing picture-in-picture capability without the use of multiple full resolution video decoders.

[0017] The decoder of the present invention achieves substantial reductions in circuit complexity and memory requirements through the use of a plurality of data reduction techniques including the use of a preparser, downsampling, and truncating bytes of data representing pixel values so that the pixel values are represented using only 5, 6 or 7 bits as opposed to, e.g., 8 bits per DCT value.

[0018] In accordance with one embodiment of the present invention, the preparser is used to discard data to permit a smaller channel buffer than would otherwise be required to be used. In addition, the preparser discards run-length/amplitude symbols for each macroblock when the number of run-length/amplitude symbols exceeds a maximum preselected number per macroblock. In one embodiment the preparser also limits the number of bits output per unit time period, e.g., by limiting the number of bits per macroblock, such that a predetermined data processing rate which is determined by the combined capability of the coded data buffer and syntax parser and variable length decoder circuit is not exceeded. In this manner, the present invention permits a simpler real-time syntax parser and variable length decoder circuit to be used than would be possible without such preparsing.

[0019] In accordance with the present invention, an inverse quantizer circuit and an inverse discrete cosine transform circuit are designed to process only a preselected set of DCT coefficients corresponding to each macroblock and to set the rest of the coefficients, e.g., the DCT coefficients removed by the preparser, to zero. In this manner the computational requirements of the inverse quantizer circuit and inverse discrete cosine transform circuit are substantially reduced allowing for simpler circuit implementation.

[0020] In addition to the use of the preparser, the use of a downsampler and/or a least significant bit truncation circuit provide for further reductions in the amount of data used to represent each video picture thereby resulting in a significant reduction in frame buffer memory requirements.

[0021] In order to compensate for the effect of data reduction, including downsampling and data elimination, the decoder of the present invention may include low pass filters.

[0022] The above described features and embodiments of the present invention along with numerous other features and embodiments are described below.

Brief Description of the Drawings

[0023]

Figure 1 illustrates a video decoder in accordance with one exemplary embodiment of the present invention.

Figure 2A illustrates a video decoder in accordance with a second exemplary embodiment of the present invention.

Figure 2B illustrates a video decoder circuit capable of decoding both HDTV and SDTV video signals in accordance with the present invention.

Figures 3A through 3E illustrate 8x8 blocks of DCT coefficients corresponding to a HDTV macroblock in accordance with different embodiments of the present invention.

Figure 4 illustrates an exemplary circuit for decoding video images to support picture-in-picture television operation in accordance with the present invention.

Detailed Description

[0024] The present invention is directed to video decoders and, more particularly, to a low cost video decoder that is capable of decoding high definition and/or standard definition digital video signals. In accordance with the present invention decoded HD pictures will be displayed with less than full HD resolution, e.g., at approximately SD resolution, while SD pictures will be displayed at full SD resolution. The decoder of the present invention can be implemented as a low cost HDTV decoder or as a joint HD/SD television decoder. While the detailed description of the present invention is directed primarily to exemplary embodiments of HDTV, SDTV and combined HDTV/SDTV decoders, it is to be understood that the numerous features of the present invention may be used to provide low cost reduced resolution digital video decoders suitable for decoding digital pic-

tures in general, and that this disclosure is therefore not limited solely to SDTV and HDTV decoders. Furthermore, while the exemplary embodiments are described as MPEG compatible decoders it should be noted that the decoders of the present invention can be implemented to decode a plurality of MPEG like video data streams that use discrete cosine transform data encoding.

[0025] In the case of television sets with relatively small screens, e.g., less than 20 inch screens, the difference in perceived resolution and picture quality between a HDTV signal and an SDTV signal will be barely noticeable. Accordingly, low cost HDTV decoders in accordance with the present invention which provide less than full HDTV picture resolution and quality are particularly well suited for such applications because of their cost advantages. The decoder of the present invention is also well suited for providing picture-in-picture capability because of the small display area of the second picture being displayed and the relatively low cost of the decoder of the present invention as compared to the cost of a full HDTV decoder.

[0026] The method of the present invention for decoding HD and SD pictures includes the steps of reducing the resolution of received HD pictures prior to decoding by using, e.g., a preparser unit and/or adaptive field/frame downsampling to reduce the complexity of later processing stages of the decoder. In addition, by using an inverse discrete cosine transform ("IDCT") circuit designed to maximize the amount of common circuitry used for processing both reduced resolution HD and SD pictures the cost of implementing a combined HD/SD decoder circuit is reduced.

[0027] Referring now to Figure 2, there is illustrated a video decoder generally indicated by the reference numeral 100, implemented in accordance with one embodiment of the present invention. The illustrated decoder 100 is capable of decoding HD and/or SD television signals, e.g., MPEG compliant television signals. When used as a HD decoder, the decoder circuit 100 can produce images from a HDTV signal that are comparable in quality or slightly better than SD television images.

[0028] The SD/HD video decoder circuit 100 comprises a preparser 112, a syntax parser and variable length decoder circuit 120, an inverse quantizer 122, an inverse DCT circuit 124, a down sampler 126, a summer 128, a switch 129, a post processor 136, a motion compensated prediction ("MCP") circuit 130, and a memory circuit 114 including a coded data buffer and a frame buffer 118.

[0029] Methods of reducing the overall cost of a HDTV decoder will now be described with reference to the embodiment of Fig. 1.

[0030] Generally, the single most expensive element of a video decoder, in terms of cost, is the frame memory 118 which may comprise, e.g., 16 MB of synchronous DRAM in a HD decoder. The coded data buffer 116, which is used for the temporary storage of the compressed bitstream represents a smaller but not insignificant cost. A fully MPEG compliant HDTV decoder is expected to require at least 1 MB of RAM for use as a coded data buffer.

[0031] Other elements of a decoder which add significantly to the cost of the decoder are the inverse discrete cosine transform circuit ("IDCT") 124 and the inverse quantizer ("IQ") circuit 122. The IDCT circuit 124 of a HDTV decoder is required to perform a large number of arithmetic computations at a high rate and therefore is likely to represent a significant portion of a decoder's circuitry. The IQ circuit 122 performs a smaller number of computations than the IDCT circuit 124 but because of the high speed and complexity of the computations, the cost of the IQ circuit 122 may also be a significant component of a HDTV decoder's overall cost.

[0032] In addition to the IDCT circuit 124 and the IQ circuit 122 motion compensation and interpolation logic may require a significant amount of logic gates, e.g., the motion compensation and interpolation logic may require more logic gates than the IQ circuit to implement but less than the IDCT circuit. The syntax parser and variable length decoder circuit 120 may also require a significant amount of logic gates to implement.

[0033] Because the cost and complexity of a HDTV decoder is largely a function of the requirement that it process large amounts of data on a real time basis, it is possible to reduce the complexity and thus the cost of a HDTV compatible decoder by reducing the amount of data that needs to be processed. While using only a small portion of the video data received in an HDTV signal will result in reduced resolution and picture quality, by carefully selecting which HDTV data to process and the method by which it is processed, video image quality comparable to or better than SD television signals can be achieved. As will be discussed below, the preparser 112 serves to dynamically limit the amount of video data supplied to the remaining elements of the decoder circuit 100 including the syntax parser and VLD circuit 120 thereby reducing the amount of data that must be processed by the subsequent circuit elements on a real time basis and the required complexity of those circuit elements. An additional benefit of the use of the preparser 112 is that it permits for the use of a smaller coded data buffer 116 than would otherwise be required.

[0034] As illustrated in Fig. 2, the preparser 112 has a first input for receiving the variable length encoded bitstream representing, e.g., a HDTV signal output by a transport demultiplexer/decoder circuit of a receiver, and a second input for receiving data rate control information. The output of the preparser 112 is coupled to the input of the coded data buffer 116 which has a rate control output coupled to the second input of the preparser 112.

[0035] The preparser 112 operates to reduce the amount of HDTV data supplied to the coded data buffer. It does this by selectively discarding some of the received HDTV data. By using the preparser 112 to parse and discard data prior to variable length decoding it is

possible to operate the preparser 112 at a data rate that is a function of the data rate of the received bitstream. This rate will be considerably lower than the data rate that the corresponding circuitry would have to be capable of supporting if it were located after the variable length decoder circuit 120. By preparsing the data prior to storing in the coded data buffer 116 and syntax parsing and variable length decoding, the need to support the worst case processing requirements that might otherwise be encountered by the SP and VLD circuit 120 is avoided. Since the maximum data rate, e.g., the worst case data rate, that the SP and VLD circuit 120 would normally have to be designed to support can be as much as 60 times higher than the average data rate, a substantial reduction in the complexity of the SP and VLD circuit 120 can be achieved by using the preparser 112 to insure that support for what would normally be the worst case variable length decoding scenario need not be provided.

[0036] The preparser 112 parses the incoming bitstream, without performing a complete variable length decode operation, to identify data corresponding to different types of video frames, such as bi-directionally coded ("B-") frames, predictively coded video frames ("P-") frames and intra-coded ("I-") frames, and to identify MPEG coding elements such as macroblocks including motion vectors and DCT coefficients associated with each of the identified frames in the received data stream.

[0037] The preparser 112 performs several data reduction operations on a HDTV bitstream as required to insure that the processing capacity of the SP and VLD circuit 120 and throughout capability of the coded data buffer 116 are not exceeded. Thus, the preparser 112 operates to insure that the preparser output data rate stays within a real time decoding envelope established by the decoding limits of the other components of the decoder 100. By reducing the data rate as required, the preparser 112 also serves to reduce the coded data buffer size requirements because the coded data buffer 116 need only be capable of storing a reduced amount of data.

[0038] In one embodiment, to insure that the preparser output data rate stays within the preselected limits of the decoding envelope, the preparser 112 limits the number of DCT coefficients used to represent a macroblock to a preselected number and also limits the number of bits per macroblock by removing the highest order DCT coefficients associated with a received macroblock until the desired number of bits per macroblock required to prevent the coded data buffer capacity and decoding limits from being exceeded is achieved. Both the number of DCT coefficients per macroblock and the number of bits per macroblock can be preselected to approximately achieve the desired data rate or can be dynamically selected by the preparser 112.

[0039] Thus, in one embodiment, to limit its output data rate to a level required to prevent the coded data buffer 116 from overflowing, the preparser 112 limits the number of DCT coefficients which are used to represent each macroblock by discarding the higher frequency DCT coefficients which exceed a preselected number of DCT coefficients. In such an embodiment, removal of AC DCT coefficients may be performed preferentially on B-frames, then P- frames and then I- frames, with a preference for retaining data in earlier P- frames as opposed to later P- frames as measured from the most recently received I- frame, as required to achieve the desired reduction in the preparser output data rate.

[0040] In DCT based video compression systems the DCT coefficients are naturally ordered in two dimensions according to vertical and horizontal frequency bins. In typical systems the coefficients are assigned a one-dimensional ordering to allow for sequential transmission. MPEG allows for two different orderings, generally called zig-zag scan and alternate scan.

[0041] It may be the case that the subset of DCT coefficients which are preserved, i.e., the DC DCT coefficients and lower frequency AC DCT coefficients not discarded by the preparser 112 may not be consistent with any linear range of coefficients in either of the MPEG scanning types. In such a case, it is difficult to limit the DCT coefficients to the desired set by discarding all of the coded coefficients of a macroblock after a certain point in the data stream.

[0042] In accordance with the present invention, two different approaches are used to insure that the preparser 112 discards the preselected DCT coefficients. In accordance with a first embodiment, the preparser 112 chooses the coefficient index in scan order after which to discard coefficients. In this embodiment the retained set of DCT coefficients will initially include all coefficients which do belong to the desired set as well as some coefficients which do not belong to the desired set. The preparser 112 then sends only the DCT coefficients which belong to the desired set to the coded data buffer 116 to be passed to the SP and VLD circuit 120.

[0043] In a second embodiment, the preparser 112 recodes the incoming bitstream. This is done by removing run length/amplitude codes which refer to undesired coefficients, and by then recoding the later desired coefficients with suitably modified run lengths.

[0044] By limiting the number of DCT coefficients per macroblock, the preparser 112 effectively discards run-length/amplitude symbols which effectively cause zero DCT coefficient values thus allowing for a simpler IDCT circuit 124 to be used, in some embodiments, as opposed to the IDCT circuit that would be required to fully decode a HDTV bitstream.

[0045] The discarding of run-length/amplitude symbols also allows for a simpler syntax parser and variable length decoder circuit 120 than would other wise be required because the use of the preparser 112 insures that no more than the preselected number of run-length/amplitude pairs per macroblock will be output by the preparser 112 for further processing.

[0046] Yet another benefit of the discarding of some DCT coefficients, i.e., the effective setting of such coefficients to zero, is that the preparser 112 effects lowpass filtering on a macroblock basis thereby reducing or eliminating the need for additional filtering before a downsampling operation, which will be described below, is performed.

[0047] In one particular embodiment, the preparser 112 also operates to detect and eliminate data from the received bitstream which will have no impact on ultimate picture quality. In one such embodiment, the preparser 112 deletes from the data stream such MPEG data as bit slice stuffing and start code zero stuffing to thereby reduce the data rate without impacting picture quality. By eliminating such unnecessary data, the preparser output data rate and the size of the coded data buffer 116 can be reduced in this manner with no impact on picture quality.

[0048] In one embodiment of the present invention, the preparser 112 dynamically adjusts the amount of data discarding performed as a function of the amount of memory available in the coded data buffer 116 for storing the received data. In order to facilitate such dynamic data discarding the coded data buffer 116 includes a data rate monitoring circuit which generates a signal supplied to the second input of the preparser 112 indicating how much data is stored at any given time in the coded data buffer 116.

[0049] In such an embodiment, the preparser 112 maintains a model of coded data buffer 116 occupancy and works to ensure that the buffer 116 will never overflow. As buffer occupancy increases as indicated by the signal received from the buffer 116, the preparser 112 becomes more severe in the amount of high frequency information that is discarded further reducing the number of DCT coefficients per macroblock from a preselected maximum number to a lower number.

[0050] The preparser 112 can look to buffer occupancy characteristics of the received bitstream, e.g., the manner in which the video data was originally encoded for data transmission, and use this information as a factor in determining what information should be discarded to achieve the required reduction in the data rate.

[0051] As one feature of the dynamic control of its output data rate and thus buffer control, the preparser 112 computes and stores the number of bits used to code each row of macroblocks that comprise a picture as the data is received. While this number may vary dramatically from row to row and picture to picture, since the decoder will take roughly the same amount of time to process each row or macroblocks regardless of the number of bits used to represent the row of macroblocks, the preparser can predict the rate of code buffer emptying. When this rate is expected to be relatively fast, e.g., because a large number of bits are used to represent the preceding rows of macroblocks, the preparser 112 can discard less data from the received data stream without concern of the coded data buffer 116 overflowing. However, when relatively few bits are used to code the macroblocks representing the preceding rows of macroblocks, the coded data buffer 116 will empty on a comparatively slow basis requiring the preparser 112 to discard more data from the received data stream until the coded data buffer 116 becomes less occupied.

[0052] In one embodiment, to minimize implementation costs, the preparser 112, which may also be referred to as a bitstream preprocessor, is designed to run at the incoming bit rate and is implemented using a bit serial architecture. Alternatively, the preparser 112 can parse an entire token at once, and at a rate that never needs to exceed the data rate of the received variable length encoded bitstream divided by the minimum length of a symbol in the bitstream.

[0053] As will be discussed below, when the decoder circuit 100 is used as a joint reduced cost HDTV decoder and SDTV decoder, the data throughput is selected to permit the passing of a full rate SDTV bitstream.

[0054] The coded data buffer 116, which is coupled to the preparser 112, in the above described manner, is used to temporarily store the variable length encoded data output by the preparser 112 until the syntax parser and variable length decoding circuit 120 is ready to accept the video data for processing.

[0055] The syntax parser and variable length decoder circuit 120 has an input coupled to a data output of the coded data buffer 116 to receive therefrom the variable length encoded data temporarily stored therein. The syntax parser and variable length decoder ("SP and VLD") circuit 120 decodes the received data to a constant length bit stream.

[0056] By using the preparser 112 in the above described manner, the computation requirements of the SP and VLD circuit 120 are substantially reduced as compared to the case where all the received data is syntax parsed and variable length decoded. The preparser 112 effectively limits the number of DCT coefficients which must be variable length decoded for any given macroblock by discarding coefficients exceeding the preselected maximum number permitted per macroblock thus reducing the burden on the real time SP and VLD circuit 120 by putting a clear limit on the amount of data that will have to be processed for each macroblock.

[0057] The output of the SP and VLD circuit 120 is coupled to the input of the inverse quantization ("IQ") circuit 122 which, in turn, has an output coupled to the input of the IDCT circuit 124.

[0058] Reduced complexity IQ and IDCT circuits 122 and 124 are implemented in accordance with the present invention by intentionally setting preselected AC DCT coefficients corresponding to each macroblock to zero. The IQ circuit 122 can be designed to preform this function.

[0059] The IQ circuit 122 receives the data output by the SP and VLD circuit 120 and operates to generate DCT values of zero for preselected DCT coefficients re-

gardless of the input value of the preselected DCT coefficients. In this manner, the IQ circuit need not actually process the preselected DCT coefficients received at its input but only the remaining DCT coefficients.

[0060] In one exemplary embodiment, the IQ circuit 122 sets all but the upper left 4X4 region of DCT coefficients of a set of 8X8 DCT coefficients representing a HDTV macroblock to zero. Fig. 3A illustrates the resulting effect on an 8x8 block of DCT coefficients representing a macroblock. In the illustration of Fig. 3, Xs are used to represent DCT values that are actually processed by the IQ circuit 122, while as illustrated all the other DCT values are set to zero.

[0061] Accordingly, in such an embodiment, the IQ circuit 122 need only include circuity for performing inverse quantization on 16 of the possible 64 DCT coefficients corresponding to each macroblock and circuitry for outputting zeros for the remaining DCT coefficient values. In this manner, the inverse quantization computation requirement is reduced by a factor of four. The complexity of the IDCT circuit 124 is reduced in a similar manner since a preselected number of the DCT values will be set to zero by the IQ circuit 122.

[0062] MPEG permits the use of either interlaced pictures or non-interlaced pictures. When encoding video data as interlaced pictures, the DCT operation may have been performed on either a field or frame DCT basis. When interlaced video data is encoded on a frame DCT basis the high frequency coefficients represent temporal as well as spatial information. In such a case it may be desirable to maintain high vertical frequencies to maximize the preservation of temporal information.

[0063] Accordingly, in one exemplary embodiment in which it is expected that some interlaced pictures encoded on a frame DCT basis will be received, the IQ circuit 120 is designed to force to zero all DCT coefficients except the DCT coefficients corresponding to rows 0, 1, 6 and 7 and columns 0, 1, 2, 3 of an 8x8 DCT coefficient two dimensional array representing a HDTV macroblock. Such a case is illustrated in Fig. 3B where Xs are used to represent DCT coefficient values that are processed by the IQ circuit 122 and zeros are used to represent the preselected DCT coefficients that are set of zero.

[0064] It should be noted that it is possible to select DCT coefficients other than those illustrated in the embodiments of Figs. 3A and 3B to be set to zero depending on the desired implementation.

[0065] The IDCT circuit 124 receives the data output by the inverse quantization circuit 122 and performs an inverse DCT operation on the received data. Because, in accordance with the present invention, preselected DCT coefficients were intentionally set to zero, the inverse DCT circuit need not include circuitry for processing those coefficients. Thus, as with the inverse quantization circuit 122, the IDCT circuit 124 can be implemented using a relatively simple circuit.

[0066] The output of the IDCT circuit 124 is coupled to the input of the downsampler 126. The downsampler 126 is used to downsample the data corresponding to each picture prior to storage in the frame buffer 118. As a result of the downsampling operation, the amount of data required to represent a video frame is substantially reduced. For example if the downsampler 126 is implemented to remove half of the digital samples used to represent a picture, the amount of data that would have to be stored will be reduced by a factor of approximately two substantially reducing the amount of memory required to implement the frame buffer 118.

[0067] Referring now briefly to Fig. 2A there is illustrated another embodiment of the decoder according to the present invention as indicated by the reference numeral 200. Like numbered elements in Figs. 1 and 2A are the same or similar to each other and thus will not be described again in detail. In the decoder 200, a small buffer 202, e.g., a buffer capable of storing the data corresponding to several lines of a video frame, in combination with a low pass filter 204, is used to couple the output of the IDCT circuit 124 to the input of the downsampler 126. The buffer 202 stores video data representing several scan lines of a picture which is then low pass filtered by the low pass filter 204 prior to downsampling to reduce the blockiness in the image that might otherwise result from the downsampling operation.

[0068] Referring again to Fig. 1 it can be seen that the output of the downsampler 126 is coupled to a first input of the summer 128 and a first input of the switch 129. A second input of the summer 128 is coupled to the output of the MCP circuit 130 which supplies motion compensation information to the summer 128 to be combined with received P- and B- video frames. The video data output by the summer 128 represents a video frame that has been processed using motion compensation data to include the relevant video information from preceding and/or subsequent anchor frames. The output of the downsampler 126, on the other hand, represents either fully decoded picture data or decoded prediction residuals in the cases of intraframe coded macroblocks and non-interframe coded macroblocks respectively. The switch 129 is controlled, as is known in the art, to selectively couple the output of the downsampler 126 to the input of the frame buffer 118 when the received video macroblock was not encoded using motion compensated prediction, e.g., when the video data output by the downsampler was intra-frame coded. However, when the video data output by the downsampler 126 was encoded using motion compensated prediction, e.g., when it is B- frame or P- frame data, the output of the summer 128 is coupled by the switch 129 to the input of the frame memory 118.

[0069] The received downsampled, decompressed video frames are stored in the frame memory 118. The frame memory 118 has a first output coupled to an input of the MCP circuit 130 and a second output coupled to an input of the post processor circuit 136. In this manner the MCP circuit is supplied with downsampled video

frames to be used as anchor frames for motion compensation purposes.

[0070] Referring again briefly to Fig. 2A, it can be seen that the decoder 200 contains additional circuitry for reducing the amount of data required to be stored by the frame buffer 118, i.e., a least significant bit ("LSB") truncation circuit 208. The LSB circuit 208 couples the output of the switch 129 to the input of the frame buffer 118. MPEG assumes that 8 bits will be used per pel when representing a video frame. In accordance with the present invention, in order to reduce frame buffer memory requirements, one or more least significant bits are truncated from each set of bits representing a pel. For example, in one embodiment, the LSB truncation circuit 208 truncates the data representing a pel from 8 bits to e.g., 6 or 7 bits. When the data corresponding to each pel is truncated to 6 bits a data savings of approximately 25% results.

[0071] The amount of truncation performed may be implemented as a function of the type of frame to which the data corresponds. Because reduction in the resolution in anchor frames will impact the quality of frames which use these frames for motion compensation purposes, it may be desirable to reduce the resolution of these frames less than frames, such as B- frames, which do not impact the quality of other frames. Accordingly, in one embodiment anchor frame data, e.g., I- and P- video frame data, is truncated to 7 bits per pel while data which is not used for anchor frames, e.g., B- frame data, is truncated to 5 bits per pel.

[0072] When LSB truncation is used to reduce frame buffer memory requirements, in order to maintain MPEG compatibility it is necessary to represent the stored data in an 8 bit per pel format. Accordingly, the outputs of the frame buffer 118 are coupled to least significant bit padding circuits 206, 207 which pad the least significant bits of the data output by the frame buffer 118 with zeros to insure that the data corresponding to each pel of a frame is represented by 8 bits. The output of the LSB padding circuit 206 is coupled to the input of the MCP circuit thereby providing the MCP circuit with downsampled video frame data. The output of the LSB padding circuit 207 is coupled to the input of an optional low pass filter 209 which, in turn, is coupled to the post processing circuit 136. The optional low pass filter 209 reduces the effect of the quantization noise generated as a result of the truncation and padding process but also results in a slight reduction in the resolution of the video frame being supplied to the post processing circuit 136.

[0073] The operation of the MCP circuit 130 illustrated in Figs. 1 and 2A, which is designed to operate using motion vectors generated in accordance with the MPEG standard, will now be described.

[0074] MPEG supports the use of motion compensation and, in particular, P- frames and B- frames each of which rely on another frame as an anchor frame. The motion vectors received as part of the video data stream supplied to the preparser 112 were calculated at encoding time for use with full resolution video frames as opposed to downsampled video frames.

[0075] In accordance with the present invention, the downsampled frames supplied by the frame buffer 118 to the MCP circuit 130 are upsampled, e.g., on-the-fly, interpolated and then downsampled prior to generating predictions based on the motion vectors. In this manner the motion vectors which were originally generated based on full resolution video frames are effectively applied to downsampled video frames.

[0076] As illustrated in Fig. 1, the MCP circuit 130 comprises an upsampler 131 which has an input coupled to the first output of the frame buffer 118, and an output coupled to the input of a half pel interpolation circuit 132. The output of the half pel interpolation circuit 132 is coupled to the input of a motion compensated prediction module 135. The output of the motion compensated prediction module 135 is coupled to a downsampler 133 which, in turn, has an output coupled to the input of the average predictions circuit 134. The output of the average predictions circuit 134, which serves as the output of the MCP circuit 130, is coupled to the second input of the summer 128.

[0077] Various known upsampling and down sampling filters may be used for the upsampler 131 and downsampler 133, respectively. However, for best results, simulations have shown that it is very important that the downsampler 133 use a downsampling process which is the exact inverse of the upsampling process since even small differences are made noticeable in inter-coded video frames after many generations of predictions.

[0078] There are several ways the required upsampling and downsampling can be accomplished. For example, in one embodiment a bilinear upsampling filter with a 3x3 kernel and a center coefficient = 1.0 is used as the upsampler 131 and a downsampler which does not perform filtering is used as the downsampler 133. This selection of filters allows for reasonably good upsampling with no additional blurring during downsampling. This filter arrangement works especially well when the residual image to be accumulated during predication has been lowpass filtered prior to accumulations. Such low pass filtering is, as discussed above, achieved to some extent as a result of the preparser 112 removing higher order AC DCT coefficients from macroblocks which include more than the preselected maximum number of DCT coefficients per macroblock.

[0079] In another embodiment an upsampling filter with a kernel size of 2x2 pixels is used as the upsampler 131 and a downsampling filter is used with the same kernel size as the upsampling filter and a transfer function such that the convolution of the upsampling filter transfer function and the downsampling filter transfer function produces a 3x3 kernel whose center coefficient is 1.0.

[0080] While it is preferred that identical downsampling circuits be used for the downsampler 126, 123

there is no requirement that this in fact be the case. However, it is important that the downsampler 133 be matched to the upsampler 131, as discussed above, to provide good results.

[0081] MPEG permits the portion of an image corresponding to a macroblock to be encoded either on an interlaced or non-interlaced manner. Macroblocks corresponding to non-interlaced pictures are always coded using a frame DCT format and with macroblocks corresponding to interlaced pictures being coded using either a field or frame DCT format.

[0082] In accordance with the present invention, downsamoling is performed separately on each individual macroblock.

[0083] Downsampling of macroblocks corresponding to non-interlaced pictures is performed by the downsampler 126 on a frame basis.

[0084] However, with regard to macroblocks corresponding to interlaced pictures downsampling can be performed on either a field or frame basis for each macroblock.

[0085] As discussed above, the downsampler 126 performs downsampling on non-interlaced pictures on a frame basis. However, with regard to interlaced pictures it can be performed on either a field or frame basis. Thus, in the case of macroblocks of interlaced pictures one is confronted with a decision whether the downsampling, performed by the downsamplers 126, 133, should be done on a field or on a frame basis. Field based downsampling preserves the greatest degree of temporal resolution whereas frame based downsampling has the potential of preserving the greatest degree of spatial resolution. In one embodiment of the present invention pictures are downsampled in a consistent manner either on a field or frame basis when interlaced pictures are received. Accordingly, in one embodiment both interlaced and non-interlaced pictures are downsampled on a frame basis. While in another embodiment non-interlaced pictures are downsampled on a frame basis while interlaced pictures are downsampled on a field basis.

[0086] In another slightly more elaborate embodiment, the downsampler 126 performs downsampling on a interlaced pictures on both a field and frame basis with the particular method depending on the individual macroblock being processed.

[0087] Field based downsampling is most appropriate when there is not much high frequency content in the macroblock being downsampled and/or there is a great deal of motion associated with the macroblock. On the other hand, frame based downsampling is most appropriate when there is significant high frequency content in the macroblock being processed and/or little motion associated with the macroblock. Accordingly, in one embodiment, the downsampler 126 assesses the described characteristics for each macroblock of an interlaced picture and dynamically determines the most appropriate method for downsampling the individual macroblock.

[0088] In yet another embodiment which supports downsampling on both a field and frame basis but which requires relatively little circuitry for deciding which down sampling approach to use, the downsampler 126 merely follows the choice made by the encoder when it originally encoded the macroblock being downsampled since the criteria used for previously deciding whether to encode the macroblock on a field or frame DCT basis is similar to the criteria which should be used to decide whether to downsample on a field or frame basis.

[0089] Accordingly, in one embodiment of the present invention the downsampler 126 downsamples macroblocks corresponding to an interlaced picture on a frame basis if they were encoded on a frame DCT basis and downsamples them on a field basis if they were encoded on a field DCT basis.

[0090] While the downsampling of frames prior to storage in the frame buffer 114 reduces frame buffer memory requirements, it has the disadvantage of requiring the use of the upsampler 131, half pel interpolation circuit 132 and downsampler 133 in order to take full advantage of the motion vectors. Such circuitry slightly increases the processing requirements as compared to those of standard MCP circuits 15 since the anchor picture data must be upsampled prior to interpolation if half-pel resolution is to be achieved. It should be noted that as an alternative to upsampling, interpolation, and then downsampling, a less complicated and thus less costly way to perform motion compensation, with somewhat lower quality results, is to divide the value of each original motion vector by the integer decease in resolution and take the average integer result of the division operation as the new motion vector value.

[0091] While downsampling thus tends to increase MCP processing requirements slightly it has the advantage of reducing the complexity of the input/output circuitry to the MCP circuit because the data bandwidth into and out of the MCP circuit 130 is reduced as a result of the downsampling by the same factor as the buffer frame memory requirements.

[0092] In accordance with one embodiment of the present invention, in order to reduce the processing and bandwidth requirements of the MCP circuit 130, and thus the complexity of the MCP circuit 130, bi-directional and dual-prime prediction is avoided. Thus eliminating the need for the average predictions circuit on the ability to process to anchor frames simultaneously. Once a picture has been upsampled by the upsampler 131 interpolation is preformed by the half pel interpolation circuit. The motion compensated prediction module then actually applies the motion vectors to the upsampled picture which is then downsampled by the downsampler 133. When the picture being processed is a bi-directionally coded picture, the upsampling interpolation, motion and prediction operations will be performing on two anchor frames which are then averaged together by the average predictions circuit to generate the single picture output by the MCP circuit 135.

[0093] This is accomplished, in accordance with one embodiment of the present invention by using only a single reference or anchor picture for prediction purposes even if the macroblock type flag associated with a macroblock being processed indicates that it is a bi-directional coded macroblock, i.e., a macroblock that was coded based on the content of two different pictures.

[0094] In such an embodiment when the bi-directionally coded macroblocks are received, the MCP circuit 130 performs motion compensation using only one reference despite the fact that the macroblock type flag associated with the individual macroblock being processed in the data stream indicates that motion compensation should be performed using two references.

[0095] In an exemplary embodiment, the upsampler circuit 131 detects when a bi-directionally or dual coded macroblock is being processed, selects which of the two possible anchor pictures associated with the macroblock to use for predication purposes and then upsamples only the selected anchor picture.

[0096] In one embodiment, the upsampler circuit 131 selects which of the two possible anchor pictures to use for predication purposes by selecting the anchor picture that is temporally closet to the current picture and thus macroblock being processed. If the two anchor pictures are temporally equidistant, the average predictions circuit 134 selects the earlier of the two possible anchor pictures to thereby select the one of the two anchor pictures which will have suffered the least degradation due to drift.

[0097] Since errors do not propagate from B-pictures, because they are not used as anchors for subsequent pictures, a fairly large degree of distortion, i.e., of the type caused by using only a single anchor picture for prediction purposes, can be tolerated with regard to B-pictures. However, the use of a single anchor picture for prediction purposes with dual-prime coded sequences may result in somewhat less satisfactory results because prediction errors may propagate when dual-prime coded sequences are used.

[0098] Referring now to Fig. 2B there is illustrated a video decoder circuit 300 according to the present invention capable of decoding HDTV signals at less than full HDTV resolution and SDTV signals at full SD resolution. As illustrated, the decoder circuit 300 is similar to the decoder circuit 100 but includes additional circuitry, i.e., a HDTV/SDTV mode control circuit 310 for controlling the decoder circuit's mode of operation, a set of switches 301, 302, 303 and a multiplexer 341 for bypassing the decoder's preparser 112, downsampler 126, upsampler 131, and downsampler 133 when the HDTV/SDTV mode control circuit 310 determines that an SDTV signal is being received. When the HDTV/SDTV mode control circuit 310 determines that a HDTV signal is being received it controls switches 301, 302, 303 and multiplexer 341 to connect the circuit elements in generally the same manner as illustrated in the embodiment of Fig. 1 so that the data reduction features of the decoder circuit 300 of Fig. 2B are operative.

[0099] The HDTV/SDTV mode control circuit 310 receives as its input the variable length encoded bitstream. From analyzing the data in the bitstream, e.g., header information indicating the resolution of the video frames being received, it determines if it is receiving HDTV data, i.e., data of a higher resolution than it can decode without performing data reduction operations on the received data, or SDTV data, i.e. data which the decoder 300 can fully decode and store without having to perform any data reduction operations.

[0100] The HDTV/SDTV mode control circuit 310 generates a mode control signal which is supplied to a position control input of the switch 301 which is part of the preparser module 312, a position control input of the switch 302 which is part of a downsampler module 326 and a position control input of the switch 303 and multiplexer 341 which is part of a motion vector interpolation module 333. As discussed above, the output signal of the HDTV/SDTV mode control circuit 310 operates to switch each of the modules 312, 326, and 333 between a first mode of operation, e.g., a SDTV mode of operation, to a second mode of operation, e.g., a HDTV mode of operation. In such a manner, the decoder 300 is controlled by the HDTV/SDTV mode control circuit to perform data reduction to reduce the resolution of the received frames during the second mode, i.e., the HDTV mode of operation, but not during the first mode of operation, i.e. the SDTV mode of operation.

[0101] While the frame buffer 118, coded channel buffer 116, IQ circuit 122, IDCT circuit 124, MCP circuit 330 and SP and VLD circuit 120 are generally the same in the decoder 300 as the decoder 100, various features of each of these decoder elements will be discussed as they relate to the particular embodiment illustrated in Fig. 2B, e.g., when they are implemented as part of a decoder which is capable of decoding both a television signal of a first resolution and a second television which is of lower resolution than the first television signal, e.g., HD and SD television signals.

[0102] The preparser 112, in the embodiment illustrated in Fig. 2B, is designed to reduce the data rate of a received HDTV signal to approximately that of a SDTV signal. Thus, the preparser 112 limits the number of run-length/amplitude symbols per coded macroblock and the number of bits per macroblock so that the SP and VLD circuit 120 can function at approximately the same rate when processing HDTV signals as when processing SDTV signals, e.g., at the MP@ML specified maximum data rate.

[0103] This reduces the memory requirements for the coded data buffer 116 which serves as a channel buffer. Thus, the decoder 300 uses a channel buffer that meets the memory requirements for a SDTV decoder but which is smaller than that required for a fully MPEG compliant HDTV decoder. U.S. ATV specifies a channel buffer of 8 Mb, whereas only 1.5 Mb are required to implement a MP@ML channel buffer. Because the MP@ML specifi-

cation requires 830 Kbits more for a frame buffer than are required for decoding reduced resolution video pictures in accordance with one embodiment of the present invention, this 830 Kbits of the frame buffer which are not used for picture storage during HDTV mode operation can be used to supplement the memory of the channel buffer when operating in HDTV mode. Thus, in accordance with the present invention, the coded data buffer is implemented using approximately 2.33 Mbits which are also required to implement a full resolution SD decoder.

[0104] It is the responsibility of the preparser 112 to insure that the coded channel buffer 116 does not overflow during HDTV mode operation. This is achieved by, e.g., the preparser 112 discarding the less useful DCT coefficients in order to prevent the smaller than full size HDTV channel buffer 116 from overflowing.

[0105] While, the SP and VLD unit 120 is designed to operate at the same general data rate as a SDTV data rate, it is also designed to accommodate the larger range of parameter values allowable for HDTV coding, as compared to SDTV decoding, e.g., frame rate, picture horizontal size and picture vertical size. Thus, the SP and VLD circuit 120, because of the larger range of parameter values required to support both HDTV and SDTV decoding, is slightly more complicated then a standard SDTV syntax parser and variable length decoder circuit in this regard.

[0106] As described above, the output of the syntax parser 120 is coupled to the input of the IQ circuit 122 which, in turn, is coupled to the IDCT circuit 124. The IQ and IDCT circuits 122, 124 of the decoder 300 will now be described.

[0107] MPEG MP@ML allows for pixel rates of up to 10.4 million pixels per second. U.S. ATV allows for pixel rates of up to 62.2 million pixels per second.

[0108] In accordance with the present invention, IQ circuitry which meets MP@ML IQ requirements is used for the IQ circuit 122 of the decoder 300. In such an embodiment, the IQ circuit 122 is designed to process all the DCT coefficients of a SDTV macroblock but only, e. g., 10 or 11 DCT coefficients of an HDTV macroblock.

[0109] That is, the IQ circuit 122 is designed to set a preselected group of DCT coefficients of a HDTV macroblock to 0 while processing the remaining 10 or 11 DCT coefficients of each HDTV macroblock being processed.

[0110] In one exemplary embodiment, for HDTV macroblocks coded using field DCTs, the DCT coefficients of an 8x8 macroblock are discarded by the IQ circuit 122 as illustrated in Fig. 3C where zeros are used to represent discarded DCT coefficients and X's are used to represent DCT coefficients which are processed by the IQ circuit 122. For HDTV macroblocks coded using frame DCTs, the DCT coefficients of an 8x8 macroblock are discarded by the IQ circuit 122 as illustrated in Fig. 3D.

[0111] The IDCT circuit 124, like the IQ circuit 122 is designed to processes only a small percentage of the DCT coefficients associated with a HDTV macroblock, e.g., the same DCT coefficients processed by the IQ circuit 122.

[0112] An IDCT engine capable of performing fast one dimensional 8 point IDCTs can be used to implement the 2-D IDCT operation required by the IDCT circuit 124. A standard MP@ML IDCT engine can be used to compute about three 8 point IDCTs in the time allowed for IDCT processing of one HDTV macroblock. Accordingly, in one embodiment of the present invention, only DCTs in the first three columns of an HDTV macroblock are processed by the IDCT circuit 124, e.g., the DCT coefficients indicated by Xs in Figs. 3C and 3D.

[0113] Accordingly, in one embodiment the IDCT circuit 124 includes a MP@ML compliant IDCT engine for calculating IDCTs of the first three columns of a HDTV macroblock and all the IDCTs of a SDTV macroblock. Since, in accordance with the exemplary embodiment of the present invention, the DCT coefficients of all but the first three columns of a 8x8 HDTV macroblock are set to zero, there is no need to calculate the IDCTs for any coefficients outside the first three columns.

[0114] While the MP@ML IDCT engine is used to calculate the column IDCTs, a IDCT engine for calculating the row IDCTs for a HDTV macroblock is also included in the IDCT circuit 124. However, in accordance with the present invention, this can be a relatively simple IDCT engine since 5 of the 8 row coefficients will always be zero by the preselected setting of such coefficients to zero. Furthermore, because only the first two or three columns contain coefficient values that are to be used in the calculation of row DCTS only 2 or 3 points need to be calculated for each row transform. Note that in the embodiment which uses the 8x8 DCT arrangement illustrated in Figs. 3C and 3D only 4 rows have to be transformed when no additional filtering is performed prior to downsampling by the downsampler 126.

[0115] As an alternative method of implementing an IDCT circuit 124 which uses an MP@ML IDCT engine as part of HD decoder IDCT circuit, the low frequency rectangle of coefficients from several macroblocks may be combined into a single macroblock as illustrated in Fig. 3E, where "1" is used to represent low-frequency coefficients from a first macroblock, "2" is used to represent low-frequency coefficients from a second blocks, "3" is used to represent low-frequency coefficients from a third macroblock and "4" is used to represent low frequency DCT coefficients from a fourth macroblock.

[0116] In accordance with this alternative embodiment, the IDCT circuit 124 arranges the DCT coefficients from four different HDTV macroblocks into a single 8x8 block of DCT coefficients in the described manner and a conventional 8x8 point IDCT engine is then used to process the composite block of DCT coefficients. After processing by the 8x8 point IDCT engine relatively simple linear operations performed on the result of the IDCT operation are used to generate a good approximation of the IDCTs of the low frequency coeffi-

cients of each one of the four component HDTV macroblocks used to form the composite coefficient block.

[0117] As discussed above, the video picture data output of the IDCT circuit 124 is downsampled when the decoder 300 is operating in HDTV mode prior to storing in the frame buffer 118 to thereby further reduce memory requirements.

[0118] MP@ML allows for pictures as large as 720x576 pels for a total of 414720 pels per picture while US ATV allows for pictures as large as 1920x1080 pels per picture. Sequences received in the 1920x1080 pel picture format can be downsampled by a factor of 3 horizontally and a factor of 2 vertically to yield a maximum resolution of 640x540 pels for a total of 345,600 pels. In such an embodiment, the same amount of memory required to implement a full resolution SD decoder is satisfactory for storing a downsampled HDTV video picture. Thus, the memory provided for MP@ML would be adequate for the reduced resolution HD decoder as well, with an additional 830 KBits available for other purposes, e.g., for use as part of the coded data buffer 116 when operating in HDTV mode as described above.

[0119] By selecting decoder components that are designed in the above manner, it is possible to implement a combined low resolution HDTV decoder and full resolution SD decoder at a cost that is expected to be about 130% of the cost of a full resolution SDTV decoder. The decoder 300 may be used as part of a television set which is designed to decode and display both HDTV and SDTV signals at a relatively low cost as compared to a system incorporating a full resolution HDTV decoder.

[0120] The decoders illustrated in any of Figs. 1 and 2A-2B may also be used to implement picture-in-picture capability in a HDTV or SDTV set without incurring the cost of having to provide a full resolution decoder for the decoder used to display the picture shown inside the main picture of a picture-in-picture display.

[0121] For a MPEG compatible digital television set to operate in a picture-in-picture mode, two MPEG decoders must be used, a first decoder to decode the full resolution picture to be displayed on a first portion of the screen and a second decoder to decode the reduced size picture displayed on a second smaller portion of the screen.

[0122] Referring now to Fig. 4, there is illustrated a picture-in-picture ("PIP") decoder 400 in accordance with the present invention. The PIP decoder 400 receives MPEG compliant demodulated digital video information, e.g., either an SD or HD TV signal, from a tuner/demodulator 399 which is supplied to the input of a primary, e.g., full resolution decoder 401 and to the input of one or more reduced resolution decoders, i.e., the first and second reduced resolution decoders 402, 403.

[0123] The primary decoder 401 is responsible for decoding the main picture of a picture-in-picture image while the first and second decoders are responsible for generating separate images which will be displayed in a small area of the main picture. A separate reduced resolution decoder 402 or 403 is used for each additional image that is to be displayed in addition to the main picture.

[0124] The output of the primary decoder 401 and the reduced resolution decoders 402, 403 is coupled to the input of a picture-in-picture video processing circuit which operates to combine the main picture with the reduced resolution pictures output by the reduced resolution decoders 402, 403 prior to the resulting combined picture being displayed.

[0125] In one embodiment of the present invention the size of the reduced resolution pictures incorporated into the main picture is selected to be 1/4 x 1/4 the size of the normal picture. In such an embodiment, each MPEG 8x8 pixel block need only be decoded to a size corresponding to a block of 2x2 pixels.

[0126] The cost of the IDCT circuit 124 used in the reduced resolution decoders 402, 403 can be substantially reduced in accordance with the present invention by performing the IDCT operations on only 2x2 blocks as opposed to 8x8 blocks. This is achieved by, e.g., retaining and processing only the upper left 2x2 block of DCT coefficients of each 8x8 DCT coefficient block of a HDTV picture with all the other DCT coefficients being set to zero. Accordingly, in such an embodiment, the IDCT circuit cost is reduced to approximately the cost of a circuit which can perform a 2x2 IDCT as opposed to an 8x8 IDCT.

[0127] The IQ circuit 122 of the reduced resolution decoders 402, 403 can be simplified in a similar manner with the IQ circuit 122 operating only on a 2x2 block of DCT coefficients, i.e., 4 coefficient values, as opposed to 64 DCT coefficient values that form an 8x8 DCT coefficient block.

[0128] In accordance with the present invention, the reduced resolution decoders 402, 403 store the low resolution frames in their reduced size. Thus, by using 2x2 DCT coefficient blocks the size of the frame buffers can be about 1/16th of the size that would be required if 8x8 DCT coefficient blocks, i.e., full resolution blocks, were stored.

[0129] In addition to reducing frame buffer size the preparser 112 serves to reduce channel buffer requirements and the complexity of the SP and VLD circuit by, in accordance with the PIP embodiment, discarding amplitude/runlength pairs corresponding to each macroblock that exceed the 4 amplitude/runlength pairs that are used by the reduced resolution PIP decoder 402 or 403.

[0130] In a PIP embodiment, the MCP circuit 130 can perform interpolation on the reference frames for macroblocks whose motion vectors are not evenly divisible by four to achieve good prediction results. For a less expensive and somewhat lower quality implementation, motion vectors could be rounded to the nearest factor of 4 and applied without interpolation.

[0131] While the above PIP decoder embodiment of the present invention has been described in the context

of using 1/4 x 1/4 size pictures for the secondary pictures inserted into the primary picture, other size pictures could also be generated at reduced cost, e.g., 1/2 x 1/2 size pictures, using the decoder 100 described above. In such a case, the downsampling would have to be performed in a manner that would produce the desired reduction in size and data rate.

[0132] It should also be noted that the arrangement illustrated in Fig. 4 can be used to provide picture-in-picture capability in a SDTV receiver as well as a HDTV receiver. Furthermore, the illustrated PIP decoder arrangement is in no way limited to a specific degree of resolution with regard to the primary decoder 401 and only requires that the secondary decoder(s) 402, 403 be implemented as reduced resolution decoders as compared to the resolution supported by the primary decoder.

Claims

1. A decoder circuit for decoding digital video data including pictures at a resolution less than the full resolution of the pictures, each picture including a plurality of macroblocks, each macroblock including a plurality of DCT coefficients, the decoder circuit comprising:

   preparser means (112) for receiving the digital video data and for removing from each macroblock DCT coefficients that exceed a preselected maximum number of DCT coefficients per macroblock;
   coded data storage means (116) for the temporary storage of the compressed bitstream, and connected to said preparser means (112);
   a syntax parser and variable length decoder circuit (120) coupled to the channel buffer; and
   a channel buffer (116) coupled to the preparser means (112) for temporarily storing the video data output by the preparser means (112).

2. The decoder of claim 1, wherein each DCT coefficient is represented by a number of bits and wherein each macroblock is represented by the total number of bits representing the DCT coefficients included in the macroblock, and

   wherein the preparser means (112) operates to remove DCT coefficients from each individual macroblock until the number of bits used to represent the individual macroblock does not exceed a predetermined maximum number of bits.

3. The decoder of claim 1, wherein the channel buffer (116) is further coupled to the preparser means (112) by a feedback line and wherein the channel buffer signals the preparser means (112) to control the output data rate of the preparser means (112) as a function of the amount of data stored in the channel buffer (116).

4. The decoder of claim 1, further comprising

   an inverse quantization circuit (122) coupled to the syntax parser and variable length decoder circuit (120) for inverse quantizing only a limited preselected number of DCT coefficients per macroblock and for outputting zeros corresponding to the DCT coefficients of the macroblock which are not inverse quantized, wherein the limited number of DCT coefficients per macroblock is less than a maximum possible number of DCT coefficients per macroblock.

5. The decoder circuit of claim 4, wherein the limited preselected number of DCT coefficients per macroblock is less than 11 and wherein the maximum possible number of DCT coefficients per macroblock is 64.

6. The decoder circuit of claim 4, further comprising an inverse DCT circuit (124) coupled to the inverse quantization circuit (122) for performing an inverse DCT operation on the limited preselected number of DCT coefficients per macroblock.

7. The decoder circuit of claim 1, further comprising:

   said syntax parser and variable length decoder circuit (120) coupled to the channel buffer (116);
   a downsampler (126) coupled to the syntax parser and variable length decoder circuit (120) for downsampling the video pictures output by the syntax parser to thereby reduce the amount of resolution of each picture and the amount of video data used to represent each video picture.

8. The decoder circuit of claim 7, wherein the pictures further include motion vectors, and

   wherein the decoder circuit further comprises:

   a frame buffer (118) coupled to the downsampler (126) for storing the reduced resolution pictures generated by the downsampler; and
   a motion compensation circuit coupled to the frame buffer (118), the motion compensation circuit including:

   i. an upsampler circuit (131) for upsampling the reduced resolution pictures to generate prediction reference pictures;
   ii. an interpolation circuit (132) for interpolating the predication reference pictures;
   iii. a motion compensated prediction module for applying the motion vectors to the

prediction reference pictures to generate new pictures; and

iv. a downsampler circuit (133) coupled to the motion compensated prediction module for downsampling the new pictures to the same resolution as the pictures stored in the frame buffer.

9. A method of decoding variable length encoded digital video data including pictures, to a resolution less than the full resolution of the pictures, each picture including a plurality of macroblocks, each macroblock including a plurality of DOT coefficients, the method comprising the steps of:

receiving digital video data;

parsing the digital video data to identifymacroblocks included in the digital video data and the DCT coefficients included in the identified macroblocks;

discarding from the digital video data the DCT coefficients included in each macroblock that exceed a preselected number of DCT coefficients; and

storing the digital video data in a coded data buffer.

10. The decoding method of claim 9, wherein each DCT coefficient is represented by a number of bits and wherein each macroblock is represented by the total number of bits representing the DCT coefficients included in the macroblock, the method further comprising the step of:

prior to storing the digital video data in a coded data buffer, discarding DCT coefficients from each identified macroblock until each identified macroblock is represented by a total number of bits that is less than a preselected maximum number of bits.

11. The method of claim 10, further comprising the steps of:

monitoring the amount of data stored in the coded data buffer to determine coded data buffer occupancy; and

dynamicly adjusting the total number of bits allowed per macroblock from the preselected maximum number to a smaller number as coded data buffer occupancy increases to insure that the coded data buffer does not overflow.

12. The method of claim 9, further comprising the steps of:

syntax parsing and variable length decoding the video data stored in the coded data buffer to generate a variable length decoded video data stream including macroblocks, each macroblock including a plurality of DCT coefficients; and

inverse quantizing a preselected number of DCT coefficients included in each macroblock of the variable length decoded video stream and outputting zero values corresponding to the macroblock DCT coefficients which are not inverse quantized.

13. The method of claim 12, further comprising the step of:

performing an inverse discrete cosine transform operation on the inverse quantized video data.

14. The method of claim 13, further comprising the steps of:

downsampling the video data to reduce the resolution of the inverse quantized video data and to reduce the amount of memory required to store the inverse quantized video data; and storing the video data in a frame buffer.

15. The method of claim 14, further comprising the steps of:

upsampling the video data stored in the frame buffer; interpolating the upsampled video data; performing motion compensated prediction on the upsampled video data; and

downsampling the upsampled video data upon which motion compensated prediction was performed.

16. The method of claim 15, wherein the downsampling operation performed on the video data after performing motion compensated prediction is an exact inverse of the upsampling performed prior to performing motion compensated prediction.

17. A method of decoding digital data representing a video frame, the digital data representing each video frame including video data representing a plurality of pixels, the video data representing each pixel including a set of bits, the method comprising the step of:

truncating the least significant bit from each set of bits representing one of the individual pixels; and

storing the truncated set of bits representing each one of the individual pixels in a frame buffer.

18. The method of claim 17, further comprising the steps of:

reading data out of the frame buffer; and
appending a zero to each set of bits representing one of the individual pixels as it is read out of the frame buffer.

19. The method of claim 18, further comprising the step of:

low pass filtering the data read out of the frame buffer.

20. A digital picture-in-picture decoder circuit for decoding a primary picture to be displayed in a primary picture area and a second picture to be displayed in a secondary picture area, the secondary picture area being smaller than the primary picture area, the decoder circuit comprising:

a full resolution video decoder (300) for receiving and decoding a first set of digital video data including the primary picture;
a first reduced resolution video decoder (402) for receiving a second set of digital video data including the second picture and for decoding the received video data to generate a reduced resolution version of the second picture; and
a post processor circuit (136) coupled to the full resolution decoder circuit (300) and the reduced resolution decoder circuit (402), the post processor circuit (136) operating to combine the primary full resolution picture and the reduced resolution version of the second picture into a single picture.

21. The digital picture-in-picture decoder circuit of claim 20, wherein the full resolution video decoder (300) is a HDTV decoder and wherein the reduced resolution video decoder is a reduced resolution video decoder that generates pictures 1/4 x 1/4 the size of the full resolution video decoder.

22. The digital picture-in-picture decoder circuit of claim 21, further comprising a second reduced resolution video decoder (403) coupled to the post processing circuit (136) for decoding a reduced resolution version of a third picture; and

wherein the post processor circuit (136) operates to combine the reduced resolution version of the third picture with the first full resolution picture and the reduced resolution version of the second picture to form the single picture.

23. The digital picture-in-picture decoder circuit of claim 20, wherein the second set of digital video data includes a plurality of macroblocks, each macroblock including a plurality of DCT coefficients; and

wherein the first reduced resolution video decoder (402) comprises:

preparser means (112) for receiving the second set of digital video data and for removing from each macroblock DCT coefficients that exceed a preselected maximum number of DCT coefficients per macroblock; and
a channel buffer (116) coupled to the preparser means (112) for temporarily storing the video data output by the preparser means (112).

24. The digital picture-in-picture decoder circuit of claim 23, wherein the first reduced resolution video decoder (402) further comprises:

a syntax parser and variable length decoder circuit (120) coupled to the channel buffer for variable length decoding the second set of digital video data;
a downsampler (133) coupled to the syntax parser and variable length decoder circuit (120) for downsampling the variable length decoded video data to thereby reduce the amount of resolution of the second picture and the amount of video data used to represent second picture.

25. A method of decoding variable length encoded digital video data including slice stuffing data, start code zero stuffing data, and macroblocks, the macroblocks representing pictures, to a resolution less than the full resolution of the pictures, the method comprising the steps of:

receiving the digital video data;
parsing the digital video data to identify bit slice stuffing and start code zero stuffing data;
discarding the bit slice stuffing data and start code zero stuffing data; and
storing the remaining video data in a channel buffer.

26. The method of claim 25, further comprising the steps of:

variable length decoding the video data stored in the channel buffer to generated fixed length video data; and
downsampling the fixed length video data.

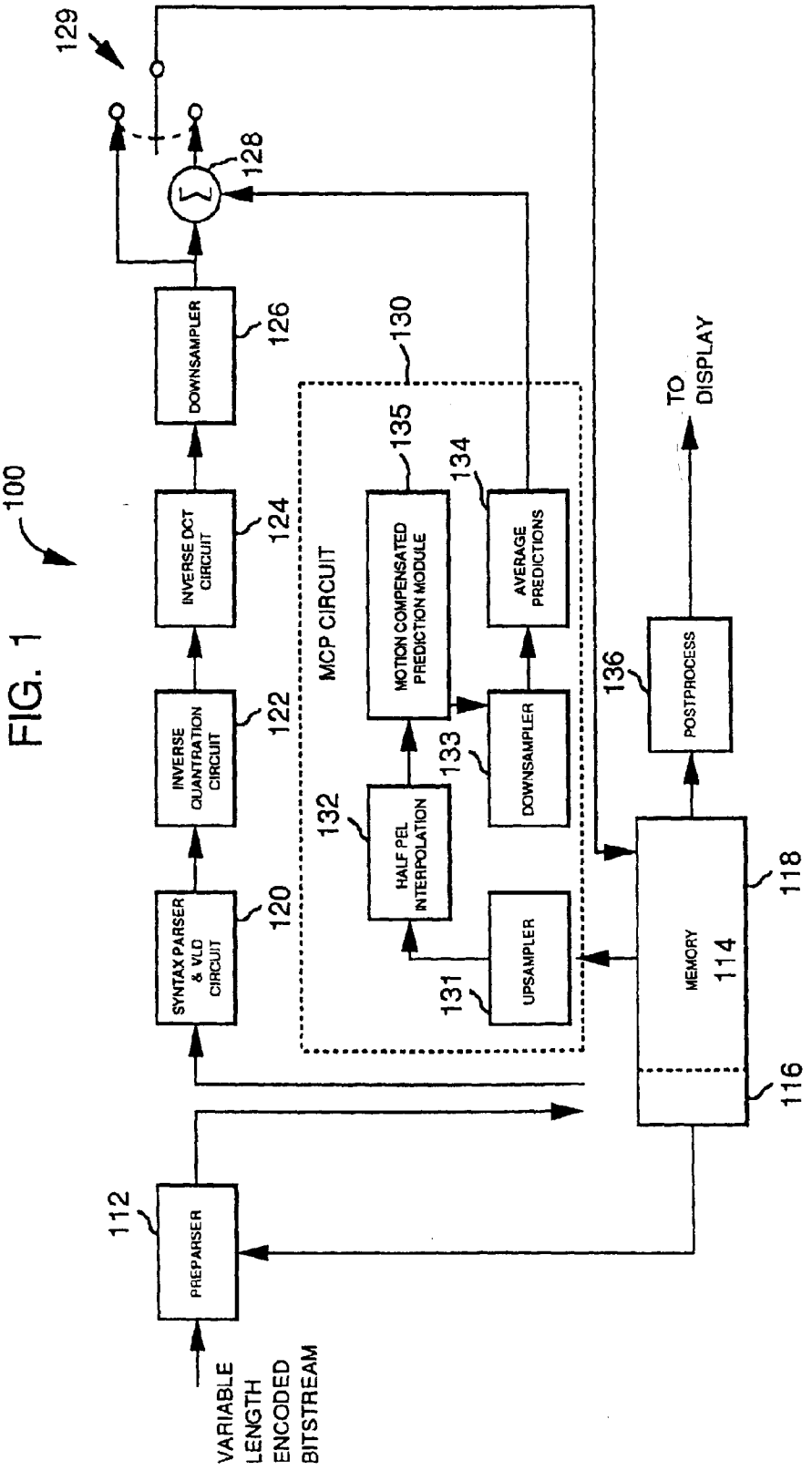
27. A method of decoding digital video data including an interlaced picture, to a resolution less than the full resolution of the interlaced picture, the interlaced picture including a plurality of macroblocks encoded in accordance with one of a field DCT basis or a frame DCT basis, the method comprising the steps of:

downsampling the macroblocks encoded on a field DCT basis on a field basis;
downsampling the macroblocks encoded on a frame DCT basis on a frame basis;
storing the downsampled macroblocks in a frame buffer.

28. The method of claim 27, wherein the video data further comprises a non-interlaced picture, the method comprising the steps of:

downsampling the non-interlaced picture on a frame basis.

FIG. 1


100
129
128
DOWNSAMPLER
126
INVERSE DCT CIRCUIT
124
INVERSE QUANTRATION CIRCUIT
122
SYNTAX PARSER & VLD CIRCUIT
120
PREPARSER
112
VARIABLE LENGTH ENCODED BITSTREAM
MCP CIRCUIT
130
MOTION COMPENSATED PREDICTION MODULE
135
AVERAGE PREDICTIONS
134
HALF PEL INTERPOLATION
132
DOWNSAMPLER
133
UPSAMPLER
131
MEMORY
114
118
116
POSTPROCESS
136
TO DISPLAY

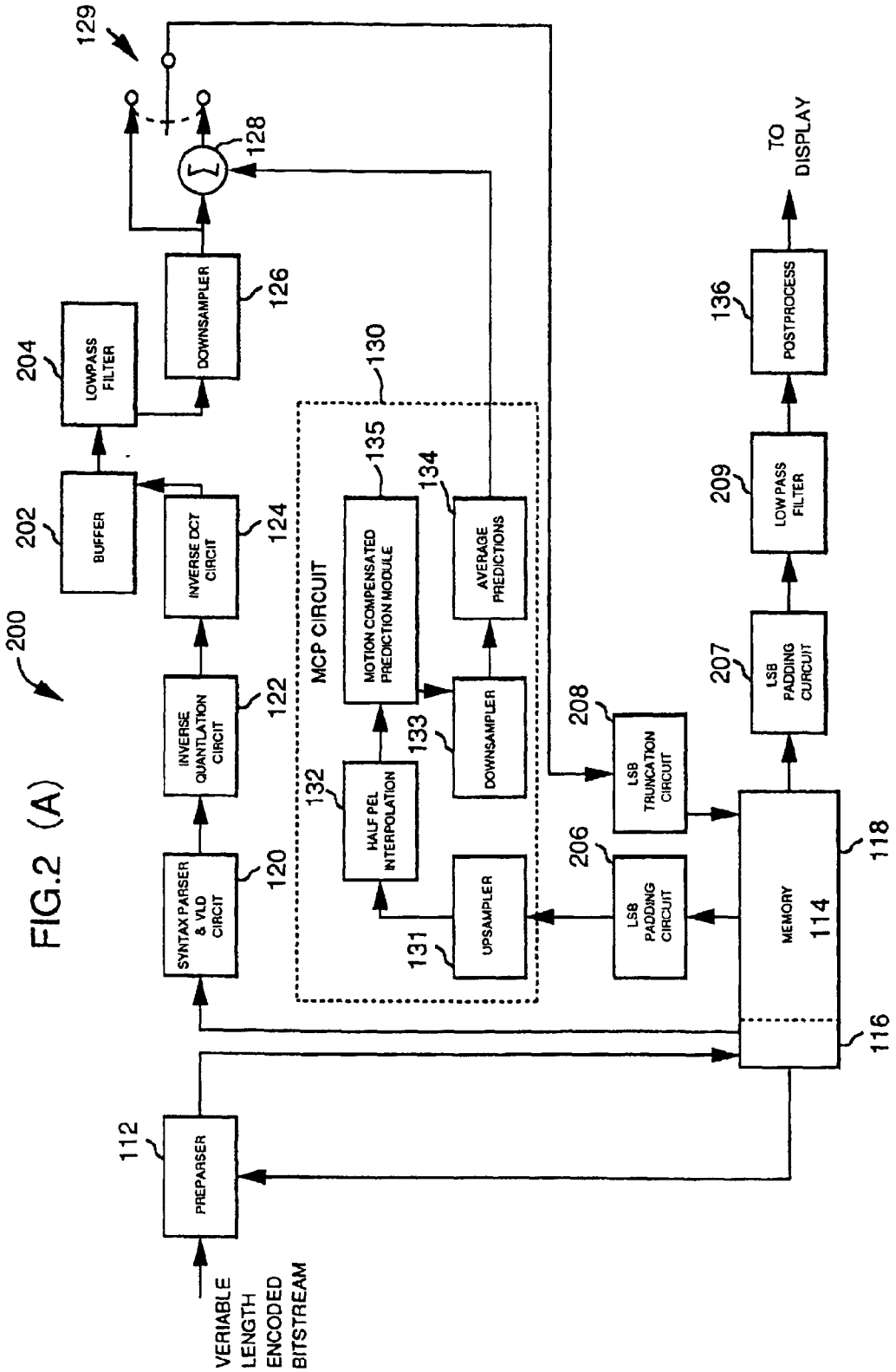

200
129
128
126
DOWNSAMPLER
204
LOWPASS FILTER
130
202
BUFFER
124
INVERSE DCT CIRCIT
135
MOTION COMPENSATED PREDICTION MODULE
134
AVERAGE PREDICTIONS
MCP CIRCUIT
122
INVERSE QUANTLATION CIRCIT
132
HALF PEL INTERPOLATION
133
DOWNSAMPLER
208
LSB TRUNCATION CIRCUIT
120
SYNTAX PARSER & VLD CIRCIT
131
UPSAMPLER
206
LSB PADDING CIRCUIT
MEMORY 114
118
116
207
LSB PADDING CURCUIT
209
LOW PASS FILTER
136
POSTPROCESS
TO DISPLAY
112
PREPARSER
VERIABLE LENGTH ENCODED BITSTREAM

FIG.2 (A)

FIG.2 (B)

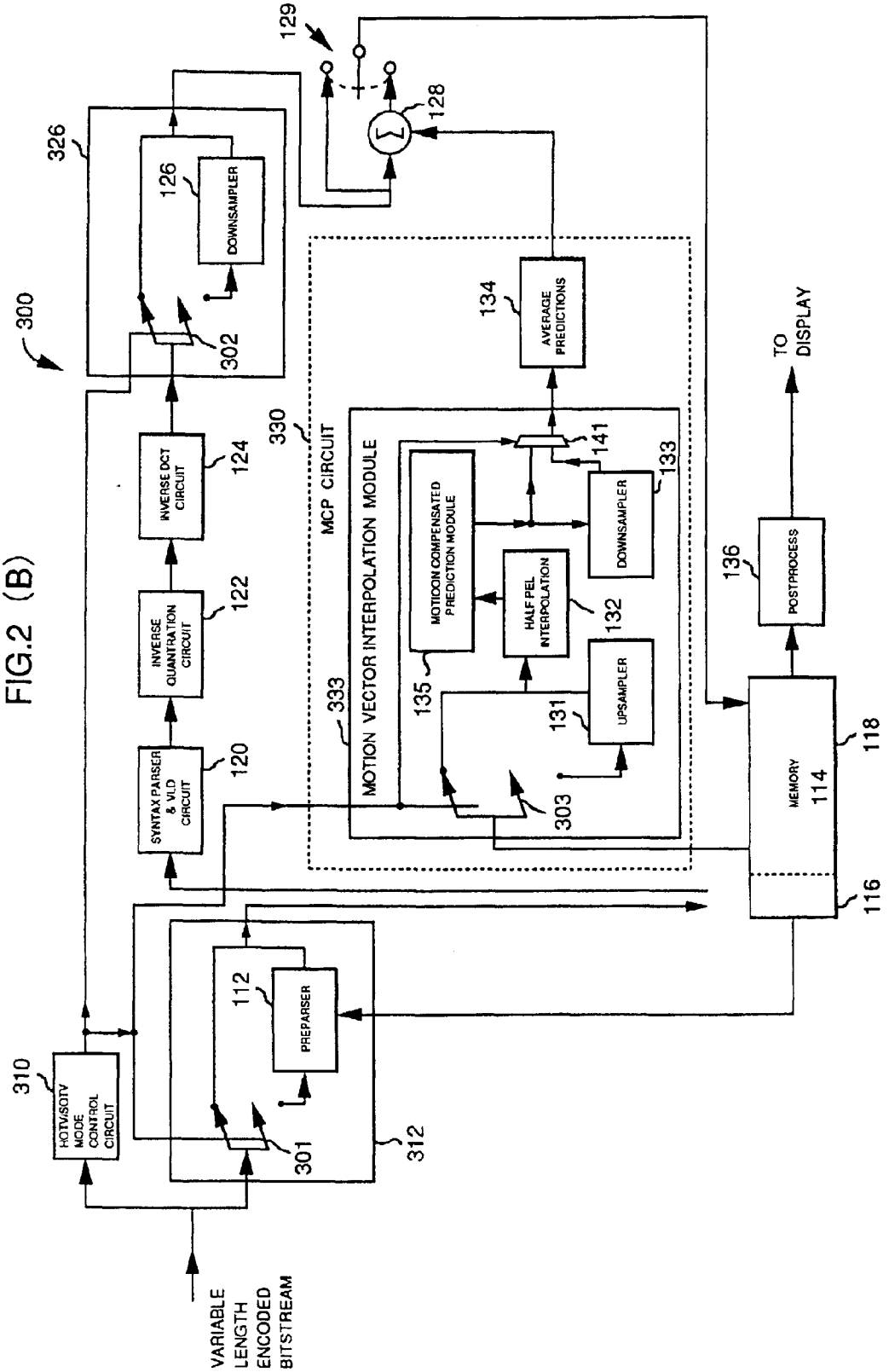

VARIABLE LENGTH ENCODED BITSTREAM
HDTV/SDTV MODE CONTROL CIRCUIT
310
PREPARSER
112
301
312
SYNTAX PARSER & VLD CIRCUIT
120
INVERSE QUANTIZATION CIRCUIT
122
INVERSE DCT CIRCUIT
124
302
DOWNSAMPLER
126
326
300
129
128
330
MCP CIRCUIT
MOTION VECTOR INTERPOLATION MODULE
333
MOTION COMPENSATED PREDICTION MODULE
135
303
UPSAMPLER
131
HALF PEL INTERPOLATION
132
DOWNSAMPLER
133
141
AVERAGE PREDICTIONS
134
MEMORY
114
118
116
POSTPROCESS
136
TO DISPLAY

FIG.3 (A)

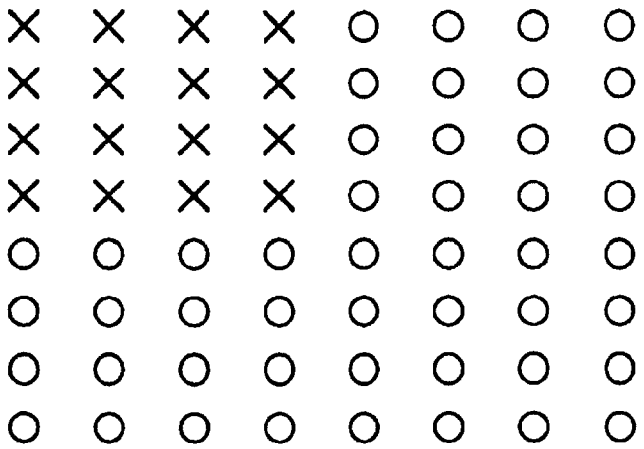


FIG.3 (B)

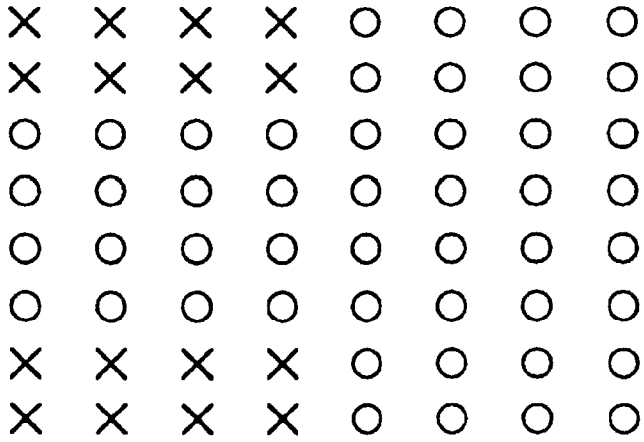


FIG.3 (C)

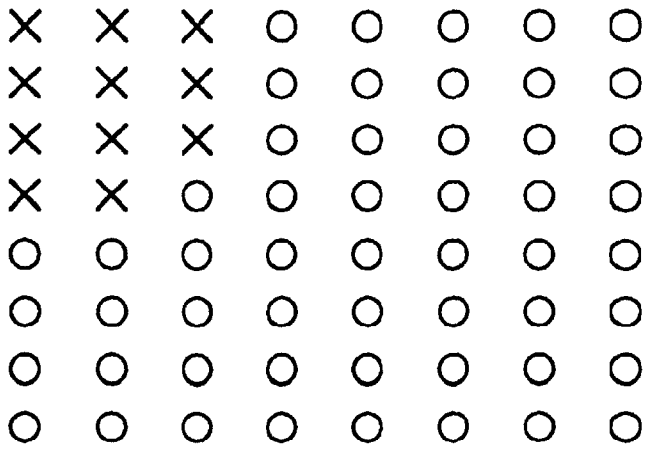


FIG.3 (D)

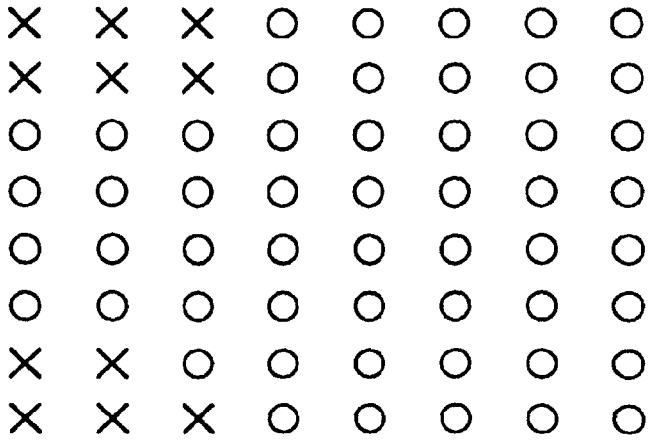
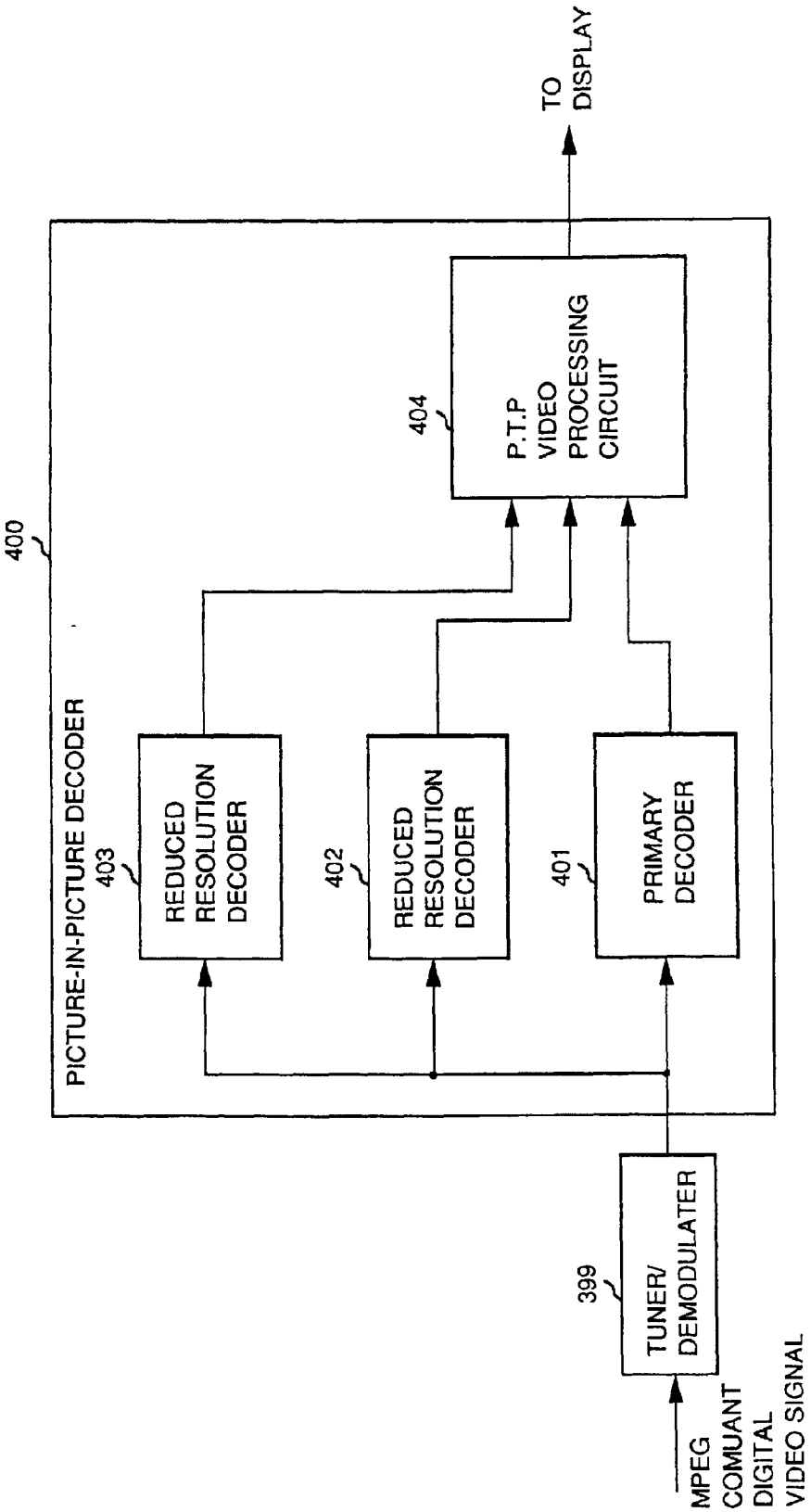


FIG.3 (E)

1	1	1	1	2	2	2	2
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1	1	1	1	2	2	2	2
1	1	1	1	2	2	2	2
3	3	3	3	4	4	4	4
3	3	3	3	4	4	4	4
3	3	3	3	4	4	4	4
3	3	3	3	4	4	4	4

FIG.4


MPEG COMUANT DIGITAL VIDEO SIGNAL
399
TUNER/ DEMODULATER
400
PICTURE-IN-PICTURE DECODER
403
REDUCED RESOLUTION DECODER
402
REDUCED RESOLUTION DECODER
401
PRIMARY DECODER
404
P.T.P VIDEO PROCESSING CIRCUIT
TO DISPLAY

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe BORDES
Filer:	Patricia A. Verlangieri/DAVIDA FORNAROTTO
Attorney Docket Number:	PF120006

Filed as Large Entity

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
National Stage Fee	1631	1	280	280
Natl Stage Search Fee - Report provided	1642	1	480	480
National Stage Exam - all other cases	1633	1	720	720
Pages:				
Claims:				
Independent claims in excess of 3	1614	1	420	420
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1900**

Electronic Acknowledgement Receipt

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Application Number:	14372021
International Application Number:	PCT/EP2013/050399
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe BORDES
Customer Number:	24498
Filer:	Patricia A. Verlangieri
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Attorney Docket Number:	PF120006
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Payment was successfully received in RAM	$1900
RAM confirmation Number	7458
Deposit Account	070832
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Transmittal Letter	PF120006_US_1390_TRANSMITTAL_LETTER.pdf	185428 f33aee967b9c04a426006945e99152041a5f3691	no	3
Warnings:					
Information:					
2	Oath or Declaration filed	PF120006_US_Combined_Declaration_and_Assignment_form.pdf	718151 b461c88b658917882a706918cd22663a831c0a32	no	3
Warnings:					
Information:					
3	Power of Attorney	PF120006_US_AIA80_WITH_POWER.pdf	586070 93ddff4570928e54ac361eadd515367499f33913	no	2
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73.	PF120006_US_AIA96_WITH_ASSIGNMENT.pdf	1066154 4958a7c31f333f552635115e4d3146b77d103a37	no	5
Warnings:					
Information:					
5	Preliminary Amendment	PF120006_US_PRELIMINARY_AMENDMENT.pdf	56306 73513ea6a67eedd5f122ac5a07cd7f6a5b0a2f5f	no	10
Warnings:					
Information:					
6	Application Data Sheet	PF120006_US_DATA_SHEET.pdf	240631 3c0ab57e04eb352b8aa4696393a08c032c2bc2fd	no	5
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
7	Information Disclosure Statement (IDS) Form (SB08)	PF120006_US_IDS.pdf	413215 63ca9ee224e192254500436f78a847f55ad79fa7	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
8	Non Patent Literature	PF120006_US_INTERNATIONAL_SEARCH_REPORT.pdf	511380 1cf46612901950e0fb83b3da00c77672749e5ffa	no	4
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Information:					

9	Foreign Reference	EP1209916.pdf	3611263 1e6d4f36b47a06f4cbb4468bbd9dcfcc631a5160	no	23
Warnings:					
Information:					
10	Non Patent Literature	Davis_Resolution_switching_for_coding_efficiency_and_resilience.pdf	1463380 751eb532655ee1a89e32943a344ade5dd526dd20	no	10
Warnings:					
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11	Non Patent Literature	Li_etal_AHG_18_Comments_on_the_Implementations_of_Resolution_Adaption_on_HEVC.pdf	1662065 8f78feada179b4b0c11aa7063420b13dcefe9953	no	12
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Information:					
12	Non Patent Literature	Lee_etal_Hybrid_Resolution_Switching_Method.pdf	790079 8c1a212389ecfe6a149e7f579894c5f70f443914	no	4
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13	Non Patent Literature	Wiegand_etal_WD3_Working_Draft_3_of_High_Efficiency_Video_Coding.pdf	1849270 3b5208fce638e9e14ad946c3b9697c5b7d6fe782	no	160
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14	Non Patent Literature	Wittmann_etal_Separable_Adaptive_Interpolation_Filter_for_Video_Coding.pdf	775279 be7e008749ef6054ff3435a8915adb1f4a459175	no	4
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15	Non Patent Literature	Han_Joint_Optimization_of_the_Motion_Estimation_Module.pdf	2265475 400d3a81820afe4786cc5b447ef6b146d0a5c100	no	12
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16	Non Patent Literature	Schwartz_etal_Overview_of_the_Scalable_Video_Coding_Extension.pdf	1491669 d145cbfe7a160c824c1d50851ad25563276f840b	no	18
Warnings:					
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17	Fee Worksheet (SB06)	fee-info.pdf	36658 f94abf734c663c8f9632507fb7f51317407fbb3d	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	17722473

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
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-1390 (03-13)
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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371

Attorney Docket No.	U.S. Application No. (if known, see 37 CFR 1.5)
PF120006	

International Application No.	International Filing Date	Priority Date Claimed
PCT/EP2013/050399	10 January 2013 (10.01.13)	13 January 2012 (13.01.12)

Title of Invention
METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

First Named Inventor
Philippe BORDES; Pierre ANDRIVON; Philippe SALMON

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☑ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.
2. ☐ A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).
3. An English language translation of the International Application (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto.
   b. ☑ has been previously submitted under 35 U.S.C. 154(d)(4).
4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))
   a. ☑ is attached.
   b. ☐ was previously filed in the international phase under PCT Rule 4.17(iv).

Items 5 to 8 below concern amendments made in the international phase.

PCT Article 19 and 34 amendments

5. ☐ Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).
6. ☐ English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).
7. ☐ English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).

Cancellation of amendments made in the international phase

8a. ☐ Do not enter the amendment made in the international phase under PCT Article 19.

8b. ☐ Do not enter the amendment made in the international phase under PCT Article 34.

NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).

The following items 9 to 17 concern a document(s) or information included.

9. ☑ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
10. ☑ A preliminary amendment.
11. ☑ An Application Data Sheet under 37 CFR 1.76.
12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).
13. ☑ A power of attorney and/or change of address letter.
14. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.3 and 37 CFR 1.821-1.825.
15. ☐ Assignment papers *(cover sheet and document(s))*. Name of Assignee: _____
16. ☑ 37 CFR 3.73(c) Statement *(when there is an Assignee)*.

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. 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 15 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No.	ATTORNEY DOCKET No.
	PCT/EP2013/050399	PF120006

17. ☐ Other items or information:

Copy of IB/306 Change of Applicant

The following fees have been submitted.	CALCULATIONS	PTO USE ONLY
18. ☑ Basic national fee (37 CFR 1.492(a)) **$280**	$ 280.00	
19. ☑ Examination fee (37 CFR 1.492(c)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) ..... **$0** All other situations **$720**	$ 720.00	
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TOTAL OF 18, 19, and 20 =	$ 1480.00	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). Fee for each additional 50 sheets of paper or fraction thereof **$400**		

Total Sheets	Extra Sheets	Number of each addition 50 or fraction thereof (round **up** to a whole number)	RATE	
29 - 100 =	/ 50 =		x **$400**	$
Surcharge of **$140.00** for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).				$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	12 - 20 =	0	x **$80**	$	
Independent claims	4 - 3 =	1	x **$420**	$ 420.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$780**	$	
Processing fee of **$140.00** for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)). +				$	
TOTAL OF ABOVE CALCULATIONS =				$ 1900.00	
☐ **Applicant asserts small entity status.** See 37 CFR 1.27. Fees above are reduced by ½.					
☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Fees above are reduced by ¾. Applicant must attach form PTO/SB/15A or B or equivalent.					
TOTAL NATIONAL FEE =				$ 1900.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property. +				$	
TOTAL FEES ENCLOSED =				$ 1900.00	
				Amount to be refunded:	$
				Amount to be charged:	$

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.

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☑ Please charge my Deposit Account No. 07-0832 in the amount of $ 1900.00 to cover the above fees.

c. ☑ The Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. 07-0832 as follows:

i. ☐ any required fee.

ii. ☐ any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

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NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File)Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013, and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

Correspondence Address

☑ The address associated with Customer Number: 24498 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone			
Email					

Signature	/Patricia A. Verlangieri; Reg. No. 42,201/	Date	July 8, 2014
Name (Print/Type)	Patricia A. VERLANGIERI	Registration No. (Attorney/Agent)	42,201

PTO-1390 (03-13)
Approved for use through 4/30/2013. OMB 0651-0021
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371

Attorney Docket No.	U.S. Application No. (if known, see 37 CFR 1.5)
PF120006	

International Application No.	International Filing Date	Priority Date Claimed
PCT/EP2013/050399	10 January 2013 (10.01.13)	13 January 2012 (13.01.12)

Title of Invention
METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

First Named Inventor
Philippe BORDES; Pierre ANDRIVON; Philippe SALMON

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☑ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.
2. ☐ A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).
3. An English language translation of the International Application (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto.
   b. ☑ has been previously submitted under 35 U.S.C. 154(d)(4).
4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))
   a. ☑ is attached.
   b. ☐ was previously filed in the international phase under PCT Rule 4.17(iv).

Items 5 to 8 below concern amendments made in the international phase.

PCT Article 19 and 34 amendments

5. ☐ Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).
6. ☐ English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).
7. ☐ English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).

Cancellation of amendments made in the international phase

8a. ☐ Do not enter the amendment made in the international phase under PCT Article 19.

8b. ☐ Do not enter the amendment made in the international phase under PCT Article 34.

NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).

The following items 9 to 17 concern a document(s) or information included.

9. ☑ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
10. ☑ A preliminary amendment.
11. ☑ An Application Data Sheet under 37 CFR 1.76.
12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).
13. ☑ A power of attorney and/or change of address letter.
14. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.3 and 37 CFR 1.821-1.825.
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TOTAL OF 18, 19, and 20 =	$ 1480.00	
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Independent claims	4 - 3 =	1	x **$420**	$ 420.00	
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Correspondence Address

☑ The address associated with Customer Number: 24498 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone			
Email					

Signature	/Patricia A. Verlangieri; Reg. No. 42,201/	Date	July 8, 2014
Name (Print/Type)	Patricia A. VERLANGIERI	Registration No. (Attorney/Agent)	42,201

[Page 3 of 3]

Customer No. 24498 **DECLARATION** Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050399 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

The above-identified application was made or authorized to be made by me.

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment 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 declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under 18 USC 1001.

ASSIGNMENT AND AGREEMENT IN AN APPLICATION FOR LETTERS PATENT

For valuable consideration received, I hereby sell, assign and transfer to Thomson Licensing, a corporation duly organized and existing under the laws of the country of France, its successors, and assigns my entire right, title and interest, for all countries in and to said inventions, and all the rights and privileges under any and all Letters Patent that may be granted therefor, and any divisions, continuations, reissues and extensions thereof.

I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at Cesson-Sevigné Date January 16, 2013

Inventor Name Philippe BORDES (Type or Print) _____ (Signature in Full – No Initials)

Post Office Address c/o Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness Jean-François VIAL (Type or Print) _____ (Signature in Full – No Initials)

2nd Witness THIEBAUD Sylvain (Type or Print) _____ (Signature in Full – No Initials)

Customer No. 24498 DECLARATION Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050399 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

The above-identified application was made or authorized to be made by me.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under 18 USC 1001.

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I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

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Signed at Cesson Sévigné Date 06/02/2013

Inventor Name Pierre ANDRIVON (Type or Print) (Signature in Full – No Initials)

Post Office Address Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness DOYEN DIDIER (Type or Print) (Signature in Full – No Initials)

2nd Witness THIEBAUD Sylvain (Type or Print) (Signature in Full – No Initials)

Customer No. 24498 **DECLARATION** Docket No.PF120006

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METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050399 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

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I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under 18 USC 1001.

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I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at CESSON SEVIGNE Date January 16, 2013

Inventor Name Philippe SALMON (Type or Print) _____ (Signature in Full - No initials)

Post Office Address Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness HIRON Franck (Type or Print) _____ (Signature in Full - No initials)

2nd Witness Jean-François VIAL (Type or Print) _____ (Signature in Full - No initials)

PC/120006

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

■ Practitioners associated with Customer Number: 24498

OR

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

Name	Registration Number	Name	Registration Number

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

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

☐ The address associated with Customer Number:

OR

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

Assignee Name and Address: THOMSON LICENSING
Robert D. Shedd, Patent Operations
THOMSON LICENSING LLC
Two Independence Way, Suite No. 200
Princeton, New Jersey 08540-6620 US

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

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

Signature	/Patricia A. Verlangieri; Reg. No. 42,201/	Date	July 8, 2014
Name	Patricia A. VERLANGIERI	Telephone	609-734-6867
Title	Sr. Patent Counsel; Reg. No. 42,201		

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

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

POWER OF ATTORNEY
THOMSON LICENSING

THOMSON LICENSING
1 rue Jeanne d'Arc
92130 Issy-les moulineaux, France

does hereby grant

Harvey D. Fried – VP Licensing Support
Robert B. Levy - Director
Reitseng Lin - Sr. Patent Counsel
Catherine A. Cooper - Sr. Patent Counsel
Kuniyuki Akiyama – Patent Advisor
Paul P. Kiel - Director
Jeffrey M. Navon - Director
Joel M. Fogelson - Sr. Patent Counsel
Joseph J. Opalach - Director
Sammy S. Henig - Sr. Patent Counsel
Patricia A. Verlangieri – Mgr., Admin & Operations
Brian J. Dorini, Patent Pools Activity Mgr.
Jorge Tony Villabon – Sr. Patent Counsel
Vincent E. Duffy - Director
Richard LaPeruta - Patent Advisor
Brian J. Cromarty – Sr. Patent Counsel
Ronald Kolczynski – Patent Counsel
Michael A. Pugel - Patent Counsel
Jeffrey D. Hale - Patent Counsel
Wan Yee Cheung – Sr. Patent Counsel
Jerome G. Schaefer – Sr. Patent Counsel
James M. McKenzie, Sr. Patent Counsel
Xiaoan Lu, Patent Agent
Gregory Weaver – Sr. Patent Counsel
Palak Bhakta – Patent Counsel
Julia Tanase – Patent Counsel
Thomson Licensing LLC
Two Independence Way, Suite No. 200
Princeton, New Jersey 08540-6620

a revocable, non-exclusive and delegable power of attorney to act for us (including the signing of requisite documents) in proceedings concerning patents and applications for patents, including international and other multi-country patents and applications for patents, in our name in the Patent Offices in all countries worldwide from April 8, 2011.

DATED this 16th day of June, 2014.

SIGNED _____

Robert D. Shedd
Vice President, U.S. Patent Operations
Thomson Licensing LLC and
Attorney In Fact for
THOMSON LICENSING

WITNESS _____

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: THOMSON LICENSING Customer No. 24498 Docket No. PF120006

Application No./Patent No.: Not Available Filed/Issue Date: July 8, 2014

Titled: METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

THOMSON LICENSING, a Corporation

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

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

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

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

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

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

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

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

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

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

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

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

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

1. From: _____ To: _____

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

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

2. From: _____ To: _____

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

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

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

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

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

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

4. From: _____ To: _____

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

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

5. From: _____ To: _____

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

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

6. From: _____ To: _____

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

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

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

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

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

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

/Patricia A. Verlangieri; Reg. No. 42,201/	July 8, 2014
Signature	Date
Patricia A. VERLANGIERI	Sr. Patent Counsel; Reg. No. 42201
Printed or Typed Name	Title or Registration Number

Customer No. 24498 **DECLARATION** Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050389 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

The above-identified application was made or authorized to be made by me.

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment 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 declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under 18 USC 1001.

ASSIGNMENT AND AGREEMENT IN AN APPLICATION FOR LETTERS PATENT

For valuable consideration received, I hereby sell, assign and transfer to Thomson Licensing, a corporation duly organized and existing under the laws of the country of France, its successors, and assigns my entire right, title and interest, for all countries in and to said inventions, and all the rights and privileges under any and all Letters Patent that may be granted therefor, and any divisions, continuations, reissues and extensions thereof.

I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at Cesson-Sevigné Date January 16, 2013

Inventor Name Philippe BORDES (Type or Print) _____ (Signature in Full – No Initials)

Post Office Address c/o Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness Jean-François VIAL (Type or Print) _____ (Signature in Full – No Initials)

2nd Witness THIEBAUD Sylvain (Type or Print) _____ (Signature in Full – No Initials)

Customer No. 24498 DECLARATION Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050399 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

The above-identified application was made or authorized to be made by me.

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment 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 declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under 18 USC 1001.

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I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at Cesson Sévigné Date 04/03/2013

Inventor Name Pierre ANDRIVON (Type or Print) _____ (Signature in Full – No Initials)

Post Office Address Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness DOYEN DIDIER (Type or Print) _____ (Signature in Full – No Initials)

2nd Witness THIEBAUD Sylvain (Type or Print) _____ (Signature in Full – No Initials)

Customer No. 24498 **DECLARATION** Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050399 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

The above-identified application was made or authorized to be made by me.

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements 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 of not more than five (5) years, or both, under 18 USC 1001.

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I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at Cesson Sévigné Date January 16, 2013

Inventor Name Philippe SALMON (Type or Print) _____ (Signature in Full - No initials)

Post Office Address Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness Hiron Evard (Type or Print) _____ (Signature in Full - No initials)

2nd Witness Jean-François VIAL (Type or Print) _____ (Signature in Full - No initials)

PCT REQUEST

Print Out (Original in Electronic Form)

VIII-2-1	**Declaration: Entitlement to apply for and be granted a patent** Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name (LAST, First)	In relation to this international application THOMSON LICENSING is entitled to apply for and be granted a patent by virtue of the following:
VIII-2-1(iii)		an agreement between THOMSON LICENSING and Technicolor R&D France, dated 01 January 2005 (01.01.2005)

RÉPUBLIQUE FRANÇAISE

INSTITUT NATIONAL
DE LA PROPRIÉTÉ
INDUSTRIELLE

d'invention

Certificat d'utilité

COPIE OFFICIELLE

Le Directeur général de l'Institut national de la propriété industrielle certifie que le document ci-annexé est la copie certifiée conforme d'une demande de titre de propriété industrielle déposée à l'Institut.

Fait à Courbevoie, le 20 NOV. 2012

Pour le Directeur général de l'Institut
national de la propriété industrielle
Le Directeur des brevets

Philippe CADRE

DB 267 - 10/2012

Siège : 15 rue des Minimes - CS 50001 - 92677 COURBEVOIE Cedex - Téléphone : 0820 210 213 - Télécopie : +33 (0)1 56 65 86 00 - www.inpi.fr - contact@inpi.fr
Établissement public national créé par la loi n°51-444 du 19 avril 1951

INSTITUT NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE

BREVET D'INVENTION

Code de la propriété intellectuelle - Livre VI

cerfa

26 bis, rue de Saint Pétersbourg - 75800 Paris Cedex 08
Pour vous informer : INPI Direct 0820 210 211
Pour déposer par télécopie : 33 (0)1 53 04 52 65

REQUÊTE EN DÉLIVRANCE

REMISE DES PIÈCES DATE	13/01/2012
N° D'ENREGISTREMENT NATIONAL ATTRIBUÉ PAR L'INPI	1250334
DATE DE DÉPÔT ATTRIBUÉE PAR L'INPI	
Vos références pour ce dossier PF120006	

1NOM ET ADRESSE DU DEMANDEUR OU DU MANDATAIRE À QUI LA CORRESPONDANCE DOIT ÊTRE ADRESSÉE

HUCHET Anne
TECHNICOLOR
1-5 rue Jeanne d'Arc
92130 Issy-Les-Moulineaux
FR

2 NATURE DE LA DEMANDE	
Nature	Brevet d'invention
3 TITRE DE L'INVENTION	
Titre	Méthode et dispositif de codage d'un bloc image, méthode et dispositif de décodage correspondants
4 PRIORITÉ	
5-1 DEMANDEUR	**Personne morale**
Nom	THOMSON LICENSING
Affaire suivie par	Anne LORETTE
Rue	1-5 rue Jeanne d'Arc
Code postal et ville	92130 Issy-les-Moulineaux
Pays	FR
Nationalité	FR
Forme juridique	Société par actions simplifiées (SAS)
N° SIREN	
Code APE-NAF	
N° de téléphone	+33 1 4186 5000
N° de télécopie	+33 1 4186 5633
Courrier électronique	
6 MANDATAIRE	
Nom	HUCHET
Prénom	Anne

Cabinet/Société	TECHNICOLOR			
Qualité	pouvoir général : 15540			
Rue	1-5 rue Jeanne d'Arc			
Code postal et ville	92130 Issy-Les-Moulineaux			
Pays	FR			
N° de téléphone	+33 2 99 27 39 62			
N° de télécopie	+33 2 99 27 35 00			
Courrier électronique	anne.lorette@technicolor.com			
7 RAPPORT DE RECHERCHE				
Type d'établissement	Établissement immédiat			
8 RÉDUCTION DU TAUX DES REDEVANCES				
9 DÉPÔT DE MATIÈRE BIOLOGIQUE				
10 SÉQUENCES DE NUCLÉOTIDES ET/OU D'ACIDES AMINÉS				
11 DOCUMENTS ET FICHIERS JOINTS	**Fichier électronique**		**Détails**	
Inventeur	Design.PDF			
Fichier corps du texte	textebrevet.pdf		page(s) 23, D 18, R 4, AB 1	
Drawings	dessins.pdf		page(s) 8, Abrégé : page 4, Fig. 6	
12 MODE DE PAIEMENT				
Mode de paiement	Prélèvement du compte client			
Numéro du compte	3334			
13 REDEVANCES JOINTES	**Devise**	**Taux**	**Quantité**	**Montant à payer**
062 Dépôt d'une demande électronique	EURO	26	1	26
063 Rapport de recherche	EURO	500	1	500
Total	EURO			526
14 ANNOTATION				
15 DATE ET SIGNATURE				
Signé numériquement par	Subject: FR, THOMSON R&D FRANCE, Anne HUCHET; Issuer: FR, INPI, INPI-EN-LIGNE 1.0			
Date	13 January 2012			
Signataire	Mandataire			

libertés, vous bénéficiez d'un droit d'accès et de rectification pour les données vous concernant auprès de l'INPI. Les données à caractère personnel que vous êtes tenu(e) de nous fournir dans ce formulaire sont exclusivement utilisées pour identifier le titulaire de la demande et son éventuel mandataire.

R E P U B L I Q U E F R A N C A I S E

INSTITUT NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE

BREVET D'INVENTION
CERTIFICAT D'UTILITE

Réception électronique de la soumission

Il est certifié par la présente qu'une demande de brevet (ou d'un certificat d'utilité) a été reçue par le biais du dépôt électronique sécurisé de l'INPI. Après réception, un numéro d'enregistrement et une date de réception ont été automatiquement attribués.

Numéro de demande	1250334	
Numéro de soumission	1000136938	
Date de réception	13 janvier 2012	
Vos références	PF120006	
Demandeur	THOMSON LICENSING	
Pays	FR	
Titre de l'invention	Méthode et dispositif de codage d'un bloc image, méthode et dispositif de décodage correspondants	
Documents envoyés	package-data.xml	requetefr.xml
	application-body.xml	fr-fee-sheet.xml
	requetefr.pdf (3 p.)	validation-log.xml
	comment.pdf (1 p.)	indication-bio-deposit.xml
	design.pdf (2 p.)	fr-office-specific-info.xml
	textebrevet.pdf (23 p.)	dessins.pdf (8 p.)
Déposé par	CN=Anne HUCHET,O=THOMSON R&D FRANCE,C=FR	
Méthode de dépôt	Dépôt électronique	
Date et heure de réception électronique	13 janvier 2012, 11:47:12 (CET)	
Empreinte officielle du dépôt	32:87:8B:D7:ED:B8:5D:4B:39:2E:7E:75:A2:51:DA:1F:7A:F1:40:8B	

/INPI, section dépôt/

INSTITUT NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE

BREVET D'INVENTION

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26 bis, rue de Saint Pétersbourg - 75800 Paris Cedex 08

Pour vous informer : INPI Direct 0820 210 211

Pour déposer par télécopie : 33 (0)1 53 04 52 65

DÉSIGNATION D'INVENTEUR(S)

Vos références pour ce dossier	PF120006
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TITRE DE L'INVENTION	
Titre	Méthode et dispositif de codage d'un bloc image, méthode et dispositif de décodage correspondants
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Méthode et dispositif de codage d'un bloc image, méthode et dispositif de décodage correspondants

1. Domaine de l'invention

L'invention se rapporte au domaine général du codage d'images.

L'invention concerne plus particulièrement un procédé de reconstruction d'un bloc image dune image courante et un procédé de codage d'un tel bloc à partir d'un bloc d'une image de référence reconstruite à une taille différente de la taille de l'image courante. L'invention concerne également les dispositifs de décodage et de codage correspondant.

2. Etat de l'art

Il est connu pour coder une séquence d'images de quantifier avec un pas de quantification les données image avant leur codage en vue de diminuer le débit de sortie du codeur. Traditionnellement, le codeur comprend un module de contrôle de débit apte à adapter la valeur du pas de quantification de manière à atteindre le meilleur compromis entre le débit de sortie du codeur et la distorsion du signal image. Lorsque le débit de sortie visé ou débit cible est faible, augmenter fortement le pas de quantification n'est pas toujours la solution la mieux adaptée car elle entraine généralement une augmentation importante de la distorsion du signal image.

Ainsi, il est connu à bas débit de diminuer la taille de l'image à coder par sous-échantillonnage avant codage comme illustré sur la figure 1. Dans ce cas, le décodeur sur-échantillonne l'image décodée avant son affichage comme illustré sur la figure 2. A cet effet, le flux codé comprend un champ indiquant la taille de l'image originale et de l'image codée. Cette adaptation dynamique de la taille de l'image est connue sous la terminologie anglaise de « adaptive resolution ».

Comme illustré sur la figure 3, l'adaptation dynamique de la taille de l'image nécessite le stockage en mémoire DPB (acronyme anglais de « Decoded Picture Buffer ») d'images de référence reconstruites à différentes tailles. En effet, les images reconstruites utilisées en tant qu'images de référence sont stockées dans la mémoire DPB. Dans le cas du mode de

codage Inter, les images de référence stockées sont utilisées pour déterminer des blocs de référence compensés en mouvement. Dans le cas particulier du procédé « adaptive resolution », l'image de référence utilisée pour la compensation de mouvement et l'image courante à coder ou à reconstruire à partir de cette image de référence peuvent être de taille différente. Ainsi, quand l'image de référence a une taille inférieure (respectivement supérieure) à la taille de l'image courante, l'image de référence doit être sur-échantillonnée (respectivement sous-échantillonnée) à la taille de l'image courante avant d'être compensée en mouvement. La version sous-échantillonnée ou sur-échantillonnée de l'image de référence est également stockée dans la mémoire DPB. Plus généralement, chaque image de référence est stockée dans la mémoire DPB avec N tailles différentes, N étant un entier représentant le nombre de tailles autorisées par le procédé « adaptive résolution ».

Dans l'exemple pris en référence à la figure 3, les deux dernières images reconstruites sont utilisées comme image de référence pour l'image courante. Ainsi, l'image 2 utilise les images 0 et 1 comme images de référence, l'image 3 utilise les images 1 et 2 comme images de référence, etc. Sur cet exemple, N=2. Les versions sur-échantillonnée et sous-échantillonnée des images de référence reconstruites sont grisées sur la figure 3 et correspondent aux images de référence additionnelles stockées dans la mémoire DPB. Les images de référence non grisées sont les images de référence reconstruites.

Le procédé « adaptive résolution » requiert donc davantage de place mémoire puisque plusieurs versions (image reconstruite et versions sur-échantillonnée et/ou sur échantillonnée) d'une même image de référence sont stockées. Augmenter la taille mémoire est un problème notamment dans les implémentations hardwares pour lesquelles notamment la surface des composants est critique.

3. Résumé de l'invention

L'invention a pour but de pallier au moins un des inconvénients de l'art antérieur.

A cet effet, l'invention concerne une méthode de reconstruction d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de

référence reconstruite à une taille différente de la taille de l'image courante. La méthode de reconstruction comprend les étapes de :

- compenser en mouvement le bloc de référence avec au moins un filtre d'interpolation;
- décoder, pour le bloc courant, un bloc de résidus ; et
- reconstruire le bloc courant à partir du bloc de résidus et du bloc de référence compensé en mouvement.

Selon l'invention, le filtre d'interpolation dépend de la taille de l'image de référence et de la taille de l'image courante.

Ainsi, selon l'invention les opérations de sur-échantillonnage ou de sous-échantillonnage des données de l'image de référence et de compensation en mouvement d'un bloc de référence sont effectuées conjointement en appliquant un filtre d'interpolation qui dépend de l'indice « n », i.e. de la taille de l'image de référence et de la taille de l'image courante.

Selon une caractéristique particulière de l'invention, le filtre d'interpolation est séparable en un filtre horizontal et un filtre vertical.

Selon un autre aspect de l'invention, le filtre horizontal est composé d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sur-échantillonnage horizontal quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sous-échantillonnage horizontal quand la taille de l'image de référence est supérieure à la taille de l'image courante et le filtre vertical est composé d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sur-échantillonnage vertical quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sous-échantillonnage vertical quand la taille de l'image de référence est supérieure à la taille de l'image courante.

Avantageusement, le filtre horizontal et le filtre vertical étant définis par des coefficients de filtrage, la méthode de reconstruction comprend en outre une étape de décodage des coefficients de filtrage.

L'invention concerne également une méthode de codage d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de l'image courante. La méthode de codage comprend les étapes suivantes :

- compenser en mouvement le bloc de référence avec au moins un filtre d'interpolation;
- calculer, pour le bloc courant, un bloc de résidus à partir du bloc courant et du bloc de référence compensé en mouvement ; et
- coder le bloc de résidus ;

Selon l'invention, le filtre d'interpolation dépend de la taille de l'image de référence et de la taille de l'image courante.

Selon une caractéristique particulière de l'invention, le filtre d'interpolation est séparable en un filtre horizontal et un filtre vertical.

Selon un autre aspect de l'invention, un filtre d'interpolation étant séparable en un filtre horizontal et un filtre vertical, le filtre horizontal est composé d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sur-échantillonnage horizontal quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sous-échantillonnage horizontal quand la taille de l'image de référence est supérieure à la taille de l'image courante et le filtre vertical est composé d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sur-échantillonnage vertical quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sous-échantillonnage vertical quand la taille de l'image de référence est supérieure à la taille de l'image courante.

Avantageusement, le filtre horizontal et le filtre vertical étant définis par des coefficients de filtrage, la méthode de codage comprend en outre une étape de codage des coefficients de filtrage.

L'invention concerne en outre un dispositif de décodage d'un flux binaire en vue de la reconstruction d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de l'image courante comprenant:

- des moyens pour compenser en mouvement le bloc de référence avec au moins un filtre d'interpolation;
- des moyens pour décoder, pour le bloc courant, un bloc de résidus; et
- des moyens pour reconstruire le bloc courant à partir du bloc de résidus et du bloc de référence compensé en mouvement .

Selon l'invention, le filtre d'interpolation dépend de la taille de l'image de référence et de la taille de l'image courante.

L'invention concerne également un dispositif de codage d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de l'image courante comprenant:

- des moyens pour compenser en mouvement le bloc de référence avec au moins un filtre d'interpolation;
- des moyens pour calculer, pour le bloc courant, un bloc de résidus à partir du bloc courant et du bloc de référence compensé en mouvement ; et
- des moyens pour coder le bloc de résidus.

Selon l'invention, le filtre d'interpolation dépend de la taille de l'image de référence et de la taille de l'image courante.

4. Listes des figures

L'invention sera mieux comprise et illustrée au moyen d'exemples de modes de réalisation et de mise en œuvre avantageux, nullement limitatifs, en référence aux figures annexées sur lesquelles :

- la figure 1 illustre un dispositif de codage avec « adaptive resolution » selon l'art antérieur;
- la figure 2 illustre un dispositif de décodage avec « adaptive resolution » selon l'art antérieur;
- la figure 3 représente une séquence de 5 images à reconstruire et l'évolution de la composition de la mémoire DPB d'images de référence lorsque les deux dernières images reconstruites sont utilisées comme images de référence;

- la figure 4 illustre l'interpolation au ¼ de pixel d'un bloc image;
- la figure 5 illustre une technique de sur-échantillonnage horizontal et vertical d'une image;
- la figure 6 illustre un procédé de reconstruction d'un bloc image selon l'invention;
- la figure 7 illustre une mise en correspondance de pixels de l'image courante avec des pixels de l'image de référence selon l'invention;
- la figure 8 illustre le procédé de compensation de mouvement selon l'invention;
- la figure 9 illustre un procédé de codage d'un bloc image selon l'invention;
- la figure 10 illustre une technique de sous-échantillonnage horizontal et vertical d'une image;
- la figure 11 illustre une mise en correspondance de pixels de l'image courante avec des pixels de l'image de référence selon une variante de réalisation;
- la figure 12 illustre un dispositif codage selon l'invention; et
- la figure 13 illustre un dispositif décodage selon l'invention.

5. Description détaillée de l'invention

Les filtres d'interpolation 2D utilisés pour la compensation de mouvement et les filtres de sur-échantillonnage et sous échantillonnage 2D sont généralement des filtres séparables. Ainsi, chaque filtre 2D se décompose en un filtre vertical 1D et un filtre horizontal 1D, lesquels sont appliqués successivement sur les colonnes et les lignes d'un bloc de pixels ou d'une image. Il est indifférent d'appliquer d'abord le filtre horizontal sur les lignes puis le filtre vertical sur les colonnes ou inversement d'appliquer d'abord le filtre vertical sur les colonnes puis le filtre horizontal sur les lignes. Les filtres d'interpolation séparables utilisés classiquement pour la compensation de mouvement sont notés MCIF (acronyme anglais de « Motion Compensation Interpolation Filter ») et sont composés d'un filtre vertical noté $MCIF_V(frac_y)$ et d'un filtre horizontal noté $MCIF_H(frac_x)$. $(frac_x,frac_y)$ représente la partie non entière de la position du pixel à interpoler vis-à-vis de la grille initiale de pixels ou encore la partie fractionnaire du

vecteur de mouvement utilisé pour la compensation de mouvement. Par exemple, dans le cas d'une compensation de mouvement au ¼ de pixel, $frac_x \in \{0, 0.25, 0.5, 0.75\}$ et $frac_y \in \{0, 0.25, 0.5, 0.75\}$ comme illustré sur la figure 4. La compensation en mouvement d'un bloc de pixels d'une image de référence est donc obtenue en appliquant successivement les filtres $MCIF_H(frac_x)$ et $MCIF_V(frac_y)$.

Les carrés noirs représentent la grille initiale de pixels, les autres carrés représentent des pixels interpolés à l'aide des filtres $MCIF_H(frac_x)$ et $MCIF_V(frac_y)$. Ainsi, le pixel H2 est obtenu à partir d'au moins deux pixels noirs situés sur la même ligne en appliquant le filtre $MCIF_H(0.25)$. A titre d'exemple, les filtres suivants peuvent être utilisés pour interpoler avec $frac_{XouY} = 0, ¼, ½, ¾$:

{ 0, 0, 0, 64, 0, 0, 0, 0 } / 64 avec $frac_{XouY} = 0$,

{ -1, 4, -10, 57, 19, -7, 3, -1 } / 64 avec $frac_{XouY} = ¼$,

{ -1, 4, -11, 40, 40, -11, 4, -1 } / 64 avec $frac_{XouY} = ½$,

{ -1, 3, -7, 19, 57, -10, 4, -1 } / 64 avec $frac_{XouY} = ¾$.

De la même manière, chaque filtre de sur-échantillonnage et de sous-échantillonnage SCF(n) est séparable et se compose d'un filtre vertical noté $SCF_H(n,\theta_x)$ et d'un filtre horizontal noté $SCF_V(n,\theta_y)$. $(\theta_x;\theta_y)$ représente la position du pixel sous-échantillonné ou sur-échantillonnée par rapport à la grille de pixels initiale de l'image de référence. Sur la figure 5, les ronds noirs représentent la grille de pixels initiale. Le pixel H1 est obtenu à partir d'au moins deux pixels noirs situés sur la même ligne et l'entourant en appliquant le filtre $SCF_H(n,\theta_x)$.

L'indice n correspond à une combinaison de taille d'une image de référence telle que reconstruite et d'une image courante à reconstruire. Si N tailles d'image sont autorisées par le procédé « adaptive resolution », alors $n \in [0;N.(N-1)-1]$. Dans le cas particulier où N=3, i.e. que 3 tailles d'image sont autorisées par le procédé « adaptive resolution » alors $n \in [0;5]$. En effet, il y a un filtre $SCF_H(0,\theta_x)$ pour passer de la taille 1 à la taille 2, un filtre $SCF_H(1,\theta_x)$ pour passer de la taille 2 à la taille 1, un filtre $SCF_H(2,\theta_x)$ pour passer de la taille 1 à la taille 3, un filtre $SCF_H(3,\theta_x)$ pour passer de la taille 3 à la taille 1,

un filtre $SCF_H(4,\theta_x)$ pour passer de la taille 2 à la taille 3 et un filtre $SCF_H(5,\theta_x)$ pour passer de la taille 3 à la taille 2.

Le sur-échantillonnage ou le sous-échantillonnage d'une image de référence est donc obtenue en appliquant successivement les filtres $SCF_H(n,\theta_x)$ et $SCF_V(n,\theta_y)$ sur les lignes et les colonnes de l'image.

A titre d'exemple, le filtre {1, -3, 0, 10, 10, 0, -3, 1} / 16 est utilisé pour sous-échantillonner par 2 les données image. Dans ce cas particulier le filtre est indépendant de la phase. Le filtre {-1, 5, 5, -1} / 8 est utilisé pour sur-échantillonner par 2 les données image quand θ_x ou θ_y=0.5 et {0, 8, 0, 0} / 8 quand θ_x ou θ_y=0.

Dans l'état de l'art, il est donc connu d'appliquer les filtres $SCF_H(n,\theta_x)$ et $SCF_V(n,\theta_y)$ sur les images de référence reconstruites en vue de générer des images de référence sur-échantillonnées et/ou sous-échantillonnées lesquelles sont stockées dans la mémoire DPB. En référence à la figure 3, l'image de référence reconstruite 1 est stockée en mémoire DPB puis elle est sous-échantillonnée en une image 1' avec les filtres $SCF_H(n_a,\theta_x)$ et $SCF_V(n_a,\theta_y)$ laquelle est également stockée dans la mémoire DPB. De même, l'image de référence reconstruite 2 est stockée en mémoire DPB puis elle est sur-échantillonnée en une image 2' avec les filtres $SCF_H(n_b,\theta_x)$ et $SCF_V(n_b,\theta_y)$ laquelle est également stockée dans la mémoire DPB. n_a et n_b sont des valeurs particulières de n. Un bloc courant de l'image courante est reconstruit à partir d'un bloc appartenant à une des images de référence stockées dans la mémoire DPB de même taille que l'image courante. Ainsi, si le bloc courant appartient à l'image 2 sur la figure 3 et est codé en mode Inter à partir d'un bloc de l'image 1 sous-échantillonnée, i.e. à partir de l'image 1', alors le bloc de référence dans l'image 1' est compensé en mouvement en appliquant les filtres $MCIF_H(frac_x)$ et $MCIF_V(frac_y)$. Dans cette approche, la compensation de mouvement est effectuée sur un bloc de référence appartenant à une image de référence éventuellement sur-échantillonnée et/ou sous-échantillonnée de même taille que l'image courante.

L'invention concerne un procédé de reconstruction d'un bloc de pixels courant d'une image courante à partir d'au moins un bloc d'une image de

référence reconstruite à une taille différente de la taille de l'image courante. Le procédé de reconstruction est décrit en référence à la figure 6. Selon l'invention, seules sont stockées dans la mémoire DPB les images de référence reconstruites, i.e. les images non grisées de la figure 3. En particulier, aucune autre version sur-échantillonnée ou sous-échantillonnée n'est stockée.

Lors d'une étape 10, le bloc de référence utilisé pour reconstruire le bloc courant est compensé en mouvement à l'aide de filtres GF_H et GF_V pour déterminer un bloc de prédiction Bp. Le bloc de référence est généralement identifié à l'aide d'un vecteur de mouvement décodé MV de composantes (MVx, MVy).

Selon l'invention, les filtres horizontaux $MCIF_H$ et SCF_H sont regroupés en un seul et même filtre GF_H appliqué sur les lignes d'un bloc de pixels. De même, les filtres verticaux $MCIF_V$ et SCF_V sont regroupés en un seul et même filtre GF_V appliqué sur les colonnes d'un bloc de pixels.

$GF_H(n, \theta_x, frac_x) = MCIF_H(frac_x) \circ SCF_H(n,\theta_x)$

$GF_V(n, \theta_y, frac_y) = MCIF_V(frac_y) \circ SCF_V(n,\theta_y)$

où $(f \circ h)(x) = f(h(x))$.

" o" est l'opérateur de composition de fonctions. GF_H et GF_V sont toujours des filtres 1D. En regroupant avantageusement, les filtres d'interpolation et de rééchantillonnage horizontalement d'une part et verticalement d'autre part, aucune image de référence rééchantillonnée, i.e. sur ou sous-échantillonnée, n'est stockée dans la mémoire DPB en plus de l'image de référence reconstruite.

Ainsi, selon l'invention les opérations de sur-échantillonnage ou de sous-échantillonnage des données de l'image de référence et de compensation en mouvement d'un bloc de référence (pour déterminer le bloc de prédiction Bp) sont effectuées conjointement en appliquant un filtre d'interpolation séparable successivement sur les lignes et les colonnes de pixels du bloc de référence, lequel filtre dépend de l'indice « n », i.e. de la taille de l'image de référence et de la taille de l'image courante.

A cet effet, pour calculer la valeur des pixels du bloc de prédiction Bp Pred(Xcur,Ycur), les valeurs Xref(Xcur),θ_x(Xcur), Yref(Ycur) et θ_y(Ycur) sont calculées de la manière suivante comme illustré sur la figure 7:

$$MVx = MVx_{int} + frac_x, \text{ avec } MVx_{int}=int(MVx)$$

$$MVy = MVy_{int} + frac_y, \text{ avec } MVy_{int}=int(MVy)$$

$$Xref(Xcur) = int(SXref . (MVx_{int} + Xcur) / SXcur)$$

$$Yref(Ycur) = int(SYref . (MVy_{int} + Ycur) / SYcur)$$

$$\theta x(Xcur) = (SXref . (MVx_{int} + Xcur) / SXcur) - Xref$$

$$\theta y(Ycur) = (SYref . (MVy_{int} + Ycur) / SYcur) - Yref$$

(Xref(Xcur), Yref(Ycur)) est la position dans l'image de référence du pixel courant compensé en mouvement avec la partie entière de MV.

(SXref, SYref) représente la taille de l'image de référence et (SXcur, SYcur) représente la taille de l'image courante.

Les filtres GF_H et GF_V sont ensuite appliqués successivement comme illustrés sur la figure 8 pour déterminer le bloc de prédiction Bp.

Deux pixels courants (Xcur, Ycur) différents peuvent être associés au même pixel (Xref, Yref) dans l'image de référence. Ils se distinguent alors par leur phase (θ_x, θ_y). Ainsi pour prédire ces deux pixels différents à partir du même pixel de référence (Xref, Yref) deux filtres différents sont appliqués sur les mêmes pixels de l'image de référence en fonction de la valeur des phases.

Sur la figure 8, les pixels {a,b,c,d} sont tous associés à la même valeur (Xref,Yref). Ils se distinguent par leur phase :

$\theta_x(a) = \theta_x(c)$

$\theta_x(b) = \theta_x(d)$

$\theta_y(a) = \theta_y(b)$

$\theta_y(c) = \theta_y(d)$

Les filtres GF_H sont d'abord appliqués comme suit:

$u = GF_H(n, \theta_x(a), frac_x)(s)$

$v = GF_H(n, \theta_x(b), frac_x)(s)$

Les filtres GF_V sont appliqués ensuite pour déterminer les pixels de Bp :

$pa = GF_V(n, \theta_y(a), frac_y)(u)$

$pb = GF_V(n, \theta_y(b), frac_y)(v)$

$pc = GF_V(n, \theta_y(c), frac_y)(u)$

$pd = GF_V(n, \theta_y(d), frac_y)(v)$

Selon une variante, GF_V est appliqué avant GF_H. A titre d'exemple, les filtres peuvent prendre les valeurs suivantes pour un sur échantillonnage par deux:

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0, frac_{X ou Y}=0)=\{\ 0\ 0\ 64\ 0\ 0\ \} / 64$

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0.5, frac_{X ou Y}=0)=\{\ -8\ 40\ 40\ -8\ 0\ \} / 64$

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0, frac_{X ou Y}=1/4)=\{\ 0\ 1\ 5\ -42\ 499\ 64\ -12\ -3\ 0\ \} / 512$

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0.5, frac_{X ou Y}=1/4)=\{\ 0\ -4\ -45\ 232\ 399\ -73\ 2\ 1\ 0\ \} / 512$

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0, frac_{X ou Y}=1/2)=\{\ 0\ 1\ 6\ -68\ 462\ 143\ -28\ -4\ 0\ \} / 512$

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0.5, frac_{X ou Y}=1/2)=\{\ 0\ -4\ -28\ 143\ 462\ -68\ 6\ 1\ 0\ \} / 512$

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0, frac_{X ou Y}=3/4)=\{\ 0\ 1\ 2\ -73\ 399\ 232\ -45\ -4\ 0\ \} / 512$

$GF_{H\ ou\ V}(n, \theta_x\ ou\ \theta_y=0.5, frac_{X ou Y}=3/4)=\{\ 0\ -3\ -12\ 64\ 499\ -42\ 5\ 1\ 0\ \} / 512$

Lors d'une étape 12, un bloc de résidu est décodé pour le bloc courant. Ce bloc de résidus provient du décodage d'un flux binaire représentatif du bloc à reconstruire. Classiquement, cette étape comprend le décodage de données binaires du flux en des coefficients. Les coefficients ainsi obtenus sont généralement dequantifiés à l'aide de pas de quantification puis transformés en des résidus.

Lors d'une étape 14, le bloc courant est reconstruit à partir du bloc de référence compensé en mouvement, i.e. du bloc de prédiction, et du bloc de résidus. A titre d'exemple illustratif, le bloc courant est obtenu par addition pixel à pixel du bloc de prédiction et du bloc de résidus ou encore par addition pondérée en tenant compte d'un modèle de variation d'illumination.

L'invention concerne un procédé de codage d'un bloc de pixel courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de l'image courante. Le procédé de codage est décrit en référence à la figure 9. Selon l'invention, seules sont stockées dans la mémoire DPB les images de référence reconstruites, i.e. les images non grisées de la figure 3. En particulier, aucune autre version sur-échantillonnée ou sous-échantillonnée n'est stockée.

Lors d'une étape 20, le bloc de référence utilisé pour coder le bloc courant est compensé en mouvement à l'aide de filtres GF_H et GF_V pour déterminer un bloc de prédiction Bp. Le bloc de référence est généralement identifié à l'aide d'un vecteur de mouvement MV de composantes (MVx, MVy). MV est déterminer par un procédé d'estimation de mouvement, p.ex. de type appariement de bloc. Selon l'invention, les filtres horizontaux $MCIF_H$ et SCF_H sont regroupés en un seul et même filtre GF_H appliqué sur les lignes d'un bloc de pixels. De même, les filtres verticaux $MCIF_V$ et SCF_V sont regroupés en un seul et même filtre GF_V appliqué sur les colonnes d'un bloc de pixels.

$GF_H(n, \theta_x, frac_x) = MCIF_H(frac_x) \circ SCF_H(n, \theta_x)$

$GF_V(n, \theta_y, frac_y) = MCIF_V(frac_y) \circ SCF_V(n, \theta_y)$

où $(f \circ h)(x) = f(h(x))$.

" o" est l'opérateur de composition de filtres. GF_H et GF_V sont toujours des filtres 1D. En regroupant avantageusement, les filtres d'interpolation et de rééchantillonnage horizontalement d'une part et verticalement d'autre part, aucune image de référence rééchantillonnée, i.e. sur ou sous-échantillonnée, n'est stockée dans la mémoire DBP en plus de l'image de référence reconstruite.

Ainsi, selon l'invention les opérations de sur-échantillonnage ou de sous-échantillonnage des données de l'image de référence et de compensation en mouvement d'un bloc de référence sont effectuées conjointement en appliquant un filtre d'interpolation séparable successivement sur les lignes et les colonnes de pixels du bloc de référence, lequel filtre dépend de l'indice « n », i.e. de la taille de l'image de référence et de la taille de l'image courante.

A cet effet, pour calculer la valeur des pixels du bloc de prédiction Pred(Xcur,Ycur), les valeurs $Xref(Xcur), \theta_x(Xcur)$, $Yref(Ycur)$ et $\theta_y(Ycur)$ sont calculées de la manière suivante comme illustré sur la figure 7:

$$MVx = MVx_{int} + frac_x, \text{ avec } MVx_{int}=int(MVx)$$

$$MVy = MVy_{int} + frac_y, \text{ avec } MVy_{int}=int(MVy)$$

$$Xref(Xcur) = int(SXref \,.\, (MVx_{int} + Xcur) / SXcur)$$

$$Yref(Ycur) = int(SYref \,.\, (MVy_{int} + Ycur) / SYcur)$$

$$\theta_x(Xcur) = (SXref . (MVx_{int} + Xcur) / SXcur) - Xref$$
$$\theta_y(Ycur) = (SYref . (MVy_{int} + Ycur) / SYcur) - Yref$$

(Xref(Xcur), Yref(Ycur)) est la position dans l'image de référence du pixel courant de composantes (Xcur, Ycur) compensé en mouvement avec la partie entière de MV.

(SXref, SYref) représente la taille de l'image de référence et (SXcur, SYcur) représente la taille de l'image courante.

Les filtres GF_H et GF_V sont ensuite appliqués successivement comme illustrés sur la figure 8 pour déterminer la bloc de prédiction Bp:

Deux pixels courants (Xcur, Ycur) différents peuvent être associés au même pixel (Xref, Yref) dans l'image de référence. Ils se distinguent alors par leur phase (θ_x, θ_y). Ainsi pour prédire ces deux pixels différents à partir du même pixel de référence (Xref, Yref) deux filtres différents sont appliqués sur les mêmes pixels de l'image de référence en fonction de la valeur des phases.

Sur la figure 8, les pixels {a,b,c,d} sont tous associés à la même valeur (Xref,Yref). Ils se distinguent par leur phase :

$\theta_x(a) = \theta_x(c)$

$\theta_x(b) = \theta_x(d)$

$\theta_y(a) = \theta_y(b)$

$\theta_y(c) = \theta_y(d)$

Les filtres GF_H sont d'abord appliqués comme suit:

$u = GF_H(n, \theta_x(a), frac_x)(s)$

$v = GF_H(n, \theta_x(b), frac_x)(s)$

s est le pixel de coordonnées (Xref, Yref) dans l'image de référence.

Les filtres GF_V sont appliqués ensuite pour déterminer les pixels de Bp :

$pa = GF_V(n, \theta_y(a), frac_y)(u)$

$pb = GF_V(n, \theta_y(b), frac_y)(v)$

$pc = GF_V(n, \theta_y(c), frac_y)(u)$

$pd = GF_V(n, \theta_y(d), frac_y)(v)$

Selon une variante, GF_V est appliqué avant GF_H. Les mêmes filtres $GF_{H\ ou\ V}$ donnés en exemple en référence au procédé de reconstruction sont utilisable par le procédé de codage.

Lors d'une étape 22, un bloc de résidus est calculé à partir du bloc de référence compensé en mouvement, i.e. du bloc de prédiction, et du bloc courant. A titre d'exemple illustratif, le bloc de résidus est obtenu en soustrayant pixel à pixel le bloc de prédiction du bloc courant ou encore par soustraction pondérée en tenant compte d'un modèle de variation d'illumination.

Lors d'une étape 24, le bloc de résidus est codé pour le bloc courant en un flux binaire. Classiquement, cette étape comprend la transformation du bloc de résidus en un bloc de coefficients lesquels sont quantifié avec un pas de quantification puis codés en des données binaires.

Selon une variante de réalisation, les filtres $SCF_H(n)$ et $SCF_V(n)$ sont indépendants de θ_x et θ_y (p.ex. sous-échantillonnage par 2). Cette variante est applicable au procédé de reconstruction et au procédé de codage. Elle est décrite en lien avec les figures 10, 11 et 12. La figure 10 correspond à la figure 5, la figure 11 correspond à la figure 7 et la figure 12 correspond à la figure 8.

Selon cette variante, pour calculer, lors des étapes 10 et 20, la valeur des pixels du bloc de prédiction Pred(Xcur,Ycur), les valeurs Xref(Xcur) et Yref(Ycur) sont calculées de la manière suivante comme illustré sur la figure 10:

$$MVx = MVx_i + frac_x, \text{ avec } MVx_{int}=int(MVx)$$
$$MVy = MVy_i + frac_y, \text{ avec } MVy_{int}=int(MVy)$$

$$Xref(Xcur) = int(SXref \,.\, (MVx_{int} + Xcur) / SXcur)$$
$$Yref(Ycur) = int(SYref \,.\, (MVy_{int} + Ycur) / SYcur)$$

(Xref(Xcur), Yref(Ycur)) est la position dans l'image de référence du pixel courant compensé en mouvement avec la partie entière de MV.

(SXref, SYref) représente la taille de l'image de référence et (SXcur, SYcur) représente la taille de l'image courante.

Les filtres GF_H et GF_V sont ensuite appliqués successivement comme suit pour déterminer la bloc de prédiction Bp:

Les filtres GF_H sont d'abord appliqués comme suit:

$u = GF_H(n, frac_x)(s)$

Les filtres GF_V sont appliqués ensuite pour déterminer la valeur p des pixels de Bp :

$p = GF_V(n, frac_y)(u)$

Selon une variante, GF_V est appliqué avant GF_H.

Les autres étapes des procédés de reconstruction et de codage sont inchangées.

L'invention concerne en outre un dispositif de codage ENC décrit en référence à la figure 12 et un dispositif de décodage DECOD décrit en référence à la figure 13. Sur cette figure, les modules représentés sont des unités fonctionnelles, qui peuvent ou non correspondre à des unités physiquement distinguables. Par exemple, ces modules ou certains d'entre eux peuvent être regroupés dans un unique composant ou circuit, ou constituer des fonctionnalités d'un même logiciel. *A contrario*, certains modules peuvent éventuellement être composés d'entités physiques séparées.

Le dispositif de codage ENC reçoit en entrée des images I appartenant à une séquence d'images. Chaque image est divisée en blocs de pixels à chacun desquels est associée au moins une donnée image, e.g. de luminance et/ou de chrominance. Le dispositif de codage ENC met en œuvre notamment un codage avec prédiction temporelle. Seuls les modules du dispositif de codage ENC se rapportant au codage par prédiction temporelle ou codage INTER sont représentés sur la figure 12. D'autres modules non représentés et connus de l'homme du métier des codeurs vidéo mettent en œuvre le codage INTRA avec ou sans prédiction spatiale. Le dispositif de codage ENC comprend notamment un module de calcul ADD1 apte à soustraire pixel à pixel d'un bloc courant Bc un bloc de prédiction Bp pour générer un résidu ou bloc résiduel noté res. Il comprend en outre un module

TQ apte à transformer puis quantifier le bloc résiduel res en des données quantifiées. La transformée T est par exemple une DCT. Le dispositif de codage ENC comprend en outre un module de codage entropique COD apte à coder les données quantifiées en un flux F binaire. Il comprend en outre un module ITQ effectuant l'opération inverse du module TQ. Le module ITQ effectue une quantification inverse suivie d'une transformation inverse. Le module ITQ est relié à un module de calcul ADD2 apte à additionner pixel à pixel le bloc de données issu du module ITQ et le bloc de prédiction Bp pour générer un bloc de données image reconstruites qui sont stockées dans une mémoire DPB. Le module AR est apte à sous-échantillonner les images en entrée du codeur en vue notamment d'améliorer le compromis débit-distortion, i.e. notamment d'augmenter la qualité de reconstruction à débit constant, le débit étant déterminé par un module de contrôle de débit.

Le dispositif de codage ENC comprend en outre un module d'estimation de mouvement ME apte à estimer au moins un vecteur de mouvement MV entre le bloc Bc et une image de référence Ir stockée dans la mémoire DPB ou entre le bloc Bc et la version Ir' de l'image de référence Ir rééchantillonnée à la taille de l'image courante. Selon une variante l'estimation de mouvement est faite entre le bloc courant Bc et l'image source correspondant à Ir auquel cas la mémoire DPB n'est pas reliée au module d'estimation de mouvement ME. Les données de mouvement sont transmises par le module d'estimation de mouvement ME à un module de décision DECISION apte à sélectionner un mode de codage pour le bloc Bc dans un ensemble prédéfinis de mode de codage. Le mode de codage retenu est par exemple celui qui minimise un critère de type débit-distorsion. Toutefois l'invention n'est pas limitée à cette méthode de sélection et le mode retenu peut être sélectionné selon un autre critère par exemple un critère de type a priori. Le mode de codage sélectionné par le module de décision DECISION ainsi que les données de mouvement, p.ex. le ou les vecteurs de mouvement dans le cas du mode de prédiction temporelle ou mode INTER sont transmis à un module de prédiction PRED. Le ou les vecteurs de mouvement et le mode de codage sélectionné sont en outre transmis au module de codage entropique COD pour être codés dans le flux F. Si un mode de codage INTER est retenu par le module de décision DECISION, le module de prédiction PRED détermine ensuite à partir de

l'image de référence Ir précédemment reconstruite et stockée dans la mémoire DPB, le bloc de prédiction Bp à partir du vecteur de mouvement MV déterminé par le module d'estimation de mouvement ME. Le module de prédiction PRED est apte à déterminer le bloc de prédiction selon l'étape 20 du procédé de codage décrit en référence à la figure 9. Le module de calcul ADD1 est apte à mettre en œuvre l'étape 22 du procédé de codage. L'étape 24 du procédé de codage est mise en œuvre par les modules TQ et COD.

Le dispositif de décodage DECOD est décrit en référence à la figure 13. Le dispositif de décodage DECOD reçoit en entrée un flux F binaire représentatif d'une séquence d'images. Le flux F est par exemple transmis par un dispositif de codage ENC. Le dispositif de décodage DECOD comprend un module de décodage entropique DEC apte à générer des données décodées, p.ex. des modes de codage et des données décodées relatives au contenu des images. Le dispositif de décodage DECOD comprend en outre un module de reconstruction de données de mouvement. Selon un premier mode de réalisation, le module de reconstruction des données de mouvement est le module de décodage entropique DEC qui décode une partie du flux F représentatif des vecteurs de mouvement.
Selon une variante non représentée sur la figure 9, le module de reconstruction des données de mouvement est un module d'estimation de mouvement. Cette solution de reconstruction de données de mouvement par le dispositif de décodage DECOD est connu sous le terme anglais de « template matching ».
Les données décodées relatives au contenu des images sont alors transmises à un module ITQ apte à effectuer une quantification inverse suivie d'une transformation inverse. Le module ITQ est identique au module ITQ du dispositif de codage ENC ayant généré le flux F. Le module ITQ est relié à un module de calcul ADD3 apte à additionner pixel à pixel le bloc issu du module ITQ et un bloc de prédiction Bp pour générer un bloc de données image reconstruites qui sont stockées dans une mémoire DPB. Le dispositif de décodage DECOD comprend en outre un module de prédiction PRED identique au module de prédiction PRED du dispositif de codage 12. Si un mode de codage INTER est décodé, le module de prédiction PRED détermine

à partir d'une image de référence Ir précédemment reconstruite et stockée dans la mémoire DPB, le bloc de référence Bp à partir du vecteur de mouvement MV décodé pour le bloc courant Bc par le module de décodage entropique DEC.

Le module de prédiction PRED est apte à déterminer le bloc de prédiction selon l'étape 10 du procédé de reconstruction décrit en référence à la figure 6. Le module de calcul ADD3 est apte à mettre en œuvre l'étape 14 du procédé de reconstruction. L'étape 12 du procédé de reconstruction est mise en œuvre par les modules DEC et ITQ.

Revendications

1. Méthode de reconstruction d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de ladite image courante comprenant les étapes de :
   - compenser en mouvement (10) le bloc de référence avec au moins un filtre d'interpolation;
   - décoder (12), pour le bloc courant, un bloc de résidus ; et
   - reconstruire (14) le bloc courant à partir dudit bloc de résidus et dudit bloc de référence compensé en mouvement ;

   ladite méthode étant caractérisée en ce que le au moins un filtre d'interpolation dépend de la taille de ladite image de référence et de la taille de ladite image courante.

2. Méthode de reconstruction selon la revendication 1, dans laquelle le au moins un filtre d'interpolation est séparable en un filtre horizontal et un filtre vertical.

3. Méthode de reconstruction selon la revendication 2, le filtre horizontal est composé d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sur-échantillonnage horizontal quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sous-échantillonnage horizontal quand la taille de l'image de référence est supérieure à la taille de l'image courante et le filtre vertical est composé d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sur-échantillonnage vertical quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sous-échantillonnage vertical quand la taille de l'image de référence est supérieure à la taille de l'image courante.

4. Méthode selon la revendication 3, dans laquelle le filtre horizontal et le filtre vertical étant définis par des coefficients de filtrage, ladite méthode de reconstruction comprend en outre une étape de décodage desdits coefficients de filtrage.

5. Méthode de codage d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de ladite image courante comprenant les étapes de :

- compenser en mouvement (20) le bloc de référence avec au moins un filtre d'interpolation;
- calculer (22), pour le bloc courant, un bloc de résidus à partir dudit bloc courant et dudit bloc de référence compensé en mouvement ; et
- coder (24) le bloc de résidus ;

ladite méthode étant caractérisée en ce que le au moins un filtre d'interpolation dépend de la taille de ladite image de référence et de la taille de ladite image courante.

6. Méthode de reconstruction selon la revendication 1, dans laquelle le au moins un filtre d'interpolation est séparable en un filtre horizontal et un filtre vertical.

7. Méthode de codage selon la revendication 6, le filtre horizontal est composé d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sur-échantillonnage horizontal quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique horizontal et d'un filtre de sous-échantillonnage horizontal quand la taille de l'image de référence est supérieure à la taille de l'image courante et le filtre vertical est composé d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sur-échantillonnage vertical quand la taille de l'image de référence est inférieure à la taille de l'image courante ou d'un filtre d'interpolation sous pixellique vertical et d'un filtre de sous-échantillonnage

vertical quand la taille de l'image de référence est supérieure à la taille de l'image courante.

8. Méthode de codage selon la revendication 5, dans laquelle le filtre horizontal et le filtre vertical étant définis par des coefficients de filtrage, ladite méthode de codage comprend en outre une étape de codage desdits coefficients de filtrage.

9. Dispositif de décodage (DECOD) d'un flux binaire en vue de la reconstruction d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de ladite image courante comprenant:

- des moyens pour compenser en mouvement (PRED) le bloc de référence avec au moins un filtre d'interpolation;
- des moyens pour décoder (DEC, ITQ), pour le bloc courant, un bloc de résidus ; et
- des moyens pour reconstruire (ADD3) le bloc courant à partir dudit bloc de résidus et dudit bloc de référence compensé en mouvement ;

le dispositif de décodage étant caractérisé en ce que le au moins un filtre d'interpolation dépend de la taille de ladite image de référence et de la taille de ladite image courante.

10. Dispositif de codage (ENC) d'un bloc courant d'une image courante à partir d'au moins un bloc d'une image de référence reconstruite à une taille différente de la taille de ladite image courante comprenant:

- des moyens pour compenser en mouvement (PRED) le bloc de référence avec au moins un filtre d'interpolation;
- des moyens pour calculer (ADD1), pour le bloc courant, un bloc de résidus à partir dudit bloc courant et dudit bloc de référence compensé en mouvement ; et
- des moyens pour coder (TQ, COD) le bloc de résidus ;

le dispositif de codage étant caractérisé en ce que le au moins un filtre d'interpolation dépend de la taille de ladite image de référence et de la taille de ladite image courante.

5

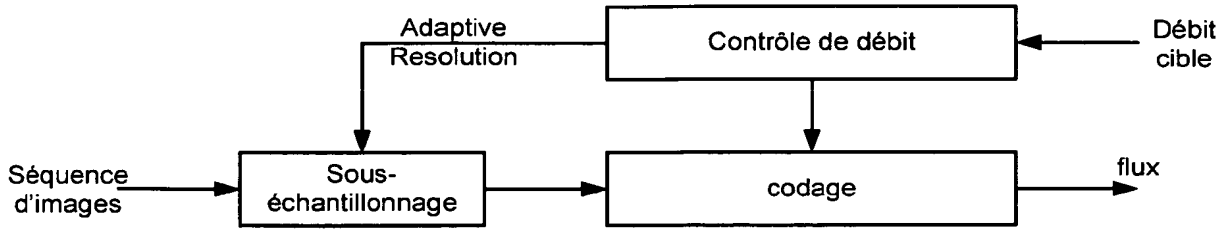


FIGURE 1 – ART ANTERIEUR

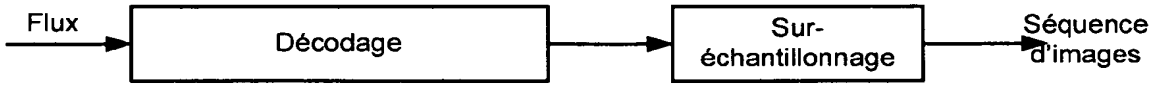


FIGURE 2– ART ANTERIEUR

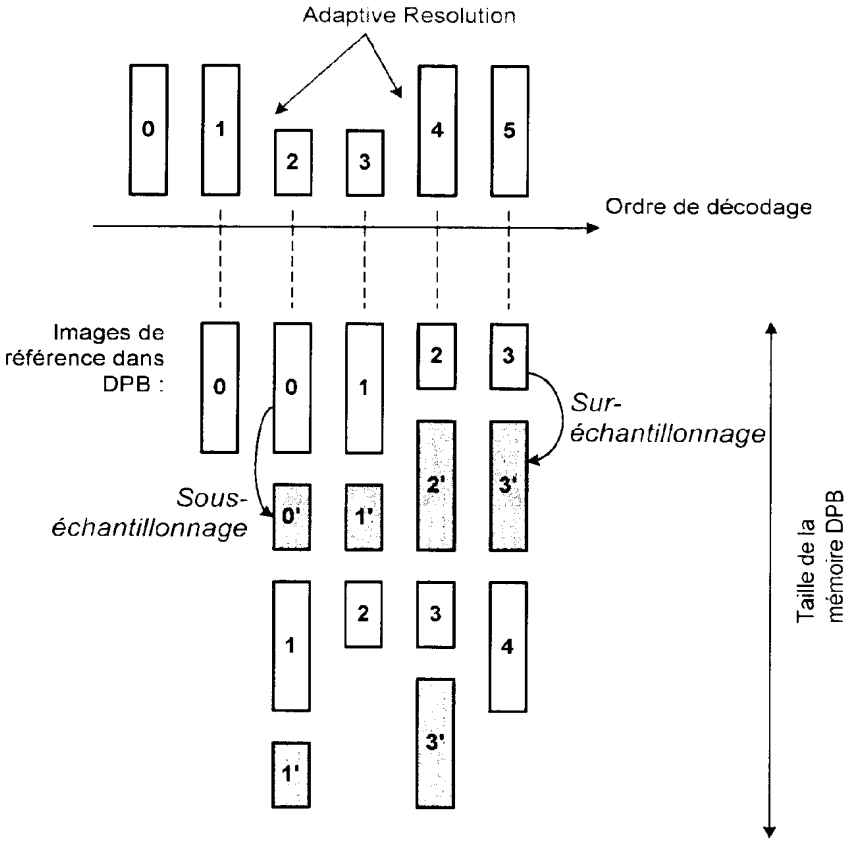

Adaptive Resolution
0
1
2
3
4
5
Ordre de décodage
Images de référence dans DPB :
0
0
1
2
3
Sur-échantillonnage
Sous-échantillonnage
0'
1'
2'
3'
1
2
3
4
1'
3'
Taille de la mémoire DPB

FIGURE 3

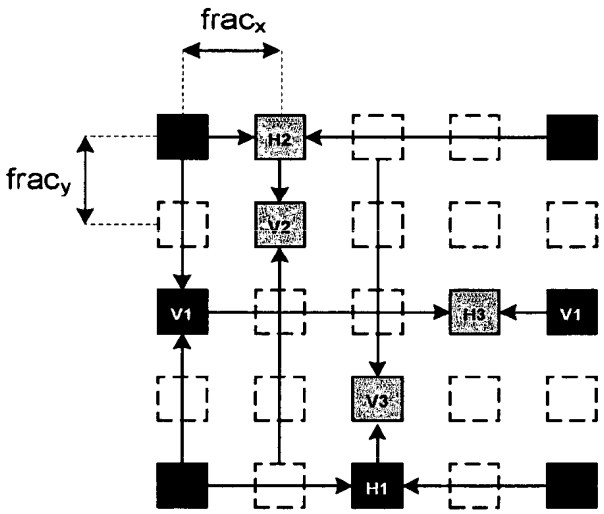


FIGURE 4

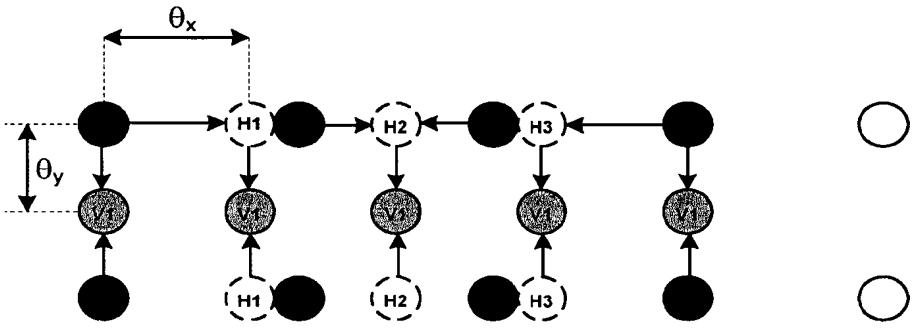


FIGURE 5

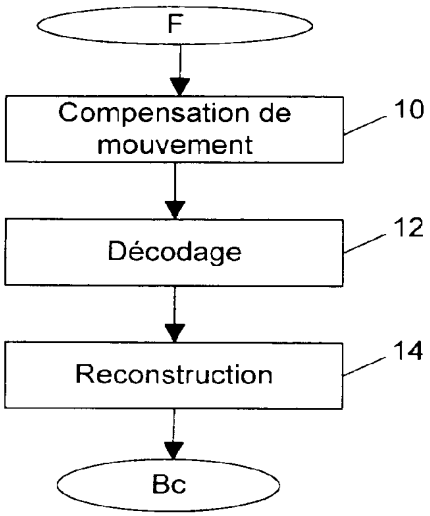


FIGURE 6

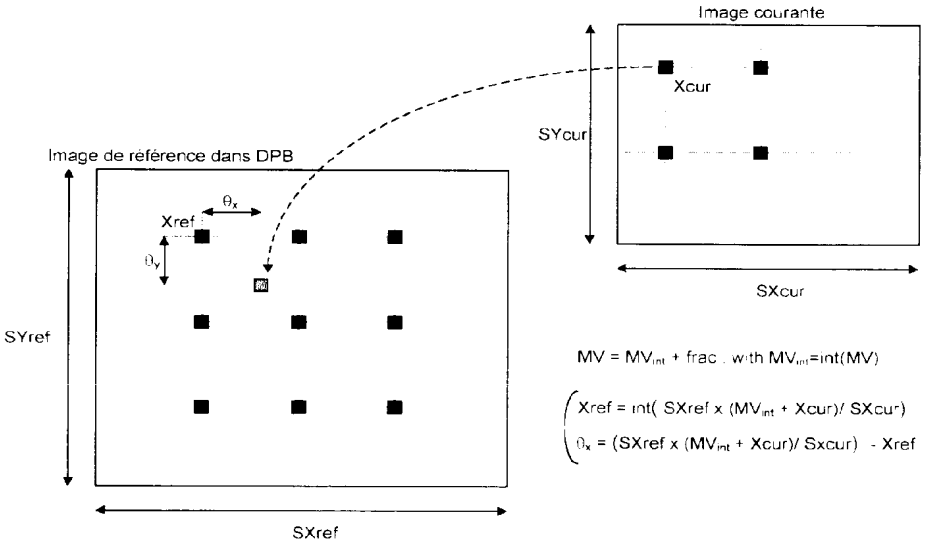


FIGURE 7

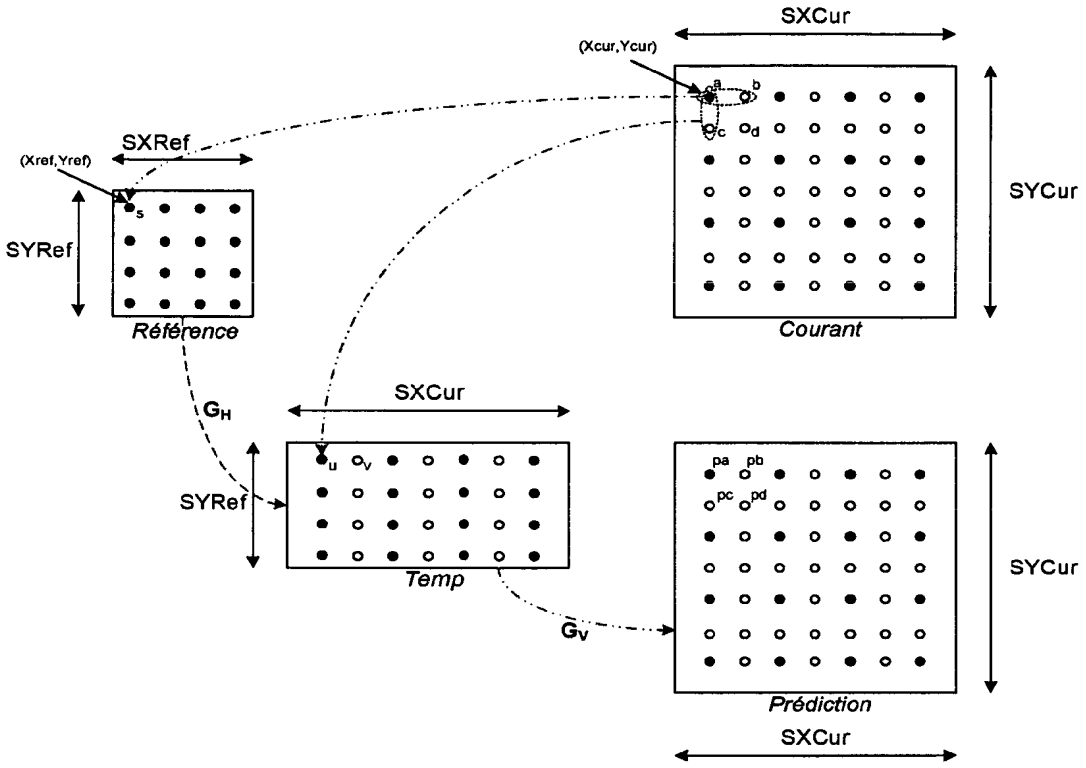


FIGURE 8

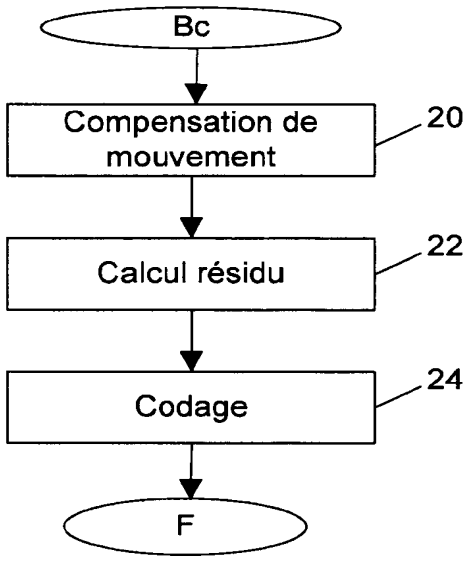


FIGURE 9

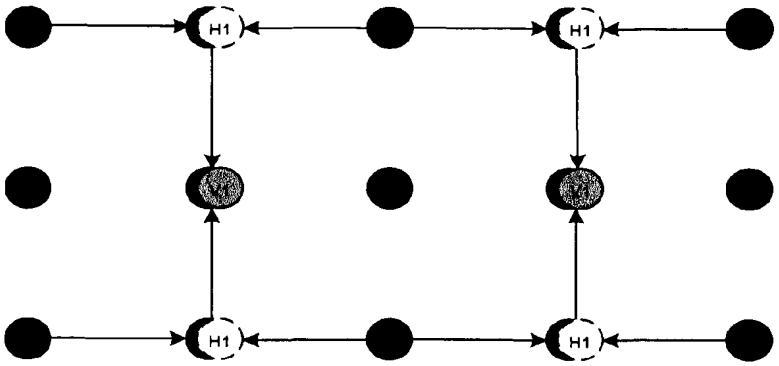


FIGURE 10

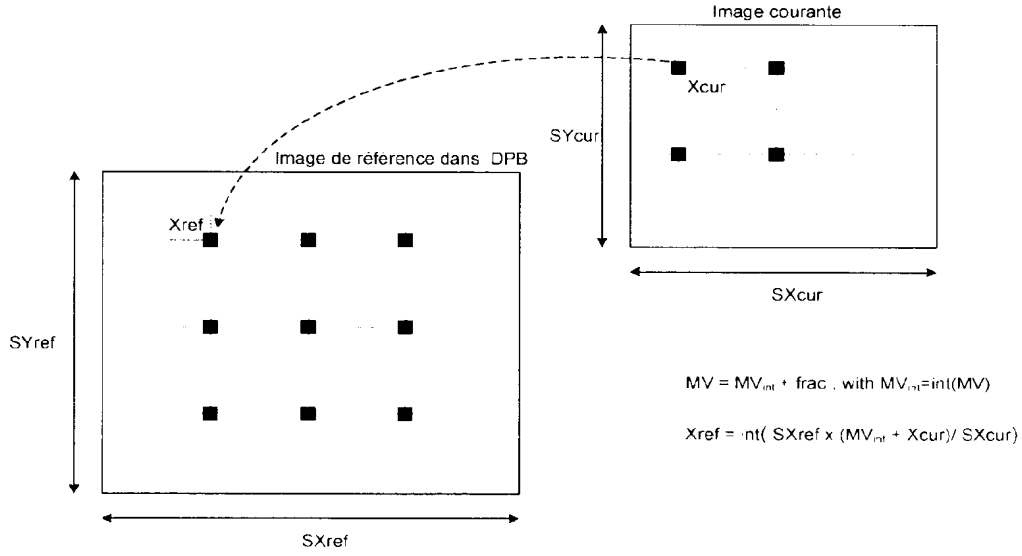


FIGURE 11

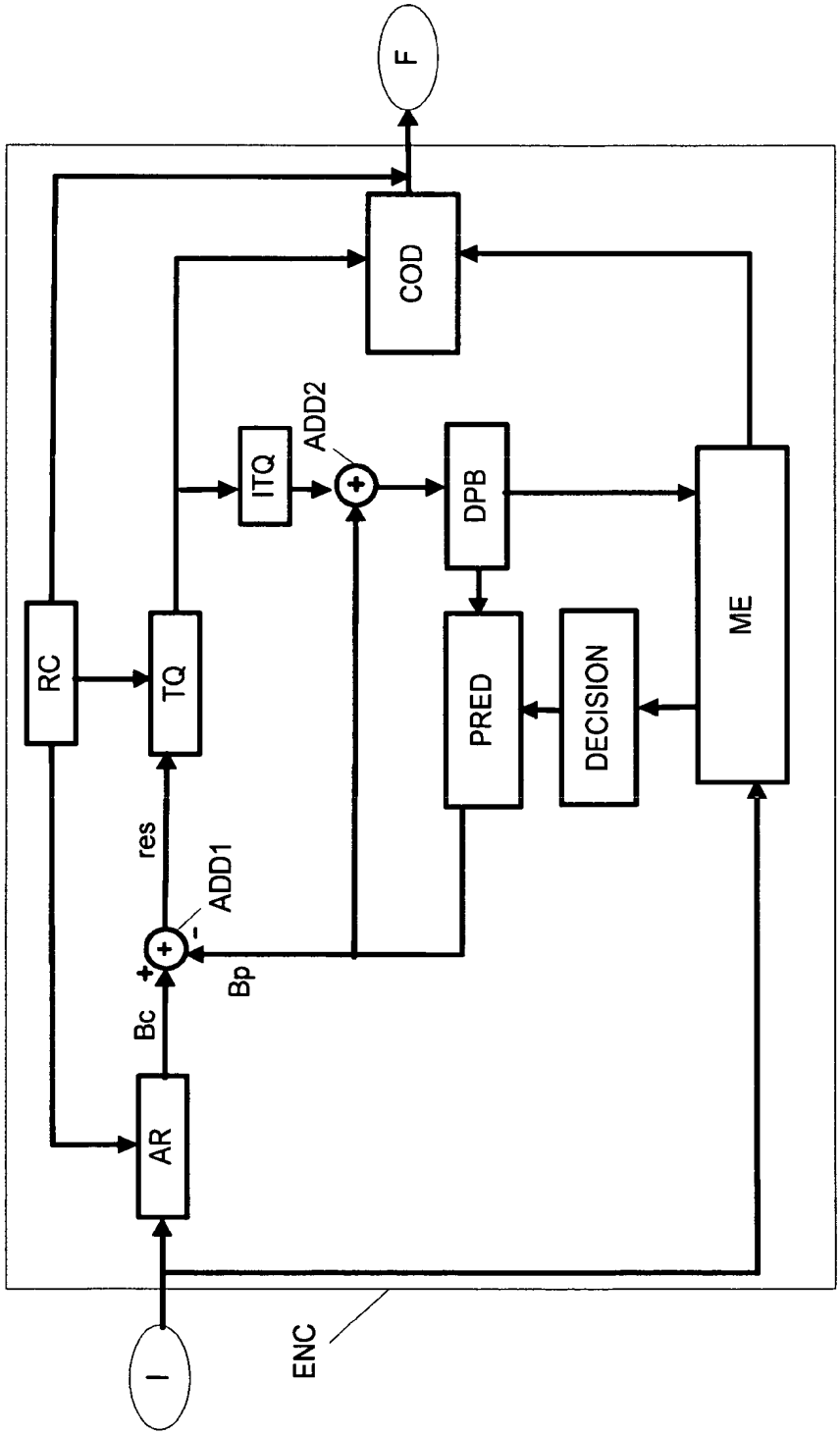


FIGURE 12

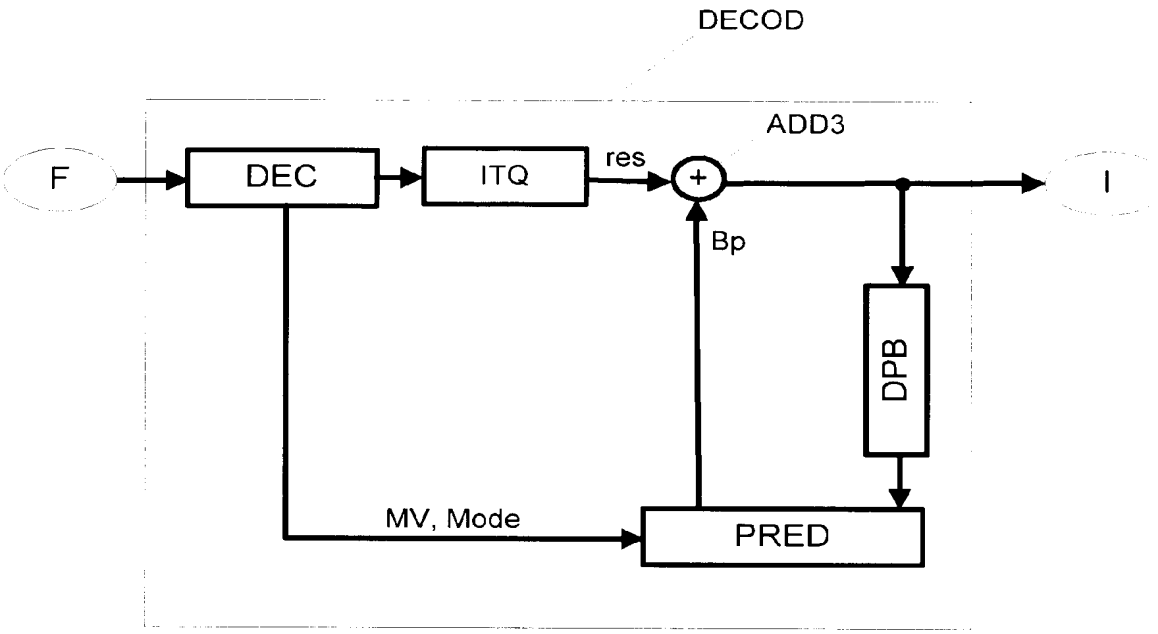


FIGURE 13

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0	**For receiving Office use only**	
0-1	International Application No.	**PCT/EP2013/050399**
0-2	International Filing Date	**10 JAN 2013 (10.01.2013)**
0-3	Name of receiving Office and "PCT International Application"	**RO/EP**

0-4	**Form PCT/RO/101 PCT Request**	
0-4-1	Prepared Using	PCT Online Filing Version 3.5.000.231 MT/FOP 20020701/0.20.5.20
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	European Patent Office (EPO) (RO/EP)
0-7	**Applicant's or agent's file reference**	PF120006
I	**Title of Invention**	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE
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IV-2	**Additional agent(s)**	additional agent(s) with same address as first named agent
IV-2-1	Name(s)	HUCHET, Anne; PERROT, Sébastien
V	**DESIGNATIONS**	
V-1	**The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.**	
VI-1	**Priority claim of earlier national application**	
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VI-1-2	Number	FR1250334
VI-1-3	Country	FR

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VI-2	**Incorporation by reference :** where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.		
VII-1	**International Searching Authority Chosen**	European Patent Office (EPO) (ISA/EP)	
VII-2	**Request to use results of earlier search; reference to that search**		
VII-2-1	Filing date	18 June 2012 (18.06.2012)	
VII-2-2	Application Number	FA761665	
VII-2-3	Country (or regional Office)	EP	
VII-2-5	Documents are available to the ISA in a form and manner acceptable to it and therefore do not need to be submitted by the applicant to the ISA (Rule 12bis.1(f)):	A copy of the results of the earlier search A copy of any document cited in the results of the earlier search	
VIII	**Declarations**	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	–	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	1	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	–	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	–	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	–	

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IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	5	✓
IX-2	Description	16	✓
IX-3	Claims	4	✓
IX-4	Abstract	1	✓
IX-5	Drawings	8	✓
IX-7	TOTAL	34	
	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	–	✓
IX-18	PCT-SAFE physical media	–	–
IX-20	**Figure of the drawings which should accompany the abstract**	6	
IX-21	**Language of filing of the international application**	English	
X-1	**Signature of applicant, agent or common representative**	(PKCS7 Digital Signature)	
X-1-1	Name (LAST, First)	LORETTE, Anne	
X-1-2	Name of signatory	FR, Thomson Licensing, A. Lorette 18274	
X-1-3	Capacity (if such capacity is not obvious from reading the request)	(Representative)	

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10-2	**Drawings:**	✓
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10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/EP
10-6	**Transmittal of search copy delayed until search fee is paid**	

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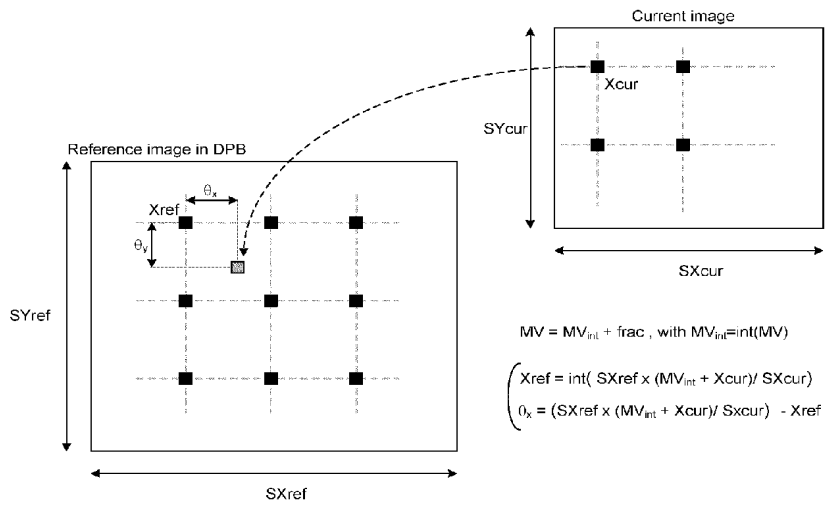


FIGURE 7

(57) Abstract: A method is described for reconstructing a current block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image. The method comprises the steps: - motion compensate (10) the reference block with at least one interpolation filter that depends on the size of said reference image and on the size of said current image, - decode (12), for the current block, a residue block, and - reconstruct (14) the current block from the residue block and from the motion compensated reference block.

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Method and device for coding an image block, corresponding method and decoding device

1. Scope of the invention

The invention relates to the general domain of image coding.

The invention more particularly relates to a method for reconstructing an image block from a current image and a method for coding such a block from a block of a reference image reconstructed at a different size from the size of the current image. The invention also relates to the corresponding decoding and coding devices.

2. Prior art

It is known to code a sequence of images to quantize with a quantization step the image data before their coding with view to reduce the output bitrate of the coder. Traditionally, the coder comprises a bitrate control module able to adapt the value of the quantization step so as to obtain the best compromise between the output bitrate of the coder and the distortion of the image signal. When the intended output bitrate or target bitrate is low, greatly increasing the quantization step is not always the best adapted solution as it generally leads to a significant increase in the distortion of the image signal.

Hence, it is known at low bitrates to reduce the size of the image to code by subsampling before coding as illustrated in figure 1. In this case, the decoder subsamples the decoded image before its display as shown in figure 2. For this purpose, the coded stream comprises a field specifying the size of the original image of the coded image. This dynamic adaptation of the size of the image is known in English terminology as adaptive resolution.

As illustrated in figure 3, the adaptive resolution of the size of the image requires the storage in DPB memory (Decoded Picture Buffer) of reconstructed reference images at different sizes. Indeed, the reconstructed images used as reference images are stored in the DPB memory. In the case of the Inter coding mode, the stored reference images are used to determine motion compensated reference blocks. In the particular case of the adaptive

resolution method, the reference image used for the motion compensation and the current image to code or to reconstruct from this reference image can be of a different size. Hence, when the reference image has a size less than (respectively greater than) the size of the current image, the reference image must be upsampled (respectively subsampled) to the size of the current image before being motion compensated. The subsampled or upsampled version of the reference image is also stored in the DPB memory. More generally, each reference image is stored in the DPB memory with N different sizes, N being an integer representing the number of sizes allowed by the adaptive resolution method.

In the example referred to in figure 3, the last two reconstructed images are used as reference image for the current image. Hence, the image 2 uses the images 0 and 1 as reference images, the image 3 uses the images 1 and 2 as reference images, etc. In this example, N=2. The upsampled and subsampled versions of the reconstructed reference images are greyed out in figure 3 and correspond to the additional reference images stored in the DPB memory. The reference images not greyed out are the reconstructed reference images.

The adaptive resolution method thus requires more memory space as several versions (reconstructed image and upsampled and/or subsampled versions) of a same reference image are stored. Increasing the memory size is a problem notably in the hardware implementations for which the surface of the component is notably critical.

3. Summary of the invention

The purpose of the invention is to overcome at least one of the disadvantages of the prior art.

For this purpose, the invention relates to a method for reconstructing a current block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image. The reconstruction method comprises steps to:

- motion compensate the reference block with at least one interpolation filter,
- decode, for the current block, a residue block, and
- reconstruct the current block from the residue block and from the motion compensated reference block.

According to the invention, the interpolation filter depends on the size of the reference image and the size of the current image.

Hence, according to the invention the operations of upsampling or subsampling of the data of the reference image and of motion compensation of a reference block are performed conjointly by applying an interpolation filter that depends on the 'n' index, i.e. on the size of the reference image and on the size of the current image.

According to a particular characteristic of the invention, the interpolation filter is separable into a horizontal filter and a vertical filter.

According to another aspect of the invention, the horizontal filter is composed of a horizontal sub-pixel interpolation filter and a horizontal upsampling filter when the size of the reference image is less than the size of the current image or of horizontal sub-pixel interpolation filter and a horizontal subsampling filter when the size of the reference image is greater than the size of the current image and the vertical filter is composed of a vertical sub-pixel interpolation filter and a vertical upsampling filter when the size of the reference image is less than the size of the current image or of a vertical sub-pixel interpolation filter and a vertical subsampling filter when the size of the reference image is greater than the size of the current image.

Advantageously, the horizontal filter and the vertical filter being defined by filtering coefficients, the reconstruction method further comprises a decoding step of the filtering coefficients.

The invention also relates to a method for coding a current block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image. The coding method comprises the following steps:

- motion compensate the reference block with at least one interpolation filter,
- calculate, for the current block, a residue block from the current block and from the motion compensated reference block, and
- code the residue block,

According to the invention, the interpolation filter depends on the size of the reference image and the size of the current image.

According to a particular characteristic of the invention, the interpolation filter is separable into a horizontal filter and a vertical filter.

According to another aspect of the invention, an interpolation filter being separable into a horizontal filter and a vertical filter, the horizontal filter is composed of a horizontal sub-pixel interpolation filter and a horizontal upsampling filter when the size of the reference image is less than the size of the current image or of horizontal sub-pixel interpolation filter and a horizontal subsampling filter when the size of the reference image is greater than the size of the current image and the vertical filter is composed of a vertical sub-pixel interpolation filter and a vertical upsampling filter when the size of the reference image is less than the size of the current image or of a vertical sub-pixel interpolation filter and a vertical subsampling filter when the size of the reference image is greater than the size of the current image.

Advantageously, the horizontal filter and the vertical filter being defined by filtering coefficients, the coding method further comprises a coding step of the filtering coefficients.

The invention further relates to a decoding device of a binary stream with a view to reconstructing a current block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image comprising:

- means to motion compensate the reference block with at least one interpolation filter,
- means to decode, for the current block, a residue block, and
- means to reconstruct the current block from the residue block and from the motion compensated reference block.

According to the invention, the interpolation filter depends on the size of the reference image and the size of the current image.

The invention also relates to a device for coding a current block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image comprising:

- means to motion compensate the reference block with at least one interpolation filter,

- means to calculate, for the current block, a residue block from the current block and from the motion compensated reference block, and
- means to code the residue block.

According to the invention, the interpolation filter depends on the size of the reference image and the size of the current image.

4. List of figures

The invention will be better understood and illustrated by means of non-restrictive embodiments and advantageous implementations, with reference to the accompanying drawings, wherein:

- figure 1 illustrates a coding device with adaptive resolution according to the prior art,
- figure 2 illustrates a decoding device with adaptive resolution according to the prior art,
- figure 3 represents a sequence of 5 images to reconstruct and the change in the composition of the DPB memory of reference images when the last two reconstructed images are used as reference images,
- figure 4 illustrates the ¼ pixel interpolation of an image block,
- figure 5 illustrates a horizontal and vertical upsampling technique of an image,
- figure 6 illustrates a method for reconstructing an image block according to the invention,
- figure 7 illustrates a matching of pixels of the current image with pixels of the reference image according to the invention,
- figure 8 illustrates the motion compensation method according to the invention,
- figure 9 illustrates a method for coding an image block according to the invention,
- figure 10 illustrates a horizontal and vertical subsampling technique of an image,
- figure 11 illustrates a matching of pixels of the current image with pixels of the reference image according to an embodiment variant,

- figure 12 illustrates a coding device according to the invention, and
- figure 13 illustrates a decoding device according to the invention.

5. Detailed description of the invention

The 2D interpolation filters used for the motion compensation and the 2D upsampling and subsampling filters are generally separable filters. Hence, each 2D filter is divided into a 1D vertical filter and a 1D horizontal filter, which are successively applied to the columns and lines of a pixel block or of an image. It is immaterial to apply first the horizontal filter on the lines then the vertical filter on the columns or conversely to apply first the vertical filter on the columns then the horizontal filter on the lines. The separable interpolation filters typically used for motion compensation are noted MCIF (Motion Compensation Interpolation Filter) and are composed of a vertical filter noted $MCIF_V(frac_y)$ and a horizontal filter noted $MCIF_H(frac_x)$. $(frac_x,frac_y)$ represents the non-integer part of the position of the pixel to interpolate in relation to the initial grid of pixels or even the fractional part of the motion vector used for the motion compensation. For example, in the case of a ¼ pixel motion compensation, $frac_x$Є{0 ,0.25,0.5,0.75} and $frac_y$Є{0 ,0.25,0.5,0.75} as illustrated in figure 4. The motion compensation of a pixel block of a reference image is thus obtained by successively applying the filters $MCIF_H(frac_x)$ and $MCIF_V(frac_y)$.

The black squares represent the initial grid of pixels, the other squares represent pixels interpolated by means of the filters $MCIF_H(frac_x)$ and $MCIF_V(frac_y)$. Hence, the pixel H2 is obtained from at least two black pixels located on the same line by applying the filter $MCIF_H(0.25)$. For example, the following filters can be used to interpolate with $frac_{XorY}$ = 0,¼, ½, ¾:

{ 0, 0, 0, 64, 0, 0, 0, 0 } / 64 with $frac_{XorY}$ = 0,

{ -1, 4, -10, 57, 19, -7, 3, -1 } / 64 with $frac_{XorY}$ = ¼,

{ -1, 4, -11, 40, 40, -11, 4, -1 } / 64 with $frac_{XorY}$ = ½,

{ -1, 3, -7, 19, 57, -10, 4, -1 } / 64 with $frac_{XorY}$ = ¾.

In the same manner, each upsampling and subsampling filter SCF(n) is separable and is composed of a vertical filter noted $SCF_H(n,\theta_x)$ and a horizontal filter noted $SCF_V(n,\theta_y)$. $(\theta_x;\theta_y)$ represents the position of the

upsampled or subsampled pixel in relation to the initial grid of pixels of the reference image. In figure 5, the black dots represent the initial grid of pixels. The pixel H1 is obtained from at least two black pixels located on the same line and surrounding it by applying the filter $SCF_H(n,\theta_x)$.

The index n corresponds to a size combination of a reference image such as reconstructed and of a current image to reconstruct. If N image sizes are authorised by the adaptive resolution method, then $n \in [0;N.(N-1)-1]$. in the particular case where N=3, i.e. that 3 image sizes are authorised by the adaptive resolution method then $n \in [0;5]$. Indeed, there is a filter $SCF_H(0,\theta_x)$ to go from size 1 to size 2, a filter $SCF_H(1,\theta_x)$ to go from size 2 to size 1, a filter $SCF_H(2,\theta_x)$ to go from size 1 to size 3, a filter $SCF_H(3,\theta_x)$ to go from size 3 to size 1, a filter $SCF_H(4,\theta_x)$ to go from size 2 to size 3 and a filter $SCF_H(5,\theta_x)$ to go from size 3 to size 2.

The upsampling or subsampling of a reference image is thus obtained by successively applying the filters $SCF_H(n,\theta_x)$ and $SCF_V(n,\theta_y)$ on the lines and columns of the image.

For example, the filter {1, -3, 0, 10, 10, 0, -3, 1} / 16 is used to subsample the image data by 2. In this particular case the filter is independent from the phase. The filter {-1, 5, 5, -1} / 8 is used to subsample the image data by 2 when θ_x or θ_y=0.5 and {0, 8, 0, 0} / 8 when θ_x or θ_y=0.

In the prior art, it is thus known to apply the filters $SCF_H(n,\theta_x)$ and $SCF_V(n,\theta_y)$ on the reconstructed reference images with a view to generating upsampled and/or subsampled images which are stored in the DPB memory. In reference to figure 3, the reconstructed reference image 1 is stored DPB memory then it is subsampled in an image 1' with the filters $SCF_H(n_a,\theta_x)$ and $SCF_V(n_a,\theta_y)$ which is also stored in the DPB memory. Likewise, the reconstructed reference image 2 is stored in DPB memory then it is upsampled in an image 2' with the filters $SCF_H(n_b,\theta_x)$ and $SCF_V(n_b,\theta_y)$ which is also stored in the DPB memory. n_a and n_b are particular values of n. A current block of the current image is reconstructed from a block belonging to one of the reference images stored in the DPB memory of the same size of the current image. Hence, if the current block belongs to the image 2 on figure 3 and is coded in Inter mode from a block of the subsampled image 1, i.e. from the image 1', then the

reference block in the image 1' is motion compensated by applying the filters $MCIF_H(frac_x)$ and $MCIF_V(frac_y)$. In this approach, the motion compensation is carried out on a reference block belonging to a reference image possibly upsampled and/or subsampled of the same size as the current image.

The invention relates to a method for reconstructing a current pixel block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image. The reconstruction method is described with reference to figure 6. According to the invention, only the reconstructed reference images are stored in the DPB memory, i.e. the images not greyed out in figure 3. In particular, no other upsampled or subsampled version is stored.

During a step 10, the reference block used to reconstruct the current block is motion compensated by means of filters GF_H and GF_V to determine a prediction block Bp. The reference block is generally identified by means of a decoded motion vector MV of components (MVx, MVy).

According to the invention, the horizontal filters $MCIF_H$ and SCF_H are grouped into a single filter GF_H applied on the lines of a pixel block. Likewise, the vertical filters $MCIF_V$ and SCF_V are grouped into a single filter GF_V applied on the columns of a pixel block.

$GF_H(n, \theta_x, frac_x) = MCIF_H(frac_x) \text{ o } SCF_H(n, \theta_x)$

$GF_V(n, \theta_y, frac_y) = MCIF_V(frac_y) \text{ o } SCF_V(n, \theta_y)$

where $(f \text{ o } h)(x) = f(h(x))$.

"o" is the function composition operator. GF_H and GF_V are always 1D filters. By advantageously grouping, the filters for interpolation and resampling horizontally on the one hand and vertically on the other hand, no resampled reference image, i.e. over- or subsampled, is stored in the DPB memory in addition to the reconstructed reference image.

Hence, according to the invention the operations of upsampling or subsampling of the data of the reference image and of motion compensation of a reference block (to determine the prediction block Bp) are performed jointly by applying a separable interpolation filter successively on the lines and on the columns of pixels of the reference block, which filter depends on the 'n'

index, i.e. on the size of the reference image and on the size of the current image.

For this purpose, to calculate the value of the pixels of the prediction block Bp Pred(Xcur,Ycur), the values Xref(Xcur),θ_x(Xcur), Yref(Ycur) and θ_y(Ycur) are calculated in the following manner as shown in figure 7:

$$MVx = MVx_{int} + frac_x, \text{ with } MVx_{int}=int(MVx)$$
$$MVy = MVy_{int} + frac_y, \text{ with } MVy_{int}=int(MVy)$$
$$Xref(Xcur) = int(SXref . (MVx_{int} + Xcur) / SXcur)$$
$$Yref(Ycur) = int(SYref . (MVy_{int} + Ycur) / SYcur)$$

$$\theta x(Xcur) = (SXref . (MVx_{int} + Xcur) / SXcur) - Xref$$
$$\theta y(Ycur) = (SYref . (MVy_{int} + Ycur) / SYcur) - Yref$$

(Xref(Xcur), Yref(Ycur)) is the position in the reference image of the motion compensated current pixel with the integer part of MV.

(SXref, SYref) represents the size of the reference image and (SXcur, SYcur) represents the size of the current image.

The filters GF_H and GF_V are then successively applied as shown in figure 8 to determine the prediction block Bp.

Two different current pixels (Xcur, Ycur) can be associated with the same pixel (Xref, Yref) in the reference image. They are then distinguished by their phase (θ_x, θ_y). Thus, to predict these two different pixels from the same reference pixel (Xref, Yref) two different filters are applied to the same pixels of the reference image according to the value of the phases.

In figure 8, the pixels {a,b,c,d} are all associated with the same value (Xref,Yref). They are distinguished by their phase:

$\theta_x(a) = \theta_x(c)$

$\theta_x(b) = \theta_x(d)$

$\theta_y(a) = \theta_y(b)$

$\theta_y(c) = \theta_y(d)$

The filters GF_H are first applied as follows:

$u = GF_H(n, \theta_x(a), frac_x)(s)$

$v = GF_H(n, \theta_x(b), frac_x)(s)$

The filters GF_V are then applied to determine the pixels of Bp:

$pa = GF_V(n, \theta_y(a), frac_y)(u)$

$pb = GF_V(n, \theta_y(b), frac_y)(v)$

$pc = GF_V(n, \theta_y(c), frac_y)(u)$

$pd = GF_V(n, \theta_y(d), frac_y)(v)$

According to a variant, GF_V is applied before GF_H. For example, the filters can have the following values for an upsampling by two:

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0, frac_{XorY}=0)=\{ \ 0\ 0\ 64\ 0\ 0 \} / 64$

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0.5, frac_{XorY}=0)=\{ \ -8\ 40\ 40\ -8\ 0 \} / 64$

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0, frac_{XorY}=1/4)= \{ \ 0\ 1\ 5\ -42\ 499\ 64\ -12\ -3\ 0 \} / 512$

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0.5, frac_{XorY}=1/4)= \{ \ 0\ -4\ -45\ 232\ 399\ -73\ 2\ 1\ 0 \} / 512$

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0, frac_{XorY}=1/2)= \{ \ 0\ 1\ 6\ -68\ 462\ 143\ -28\ -4\ 0 \} / 512$

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0.5, frac_{XorY}=1/2)= \{ \ 0\ -4\ -28\ 143\ 462\ -68\ 6\ 1\ 0 \} / 512$

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0, frac_{XorY}=3/4)= \{ \ 0\ 1\ 2\ -73\ 399\ 232\ -45\ -4\ 0 \} / 512$

$GF_{H \text{ or } V}(n, \theta_x \text{ or } \theta_y=0.5, frac_{XorY}=3/4)= \{ \ 0\ -3\ -12\ 64\ 499\ -42\ 5\ 1\ 0 \} / 512$

During a step 12, a residue block is decoded for the current block. This residue block comes from the decoding of a binary stream representative of a block to reconstruct. Typically, this step comprises the decoding of binary data of the stream into coefficients. The coefficients thus obtained are generally dequantized using a quantization step then transformed into residues.

During a step 14, the current block is reconstructed from the motion compensated reference block, i.e. from the prediction block and the residue block. As an illustrative example, the current block is obtained by pixel to pixel addition of the prediction block and of the residue block or yet by weighted addition taking into account an illumination variation model.

The invention relates to a method for coding a current pixel block of a current image from at least one block of a reconstructed reference image at a different size from the size of the current image. The coding method is described with reference to figure 9. According to the invention, only the reconstructed reference images are stored in the DPB memory, i.e. the images not greyed out in figure 3. In particular, no other upsampled or subsampled version is stored.

During a step 20, the reference block used to code the current block is motion compensated by means of filters GF_H and GF_V to determine a prediction block Bp. The reference block is generally identified by means of a motion vector MV of components (MVx, MVy). MV is determined by a motion estimation method, for example of block matching type. According to the invention, the horizontal filters $MCIF_H$ and SCF_H are grouped into a single filter GF_H applied on the lines of a pixel block. Likewise, the vertical filters $MCIF_V$ and SCF_V are grouped into a single filter GF_V applied on the columns of a pixel block.

$GF_H(n, \theta_x, frac_x) = MCIF_H(frac_x) \text{ o } SCF_H(n, \theta_x)$

$GF_V(n, \theta_y, frac_y) = MCIF_V(frac_y) \text{ o } SCF_V(n, \theta_y)$

where $(f \text{ o } h)(x) = f(h(x))$.

"o" is the filter composition operator. GF_H and GF_V are always 1D filters. By advantageously grouping, the interpolation filters and resampling horizontally on the one hand and vertically on the other hand, no resampled reference image, i.e. over- or subsampled, is stored in the DPB memory in addition to the reconstructed reference image.

Hence, according to the invention the operations of upsampling or subsampling of the data of the reference image and of motion compensation of a reference block are performed jointly by applying an interpolation filter successively separable on the lines and the columns of pixels of the reference block, which filter depends on the 'n' index, i.e. on the size of the reference image and on the size of the current image.

For this purpose, to calculate the value of the pixels of the prediction block Pred(Xcur,Ycur), the values Xref(Xcur),θ_x(Xcur), Yref(Ycur) and θ_y(Ycur) are calculated in the following manner as shown in figure 7:

$$MVx = MVx_{int} + frac_x, \text{ with } MVx_{int}=int(MVx)$$
$$MVy = MVy_{int} + frac_y, \text{ with } MVy_{int}=int(MVy)$$

$$Xref(Xcur) = int(SXref . (MVx_{int} + Xcur) / SXcur)$$
$$Yref(Ycur) = int(SYref . (MVy_{int} + Ycur) / SYcur)$$

$$\theta_x(Xcur) = (SXref . (MVx_{int} + Xcur) / SXcur) - Xref$$
$$\theta_y(Ycur) = (SYref . (MVy_{int} + Ycur) / SYcur) - Yref$$

(Xref(Xcur), Yref(Ycur)) is the position in the reference image of the current pixel with motion compensated components (Xcur, Ycur) with the integer part of MV.

(SXref, SYref) represents the size of the reference image and (SXcur, SYcur) represents the size of the current image.

The filters GF_H and GF_V are then successively applied as shown in figure 8 to determine the prediction block Bp.

Two different current pixels (Xcur, Ycur) can be associated with the same pixel (Xref, Yref) in the reference image. They are then distinguished by their phase (θ_x, θ_y). Thus, to predict these two different pixels from the same reference pixel (Xref, Yref) two different filters are applied to the same pixels of the reference image according to the value of the phases.

In figure 8, the pixels {a,b,c,d} are all associated with the same value (Xref,Yref). They are distinguished by their phase:

$\theta_x(a) = \theta_x(c)$

$\theta_x(b) = \theta_x(d)$

$\theta_y(a) = \theta_y(b)$

$\theta_y(c) = \theta_y(d)$

The filters GF_H are first applied as follows:

$u = GF_H(n, \theta_x(a), frac_x)(s)$

$v = GF_H(n, \theta_x(b), frac_x)(s)$

s is the pixel of coordinates (Xref, Yref) in the reference image.

The filters GF_V are then applied to determine the pixels of Bp:

$pa = GF_V(n, \theta_y(a), frac_y)(u)$

$pb = GF_V(n, \theta_y(b), frac_y)(v)$

$pc = GF_V(n, \theta_y(c), frac_y)(u)$

$pd = GF_V(n, \theta_y(d), frac_y)(v)$

According to a variant, GF_V is applied before GF_H. The same $GF_{H \text{ or } V}$ filters given as an example with reference to the reconstruction method can be used by the coding method.

During a step 22, the residue block is calculated from the motion compensated reference block, i.e. from the prediction block and the current

block. As an illustrative example, the residue block is obtained by subtracting the prediction block pixel by pixel from the current block or yet by weighted subtraction taking into account an illumination variation model.

During a step 24, the residue block is coded for the current block into a binary stream. Typically, this step comprises the transformation of the residue block into a block of coefficients which are quantized with a quantization step then coded into binary data.

According to an embodiment variant, the filters $SCF_H(n)$ and $SCF_V(n)$ are separate from θ_x and θ_y (e.g. subsampling by 2). This variant is applicable to the reconstruction method and to the coding method. It is described in relation to figures 10, 11 and 12. Figure 10 corresponds to figure 5, figure 11 corresponds to figure 7 and figure 12 corresponds to figure 8.

According to this variant, to calculate, during steps 10 and 20, the value of the pixels of the prediction block Pred(Xcur,Ycur), the values Xref(Xcur) and Yref(Ycur) are calculated in the following manner as shown in figure 10:

$$MVx = MVx_i + frac_x, \text{ with } MVx_{int}=int(MVx)$$
$$MVy = MVy_i + frac_y, \text{ with } MVy_{int}=int(MVy)$$

$$Xref(Xcur) = int(SXref . (MVx_{int} + Xcur) / SXcur)$$
$$Yref(Ycur) = int(SYref . (MVy_{int} + Ycur) / SYcur)$$

(Xref(Xcur), Yref(Ycur)) is the position in the reference image of the motion compensated current pixel with the integer part of MV.

(SXref, SYref) represents the size of the reference image and (SXcur, SYcur) represents the size of the current image.

The filters GF_H and GF_V are then successively applied as follows to determine the prediction block Bp.

The filters GF_H are first applied as follows:

$u = GF_H(n, frac_x)(s)$

The filters GF_V are then applied to determine the value p of the pixels of Bp:

$p = GF_V(n, frac_y)(u)$

According to a variant, GF_V is applied before GF_H.

The other steps of the reconstruction and coding methods are unchanged.

According to a particular embodiment of the invention, the binary stream is a scalable binary stream. The scalable binary stream comprises a base layer coding low resolution images and at least one enhancement layer coding high resolution images, i.e. the resolution of which is greater than that of the low resolution images. The current image is one of the high resolution images and the reference image is one of the low resolution images. The reconstructed low resolution images thus being used to predict the high resolution images are then stored in low resolution, i.e. in their original resolution, in the DPB memory of the enhancement layer.

The invention further relates to a coding device ENC described with reference to figure 12 and a decoding device DECOD described with reference to figure 13. In this figure, the modules shown are functional units that may or may not correspond to physically distinguishable units. For example, these modules or some of them can be grouped together in a single component or circuit, or constitute functions of the same software. *On the contrary*, some modules may be composed of separate physical entities.

The coding device ENC receives at input images I belonging to a sequence of images. Each image is divided into blocks of pixels each of which is associated with at least one item of image data, e.g. of luminance and/or of chrominance. The coding device ENC notably implements a coding with temporal prediction. Only the modules of the coding device ENC relating to coding by temporal prediction or INTER coding are represented in figure 12. Other modules not represented and known to those skilled in the art of video coders implement the INTRA coding with or without spatial prediction. The coding device ENC notably comprises a calculation module ADD1 capable of subtracting pixel by pixel from a current block Bc a prediction block Bp to generate a residue or residual block noted res. It further comprises a module TQ capable of transforming then quantizing the residual block res into quantized data. The transform T is for example a DCT. The coding device ENC further comprises an entropy coding module COD able to code the quantized data into a binary stream S. It further comprises a module ITQ

carrying out the reverse operation of module TQ. The module ITQ carries out a reverse quantization followed by an inverse transform. The module ITQ is connected to a calculation module ADD2 able to add pixel by pixel the block of data from the module ITQ and the prediction block Bp to generate a block of reconstructed image data that is stored in a DPB memory. The module AR is able to subsample the images at the input of the coder notably with a view to improving the bitrate-distortion compromise, i.e. notably to increase the constant bitrate reconstruction quality, the bitrate being determined by a bitrate control module.

The coding device ENC further comprises a motion estimation module ME able to estimate at least one motion vector MV between the block Bc and a reference image Ir stored in the DPB memory or between the block Bc and the version Ir' of the resampled reference image Ir at the size of the current image. According to one variant, the motion estimation is made between the current block Bc and the source image corresponding to Ir, in which case the DPB memory is not connected to the motion estimation module ME. The motion data are transmitted by the motion estimation module ME to a decision module DECISION able to select a coding mode for the block Bc in a predefined set of coding modes. The chosen coding mode is for example the one that minimises a bitrate-distortion type criterion. However, the invention is not restricted to this selection method and the mode chosen can be selected according to another criterion for example an a priori type criterion. The coding mode selected by the decision module DECISION as well as the motion data, for example the motion vector or vectors in the case of the temporal prediction mode or INTER mode are transmitted to a prediction module PRED, also called motion compensation module. The motion vector or vectors and the selected coding mode are moreover transmitted to the entropy coding module COD to be coded in the stream S. If a coding mode INTER is retained by the decision module DECISION the prediction module PRED then determines from the reference image Ir previously reconstructed and stored in the DPB memory, the prediction block Bp from the motion vector MV determined by the motion estimation module ME. The prediction module PRED is able to determine the prediction block according to step 20 of the coding method described with reference to figure 9. The calculation module

ADD1 is able to implement step 22 of the coding method. Step 24 of the coding method is implemented by the modules TQ and COD.

The decoding device DECOD is described with reference to figure 13. The decoding device DECOD receives at input a binary stream S representative of a sequence of images. The stream S is for example transmitted by a coding device ENC. The decoding device DECOD comprises an entropy decoding module DEC able to generate decoded data, for example coding modes and decoded data relating to the content of the images. The decoding device DECOD further comprises a motion data reconstruction module. According to a first embodiment, the motion data reconstruction module is the entropic decoding module DEC that decodes a part of the stream S representative of motion vectors.

According to a variant not shown in figure 9, the motion data reconstruction module is a motion estimation module. This solution for reconstructing motion data by the decoding device DECOD is known as “template matching”.

The decoded data relating to the content of the pictures is then sent to a module ITQ capable of carrying out a reverse quantization followed by an inverse transformation. The module ITQ is identical to the module ITQ of the coding device ENC having generated the stream S. The module ITQ is connected to a calculation module ADD3 able to add pixel by pixel the block from the module ITQ and a prediction block Bp to generate a block of reconstructed image data that is stored in a DPB memory. The decoding device DECOD further comprises a prediction module PRED identical to the prediction module PRED of the coding device 12. If a coding mode INTER is decoded, the prediction module PRED determines from a reference image Ir previously reconstructed and stored in the DPB memory, the reference block Bp from the motion vector Vp decoded for the current block Bc by the entropy decoding module DEC.

The prediction module PRED is able to determine the prediction block according to step 10 of the reconstruction method described with reference to figure 6. The calculation module ADD3 is able to implement step 14 of the reconstruction method. Step 12 of the reconstruction method is implemented by the modules DEC and ITQ.

Claims

1. Decoding method of a binary stream to reconstruct a current block of a current image from at least one reference block of a reference image reconstructed at a different size from the size of said current image comprising the steps of:

- motion compensating (10) the reference block with at least one interpolation filter,
- decoding (12), for the current block, a residue block, and
- reconstructing (14) the current block from said residue block and from said motion compensated reference block,

said method being characterized in that the motion compensation step is performed jointly at a resampling step of said reference block by applying to said reference block said at least one interpolation filter which depends on the size of said reference image and of the size of said current image.

2. Decoding method according to claim 1, wherein the at least one interpolation filter is separable into a horizontal filter and a vertical filter, said horizontal filter being composed of a horizontal sub-pixel interpolation filter and of a horizontal resampling filter and said vertical being composed of a vertical sub-pixel interpolation filter and of a vertical resampling filter.

3. Decoding method according to claim 2, the horizontal filter is composed of a horizontal sub-pixel interpolation filter and of a horizontal upsampling filter when the size of the reference image is less than the size of the current image or of a horizontal sub-pixel interpolation filter and of a horizontal subsampling filter when the size of the reference image is greater than the size of the current image and the vertical filter is composed of a vertical sub-pixel interpolation filter and of a vertical upsampling filter when the size of the reference image is less than the size of the current image or of a vertical sub-pixel interpolation filter and of a vertical subsampling filter when the size of the reference image is greater than the size of the current image.

4. Decoding method according to claim 3, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said decoding method further comprises a decoding step of said filtering coefficients.

5. Decoding method according to one of claims 1 to 4, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

6. Coding method of a current block of a current image from at least one reference block of a reference image reconstructed at a different size from the size of said current image comprising the steps of:

- motion compensating (20) the reference block with at least one interpolation filter,
- calculating (22), for the current block, a residue block from said current block and from said motion compensated reference block, and
- coding (24) the residue block in a binary stream,

said method being characterized in that the motion compensation step is performed jointly at a resampling step of said reference block by applying to said reference block said at least one interpolation filter which depends on the size of said reference image and on the size of said current image.

7. Coding method according to claim 6, wherein the at least one interpolation filter is separable into a horizontal filter and a vertical filter, said horizontal filter being composed of a horizontal sub-pixel interpolation filter and of a horizontal resampling filter and said vertical filter being composed of a vertical sub-pixel interpolation filter and of a vertical resampling filter.

8. Coding method according to claim 7, the horizontal filter is composed of a horizontal sub-pixel interpolation filter and of a horizontal upsampling filter when the size of the reference image is less than the size of the current image or of a horizontal sub-pixel interpolation filter and of a horizontal subsampling filter when the size of the reference image is greater than the size of the

current image and the vertical filter is composed of a vertical sub-pixel interpolation filter and of a vertical upsampling filter when the size of the reference image is less than the size of the current image or of a vertical sub-pixel interpolation filter and of a vertical subsampling filter when the size of the reference image is greater than the size of the current image.

9. Coding method according to claim 8, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said coding method further comprises a coding step of said filtering coefficients.

10. Coding method according to one of claims 6 to 9, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

11. Decoding device (DECOD) of a binary stream to reconstruct a current block of a current image from at least one reference block of a reference image reconstructed at a different size from the size of said current image comprising:

- means to motion compensate (PRED) the reference block with at least one interpolation filter,
- means to decode (DEC, ITQ), for the current block, a residue block, and
- means to reconstruct (ADD3) the current block from said residue block and from said motion compensated reference block,

the decoding device being characterized in that the motion compensation means perform jointly with the motion compensation a resampling of said reference block by applying to said reference block said at least one interpolation filter which depends on the size of said reference image and on the size of said current image.

12. Decoding device according to claim 11, said device being suitable to execute the decoding method according to one of claims 1 to 5.

13. Coding device (ENC) of a current block of a current image from at least one reference block of a reference image reconstructed at a different size from the size of said current image comprising:

- means to motion compensate (PRED) the reference block with at least one interpolation filter,
- means to calculate (ADD1), for the current block, a residue block from said current block and from said motion compensated reference block, and
- means to code (TQ, COD) the residue block,

the coding device being characterized in that the motion compensation means perform jointly with the motion compensation a resampling of said reference block by applying to said reference block said at least one interpolation filter which depends on the size of said reference image and on the size of said current image.

14. Coding device according to claim 13, said device being adapted to execute the coding method according to one of claims 6 to 10.

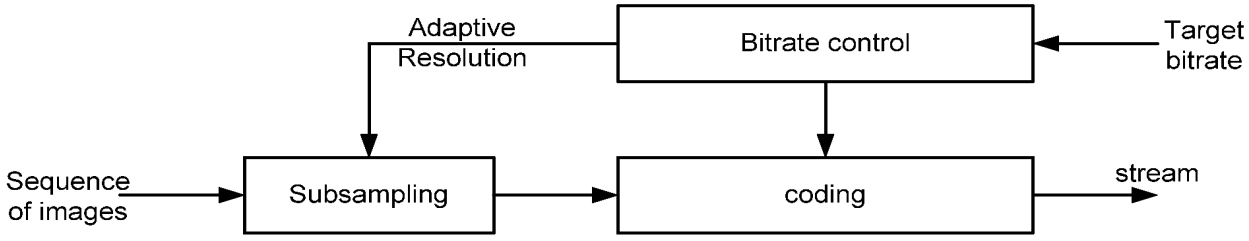


FIGURE 1 – PRIOR ART

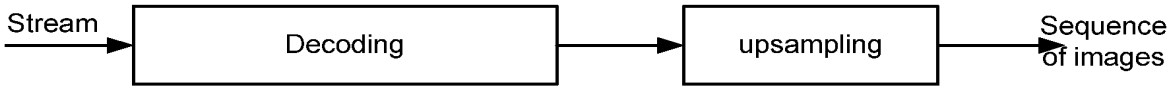


FIGURE 2– PRIOR ART

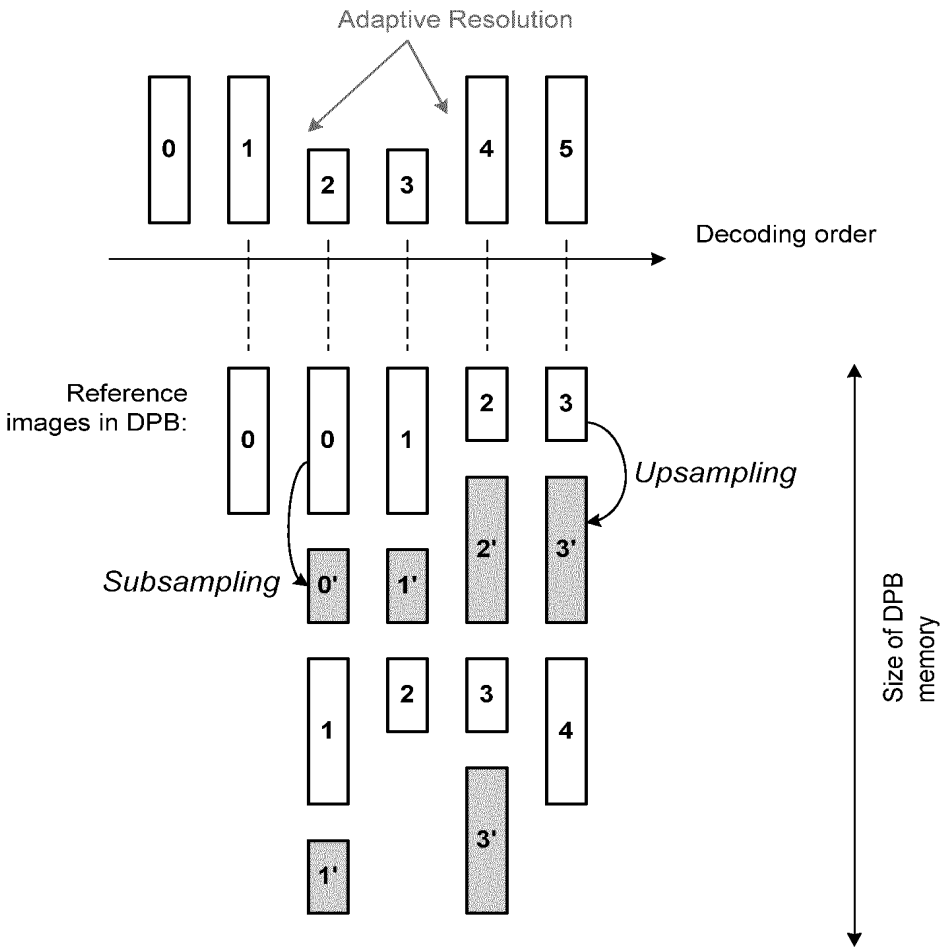

Adaptive Resolution
0
1
2
3
4
5
Decoding order
Reference images in DPB:
0
0
1
2
3
Upsampling
Subsampling
0'
1'
2'
3'
1
2
3
4
3'
1'
Size of DPB memory

FIGURE 3

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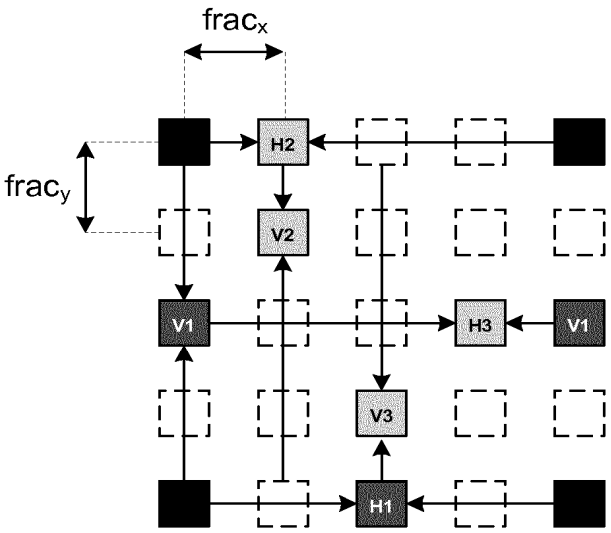


FIGURE 4

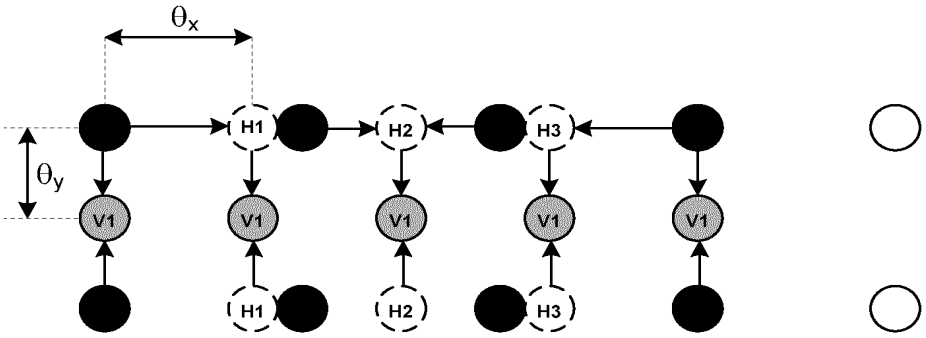


FIGURE 5

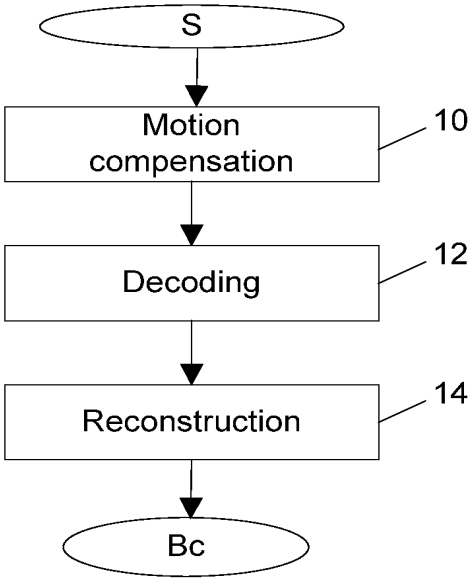


FIGURE 6

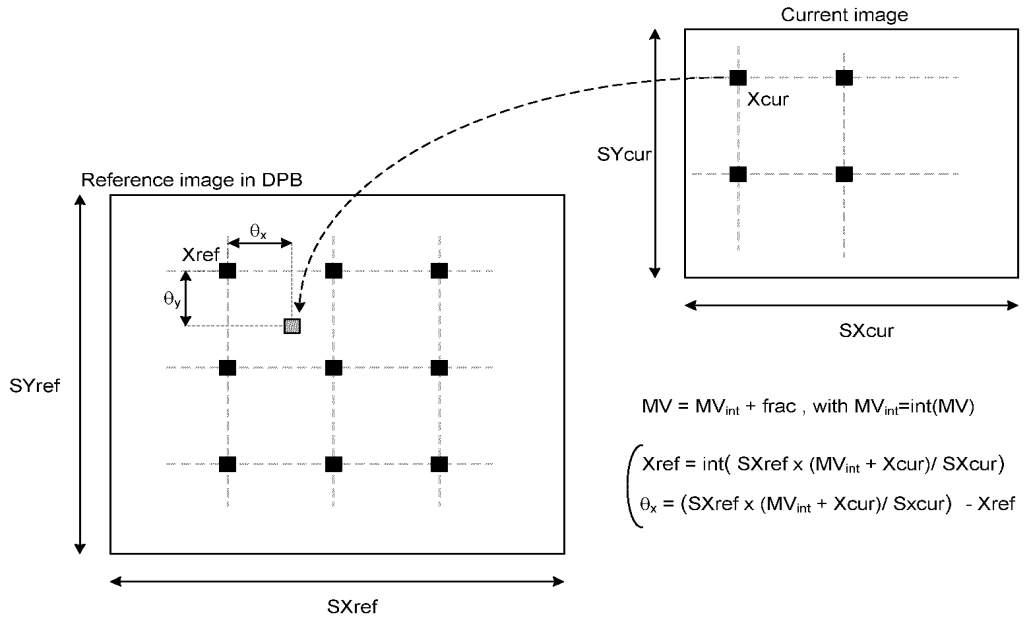


FIGURE 7

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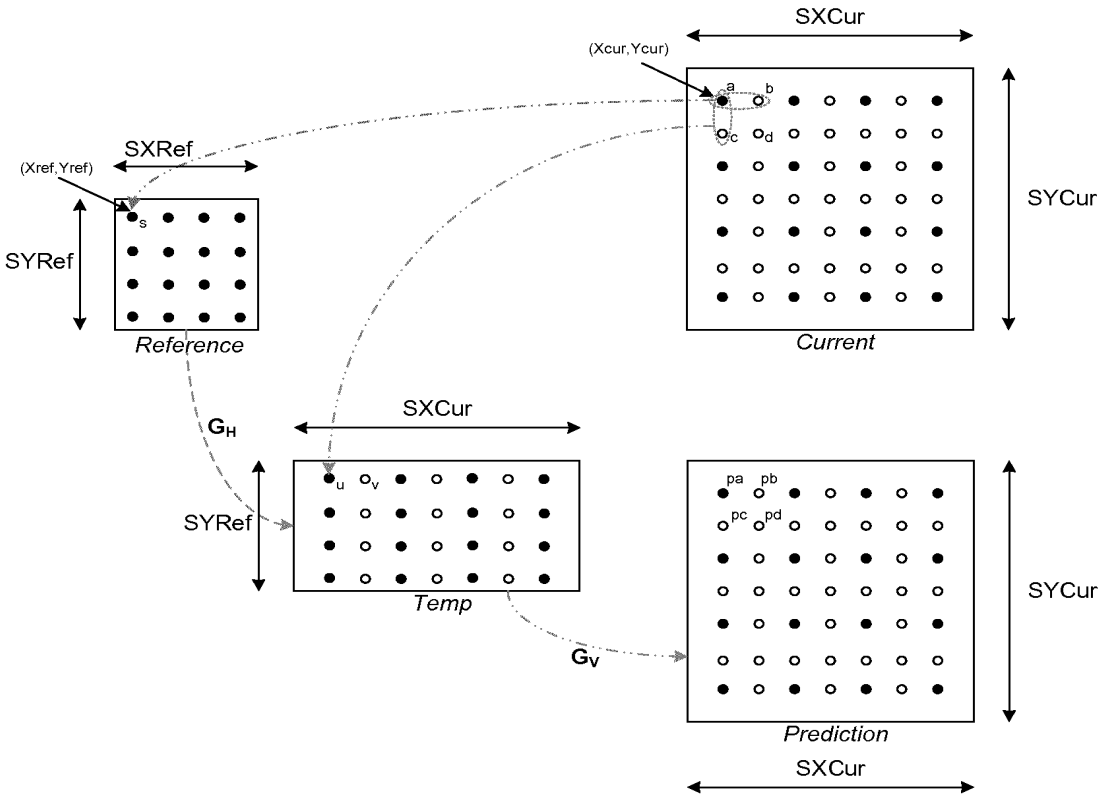


FIGURE 8

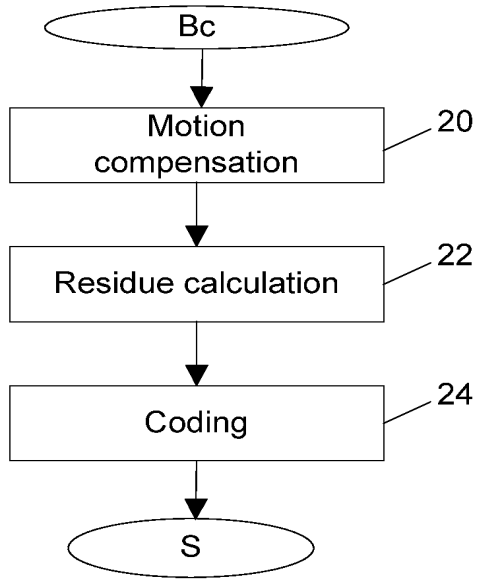


FIGURE 9

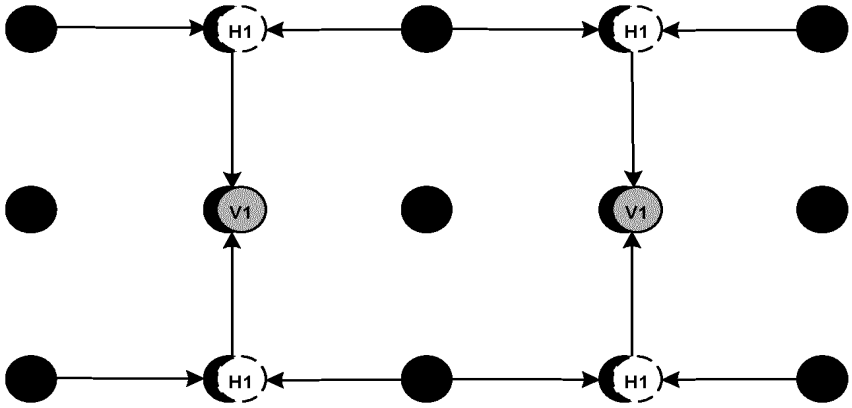


FIGURE 10

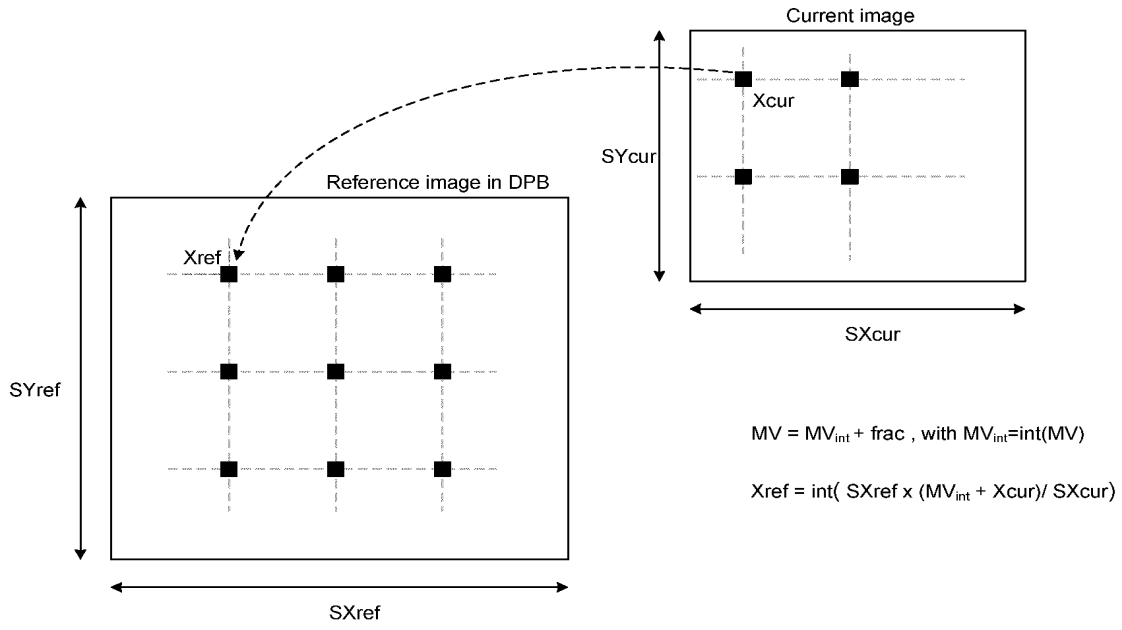


FIGURE 11

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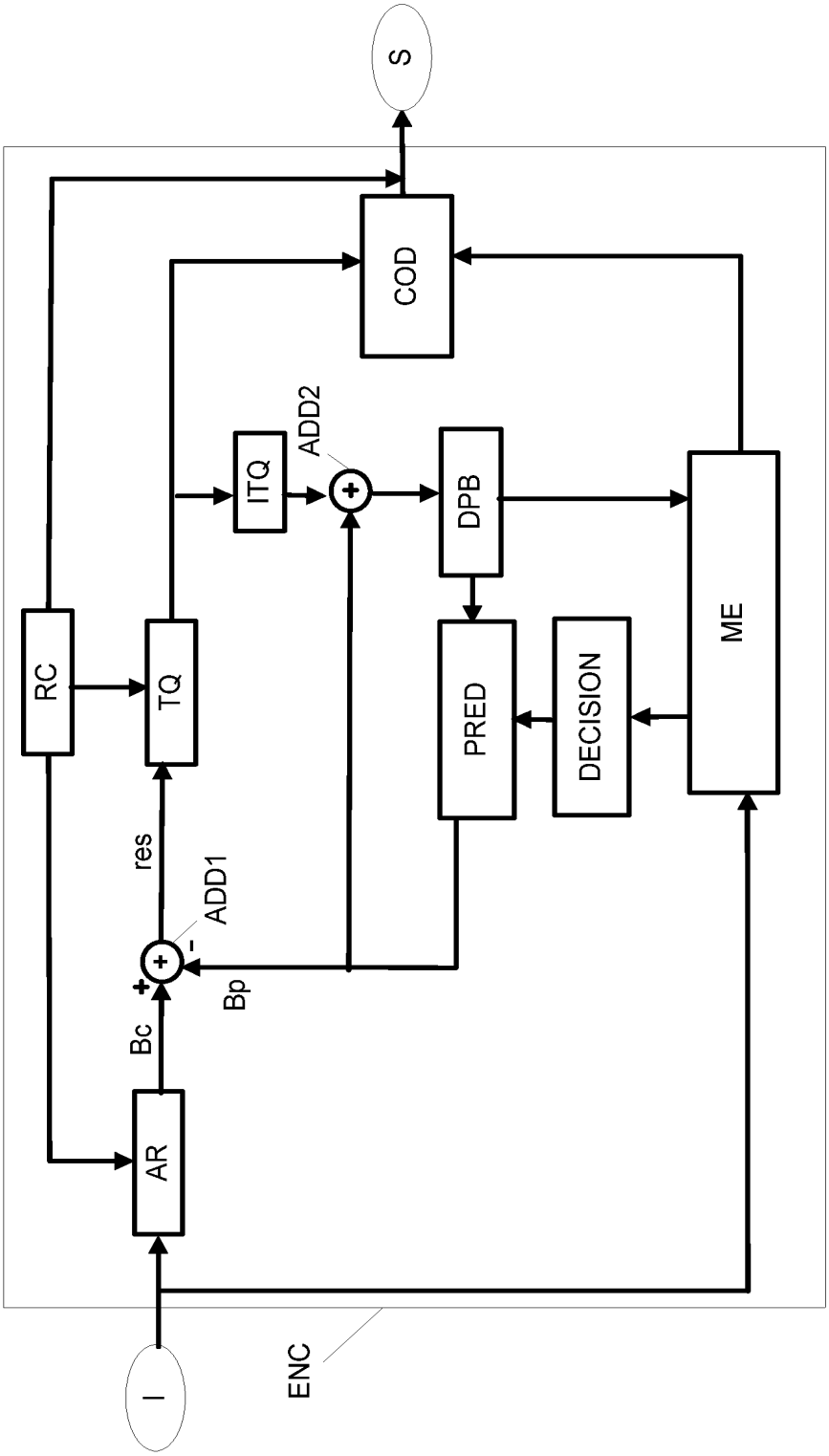


FIGURE 12

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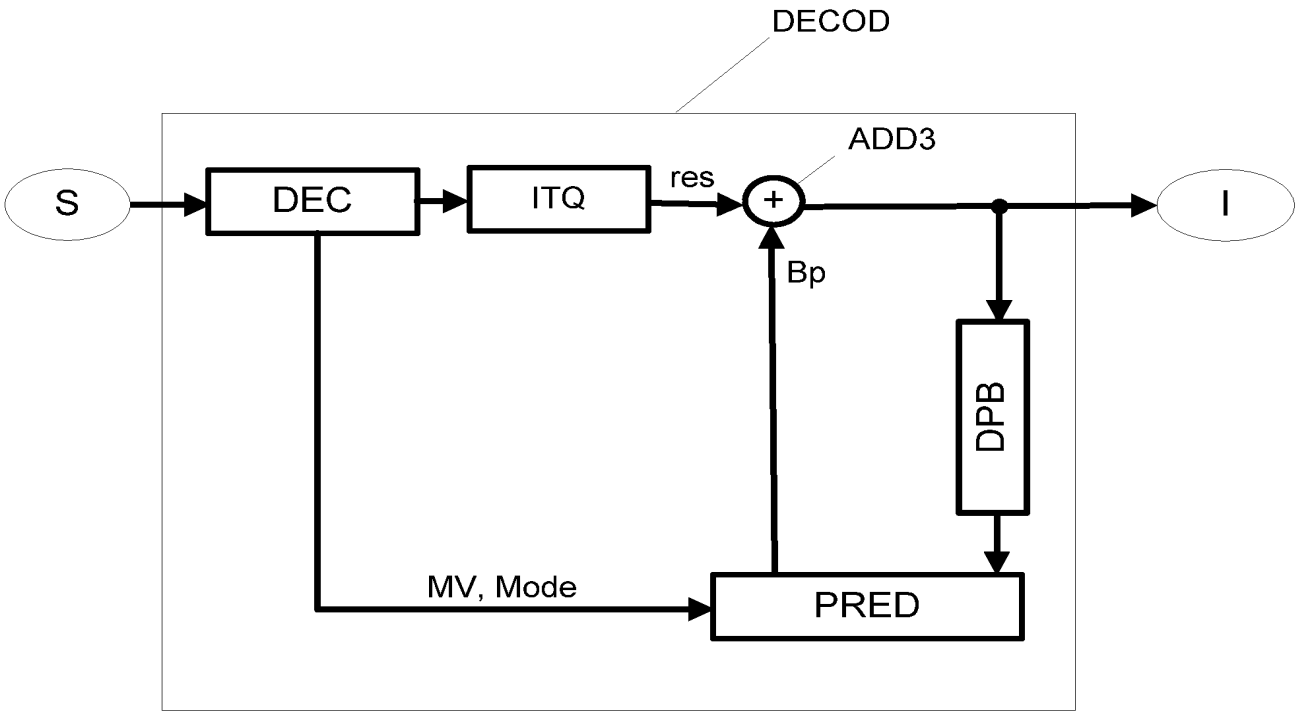


FIGURE 13

PTO/SB/06 (09-11)
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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 14/372,021	Filing Date 07/13/2014	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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

AMENDMENT 07/13/2014

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 12	Minus	** 20	=	X $ =	
Independent (37 CFR 1.16(h))	* 4	Minus	***4	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

AMENDMENT

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

LDRC
/ROBERT SHERMAN/

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.

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT3031621

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
PHILIPPE BORDES	01/16/2013
PIERRE ANDRIVON	02/06/2013
PHILIPPE SALMON	01/16/2013

RECEIVING PARTY DATA

Name:	THOMSON LICENSING
Street Address:	1 RUE JEANNE D'ARC
City:	ISSY LES MOULINEAUX
State/Country:	FRANCE
Postal Code:	92130

PROPERTY NUMBERS Total: 1

Property Type	Number
Application Number:	14372021

CORRESPONDENCE DATA

Fax Number: (609)734-6888

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone: 609-734-6828
Email: tara.laposa@technicolor.com
Correspondent Name: ROBERT D. SHEDD, US PATENT OPERATIONS
Address Line 1: TWO INDEPENDENCE WAY
Address Line 2: SUITE #200
Address Line 4: PRINCETON, NEW JERSEY 08540-6620

ATTORNEY DOCKET NUMBER:	PF120006
NAME OF SUBMITTER:	PATRICIA A. VERLANGIERI
SIGNATURE:	/Patricia A. Verlangieri, Reg No, 42201/
DATE SIGNED:	09/22/2014
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 3
source=PF120006_assignment#page1.tif
source=PF120006_assignment#page2.tif

source=PF120006_assignment#page3.tif

Customer No. 24498 **DECLARATION** Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050389 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

The above-identified application was made or authorized to be made by me.

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment 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 declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under 18 USC 1001.

ASSIGNMENT AND AGREEMENT IN AN APPLICATION FOR LETTERS PATENT

For valuable consideration received, I hereby sell, assign and transfer to Thomson Licensing, a corporation duly organized and existing under the laws of the country of France, its successors, and assigns my entire right, title and interest, for all countries in and to said inventions, and all the rights and privileges under any and all Letters Patent that may be granted therefor, and any divisions, continuations, reissues and extensions thereof.

I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at Cesson-Sevigné Date January 16, 2013

Inventor Name Philippe BORDES (Type or Print) _____ (Signature in Full – No initials)

Post Office Address c/o Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness Jean-François VIAL (Type or Print) _____ (Signature in Full – No initials)

2nd Witness THIEBAUD Ghislain (Type or Print) _____ (Signature in Full – No initials)

Customer No. 24498 DECLARATION Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

the specification of which was filed on January 10, 2013 as Application Serial No. PCT/EP2013/050399 and was amended on _____, or, if not identified here by filing date and serial number, is attached hereto.

The above-identified application was made or authorized to be made by me.

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment 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 declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under 18 USC 1001.

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I agree that, when requested, I will, without charge to said corporation but at its expense, sign all papers, take all rightful oaths, make all rightful declarations and do all acts which may be necessary, desirable or convenient for securing and maintaining patents or other forms of protection for said inventions in any and all countries and for vesting title thereto in said corporation, its successors, assigns or nominees.

I agree that I will communicate to said corporation or its representatives any facts known to me respecting said inventions and when requested by said corporation and at its expense will testify in any legal proceedings, and generally do everything possible to aid said corporation, its successors, assigns and legal representatives or nominees, to obtain or enforce proper protection for said inventions in any and all countries.

I authorize and empower said corporation, its successors, assigns or nominees, to make application for patent or other form of protection for said inventions in its or their own name, or in my/our name, in any and all countries and to invoke and claim for any application for patent or other form of protection for said inventions filed by it or them, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, and to invoke and claim such right of priority without further written or oral authorization from me.

I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at Cesson Sévigné Date 06/12/13

Inventor Name Pierre ANDRIVON (Type or Print) _____ (Signature in Full - No Initials)

Post Office Address Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness DOYEN DIDIER (Type or Print) _____ (Signature in Full - No Initials)

2nd Witness THIEBAUD Sylvain (Type or Print) _____ (Signature in Full - No Initials)

Customer No. 24498 **DECLARATION** Docket No.PF120006

As a below named inventor, I hereby declare that:

I believe I am the original inventor or an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING METHOD AND DECODING DEVICE

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I hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document which may be required in any country for any purpose and more particularly in proof of the right of the said corporation or its successors, assigns or nominees to apply for patent or other proper protection for said inventions, and to claim the aforesaid benefits of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

I covenant with Thomson Licensing, its successors, assigns, legal representatives, and nominees, that to the best of my knowledge the right, title and interest herein conveyed by me are free and clear of any encumbrance, and that I have full right to convey the same as herein expressed.

Signed at CESSON SEVIGNE Date January 16, 2013

Inventor Name Philippe SALMON (Type or Print) _____ (Signature in Full - No Initials)

Post Office Address Technicolor R&D France, 975, avenue des Champs Blancs
ZAC des Champs Blancs, CS 17616, 35576 Cesson-Sévigné, FRANCE

1st Witness Hiron Evard (Type or Print) _____ (Signature in Full - No Initials)

2nd Witness Jean-François VIAL (Type or Print) _____ (Signature in Full - No Initials)

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

U.S. APPLICATION NUMBER NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
14/372,021	Philippe Bordes	PF120006

24498
Robert D. Shedd, Patent Operations
THOMSON Licensing LLC
2 Independence Way
Suite 200
Princeton, NJ 08540-6620

INTERNATIONAL APPLICATION NO.	
PCT/EP2013/050399	
I.A. FILING DATE	PRIORITY DATE
01/10/2013	01/13/2012

CONFIRMATION NO. 8346
371 ACCEPTANCE LETTER

OC000000071806322

Date Mailed: 11/14/2014

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

07/13/2014
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 07/13/2014
- Copy of the International Search Report filed on 07/13/2014
- Copy of IPE Report filed on 11/10/2014
- Preliminary Amendments filed on 07/13/2014
- Information Disclosure Statements filed on 07/13/2014
- Inventor's Oath or Declaration filed on 07/13/2014
- Request for Immediate Examination filed on 07/13/2014
- U.S. Basic National Fees filed on 07/13/2014
- Assignment filed on 07/13/2014
- Priority Documents filed on 07/13/2014
- Power of Attorney filed on 07/13/2014
- Authorization to Permit Access filed on 07/13/2014
- Application Data Sheet (37 CFR 1.76) filed on 07/13/2014

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

CHARITTA A SHELTON

Telephone: (571) 272-3926

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
14/372,021	07/13/2014		1900	PF120006	12	4

CONFIRMATION NO. 8346

24498
Robert D. Shedd, Patent Operations
THOMSON Licensing LLC
2 Independence Way
Suite 200
Princeton, NJ 08540-6620

FILING RECEIPT



Date Mailed: 11/14/2014

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**

Inventor(s)

Philippe Bordes, Laille, FRANCE;
Pierre Andrivon, Liffre, FRANCE;
Philippe Salmon, Saint Sulpice La Foret, FRANCE;

Applicant(s)

THOMSON LICENSING, Issy de Moulineaux, FRANCE

Power of Attorney: The patent practitioners associated with Customer Number 24498

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/EP2013/050399 01/10/2013

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
FRANCE FR1250334 01/13/2012

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 11/10/2014

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/372,021**

Projected Publication Date: 02/19/2015

Non-Publication Request: No

Early Publication Request: No

Title

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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 (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

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).

SelectUSA

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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/372,021

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	480
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	12 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1				x 420 =	420
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1900

APPLICATION AS AMENDED - PART II

		(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($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	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	

		(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($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
14372021	

Applicant(s) Philippe BORDES

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1		1			
2		1	---	---		
3		1	---	---		
4		1		1		
5		4		1		
6	1		1			
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Total Indep	4		4		0	
Total Depend	16	↵	8	↵	0	↵
Total Claims	20		12		0	

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UNITED STATES DEPARTMENT OF COMMERCE
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/372,021	07/13/2014	Philippe Bordes	PF120006

CONFIRMATION NO. 8346

24498
Robert D. Shedd, Patent Operations
THOMSON Licensing LLC
4 Research Way
3rd Floor
Princeton, NJ 08543

PUBLICATION NOTICE

OC00000073478474

Title:METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

Publication No.US-2015-0049802-A1
Publication Date:02/19/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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

PTO/SB/08a (01-10)
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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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(**Not for submission under 37 CFR 1.99)**

Application Number	14372021
Filing Date	2013-01-10
First Named Inventor	BORDES
Art Unit	2482
Examiner Name	KELLEY, Christopher S.
Attorney Docket Number	PF120006-US-PCT

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					

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
	1					

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]
	1							☐

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]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14372021
	Filing Date	2013-01-10
	First Named Inventor	BORDES
	Art Unit	2482
	Examiner Name	KELLEY, Christopher S.
	Attorney Docket Number	PF120006-US-PCT

	1	BORDES ET AL., "AHG18 resolution adaptation coding using single resolution in DPB", Joint Collaborative Team on Video Coding, 8th Meeting, San José, California, USA, 1 February 2012, pp. 1-11.	☐
	2	BROSS ET AL., "WD4 Working draft 4 of high efficiency video coding", Joint Collaborative Team on Video Coding, 6th Meeting: Torino, Italy, 14 July 2011, pp. 1-231.	☐
	3	DAVIES ET AL., "AHG18 adaptive resolution coding (ARC)", Joint Collaborative Team on Video Coding, 7th Meeting, Geneva, Switzerland, 21 November 2011, pp. 1-12.	☐
	4	DAVIES ET AL., "JCTVC AHG report resolution adaptation", Joint Collaborative Team on Video Coding, 7th Meeting, Geneva, Switzerland, 21 November 2011, pp. 1-2.	☐
	5	MPEG 4 ITU-T H264 STANDARD, "Advanced video coding for generic audiovisual", International Telecommunication Union, May 2003, pp. 1-282.	☐

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

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	14372021
	Filing Date	2013-01-10
	First Named Inventor	BORDES
	Art Unit	2482
	Examiner Name	KELLEY, Christopher S.
	Attorney Docket Number	PF120006-US-PCT

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	/Patricia A. Verlangieri, Reg. No. 42201/	Date (YYYY-MM-DD)	2015-08-22
Name/Print	Patricia A. Verlangieri	Registration Number	42201

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:	23284217
Application Number:	14372021
International Application Number:	
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Customer Number:	24498
Filer:	Patricia A. Verlangieri
Filer Authorized By:	
Attorney Docket Number:	PF120006
Receipt Date:	24-AUG-2015
Filing Date:	13-JUL-2014
Time Stamp:	14:08:07
Application Type:	U.S. National Stage under 35 USC 371

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	Non Patent Literature	Bordes.pdf	237396 31074d7d3863561e349663f8c7f99d970a113f29	no	11

Warnings:	
Information:	

2	Non Patent Literature	BROSS1.pdf	2341732 c2686e32c7647757f7be7870d5e1578153a1c10a	no	231
Warnings:					
Information:					
3	Non Patent Literature	DAVIES.pdf	325852 ec82fa52f67253998b516cfb08dc380e9c724fde	no	12
Warnings:					
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4	Non Patent Literature	DAVIES1on.pdf	57217 a1807bc77b381070f41f7f3f15728b3c921b4aaa	no	2
Warnings:					
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5	Non Patent Literature	MPEG4ITUTH264.pdf	3021078 e243d895731a845db4d4478548e1be15b7055346	no	282
Warnings:					
Information:					
6	Information Disclosure Statement (IDS) Form (SB08)	PF120006USIDS.pdf	38525 337a3dcc4768747ce2b3b4ec09449a2529a5c68b	no	4
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
		Total Files Size (in bytes):	6021800		

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 DEPARTMENT OF COMMERCE
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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
14/372,021		2486	24593

PAIR Correspondence Address/Fee Address Change

The following fields have been changed to Customer Number 24336 on 09/07/2016 via Private PAIR in view of the certification copied below that authorized the change.

- Correspondence Address

The address for Customer Number 24336 is:
24336
TUTUNJIAN & BITETTO, P.C.
401 Broadhollow Road, Suite 402
Melville, NY 11747

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature:	/Patricia A. Verlangieri/
Name:	Patricia A. Verlangieri
Registration Number:	42201

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
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	07/13/2014	Philippe Bordes	PF120006	8346

24336 7590 03/23/2017

TUTUNJIAN & BITETTO, P.C.
401 Broadhollow Road, Suite 402
Melville, NY 11747

EXAMINER
LEE, JIMMY S

ART UNIT	PAPER NUMBER
2486	

NOTIFICATION DATE	DELIVERY MODE
03/23/2017	ELECTRONIC

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

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

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

docketing@tb-iplaw.com

Office Action Summary	Application No. 14/372,021	Applicant(s) BORDES ET AL.	
	Examiner JIMMY S. LEE	Art Unit 2486	AIA (First Inventor to File) Status No

-- 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 MONTHS 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 *7/11/2014*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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) *1,4-6,9-11,13 and 15-18* 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) *1,4-6,9-11,13 and 15-18* is/are rejected.

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

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

* If any claims have been determined allowable, 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.

Application Papers

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

11)☐ The drawing(s) filed on _____ 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).

Priority under 35 U.S.C. § 119

12)☒ 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)).

** 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) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *8/24/2015,7/13/2014*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Claim Interpretations – 35 USC § 112(f)

The following is a quotation of 35 U.S.C. 112(f):

> (f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

Use of the word "means" (or "step for") in a claim with functional language creates a rebuttable presumption that the claim element is to be treated in accordance with 35 U.S.C. 112(f) (pre-AIA 35 U.S.C. 112, sixth paragraph).

> In addition, please see Supplemental Examination Guidelines for Determining Compliance With 35 U.S.C. 112 and for Treatment of Related Issues In Patent Applications, January 21,2011 for a list of other phrases that may also invoke § 112, sixth paragraph treatment (i.e., "mechanism for," "module for," "device for," "unit for," "component for," "element for," "member for," "apparatus for," "machine for," and "system for").

The presumption that 35 U.S.C. 112(f) (pre-AIA 35 U.S.C. 112, sixth paragraph) is invoked is rebutted when the function is recited with sufficient structure, material, or acts within the claim itself to entirely perform the recited function.

Absence of the word "means" (or "step for") in a claim creates a rebuttable presumption that the claim element **is not** to be treated in accordance with 35 U.S.C. 112(f) (pre-AIA 35 U.S.C. 112, sixth paragraph). The presumption that 35 U.S.C. 112(f) (pre-AIA 35 U.S.C. 112, sixth paragraph) is not invoked is rebutted when the claim element recites function but fails to recite sufficiently definite structure, material or acts to perform that function.

Claim elements in this application that use the word "means" (or "step for") are presumed to invoke 35 U.S.C. 112(f) except as otherwise indicated in an Office action. Similarly, claim elements that do not use the word "means" (or "step for") are presumed not to invoke 35 U.S.C. 112(f) except as otherwise indicated in an Office action.

1. Claim limitation "a module configured to resample", "a module configured to motion compensate", "a module configured to decode", "a module configured to reconstruct", "a module configured to resample", "a module configured to motion compensate", "a module configured to calculate", and "a module configured to code" have been interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because they use a generic placeholder "module" coupled with functional language "resample", "motion compensate", "decode", "reconstruct", "resample", "motion compensate", "calculate", and "code" without reciting sufficient structure to achieve the function. Furthermore, the generic placeholder is not preceded by a structural modifier.

Since the claim limitation(s) invokes 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, claim(s) 11, 13, and 15-18 have been interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows that the following appears to be the corresponding structure described in the specification for the 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph limitation:

The second paragraph on the 14th page of the specification indicates that the described modules shown in figure 12 (of ENC) and 13 (DECOD), can be grouped together in a single circuit or constitute functions of the same software or of separate entities. It is further described in the specification on page 16 that DECOD has a reconstruction module DEC which can generate decoded data as well as motion data as motion vectors. But motion compensate and resample are not explicitly detailed with relation to the decoding. However, the examiner would like to note that the closest analog to a module configured to motion compensate would be the PRED which is a prediction module; but, maintains that explicitly a module configured to motion compensate is not clearly defined. With regards to the ENC, module AR is able to subsample for bitrate reconstruction, an ADD1 that generates residue or residual blocks, and a coding module COD able to code quantized data are described in the paragraph that begins on page 15 and ends on page 16. But explicit module functioning as a motion compensating module is not

indicated in the specification. However, the examiner would like to note, again, that the closest analog to a module configured to motion compensate would be the PRED which is a prediction module; but, maintains that explicitly a module configured to motion compensate is not clearly defined..

If applicant wishes to provide further explanation or dispute the examiner's interpretation of the corresponding structure, applicant must identify the corresponding structure with reference to the specification by page and line number, and to the drawing, if any, by reference characters in response to this Office action.

If applicant does not intend to have the claim limitation(s) treated under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112 , sixth paragraph, applicant may amend the claim(s) so that it/they will clearly not invoke 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, or present a sufficient showing that the claim recites/recite sufficient structure, material, or acts for performing the claimed function to preclude application of 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

For more information, see MPEP § 2173 *et seq.* and *Supplementary Examination Guidelines for Determining Compliance With 35 U.S.C. 112 and for Treatment of Related Issues in Patent Applications*, 76 FR 7162, 7167 (Feb. 9, 2011).

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> 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.

1. Claim 11, 13, 15-18 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim element(s) "module configured to resample", "module configured to motion compensate" of claim 11 are limitations that invoke 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, 6th paragraph. Additionally, claim elements "module configured to motion compensate" of claim 13 is a limitation that invokes 35

U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, 6th paragraph. In particular, nowhere in the specification can there be indicated or identified a setting section with particular support found within the specification nor anything specifically which is identified as what could be a processing section. Because of this consideration, the examiner considers that the claimed setting section and processing section of the apparatus claim are not supported by the specification and rendered indefinite.

If applicant does not wish to have the claim limitation treated under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, 6th Paragraph applicant may:

(a) Amend the claim to add structure, material or acts that are sufficient to perform the claimed function; or

(b) Present a sufficient showing that the claim limitation recites sufficient structure, material, or acts for performing the claimed function to preclude application of 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. For more information, see MPEP § 2181.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 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, 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.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claim 1, 5, 6, 10, 11, 13, 16, and 18 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Ye et al. (US 8199812 B2) with Hong et al. (US 20130003847 A1) (with relevant prior art citation from provisional application 61/503092 filed 6/30/2011)**

Regarding claim 1, Ye teaches,

A decoding method of a binary stream **("entropy decoding technique to decode the information" by entropy unit 52a of video decoder 60)[Fig. 3, 13:14-16]** to reconstruct a current image **(output of inverse transform unit 58a "combined with upsampled base layer information as output of upsampler 59" which is upsampled to enhancement layer spatial resolution)[13:27-29, 14:25-27]** comprising:

- sampling said reference image **("upsampling from a lower resolution base layer")[14:16-17]** to the size of said current image **("to the higher resolution of the enhancement layer" occurring in two dimensions)[14:16-17]** with a resampling filter composed of an horizontal resampling filter **(base layer video "upsampled in the horizontal direction" designated "label X")[14:22-24]** and a vertical resampling filter, **(array X "upsampled in the vertical direction" designated "label E")[14:24-27]**

- motion compensating **("motion compensation unit 54" depicted in Fig. 3)[Fig. 3-54, 13:20-21]** a reference block of said resampled reconstructed reference image **("receives motion vectors and one or more reconstructed reference frames" from reference frame store 62 and upsampled motion base motion layer motion vectors as depicted in Fig. 3)[13:20-23, 12:45-47]** with at least one interpolation filter **("bilinear interpolation")[16:11-14]** composed of a horizontal motion compensation interpolation filter **(upsampled base layer pixels in a horizontal direction, "bilinear interpolation in that direction is invoked" to obtain value in upsampled data)[16:11-14]** and a vertical motion compensation interpolation filter, **(upsampled base layer pixels in a vertical direction, "then bilinear interpolation in that direction is invoked" to obtain value in upsampled data)[16:11-14]**

- decoding, (**"entropy decoding technique"**)[13:15-16] for the current block, (**"applied to encoded video bitstream"**)[13:15] a residue block, (**produce residual coefficients which have "inverse transform, e.g., an inverse DCT, to the coefficients to produce residual blocks"**)[13:25-26] and

- reconstructing the current block (**"form decoded blocks"**)[13:31-32] from said residue block (**"residual blocks"**)[13:31] and from said motion compensated reference block, (**motion compensation unit 54 producing "motion compensated blocks" (made from motion vectors and one or more reconstructed reference frames)**)[13:20-22] **which are summed with residual blocks to "form decoded blocks"**)[13:29-32]

wherein resampling (**"upsampling"**)[16:8] and motion compensating (**"motion compensation" using upsampled motion vectors associated with the motion up sampler 61**)[12:45-47] are performed jointly by applying a vertical filter (**base layer resolution to enhancement layer resolution "upsampled in the vertical direction"**)[14:15-17,24-25] equal to said vertical motion compensation interpolation filter (**motion upsampler 61 "upsample motion vectors associated with the base layer so that such motion vectors correspond to the spatial resolution of the enhancement layer video data"**)[13:10-13] composed with said vertical resampling filter (**bilinear interpolation in that direction based on "same base layer coding block in a given direction" of upsampled data**)[16:9-14] and a horizontal filter (**base layer resolution to enhancement layer resolution "upsampled in the horizontal direction"**)[14:15-17,22] equal to said horizontal motion compensation interpolation filter (**motion upsampler 61 "upsample motion vectors associated with the base layer so that such motion vectors correspond to the spatial resolution of the enhancement layer video data"**)[13:10-13]

composed with said horizontal resampling filter (**bilinear interpolation in that direction based on "same base layer coding block in a given direction" of upsampled data**)[16:9-14]

But does not explicitly teach,

A decoding method of a binary stream to reconstruct a current block of a current image from a reference image reconstructed at a different size from the size of said current image comprising:

- resampling said reconstructed reference image of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;

However, Hong teaches,

A decoding method **(Fig. 3 depicting a decoder)**[¶38, Fig. 3] of a binary stream **(bitstreams 308 and 314)**[fig. 3-308, 314] to reconstruct a current block **("PU" of the enhancement layer motion compensated using upsampled reconstructed base layer samples)**[¶60, 59] of a current image from a reference image reconstructed at a different size **("reference pictures" stored in a base layer)**[¶59] from the size of said current image **(upscaled "to reflect the picture size ratio between the base layer and the enhancement layer")**[¶59] comprising:

- resampling **("upsampled form 311" from upscale unit 310)**[¶59, Fig. 3-311] said reconstructed reference image **("reconstructed picture sample 309")**[¶59] of said current image **("coded enhancement layer picture")**[¶51 with a resampling filter **(upscale unit 310)**[¶59, Fig. 3-310]

It would have been obvious to one with ordinary skill in the art to combine the adaptive upsampling of Ye with the layer sampling of Hong to use upsampled reconstructed base layer references. The benefit comes from using upsampled base layer references increases potential for increases in coding efficiency.

Regarding claim 5, Ye in view of Hong teach the limitation of claim 1,

Ye teaches additionally,

scalable stream comprising a base layer **("base layer information" from entropy unit 52b)**[12:56-57] coding low resolution images **("lower resolution base layer")**[14:15-16] and at least one enhancement layer **("enhancement layer information" from entropy unit 52a)**[12:54-55] coding high resolution images, **("higher resolution of the enhancement layer")**[14:16-17]

said current image is one of said high resolution images and said reference image is one of the low resolution images. (**"upsampling from a lower resolution base layer to the higher resolution of the enhancement layer"**)[14:15-17]

With regards to claim 6, it is the encoding method of decoding method claim 1. Claim 1 can teach the limitations of claim 6 with exception to the following limitations which are still taught by Ye:

- calculating, (**"form"**)[10:28] for the current block, (**"original, current video block 31"**)[10:30] a residue block (**"residual video block"**)[10:28] from said current block and from said motion compensated reference block, (**"by "subtracting the prediction video block produced by motion compensation unit 37 from the original, current video block 31"**)[10:28-30] and

– coding the residue block (**quantization unit 41 "quantizes the residual transform block coefficients"**)[11:8-9] in a binary stream, (**"entropy unit 46 codes quantized transform coefficients"**)[11:29-30]

Refer to the rejection of claim 1 to teach the rest of the rejection of claim 6.

Regarding claim 10, dependent on claim 6, it is the encoding claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 10.

Regarding claim 11, it is the decoding device claim of decoding method claim 1. Refer to the rejection of claim 1 to reject claim 11.

Regarding claim 13, it is the encoding device claim of encoding method claim 6. Refer to the rejection of claim 6 to reject claim 13.

Regarding claim 16, dependent on claim 11, it is the decoding device claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 16.

Regarding claim 18, dependent on claim 13, it is the encoding claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 18.

2. Claim 4, 9, 15, and 17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Ye et al. (US 8199812 B2) with Hong et al. (US 20130003847 A1) (with relevant prior art citation from provisional application 61/503092 filed 6/30/2011) in view of Karczewicz et al. (US 20090175336 A1)**

Regarding claim 4, Ye with Hong teach the limitations of claim 1,

But not explicitly the additional limitations of claim 4,

However, Karzewicz teaches,

> horizontal filter and the vertical filter (**"horizontal and/or vertical symmetry "by filter unit 47")**{¶65} being defined by filtering coefficients, (**"relative to other filter coefficients")**{¶65} said decoding method further comprises a decoding step of said filtering coefficients. (**"decoder may reconstruct all of the filter coefficients")**{¶65}

It would have been obvious to one with ordinary skill in the art to combine the adaptive upsampling of Ye with the layer sampling of Hong with filter of Karczewicz to have filter coefficients relative to other filter coefficients. The benefit of this being this reduces the amount of data needed to convey filter coefficients.

Regarding claim 9, dependent on claim 6, it is the encoding claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 9.

Regarding claim 15, dependent on claim 11, it is the decoding device claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 15.

Regarding claim 17, dependent on claim 13, it is the encoding claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 17.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JIMMY S. LEE whose telephone number is (571)270-7322. The examiner can normally be reached on Monday thru Friday 10-7.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MEHRDAD DASTOURI can be reached on 571-272-7418. 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.

/JIMMY S LEE/
Examiner, Art Unit 2486

/MOHAMMED RAHAMAN/
Primary Examiner, Art Unit 2486

Notice of References Cited	Application/Control No. 14/372,021	Applicant(s)/Patent Under Reexamination BORDES ET AL.	
	Examiner JIMMY S. LEE	Art Unit 2486	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2009/0175336 A1	07-2009	Karczewicz; Marta	H04N19/176	375/240.12
*	B	US-8,199,812 B2	06-2012	Ye; Yan	H04N19/105	375/240.02
*	C	US-2013/0003847 A1	01-2013	Hong; Danny	H04N19/52	375/240.16
	D	US-				
	E	US-				
	F	US-				
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14372021
Filing Date	2013-01-10
First Named Inventor	BORDES
Art Unit	2482
Examiner Name	KELLEY, Christopher S.
Attorney Docket Number	PF120006-US-PCT

U.S.PATENTS

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First Named Inventor	BORDES
Art Unit	2482
Examiner Name	KELLEY, Christopher S.
Attorney Docket Number	PF120006-US-PCT

	1	BORDES ET AL., "AHG18 resolution adaptation coding using single resolution in DPB", Joint Collaborative Team on Video Coding, 8th Meeting, San José, California, USA, 1 February 2012, pp. 1-11.	☐
	2	BROSS ET AL., "WD4 Working draft 4 of high efficiency video coding", Joint Collaborative Team on Video Coding, 6th Meeting: Torino, Italy, 14 July 2011, pp. 1-231.	☐
	3	DAVIES ET AL., "AHG18 adaptive resolution coding (ARC)", Joint Collaborative Team on Video Coding, 7th Meeting, Geneva, Switzerland, 21 November 2011, pp. 1-12.	☐
	4	DAVIES ET AL., "JCTVC AHG report resolution adaptation", Joint Collaborative Team on Video Coding, 7th Meeting, Geneva, Switzerland, 21 November 2011, pp. 1-2.	☐
	5	MPEG 4 ITU-T H264 STANDARD, "Advanced video coding for generic audiovisual", International Telecommunication Union, May 2003, pp. 1-282.	☐

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EXAMINER SIGNATURE

Examiner Signature	/JIMMY S LEE/	Date Considered	03/06/2017

*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.

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(**Not for submission under 37 CFR 1.99)**

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First Named Inventor	BORDES
Art Unit	2482
Examiner Name	KELLEY, Christopher S.
Attorney Docket Number	PF120006-US-PCT

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

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☐ 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	/Patricia A. Verlangieri, Reg. No. 42201/	Date (YYYY-MM-DD)	2015-08-22
Name/Print	Patricia A. Verlangieri	Registration Number	42201

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.**

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public 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.

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APPLICANTS

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Philippe Salmon, Saint Sulpice La Foret, FRANCE;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/EP2013/050399 01/10/2013

**** FOREIGN APPLICATIONS ***************************

FRANCE FR1250334 01/13/2012

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11/10/2014

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/JIMMY S LEE/ Examiner's Signature	☐ Initials	FRANCE	8	12	4

ADDRESS

TUTUNJIAN & BITETTO, P.C.
401 Broadhollow Road, Suite 402
Melville, NY 11747
UNITED STATES

TITLE

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

FILING FEE RECEIVED		
1900	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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14372021	BORDES ET AL.
	Examiner	Art Unit
	JIMMY S LEE	2486

CPC- SEARCHED		
Symbol	Date	Examiner
h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33	3/18/2017	J.L.

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
375	240.02,240.020	3/18/2017	J.L.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST searched (US-PGPUB; USPAT)	3/18/2017	J.L.
CPC searched	3/18/2017	J.L.
USclass searched	3/18/2017	J.L.
IDS searched	3/18/2017	J.L.
assignee searched	3/18/2017	J.L.
Inventors searched	3/18/2017	J.L.
keyword with priority date searched	3/18/2017	J.L.

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/JIMMY S LEE/ Examiner.Art Unit 2486	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	659	filter$3 with coefficient$3 with (horizontal$3 and vertical$3) and decod$3	USPAT	OR	ON	2017/03/17 15:17
L2	9077741	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
L3	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
L4	30369	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
L5	270	1 and L2 and (L3 L4)	USPAT	OR	ON	2017/03/17 15:18
L6	98	filter$3 with coefficient$3 with (horizontal$3 and vertical$3) same decod$3	USPAT	OR	ON	2017/03/17 15:18
L8	43	6 and L2 and (L3 L4)	USPAT	OR	ON	2017/03/17 15:18
L9	1	"20090175336"	USPAT	OR	ON	2017/03/17 15:23
L10	2	"20090175336"	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
L11	270	1 and L2 and (L3 L4)	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
L12	43	6 and L2 and (L3 L4)	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
S1	223	(("THOMSON") near3 ("LICENSING")).AANM.	USPAT	OR	ON	2017/03/06 12:54
S2	60	(("BORDES") near3 ("Philippe")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:54
S3	11	(("ANDRIVON") near3 ("Pierre")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:55
S4	23	(("SALMON") near3 ("Philippe")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:55
S5	9076723	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/06 12:56
S6	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/06 16:26
S7	30224	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/06 16:27
S8	39	(sampl$3 resampl$3) same (construct$3 reconstruct$3) with siz$3 same	USPAT	OR	ON	2017/03/09

		horizontal$3 same vertical$3				12:47
S9	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S10	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S11	30277	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S12	1	S8 and S9 and (S10 S11)	USPAT	OR	ON	2017/03/09 12:48
S13	1	"20130077883"	USPAT	OR	ON	2017/03/09 12:48
S14	50519	horizontal$3 same vertical$3 same motion$3	USPAT	OR	ON	2017/03/09 18:00
S15	961	(horizontal$3 same vertical$3) with filter$3 same motion$3	USPAT	OR	ON	2017/03/09 18:00
S17	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/09 18:00
S18	286	375/240.$.ccls. and S17 and S15	USPAT	OR	ON	2017/03/09 18:00
S19	270	(horizontal$3 same vertical$3) with filter$3 same motion$3 with compensat$3	USPAT	OR	ON	2017/03/09 18:01
S20	138	375/240.$.ccls. and S17 and S19	USPAT	OR	ON	2017/03/09 18:01
S21	5	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstrut$3) same motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 16:09
S22	6	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 16:10
S23	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/10 16:10
S24	2	375/240.$.ccls. and S23 and S22	USPAT	OR	ON	2017/03/10 16:10
S25	35	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same4 motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 17:38
S26	14	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same2 motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 17:38
S27	3	375/240.$.ccls. and S23 and S26	USPAT	OR	ON	2017/03/10 17:38
S28	7	375/240.$.ccls. and S23 and S25 NOT S27	USPAT	OR	ON	2017/03/10 17:40
S29	0	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 with reconstruct$3)	USPAT	OR	ON	2017/03/10 19:39
S30	0	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 same reconstruct$3)	USPAT	OR	ON	2017/03/10 19:40
S31	69	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3)	USPAT	OR	ON	2017/03/10 19:40
S32	0	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3) with motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 19:40
S33	4	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3) with motion$3	USPAT	OR	ON	2017/03/10 19:41
S34	2	375/240.$.ccls. and S23 and S33	USPAT	OR	ON	2017/03/10 19:41
S35	32445	(horizontal$3 and vertical$3) with (sampl$3 resampl$3 filter$3)	USPAT	OR	ON	2017/03/14 23:02
S36	190148	(interpolat$4 extrapolat$4 downsampl$3 upsampl$3 resampl$3)	USPAT	OR	ON	2017/03/14 23:03

S37	84268	motion$3 with (estimat$3 compnesat$4 determin$5)	USPAT	OR	ON	2017/03/14 23:03
S38	2097	S35 and S36 and S37	USPAT	OR	ON	2017/03/14 23:03
S39	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S40	30324	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S41	483	S40 and S39	USPAT	OR	ON	2017/03/14 23:04
S42	9077739	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S43	14	S42 and S41 and S38	USPAT	OR	ON	2017/03/14 23:04
S44	69138	((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3)with (sampl$3 resampl$3 filter$3)	USPAT	OR	ON	2017/03/15 12:44
S45	84268	motion$3 with (estimat$3 compnesat$4 determin$5)	USPAT	OR	ON	2017/03/15 13:06
S46	311	((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3) with (sampl$3 resampl$3 filter$3) with S45	USPAT	OR	ON	2017/03/15 13:06
S47	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S48	30324	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S49	483	S48 and S47	USPAT	OR	ON	2017/03/15 13:06
S50	9077739	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S51	1	S50 and S49 and S46	USPAT	OR	ON	2017/03/15 13:06
S52	90	"375".clas. and h04n19/$.cpc. and S50 and S46	USPAT	OR	ON	2017/03/15 13:48
S53	89	S52 not S51	USPAT	OR	ON	2017/03/15 13:48
S54	1885	(horizontal$3 and vertical$3) with S45	USPAT	OR	ON	2017/03/15 13:49
S55	9	S54 and S49 and S50	USPAT	OR	ON	2017/03/15 13:49
S56	190148	(interpolat$4 extrapolat$4 downsampl$3 upsampl$3 resampl$3)	USPAT	OR	ON	2017/03/15 14:39
S57	5168	(horizontal$3 and vertical$3) with S56	USPAT	OR	ON	2017/03/15 14:39
S58	17	S57 and S49 and S50	USPAT	OR	ON	2017/03/15 14:40
S59	1	(US-8199812-$).did.	USPAT	OR	ON	2017/03/15 16:51
S60	1	S59 and motion$3 with compensat$4	USPAT	OR	ON	2017/03/15 16:51
S61	1	"20080165848"	USPAT	OR	ON	2017/03/15 16:54
S62	1	S59 and residu$3 with block	USPAT	OR	ON	2017/03/15 17:25
S63	1	S59 and residu$3 with block same (cod$3 encod$3 decod$3)	USPAT	OR	ON	2017/03/15 17:25

S66	1	S59 and reconstruct$3 with residu$3	USPAT	OR	ON	2017/03/15 22:26
S67	1	S59 and reconstruct$3 with block$3	USPAT	OR	ON	2017/03/15 22:27
S68	1	S59 and reconstruct$3	USPAT	OR	ON	2017/03/15 22:30
S69	1	"5614952".pn.	USPAT	OR	ON	2017/03/17 01:18
S70	31	(cod$3 encod$3 decod$3) and reconstruct$3 with (resampl$3 upsampl$3 downsampl$3) with ((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3)	USPAT	OR	ON	2017/03/17 01:30
S71	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S72	30369	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S73	483	S72 and S71	USPAT	OR	ON	2017/03/17 01:30
S74	9077741	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S75	0	S73 and S74 and S70	USPAT	OR	ON	2017/03/17 01:30
S76	27	S74 and S70	USPAT	OR	ON	2017/03/17 01:31
S77	19	(horizontal$3 and vertical$3) with reconstruct$3 with (resampl$3 upsampl$3 downsampl$3)	USPAT	OR	ON	2017/03/17 01:35
S78	18	S77 and S74	USPAT	OR	ON	2017/03/17 01:35
S79	696	(horizontal$3 and vertical$3) with (resampl$3 upsampl$3 downsampl$3)	USPAT	OR	ON	2017/03/17 01:56
S80	39	(horizontal$3 and vertical$3) with (resampl$3 upsampl$3 downsampl$3) with referenc$3	USPAT	OR	ON	2017/03/17 01:56
S83	0	S80 and S74 and S73	USPAT	OR	ON	2017/03/17 01:57
S84	37	S80 and S74	USPAT	OR	ON	2017/03/17 01:57
S85	0	"20130003847"	USPAT	OR	ON	2017/03/17 13:28
S86	1	"20130003847"	US-PGPUB; USPAT	OR	ON	2017/03/17 13:29

EAST Search History (Interference)

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14372021	BORDES ET AL.
	Examiner	Art Unit
	JIMMY S LEE	2486

✓	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	03/17/2017								
	1	✓								
	2	-								
	3	-								
	4	✓								
	5	✓								
	6	✓								
	7	-								
	8	-								
	9	✓								
	10	✓								
	11	✓								
	12	-								
	13	✓								
	14	-								
	15	✓								
	16	✓								
	17	✓								
	18	✓								

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Philippe BORDES etal
Art Unit	
Examiner Name	
Attorney Docket Number	PF120006-US-PCT

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		EP - EP1209916	05-29-2002	HITACHI LTD		

Examiner Signature	/JIMMY S LEE/	Date Considered	03/06/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, 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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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.S.L/

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Philippe BORDES et al
Art Unit	
Examiner Name	
Attorney Docket Number	PF120006-US-PCT

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		DAVIES et al: "Resolution switching for coding efficiency and error resilience", (Joint collaborative team on video coding of ISO/IEC JTC1/SC29/WG11 AND ITU-T SG16); 15 July 2011	
		LI ETAL: "AHG18: Comments on the implementations of resolution adaption on HEVC", 7 JCT-VC Meeting (Joint Collaborative Team on Video Coding of ISO/IEC ...), 8 Nov. 2011	
		LEE ETAL: "Hybrid resolution switching method for low bit rate video coding", Image Processing, 2007, ICIP 2007, IEEE Intl Conf on IEEE, 1 September 2007, pages VI-73	
		WIEGAND ETAL: "WD3: Working draft 3 of high-efficiency video coding", no. JCTVC-E603, 29 March 2011, pps. 1-160	
		WITTMANN ETAL: "Separable adaptive interpolation filter for video coding", Image processing, 2008. 15TH IEEE Intl Conf, IEEE, 12 October 2008, pages 2500-2503	
		HAN ETAL: "Joint optimization of the motion estimation module and the Up/Down scaler in transcoders", IEEE transactions on circuits and systems for video technology, vol. 15, n° 10, 1 October 2005, pages 1303-1313	
		Schwarz ETAL: "Overview of the scalable video coding extension of the H.264/AVC standard", IEEE transactions on circuits and systems for video technology, vol. 17, n°9, 1 September 2007, pages 1103-1120	
		COPY OF SEARCH REPORT DATED FEBRUARY 8, 2013	

Examiner Signature	/JIMMY S LEE/	Date Considered	03/06/2017

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

1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 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 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, 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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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.S.L/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Philippe Bordes, *et al.*
Ser. No.:	14/372,021
Filed:	July 13, 2014
For:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
Examiner:	Jimmy S. Lee
Art Unit:	2486
Customer No.:	24336
Confirmation No.:	8346

RESPONSE UNDER 37 CFR §1.111

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

Examiner:

Responsive to the Office Action dated March 23, 2017 having a shortened statutory period for responses which expires on June 23, 2017, Applicants hereby submit the following Amendment with the accompanying remarks. Reconsideration of the application in view of the Amendment is respectfully requested.

Listing and Amendments to the Claims

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

1. (Currently amended) A decoding method of a binary stream to reconstruct a current block of a current image from a reference image reconstructed at a different size from the size of said current image comprising:

- resampling said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- motion compensating a reference block of said resampled reconstructed reference image with at least one interpolation filter composed of a horizontal motion compensation interpolation filter and a vertical motion compensation interpolation filter,
- decoding, for the current block, a residue block, and
- reconstructing the current block from said residue block and from said motion compensated reference block,

wherein resampling and motion compensating are performed jointly by applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.

2. (Canceled)

3. (Canceled)

4. (Previously presented) The decoding method according to claim 1, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said decoding method further comprises a decoding step of said filtering coefficients.

5. (Previously presented) The decoding method according to claim 1, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

6. (Currently amended) A coding method of a current block of a current image from a reference image reconstructed at a different size from the size of said current image comprising:

- resampling said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- motion compensating a reference block of said resampled reconstructed reference image with at least one interpolation filter composed of a horizontal motion compensation interpolation filter and a vertical motion compensation interpolation filter,

- calculating, for the current block, a residue block from said current block and from said motion compensated reference block, and
- coding the residue block in a binary stream,

wherein resampling and motion compensating are performed jointly by applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.

7. (Canceled)

8. (Canceled)

9. (Previously presented) The coding method according to claim 6, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said coding method further comprises a coding step of said filtering coefficients.

10. (Previously presented) The coding method according to claim 6, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

11. (Currently amended) A decoding device ~~of a binary stream to reconstruct a current block of a current image from a reference image reconstructed at a different size from the size of said current image~~ comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;
- ~~a module configured to~~ resample said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- ~~a module configured to~~ motion compensate the reference block with at least one interpolation filter,
- ~~a module configured to~~ decode, for ~~the~~ a current block of said current image, a residue block from a binary stream, and
- ~~a module configured to~~ reconstruct the current block from said residue block and from said motion compensated reference block, wherein ~~the module configured~~ to resample and ~~the module configured~~ to motion compensate are ~~one and the same module which is configured to~~ performed jointly ~~resampling and motion compensating~~ by applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.

12. (Canceled)

13. (Currently amended) A coding device ~~of a current block of a current image from a reference image reconstructed at a different size from the size of said current image~~ comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;
- ~~a module configured to~~ resample said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;
- ~~a module configured to~~ motion compensate the reference block with at least one interpolation filter,
- ~~a module configured to~~ calculate, for ~~the~~ a current block of said current image, a residue block from said current block and from said motion compensated reference block, and
- ~~a module configured to~~ code the residue block in a binary stream, wherein ~~the module configured~~ to resample and ~~the module configured~~ to motion compensate are ~~one and the same module which is configured to~~ performed jointly ~~resampling and motion compensating~~ by applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.

14. (Canceled)

15. (Previously presented) The decoding device according to claim 11, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said decoding device further comprises a module configured to decode said filtering coefficients.

16. (Previously presented) The decoding device according to claim 11, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

17. (Previously presented) The coding device according to claim 13, wherein the horizontal filter and the vertical filter being defined by filtering coefficients, said coding device further comprises a module configured to code said filtering coefficients.

18. (Previously presented) The coding device according to claim 13, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

Remarks/Arguments

The Office Action mailed March 23, 2017 has been reviewed and carefully considered. Claims 1, 6, 11 and 13 have been amended. No new matter has been introduced. Claims 1, 4-6, 9-11, 13 and 15-18 are now pending in this application. Reconsideration of the above-identified application, as herein amended and in view of the following remarks, is respectfully requested.

I. Rejections under 35 U.S.C. § 112

Claims 11, 13 and 15-18 stand rejected under 35 U.S.C. §112(b) as being indefinite with respect to the features "module configured to resample" and "module configured to motion compensate". While Applicant disagrees, Applicant has amended the claims to specify that these are features of "at least one circuit". These features are disclosed at least on p. 14, lines 16-19 of the Original Specification.

Furthermore, Applicant has added the features of "a decoded picture buffer" to the device of claim 11. The device of claim 11 also includes filters which are components used in image processing. Claim 11 further provides that the blocks are coded in a binary stream or decoded from a binary stream. Therefore, the features concerning processing recited in the claims are sufficiently clear under 35 U.S.C. §112(b).

Thus, reconsideration of the rejections is respectfully requested.

II. Rejections under 35 U.S.C. § 102 and § 103

Claims 1, 5, 6, 10, 11, 13, 16 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 8199812 to Ye et al. (hereinafter "Ye") in view of U.S. Publication No. 2013/0003847 to Hong et al. (hereinafter "Hong"). Claims 4, 9, 15 and 17 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ye and Hong in view of U.S. Publication No. 2009/0175336 to Karczewicz et al. (hereinafter "Karczewicz").

The failure of an asserted combination to teach or suggest each and every feature of a claim remains fatal to an obviousness rejection under 35 U.S.C. §103. Section §2143.03 of the MPEP requires the "consideration" of every claim feature in an obviousness determination. To render a claim unpatentable, however, the Office must do more than merely "consider" each and every feature for this claim. Instead, the asserted combination of the patents must also teach or suggest *each and every claim feature*. *See In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (emphasis added) (to establish *prima facie* obviousness of a claimed invention, all the claim features must be taught or suggested by the prior art). "If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious" (MPEP §2143.03, citing *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)).

Amended independent claim 1 recites, *inter alia*, a decoding method of a binary stream to reconstruct a current block of a current image from a reference image reconstructed at a different size from the size of said current image that includes:

"resampling said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;

motion compensating a reference block of the resampled reconstructed reference image with at least one interpolation filter composed of a horizontal motion compensation interpolation filter and a vertical motion compensation interpolation filter,

wherein resampling and motion compensating are performed jointly by applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter".

Ye is totally silent with respect to the above mentioned features. In particular, Ye fails to teach motion compensating a reference block of the resampled reconstructed reference image. The Examiner asserts on page 6 of the Office Action that the resampled reconstructed reference image is the output of the module 59 of Figure 3.

inverse transform unit 58a "combined with upsampled base layer information as output of upsampler 59" which is upsampled to enhancement layer spatial resolution)[13:27-29, 14:25-27]

Indeed, the module 59 is the only module of the decoder that refers to upsampling of video blocks (*see* Ye, Col. 14 lines 38-42). However, the motion compensation unit 54 in Figure 3 does not motion compensate blocks of the upsampled picture as opposed to what is claimed in claim 1. In Ye the motion

compensation unit 54 clearly applies to the picture from the reference frame store 62 (*see also* Ye, Col. 13 lines 33-35) and not to the picture provided by the upsampler 59.

The Examiner further asserts that Ye discloses motion compensating a reference block of the resampled reconstructed reference image with at least one interpolation filter by referring to the bilinear interpolation mentioned on Col. 16, lines 11-14.

- motion compensating ("**motion compensation unit 54**" depicted in Fig. 3)[Fig. 3-54, 13:20-21] a reference block of said resampled reconstructed reference image ("**receives motion vectors and one or more reconstructed reference frames**" from reference frame store 62 and upsampled motion base motion layer motion vectors as depicted in Fig. 3)[13:20-23, 12:45-47] with at least one interpolation filter ("**bilinear interpolation**")[16:11-14] composed of a horizontal motion compensation interpolation filter

The applicant draws attention of the Examiner to the fact that the bilinear interpolation is used for the upsampling **not** for the motion compensation ("*If the base layer belong to the same base layer coding block in a given direction then bilinear interpolation in that direction is invoked to* ***obtain the value in the upsampled data***"). The motion compensation in Ye is not done by the bilinear interpolation filter.

In addition, in Ye the motion compensation and upsampling are clearly not performed jointly for two reasons. First, they are performed by different modules, motion compensation being performed by module 54 and upsampling being performed by module 59. Second, motion compensation is applied on a picture

from the reference frame store 54, said picture being reconstructed from the outputs of modules 59, 58A, 54 and further 53.

The motion compensation in Ye makes use of upsampled motion vectors. However, motion compensation and upsampling the reconstructed reference picture are not performed **jointly** by applying **a single** vertical and **a single** horizontal filter. The motion upsampler 61 upsampled motion vectors not a picture and is different than the upsampler 59 that upsampled a picture. The bilinear interpolation filter of Ye is not capable of doing the motion compensation. In Ye both operations are independent and realized by different modules namely upsampler 59 and motion compensation unit 54.

Hong merely discloses upscaling reconstructed base layer samples which can be used as input in upsampled form in the enhancement layer encoder (*see* [0054 of provisional application]) and motion compensation in the enhancement layer decoder 302. However, Hong does not cure the above deficiencies. In particular, Hong does not teach that upscaling (304 on Figure 3) and motion compensating (302 in Fig.3) are performed **jointly** by applying a **single vertical filter** equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and **a single horizontal filter** equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter. In Hong, the upsamplings 304 and 310 are performed independently from motion compensation.

Karczewicz does not cure the above deficiencies. In particular, Karczewicz does not teach that resampling and motion compensating are performed jointly by

applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.

Claim 1 is thus patentable. The same rationale applies to the other independent claims. The dependent claims are also patentable by virtue of their dependency.

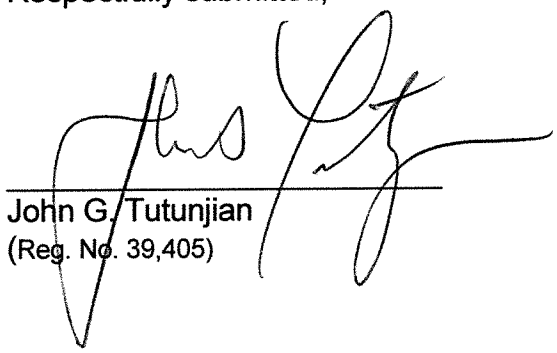
Thus, reconsideration of the rejections is respectfully requested.

III. Conclusion

It is respectfully submitted that all pending claims are in condition for allowance. The Applicant reserves the right to pursue the cancelled claims in a separately filed continuation application. Early and favorable consideration is respectfully requested.

It is believed that no additional fees or charges are currently due. However, in the event that any additional fees or charges are required at this time in connection with the application, they may be charged to Applicants' representatives Deposit Account No. 07-0832.

Respectfully submitted,



John G. Tutunjian
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Dated: 6/14/17

Electronic Acknowledgement Receipt

EFS ID:	29495614
Application Number:	14372021
International Application Number:	
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Customer Number:	24336
Filer:	John George Tutunjian/Beth Robson
Filer Authorized By:	John George Tutunjian
Attorney Docket Number:	PF120006
Receipt Date:	14-JUN-2017
Filing Date:	13-JUL-2014
Time Stamp:	14:26:15
Application Type:	U.S. National Stage under 35 USC 371

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		PF120006_Response.pdf	706824 400ba00c9dd670bee5608bce99db6be1fd08a8a2	yes	14

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	14

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/372,021	Filing Date 07/13/2014	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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

AMENDMENT **06/14/2017**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 12	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $420 =	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

AMENDMENT

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

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PTO/AIA/82A (07-13)
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Application Number	14/372,021
Filing Date	July 13, 2014
First Named Inventor	Philippe Bordes
Title	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
Art Unit	2486
Examiner Name	Jimmy S. Lee
Attorney Docket Number	PF120006

SIGNATURE of Applicant or Patent Practitioner

Signature	/John G. Tutunjian/	Date (Optional)	2017-06-22
Name	John G. Tutunjian	Registration Number	39405
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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

☐ *Total of _____ forms are submitted.

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

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POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date
14/372,021	July 13, 2014

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

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 147897

OR

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

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Firm or Individual Name					
Address					
City		State		Zip	
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Telephone		Email			

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

THOMSON LICENSING

☐ Inventor or Joint Inventor (title not required below)

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

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

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

SIGNATURE of Applicant for Patent

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

Signature	/Brian J. Dorini/	Date (Optional)	June 15, 2017
Name	Brian J. Dorini		
Title	Chief US Attorney, U.S. Patent Management		

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

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Electronic Acknowledgement Receipt

EFS ID:	29575406
Application Number:	14372021
International Application Number:	
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Customer Number:	24336
Filer:	John George Tutunjian/Aileen Walsh
Filer Authorized By:	John George Tutunjian
Attorney Docket Number:	PF120006
Receipt Date:	22-JUN-2017
Filing Date:	13-JUL-2014
Time Stamp:	12:18:26
Application Type:	U.S. National Stage under 35 USC 371

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	Power of Attorney	PF120006_POA.pdf	193090 f7fd89f21449eb48057370d9d45d6fb6afb19f78	no	2

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New Applications Under 35 U.S.C. 111

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

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

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New International Application Filed with the USPTO as a Receiving Office

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/372,021	07/13/2014	Philippe Bordes	PF120006

CONFIRMATION NO. 8346

POWER OF ATTORNEY NOTICE

24336
TUTUNJIAN & BITETTO, P.C.
401 Broadhollow Road, Suite 402
Melville, NY 11747

OC000000092322315

Date Mailed: 06/26/2017

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/22/2017.

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

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

/aabranyos/

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/372,021	07/13/2014	Philippe Bordes	PF120006

CONFIRMATION NO. 8346

POA ACCEPTANCE LETTER

147897
Tutunjian & Bitetto, P.C.
401 Broadhollow Road
Suite 402
Melville, NY 11747

OC00000092322347

Date Mailed: 06/26/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/22/2017.

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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	07/13/2014	Philippe Bordes	PF120006	8346

147897 7590 10/10/2017

Tutunjian & Bitetto, P.C.
401 Broadhollow Road
Suite 402
Melville, NY 11747

EXAMINER	
LEE, JIMMY S	

ART UNIT	PAPER NUMBER
2486	

NOTIFICATION DATE	DELIVERY MODE
10/10/2017	ELECTRONIC

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

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

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

docketing@tb-iplaw.com

Office Action Summary	Application No. 14/372,021	Applicant(s) BORDES ET AL.	
	Examiner JIMMY S. LEE	Art Unit 2486	AIA (First Inventor to File) Status No

-- 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 MONTHS 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 *3/23/2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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) *1,4-6,9-11,13 and 15-18* 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) *1,4-6,9-11,13 and 15-18* is/are rejected.

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

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

* If any claims have been determined allowable, 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.

Application Papers

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

11)☐ The drawing(s) filed on _____ 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).

Priority under 35 U.S.C. § 119

12)☒ 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)).

** 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) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Response to Arguments

2. Applicant's arguments with respect to the interpretation under 35 U.S.C. 112(f) has been fully considered and is withdrawn.

3. Applicant's arguments with respect to the rejection under 35 U.S.C. 112(b) has been fully considered and is withdrawn.

4. Applicant's arguments filed 6/14/2017 have been fully considered but they are not persuasive. To start, the applicant argues the application of Ye to teach the limitations of the claimed invention. Specifically, the applicant argues that Ye is silent with regards to motion compensating a reference block of the resampled reconstructed reference image. The applicant supports this with arguing that the motion compensation unit 54 of Ye fig. 3 does not motion compensate blocks and indicates that module 59 refers to upsampling of video blocks, which the applicant believes are not motion compensated by the prior art. However, what is taught by Ye, and relied upon, is that the process of motion compensation by the motion compensation unit 54 takes in for motion compensation the received motion vectors and one or more reconstructed frames from the reference store 62 which produces motion compensated blocks. In this way, although there is no motion compensation of the upsample from module 59, the examiner observes that what is being taught by Ye is motion compensation of a reconstructed reference frame (resampled reconstructed reference image) using motion vectors decoded unit 52a and motion up sampler 61 (motion compensation used on the reconstructed reference image) to produce motion compensated blocks which are then summed with residual blocks to form decoded blocks; which, to the examiner, is similar to the claimed motion compensating a reference block of the resampled reconstructed reference image.

5. The applicant then argues the citing of Ye to teach motion compensating with at least one interpolation filter by referring to the bilinear interpolation, arguing that bilinear interpolation is used for upsampling **not** for the motion compensation. However, in view of this argument, the applicant asserts later on in the claim that the motion compensation and resampling are performed jointly, which to the examiner reads to the claim entirely that the

resampling and motion compensation occur at the same time. In this way, it indicates that the process performs jointly the mechanism of motion and filtering as presented in the claimed invention. To the examiner, this makes it capable to implement the filtering of the horizontal and vertical up sample of Ye to be relevant to the motion compensation being presented in the prior art of record of the motion vectors and reconstructed reference frames. To more clearly elaborate, since the sampling occurs jointly as the motion compensation, it still teaches that the horizontal filtering and vertical filtering performed in the sampling is performed jointly with the motion compensation as claimed which is specified in the last limitation of the claimed invention.

6. The applicant then provides the argument that module 54 and 59 are not clearly performed jointly. However, since the reference blocks being used can be generated by the interpolation as previously indicated which are then used in motion compensation since the reference frame store 62 also stores reference blocks, the use of the interpolation of the upsampler 59 can still be associated with the motion compensation unit 54 since reference blocks supplied from the reference frame store 62 are provided to motion compensation and for decoding video to drive display device. The examiner maintains that Ye teaches the claimed invention.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 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, 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.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claim 1, 5, 6, 10, 11, 13, 16, and 18 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Ye et al. (US 8199812 B2) with Hong et al. (US 20130003847 A1) (with relevant prior art citation from provisional application 61/503092 filed 6/30/2011)**

Regarding claim 1, Ye teaches,

A decoding method of a binary stream **("entropy decoding technique to decode the information" by entropy unit 52a of video decoder 60)[Fig. 3, 13:14-16]** to reconstruct a current image **(output of inverse transform unit 58a "combined with upsampled base layer information as output of upsampler 59" which is upsampled to enhancement layer spatial resolution)[13:27-29, 14:25-27]** comprising:

- sampling said reference image **("upsampling from a lower resolution base layer")[14:16-17]** to the size of said current image **("to the higher resolution of the enhancement layer" occurring in two dimensions)[14:16-17]** with a resampling filter composed of an horizontal resampling filter **(base layer video "upsampled in the horizontal direction" designated "label X")[14:22-24]** and a vertical resampling filter, **(array X "upsampled in the vertical direction" designated "label E")[14:24-27]**

- motion compensating **("motion compensation unit 54" depicted in Fig. 3)[Fig. 3-54, 13:20-21]** a reference block of said resampled reconstructed reference image **("receives motion vectors and one or more reconstructed reference frames" from reference frame store 62 and upsampled motion base motion layer motion vectors as depicted in Fig. 3)[13:20-23, 12:45-47]** with at least one interpolation filter **("bilinear interpolation")[16:11-14]** composed of a horizontal motion compensation interpolation filter **(upsampled base layer pixels in a horizontal direction, "bilinear interpolation in that direction is invoked" to obtain value in upsampled data)[16:11-14]** and a vertical motion compensation interpolation filter, **(upsampled base layer pixels in a vertical direction, "then bilinear interpolation in that direction is invoked" to obtain value in upsampled data)[16:11-14]**

- decoding, (**"entropy decoding technique"**)[13:15-16] for the current block, (**"applied to encoded video bitstream"**)[13:15] a residue block, (**produce residual coefficients which have "inverse transform, e.g., an inverse DCT, to the coefficients to produce residual blocks"**)[13:25-26] and

- reconstructing the current block (**"form decoded blocks"**)[13:31-32] from said residue block (**"residual blocks"**)[13:31] and from said motion compensated reference block, (**motion compensation unit 54 producing "motion compensated blocks" (made from motion vectors and one or more reconstructed reference frames)**)[13:20-22] **which are summed with residual blocks to "form decoded blocks"**)[13:29-32]

wherein resampling (**"upsampling"**)[16:8] and motion compensating (**"motion compensation" using upsampled motion vectors associated with the motion up sampler 61**)[12:45-47] are performed jointly by applying a single vertical filter (**base layer resolution to enhancement layer resolution "upsampled in the vertical direction"**)[14:15-17,24-25] equal to said vertical motion compensation interpolation filter (**motion upsampler 61 "upsample motion vectors associated with the base layer so that such motion vectors correspond to the spatial resolution of the enhancement layer video data"**)[13:10-13] composed with said vertical resampling filter (**bilinear interpolation in that direction based on "same base layer coding block in a given direction" of upsampled data**)[16:9-14] and a single horizontal filter (**base layer resolution to enhancement layer resolution "upsampled in the horizontal direction"**)[14:15-17,22] equal to said horizontal motion compensation interpolation filter (**motion upsampler 61 "upsample motion vectors associated with the base layer so that such motion vectors correspond to the spatial resolution of the enhancement layer video data"**)[13:10-13] composed with said horizontal resampling filter (**bilinear interpolation in that direction based on "same base layer coding block in a given direction" of upsampled data**)[16:9-14]

But does not explicitly teach,

A decoding method of a binary stream to reconstruct a current block of a current image from a reference image reconstructed at a different size from the size of said current image comprising:

- resampling said reconstructed reference image of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;

However, Hong teaches,

A decoding method **(Fig. 3 depicting a decoder)**[¶38, Fig. 3] of a binary stream **(bitstreams 308 and 314)**[fig. 3-308, 314] to reconstruct a current block **("PU" of the enhancement layer motion compensated using upsampled reconstructed base layer samples)**[¶60, 59] of a current image from a reference image reconstructed at a different size **("reference pictures" stored in a base layer)**[¶59] from the size of said current image **(upscaled "to reflect the picture size ratio between the base layer and the enhancement layer")**[¶59] comprising:

- resampling **("upsampled form 311" from upscale unit 310)**[¶59, Fig. 3-311] said reconstructed reference image **("reconstructed picture sample 309")**[¶59] of said current image **("coded enhancement layer picture")**[¶51 with a resampling filter **(upscale unit 310)**[¶59, Fig. 3-310]

It would have been obvious to one with ordinary skill in the art to combine the adaptive upsampling of Ye with the layer sampling of Hong to use upsampled reconstructed base layer references. The benefit comes from using upsampled base layer references increases potential for increases in coding efficiency.

Regarding claim 5, Ye in view of Hong teach the limitation of claim 1,

Ye teaches additionally,

scalable stream comprising a base layer **("base layer information" from entropy unit 52b)**[12:56-57] coding low resolution images **("lower resolution base layer")**[14:15-16] and at least one enhancement layer **("enhancement layer information" from entropy unit 52a)**[12:54-55] coding high resolution images, **("higher resolution of the enhancement layer")**[14:16-17]

said current image is one of said high resolution images and said reference image is one of the low resolution images. (**"upsampling from a lower resolution base layer to the higher resolution of the enhancement layer"**)[14:15-17]

With regards to claim 6, it is the encoding method of decoding method claim 1. Claim 1 can teach the limitations of claim 6 with exception to the following limitations which are still taught by Ye:

- calculating, (**"form"**)[10:28] for the current block, (**"original, current video block 31"**)[10:30] a residue block (**"residual video block"**)[10:28] from said current block and from said motion compensated reference block, (**"by "subtracting the prediction video block produced by motion compensation unit 37 from the original, current video block 31"**)[10:28-30] and

– coding the residue block (**quantization unit 41 "quantizes the residual transform block coefficients"**)[11:8-9] in a binary stream, (**"entropy unit 46 codes quantized transform coefficients"**)[11:29-30]

Refer to the rejection of claim 1 to teach the rest of the rejection of claim 6.

Regarding claim 10, dependent on claim 6, it is the encoding claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 10.

Regarding claim 11, it is the decoding device claim of decoding method claim 1. Refer to the rejection of claim 1 to reject claim 11.

Regarding claim 13, it is the encoding device claim of encoding method claim 6. Refer to the rejection of claim 6 to reject claim 13.

Regarding claim 16, dependent on claim 11, it is the decoding device claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 16.

Regarding claim 18, dependent on claim 13, it is the encoding claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 18.

2. Claim 4, 9, 15, and 17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Ye et al. (US 8199812 B2) with Hong et al. (US 20130003847 A1) (with relevant prior art citation from provisional application 61/503092 filed 6/30/2011) in view of Karczewicz et al. (US 20090175336 A1)**

Regarding claim 4, Ye with Hong teach the limitations of claim 1,

But not explicitly the additional limitations of claim 4,

However, Karzewicz teaches,

> horizontal filter and the vertical filter (**"horizontal and/or vertical symmetry "by filter unit 47")**{¶65} being defined by filtering coefficients, (**"relative to other filter coefficients")**{¶65} said decoding method further comprises a decoding step of said filtering coefficients. (**"decoder may reconstruct all of the filter coefficients")**{¶65}

It would have been obvious to one with ordinary skill in the art to combine the adaptive upsampling of Ye with the layer sampling of Hong with filter of Karczewicz to have filter coefficients relative to other filter coefficients. The benefit of this being this reduces the amount of data needed to convey filter coefficients.

Regarding claim 9, dependent on claim 6, it is the encoding claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 9.

Regarding claim 15, dependent on claim 11, it is the decoding device claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 15.

Regarding claim 17, dependent on claim 13, it is the encoding claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 17.

Conclusion

7. **THIS ACTION IS MADE FINAL.** 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 mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JIMMY S. LEE whose telephone number is (571)270-7322. The examiner can normally be reached on Monday thru Friday 10-7.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MEHRDAD DASTOURI can be reached on 571-272-7418. 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.

/JIMMY S LEE/
Examiner, Art Unit 2486

/MOHAMMED RAHAMAN/
Primary Examiner, Art Unit 2486

Notice of References Cited	Application/Control No. 14/372,021	Applicant(s)/Patent Under Reexamination BORDES ET AL.	
	Examiner JIMMY S. LEE	Art Unit 2486	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2009/0175336 A1	07-2009	Karczewicz; Marta	H04N19/176	375/240.12
*	B	US-8,199,812 B2	06-2012	Ye; Yan	H04N19/105	375/240.02
*	C	US-2013/0003847 A1	01-2013	Hong; Danny	H04N19/52	375/240.16
	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	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

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

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

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BIB DATA SHEET

CONFIRMATION NO. 8346

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/372,021	07/13/2014 RULE	375	2486	PF120006

APPLICANTS

THOMSON LICENSING, Issy de Moulineaux, FRANCE;

INVENTORS

Philippe Bordes, Laille, FRANCE;
Pierre Andrivon, Liffre, FRANCE;
Philippe Salmon, Saint Sulpice La Foret, FRANCE;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/EP2013/050399 01/10/2013

**** FOREIGN APPLICATIONS ***************************

FRANCE FR1250334 01/13/2012

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

11/10/2014

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/JIMMY S LEE/ Examiner's Signature	☐ Initials	FRANCE	8	12	4

ADDRESS

Tutunjian & Bitetto, P.C.
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Suite 402
Melville, NY 11747
UNITED STATES

TITLE

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
1900	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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14372021	BORDES ET AL.
	Examiner	Art Unit
	JIMMY S LEE	2486

CPC- SEARCHED		
Symbol	Date	Examiner
h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33	3/18/2017	J.L.

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
375	240.02,240.020	3/18/2017	J.L.

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST searched (US-PGPUB; USPAT)	3/18/2017	J.L.
CPC searched	3/18/2017	J.L.
USclass searched	3/18/2017	J.L.
IDS searched	3/18/2017	J.L.
assignee searched	3/18/2017	J.L.
Inventors searched	3/18/2017	J.L.
keyword with priority date searched	3/18/2017	J.L.

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14372021	BORDES ET AL.
	Examiner	**Art Unit**
	JIMMY S LEE	2486

✓	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	03/17/2017	09/20/2017							
	1	✓	✓							
	2	-	-							
	3	-	-							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	-	-							
	8	-	-							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	-	-							
	13	✓	✓							
	14	-	-							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Philippe Bordes, *et al.*
Ser. No.:	14/372,021
Filed:	July 13, 2014
For:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
Examiner:	Jimmy S. Lee
Art Unit:	2486
Customer No.:	147897
Confirmation No.:	8346

RESPONSE UNDER 37 CFR §1.116

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

Examiner:

Responsive to the Final Office Action dated October 10, 2017 having a shortened statutory period for responses which expires on January 10, 2018, Applicants hereby submit the following Amendment with the accompanying remarks. Reconsideration of the application in view of the Amendment is respectfully requested.

Listing and Amendments to the Claims

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

1. (Currently amended) A decoding method of a binary stream to reconstruct a current block of a current image from a reference block of a reference image reconstructed at a different size from the size of said current image, said reconstructed reference image being stored in a decoded picture buffer comprising:

- ~~resampling said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;~~
- motion compensating said ~~a~~ reference block of said ~~resampled~~ reconstructed reference image by applying a single horizontal filter GF_H ~~with at least one interpolation filter composed of a horizontal motion compensation interpolation filter~~ and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block, ~~motion compensation interpolation filter,~~
- decoding, for the current block, a residue block, and
- reconstructing the current block from said residue block and from said motion compensated reference block,

wherein said ~~resampling and motion compensating are performed jointly by applying a~~ single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$,

where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer. ~~equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.~~

2. (Canceled)

3. (Canceled)

4. (Currently amended) The decoding method according to claim 1, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said decoding method further comprises a decoding step of said filtering coefficients.

5. (Previously presented) The decoding method according to claim 1, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

6. (Currently amended) A coding method of a current block of a current image from a reference block of a reference image reconstructed at a different size from the

size of said current image, said reconstructed reference image being stored in a decoded picture buffer comprising:

- ~~resampling said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;~~
- motion compensating a said reference block of said ~~resampled~~ reconstructed reference image by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block, ~~with at least one interpolation filter composed of a horizontal motion compensation interpolation filter and a vertical motion compensation interpolation filter,~~
- calculating, for the current block, a residue block from said current block and from said motion compensated reference block, and
- coding the residue block in a binary stream,

wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

~~resampling and motion compensating are performed jointly by applying a single vertical filter equal to said vertical motion compensation interpolation filter~~

~~composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.~~

7. (Canceled)

8. (Canceled)

9. (Currently amended) The coding method according to claim 6, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said coding method further comprises a coding step of said filtering coefficients.

10. (Previously presented) The coding method according to claim 6, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

11. (Currently amended) A decoding device comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;

- ~~resample said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;~~

- motion compensate a ~~the~~ reference block of said reconstructed reference image by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block, ~~with at least one interpolation filter,~~

- decode, for a current block of said current image, a residue block from a binary stream, and

- reconstruct the current block from said residue block and from said motion compensated reference block, wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer. ~~to resample and to motion compensate are performed jointly by applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.~~

12. (Canceled)

13. (Currently amended) A coding device comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;
- ~~resample said reconstructed reference image to the size of said current image with a resampling filter composed of an horizontal resampling filter and a vertical resampling filter;~~
- motion compensate a ~~the~~ reference block of said reconstructed reference image by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block, ~~with at least one interpolation filter,~~
- calculate, for a current block of said current image, a residue block from said current block and from said motion compensated reference block, and
- code the residue block in a binary stream, wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer. ~~to resample and to motion compensate are performed jointly by~~

~~applying a single vertical filter equal to said vertical motion compensation interpolation filter composed with said vertical resampling filter and a single horizontal filter equal to said horizontal motion compensation interpolation filter composed with said horizontal resampling filter.~~

14. (Canceled)

15. (Currently amended) The decoding device according to claim 11, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said decoding device further comprises a module configured to decode said filtering coefficients.

16. (Previously presented) The decoding device according to claim 11, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

17. (Currently amended) The coding device according to claim 13, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said coding device further comprises a module configured to code said filtering coefficients.

18. (Previously presented) The coding device according to claim 13, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

Remarks/Arguments

The Final Office Action mailed October 10, 2017 has been reviewed and carefully considered.

Claims 2-3, 7-8, 12 and 14 have been canceled without prejudice. Claims 1, 4, 6, 9, 11, 13, 15 and 17 have been amended. No new matter has been introduced. Claims 1, 4-6, 9-11, 13 and 15-18 are now pending in this application.

The independent claims are amended to make it clear that a block of a reference image is motion compensated by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of the reference block, wherein the single vertical filter $GF_V(s)$ is equal to $MCIF_V(SCFV(s))$, wherein $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter and the single horizontal filter $GF_{H(u)}$ is equal to $MCIF_H(SCF_H(u))$, wherein $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter. This is supported by the specification page 8 lines 17-23 and further figure 6.

In addition, it is further specified that no version of the reconstructed reference image is stored in the decoded picture buffer. This is supported by the specification page 8 lines 11-12 and further lines 26-28.

Reconsideration of the above-identified application, as herein amended and in view of the following remarks, is respectfully requested.

I. Rejection under 35 U.S.C. § 103

Claims 1, 5, 6, 10, 11, 13, 16 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 8199812 to Ye et al. (hereinafter "Ye") in view of U.S. Publication No. 2013/0003847 to Hong et al. (hereinafter "Hong"). Claims 4, 9, 15 and 17 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ye and Hong in view of U.S. Publication No. 2009/0175336 to Karczewicz et al. (hereinafter "Karczewicz").

The failure of an asserted combination to teach or suggest each and every feature of a claim remains fatal to an obviousness rejection under 35 U.S.C. §103. Section §2143.03 of the MPEP requires the "consideration" of every claim feature in an obviousness determination. To render a claim unpatentable, however, the Office must do more than merely "consider" each and every feature for this claim. Instead, the asserted combination of the patents must also teach or suggest *each and every claim feature*. *See In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (emphasis added) (to establish *prima facie* obviousness of a claimed invention, all the claim features must be taught or suggested by the prior art). "If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious" (MPEP §2143.03, citing *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)).

Independent claim 1 recites (among other things):

"said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$,

where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

Ye is totally silent about the above mentioned features. In particular, Ye fails to teach a single vertical filter GF_V applied on a pixel s that is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter. Similarly, Ye fails to teach a single horizontal filter GF_H applied on a pixel u that is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter.

In addition, in Ye the upsampled picture is clearly stored in the reference frame store, *i.e.*, in the decoded picture buffer contrary to the teachings of claim 1. The Examiner on page 4 of the Office Action explicitly indicates that Ye teaches motion compensating a reference block of said resampled reconstructed reference image obtained from reference frame store 62. It is clear on figure 3, that the picture stored in the reference frame store 62 are upsampled pictures obtained from modules 59, 57, and 64.

Hong merely discloses upscaling reconstructed base layer samples which can be used as input in upsampled form in the enhancement layer encoder (see [0054 of provisional application]) and motion compensation in the enhancement layer decoder 302. However, Hong does not cure the above deficiencies. Hong fails to teach a single vertical filter GF_V applied on a pixel s that is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation

interpolation filter and SCF_V is a vertical resampling filter. Similarly, Ye fails to teach a single horizontal filter GF_H applied on a pixel u that is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter.

Karczewicz, does not cure the above deficiencies. In particular, Karczewicz fails to teach a single vertical filter GF_V applied on a pixel s that is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter. Similarly, Ye fails to teach a single horizontal filter GF_H applied on a pixel u that is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter.

Claim 1 is thus patentable. The same rationale applies to the other independent claims. The dependent claims are also patentable by virtue of their dependency.

Thus, reconsideration of the rejections is respectfully requested.

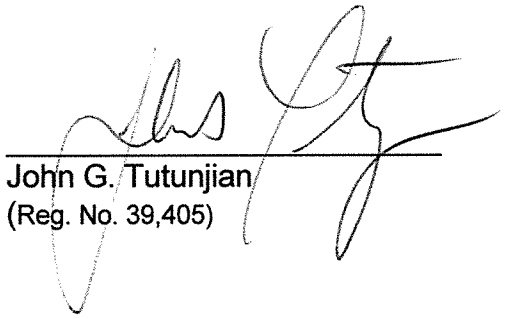
II. Conclusion

It is respectfully submitted that all pending claims are in condition for allowance. The Applicant reserves the right to pursue the cancelled claims in a separately filed continuation application. Early and favorable consideration is respectfully requested.

It is believed that no additional fees or charges are currently due. However, in the event that any additional fees or charges are required at this

time in connection with the application, they may be charged to Applicants' representatives Deposit Account No. 50-6977.

Respectfully submitted,



John G. Tutunjian
(Reg. No. 39,405)

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Dated: 11/24/17

Electronic Acknowledgement Receipt

EFS ID:	31037047
Application Number:	14372021
International Application Number:	
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Customer Number:	147897
Filer:	John George Tutunjian/Beth Robson
Filer Authorized By:	John George Tutunjian
Attorney Docket Number:	PF120006
Receipt Date:	24-NOV-2017
Filing Date:	13-JUL-2014
Time Stamp:	09:59:23
Application Type:	U.S. National Stage under 35 USC 371

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		PF120006_Response.pdf	714082 bfb29a1403a917767118ee3c6c5c11ec4b27bf97	yes	14

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	9
	Applicant Arguments/Remarks Made in an Amendment	10	14

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New Applications Under 35 U.S.C. 111

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

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

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 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/372,021	Filing Date 07/13/2014	☐ 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)		
	11/24/2017	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 12	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $420 =	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

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PTO/SB/30EFS (07-14)
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	14372021	Filing Date	2014-07-13	Docket Number (if applicable)	PF120006	Art Unit	2486
First Named Inventor	Philippe Bordes			Examiner Name	Jimmy S. Lee		

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, to any international application that does not comply with the requirements of 35 U.S.C. 371, 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 RESPONSE UNDER 37 CFR §1.116 filed on November 24, 2017

☐ 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 506977

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (07-14)
Approved for use through 07/31/2016. 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.

Signature of Registered U.S. Patent Practitioner			
Signature	/John G. Tutunjian/	Date (YYYY-MM-DD)	2017-11-27
Name	John G. Tutunjian	Registration Number	39405

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.

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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:

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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.

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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 Patent Application Fee Transmittal

Application Number:	14372021
Filing Date:	13-Jul-2014
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Filer:	John George Tutunjian/Beth Robson
Attorney Docket Number:	PF120006

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

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:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1st Request	1801	1	1200	1200
		Total in USD ($)		**1200**

Electronic Acknowledgement Receipt

EFS ID:	31045780
Application Number:	14372021
International Application Number:	
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Customer Number:	147897
Filer:	John George Tutunjian/Beth Robson
Filer Authorized By:	John George Tutunjian
Attorney Docket Number:	PF120006
Receipt Date:	27-NOV-2017
Filing Date:	13-JUL-2014
Time Stamp:	14:12:10
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1200
RAM confirmation Number	112817INTEFSW00000550506977
Deposit Account	506977
Authorized User	Beth Robson

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

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

37 CFR 1.492(a) (Basic national fee only)

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)	PF120006_RequestforContinuedExam.pdf	1349923 46e86f314381002ed3c1483a7f1073e6ca34efa3	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30584 502fdd3fd00758ff5d5dec53e3f9078e7c1469d6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1380507		

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	07/13/2014	Philippe Bordes	PF120006	8346

147897 7590 04/18/2018

Tutunjian & Bitetto, P.C.
401 Broadhollow Road
Suite 402
Melville, NY 11747

EXAMINER	
LEE, JIMMY S	

ART UNIT	PAPER NUMBER
2486	

NOTIFICATION DATE	DELIVERY MODE
04/18/2018	ELECTRONIC

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

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

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

docketing@tb-iplaw.com

Office Action Summary	Application No. 14/372,021	Applicant(s) BORDES ET AL.	
	Examiner JIMMY S. LEE	Art Unit 2486	AIA (First Inventor to File) Status No

-- 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 MONTHS 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 *11/24/2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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) *1,4-6,9-11,13 and 15-18* 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) *1,4-6,9-11,13 and 15-18* is/are rejected.

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

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

* If any claims have been determined allowable, 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.

Application Papers

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

11)☐ The drawing(s) filed on _____ 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).

Priority under 35 U.S.C. § 119

12)☒ 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)).

** 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) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

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 11/24/2017 has been entered.

Response to Arguments

1. Applicant's arguments with respect to claim 1 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 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, 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.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claim 1, 5, 6, 10, 11, 13, 16, and 18 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Ye et al. (US 8199812 B2) with Tsai et al. (US 20120082241 A1) in view of Robertson et al. (US 20100226437 A1) with Sato et al. (US 6748018 B2)**

Regarding claim 1, Ye teaches,

> A decoding method of a binary stream (**"entropy decoding technique to decode the information" by entropy unit 52a of video decoder 60**)[Fig. 3, 13:14-16] to reconstruct a current block of a current image (**output of inverse transform unit 58a "combined with upsampled base layer information as output of upsampler 59" which is upsampled to enhancement layer spatial resolution**)[13:27-29, 14:25-27] from a reference block (**"reference blocks" from motion compensation**)[13:34-35] of a reference image reconstructed (**"one or more reconstructed reference frames" used to produce reference blocks placed in store frame 62**)[13:21-22,33-35], said reconstructed reference image being stored in a decoded picture buffer (**reconstructed reference frames from reference frame store 62"**)[13:22-23] reference image reconstructed at a different size from the size of said current image (**base layer information using the actual block size of 4x4 indicated by 'FRext' syntax indicating that during upsampling, enhancement layer block size may be assumed to be "8x8" when the "base layer residual signal is upsampled to the resolution of the enhancement layer"**)[20:30-42, 13:54-56]
>
> comprising:
>
> - decoding, (**"entropy decoding technique"**)[13:15-16] for the current block, (**"applied to encoded video bitstream"**)[13:15] a residue block, (**produce residual coefficients which have "inverse transform, e.g., an inverse DCT, to the coefficients to produce residual blocks"**)[13:25-26] and
> - reconstructing the current block (**"form decoded blocks"**)[13:31-32] from said residue block (**"residual blocks"**)[13:31] and from said motion compensated reference block, (**motion compensation unit 54 producing "motion compensated blocks" (made from motion vectors and one or more reconstructed reference frames)**)[13:20-22] **which are summed with residual blocks to "form decoded blocks"**)[13:29-32]

But does not explicitly teach,

- motion compensating said a reference block of said reconstructed reference image by applying a single horizontal filter GFH and a single vertical filter GFV successively on the lines and on the columns of pixels of said reference block,

single vertical filter GFV applied on a pixel s is such that GFV(s)=MCIFV(SCFV(s)), where MCIFV is a vertical motion compensation interpolation filter and SCFV is a vertical resampling filter and wherein said single horizontal filter GFH applied on a pixel u is such that GFH(u)=MCIFH(SCFH(u)), where MCIFH is a horizontal motion compensation interpolation filter and SCFH is a horizontal resampling filter and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

However, Tsai teaches additionally,

- motion compensating **("motion-compensated video compression" as depicted in Fig. 1)[¶21,22 Fig. 1]** said a reference block of said reconstructed reference image by applying a single horizontal filter GFH and a single vertical filter GFV successively on the lines and on the columns of pixels of said reference block, **(including an ALF 180 which typically uses a two-dimensional (2D) linear filter for spatial "designed to be separable so that the 2D filter can be implemented using two separate one-dimensional filters where one is applied to the horizontal direction and the other is applied to the vertical direction" for in-loop reconstruction of frames)[¶22]**

It would have been obvious to one with ordinary skill in the art to combine the upsampling of Ye with the two dimensional filtering technique of Tsai to use a one-dimensional vertical filter and one-dimensional horizontal filter in place of the two dimensional filter. This would result in reduced implementation costs. But does not explicitly teach,

single vertical filter GFV applied on a pixel s is such that GFV(s)=MCIFV(SCFV(s)), where MCIFV is a vertical motion compensation interpolation filter and SCFV is a vertical resampling filter and wherein said single horizontal filter GFH applied on a pixel u is such that GFH(u)=MCIFH(SCFH(u)), where MCIFH is a horizontal motion compensation interpolation

filter and SCFH is a horizontal resampling filter and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

However, Robertson teaches,

single vertical filter GFV (**"prediction signal" added to "a spatial domain residual" as depicted in Fig. 7**)[¶69, 68, Fig. 7] applied on a pixel s is such that GFV(s)=MCIFV(SCFV(s)), (**"vertical resampling component 718" using filters applied to the motion compensation 714**)[¶71, Fig. 7] where MCIFV is a motion compensation interpolation filter (**"Inter coding implements motion compensation 714" which uses the vertical resampling from vertical sampling 718)[¶69,71]** and SCFV is a vertical resampling filter (**"vertical resampling 718" using "9:4 vertical resampling ratio" filters designed to account for interlacing and "to account for the different phases of the output pixels relative to the input pixels"**)[¶71, 34] and wherein said single horizontal filter GFH (**"prediction signal" added to "a spatial domain residual" as depicted in Fig. 7**)[¶69, 68, Fig. 7] applied on a pixel u is such that GFH(u)=MCIFH(SCFH(u)), (**"horizontal resampling component 716" applied to the motion compensation 714**)[¶71, Fig. 7] where MCIFH is a motion compensation interpolation filter (**"Inter coding implements motion compensation 714 from other previously decoded pictures" which uses the horizontal resampling from horizontal sampling 716)[¶69,71]** and SCFH is a horizontal resampling filter (**"horizontal resampling 716" using "2:1 horizontal resampling" using a "linear phase filter" on the lines of pixels)[¶71, 28]** and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer. **(resampling only used to apply to motion compensation or as "reduced resolution video for display or transcode" as depicted in fig. 7)[¶71, Fig. 7]**

It would have been obvious to one with ordinary skill in the art to combine the upsampling of Ye with the two dimensional filtering technique of Tsai with the resampling used with motion compensation of Robertson to motion compensate using a horizontal resample and a vertical resample. The benefit of such resampling is prediction operating with the aims of reducing the complexity of AVC decoding.

But does not explicitly teach,

where MCIFV is a vertical motion compensation interpolation filter

where MCIFH is a horizontal motion compensation interpolation filter

However, Sato teaches additionally,

where MCIFV is a vertical motion compensation interpolation filter **("filter taps for motion compensation in the vertical direction and by using linear interpolation")[17:53-55]**

where MCIFH is a horizontal motion compensation interpolation filter **("filter taps for motion compensation in the horizontal direction to approximate the linear interpolation")[17:56-57]**

It would have been obvious to one with ordinary skill in the art to combine the upsampling of Ye with the two dimensional filtering technique of Tsai with the resampling used with motion compensation of Robertson with the directional motion compensation of Sato to interpolate in a horizontal or vertical direction. The benefit of such an inclusion being processing volume reduction without picture quality reduction.

Regarding claim 5, Ye in view of Tsai with Robertson with Sato teach the limitation of claim 1,

Ye teaches additionally,

scalable stream comprising a base layer **("base layer information" from entropy unit 52b)[12:56-57]** coding low resolution images **("lower resolution base layer")[14:15-16]** and at least one enhancement layer **("enhancement layer information" from entropy unit 52a)[12:54-55]** coding high resolution images, **("higher resolution of the enhancement layer")[14:16-17]** said current image is one of said high resolution images and said reference image is one of the low resolution images. **("upsampling from a lower resolution base layer to the higher resolution of the enhancement layer")[14:15-17]**

With regards to claim 6, it is the encoding method of decoding method claim 1. Claim 1 can teach the limitations of claim 6 with exception to the following limitations which are still taught by Ye:

- calculating, **("form")[10:28]** for the current block, **("original, current video block 31")[10:30]** a residue block **("residual video block")[10:28]** from said current block and from said motion compensated

reference block, (**"by "subtracting the prediction video block produced by motion compensation unit 37 from the original, current video block 31")[10:28-30]** and

– coding the residue block (**quantization unit 41 "quantizes the residual transform block coefficients")[11:8-9]** in a binary stream, (**"entropy unit 46 codes quantized transform coefficients")[11:29-30]**

Refer to the rejection of claim 1 to teach the rest of the rejection of claim 6.

Regarding claim 10, dependent on claim 6, it is the encoding claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 10.

Regarding claim 11, it is the decoding device claim of decoding method claim 1. Refer to the rejection of claim 1 to reject claim 11.

Regarding claim 13, it is the encoding device claim of encoding method claim 6. Refer to the rejection of claim 6 to reject claim 13.

Regarding claim 16, dependent on claim 11, it is the decoding device claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 16.

Regarding claim 18, dependent on claim 13, it is the encoding claim of decoding method claim 5, dependent on claim 1. Refer to the rejection of claim 5 to teach the rejection of claim 18.

2. Claim 4, 9, 15, and 17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Ye et al. (US 8199812 B2) with Tsai et al. (US 20120082241 A1) in view of Robertson et al. (US 20100226437 A1) with Sato et al. (US 6748018 B2) in view of Karczewicz et al. (US 20090175336 A1)**

Regarding claim 4, Ye in view of Tsai with Robertson with Sato teach the limitations of claim 1,

But not explicitly the additional limitations of claim 4,

However, Karzewicz teaches,

> the single horizontal filter and the single vertical filter (**"horizontal and/or vertical symmetry "by filter unit 47")**[¶65] being defined by filtering coefficients, (**"relative to other filter coefficients")**[¶65] said decoding method further comprises a decoding step of said filtering coefficients. (**"decoder may reconstruct all of the filter coefficients")**[¶65]

It would have been obvious to one with ordinary skill in the art to combine the adaptive upsampling of Ye with the two dimensional filtering technique of Tsai with the resampling used with motion compensation of Robertson with the directional motion compensation of Sato with filter of Karczewicz to have filter coefficients relative to other filter coefficients. The benefit of this being this reduces the amount of data needed to convey filter coefficients.

Regarding claim 9, dependent on claim 6, it is the encoding claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 9.

Regarding claim 15, dependent on claim 11, it is the decoding device claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 15.

Regarding claim 17, dependent on claim 13, it is the encoding claim of decoding method claim 4, dependent on claim 1. Refer to the rejection of claim 4 to teach the rejection of claim 17.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JIMMY S. LEE whose telephone number is (571)270-7322. The examiner can normally be reached on Monday thru Friday 10-7.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MEHRDAD DASTOURI can be reached on 571-272-7418. 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.

/JIMMY S LEE/
Examiner, Art Unit 2486

/MOHAMMED RAHAMAN/
Primary Examiner, Art Unit 2486

Notice of References Cited	Application/Control No. 14/372,021	Applicant(s)/Patent Under Reexamination BORDES ET AL.	
	Examiner JIMMY S. LEE	Art Unit 2486	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-6,748,018 B2	06-2004	Sato; Kazushi	H04N19/139	348/556
*	B	US-2009/0175336 A1	07-2009	Karczewicz; Marta	H04N19/176	375/240.12
*	C	US-2010/0226437 A1	09-2010	Robertson; Mark A.	H04N19/44	375/240.16
*	D	US-2012/0082241 A1	04-2012	Tsai; Chia-Yang	H04N19/176	375/240.25
*	E	US-8,199,812 B2	06-2012	Ye; Yan	H04N19/105	375/240.02
*	F	US-8,638,852 B2	01-2014	Karczewicz; Marta	H04N19/176	375/240.12
*	G	US-9,813,738 B2	11-2017	Tsai; Chia-Yang	H04N19/176	1/1
	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	CPC 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.

Bibliographic Data

Application No: 14372021

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /JIMMY S LEE/ Examiner's Signature [ ] Initials

Title: METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
07/13/2014	375	2486	PF120006
RULE			

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Philippe Salmon, Saint Sulpice La Foret, FRANCE

CONTINUING DATA

This application is a 371 of PCT/EP2013/050399 01/10/2013

FOREIGN APPLICATIONS

FRANCE 1250334 01/13/2012

IF REQUIRED, FOREIGN LICENSE GRANTED**

11/10/2014

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FILING FEE RECEIVED

$1,900

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14372021	BORDES ET AL.
	Examiner	**Art Unit**
	JIMMY S LEE	2486

✓	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	03/17/2017	09/20/2017	03/28/2018						
	1	✓	✓	✓						
	2	-	-	-						
	3	-	-	-						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	-	-	-						
	8	-	-	-						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	-	-	-						
	13	✓	✓	✓						
	14	-	-	-						
	15	✓	✓	✓						
	16	✓	✓	✓						
	17	✓	✓	✓						
	18	✓	✓	✓						

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L6	559	motion near2 compensation with horizontal$6 same3 motion near2 compensation with vertical$6 same3 interpolat$6	US-PGPUB; USPAT	OR	ON	2018/04/10 11:28
L7	9098784	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/04/10 11:29
L8	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/04/10 11:29
L9	33631	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/04/10 11:29
L10	185	6 and L7 and (L8 L9)	USPAT	OR	ON	2018/04/10 11:29
S1	223	(("THOMSON") near3 ("LICENSING")).AANM.	USPAT	OR	ON	2017/03/06 12:54
S2	60	(("BORDES") near3 ("Philippe")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:54
S3	11	(("ANDRIVON") near3 ("Pierre")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:55
S4	23	(("SALMON") near3 ("Philippe")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:55
S5	9076723	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/06 12:56
S6	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/06 16:26
S7	30224	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/06 16:27
S8	39	(sampl$3 resampl$3) same (construct$3 reconstruct$3) with siz$3 same horizontal$3 same vertical$3	USPAT	OR	ON	2017/03/09 12:47
S9	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S10	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S11	30277	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S12	1	S8 and S9 and (S10 S11)	USPAT	OR	ON	2017/03/09 12:48
S13	1	"20130077883"	USPAT	OR	ON	2017/03/09 12:48
S14	50519	horizontal$3 same vertical$3 same motion$3	USPAT	OR	ON	2017/03/09 18:00
S15	961	(horizontal$3 same vertical$3) with filter$3 same motion$3	USPAT	OR	ON	2017/03/09 18:00
S17	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/09 18:00
S18	286	375/240.$.ccls. and S17 and S15	USPAT	OR	ON	2017/03/09 18:00
S19	270	(horizontal$3 same vertical$3) with filter$3 same motion$3 with compensat$3	USPAT	OR	ON	2017/03/09 18:01
S20	138	375/240.$.ccls. and S17 and S19	USPAT	OR	ON	2017/03/09 18:01
S21	5	(horizontal$3 same vertical$3) with filter$3 with (resampl$3	USPAT	OR	ON	2017/03/10

		reconstrut$3) same motion$3 with compensat$3				16:09
S22	6	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 16:10
S23	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/10 16:10
S24	2	375/240.$.ccls. and S23 and S22	USPAT	OR	ON	2017/03/10 16:10
S25	35	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same4 motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 17:38
S26	14	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same2 motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 17:38
S27	3	375/240.$.ccls. and S23 and S26	USPAT	OR	ON	2017/03/10 17:38
S28	7	375/240.$.ccls. and S23 and S25 NOT S27	USPAT	OR	ON	2017/03/10 17:40
S29	0	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 with reconstruct$3)	USPAT	OR	ON	2017/03/10 19:39
S30	0	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 same reconstruct$3)	USPAT	OR	ON	2017/03/10 19:40
S31	69	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3)	USPAT	OR	ON	2017/03/10 19:40
S32	0	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3) with motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 19:40
S33	4	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3) with motion$3	USPAT	OR	ON	2017/03/10 19:41
S34	2	375/240.$.ccls. and S23 and S33	USPAT	OR	ON	2017/03/10 19:41
S35	32445	(horizontal$3 and vertical$3) with (sampl$3 resampl$3 filter$3)	USPAT	OR	ON	2017/03/14 23:02
S36	190148	(interpolat$4 extrapolat$4 downsampl$3 upsampl$3 resampl$3)	USPAT	OR	ON	2017/03/14 23:03
S37	84268	motion$3 with (estimat$3 compnesat$4 determin$5)	USPAT	OR	ON	2017/03/14 23:03
S38	2097	S35 and S36 and S37	USPAT	OR	ON	2017/03/14 23:03
S39	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S40	30324	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S41	483	S40 and S39	USPAT	OR	ON	2017/03/14 23:04
S42	9077739	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S43	14	S42 and S41 and S38	USPAT	OR	ON	2017/03/14 23:04
S44	69138	((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3)with (sampl$3 resampl$3 filter$3)	USPAT	OR	ON	2017/03/15 12:44
S45	84268	motion$3 with (estimat$3 compnesat$4 determin$5)	USPAT	OR	ON	2017/03/15 13:06
S46	311	((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3) with (sampl$3 resampl$3 filter$3) with S45	USPAT	OR	ON	2017/03/15 13:06
S47	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S48	30324	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S49	483	S48 and S47	USPAT	OR	ON	2017/03/15 13:06
S50	9077739	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S51	1	S50 and S49 and S46	USPAT	OR	ON	2017/03/15 13:06

S52	90	"375".clas. and h04n19/$.cpc. and S50 and S46	USPAT	OR	ON	2017/03/15 13:48
S53	89	S52 not S51	USPAT	OR	ON	2017/03/15 13:48
S54	1885	(horizontal$3 and vertical$3) with S45	USPAT	OR	ON	2017/03/15 13:49
S55	9	S54 and S49 and S50	USPAT	OR	ON	2017/03/15 13:49
S56	190148	(interpolat$4 extrapolat$4 downsampl$3 upsampl$3 resampl$3)	USPAT	OR	ON	2017/03/15 14:39
S57	5168	(horizontal$3 and vertical$3) with S56	USPAT	OR	ON	2017/03/15 14:39
S58	17	S57 and S49 and S50	USPAT	OR	ON	2017/03/15 14:40
S59	1	(US-8199812-$).did.	USPAT	OR	ON	2017/03/15 16:51
S60	1	S59 and motion$3 with compensat$4	USPAT	OR	ON	2017/03/15 16:51
S61	1	"20080165848"	USPAT	OR	ON	2017/03/15 16:54
S62	1	S59 and residu$3 with block	USPAT	OR	ON	2017/03/15 17:25
S63	1	S59 and residu$3 with block same (cod$3 encod$3 decod$3)	USPAT	OR	ON	2017/03/15 17:25
S66	1	S59 and reconstruct$3 with residu$3	USPAT	OR	ON	2017/03/15 22:26
S67	1	S59 and reconstruct$3 with block$3	USPAT	OR	ON	2017/03/15 22:27
S68	1	S59 and reconstruct$3	USPAT	OR	ON	2017/03/15 22:30
S69	1	"5614952".pn.	USPAT	OR	ON	2017/03/17 01:18
S70	31	(cod$3 encod$3 decod$3) and reconstruct$3 with (resampl$3 upsampl$3 downsampl$3) with ((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3)	USPAT	OR	ON	2017/03/17 01:30
S71	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S72	30369	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S73	483	S72 and S71	USPAT	OR	ON	2017/03/17 01:30
S74	9077741	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S75	0	S73 and S74 and S70	USPAT	OR	ON	2017/03/17 01:30
S76	27	S74 and S70	USPAT	OR	ON	2017/03/17 01:31
S77	19	(horizontal$3 and vertical$3) with reconstruct$3 with (resampl$3 upsampl$3 downsampl$3)	USPAT	OR	ON	2017/03/17 01:35
S78	18	S77 and S74	USPAT	OR	ON	2017/03/17 01:35
S79	696	(horizontal$3 and vertical$3) with (resampl$3 upsampl$3 downsampl$3)	USPAT	OR	ON	2017/03/17 01:56
S80	39	(horizontal$3 and vertical$3) with (resampl$3 upsampl$3 downsampl$3) with referenc$3	USPAT	OR	ON	2017/03/17 01:56
S83	0	S80 and S74 and S73	USPAT	OR	ON	2017/03/17 01:57
S84	37	S80 and S74	USPAT	OR	ON	2017/03/17 01:57
S85	0	"20130003847"	USPAT	OR	ON	2017/03/17 13:28
S86	1	"20130003847"	US-PGPUB;	OR	ON	2017/03/17

			USPAT			13:29
S87	659	filter$3 with coefficient$3 with (horizontal$3 and vertical$3) and decod$3	USPAT	OR	ON	2017/03/17 15:17
S88	9077741	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
S89	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
S90	30369	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
S91	270	S87 and S88 and (S89 S90)	USPAT	OR	ON	2017/03/17 15:18
S92	98	filter$3 with coefficient$3 with (horizontal$3 and vertical$3) same decod$3	USPAT	OR	ON	2017/03/17 15:18
S94	43	S92 and S88 and (S89 S90)	USPAT	OR	ON	2017/03/17 15:18
S95	1	"20090175336"	USPAT	OR	ON	2017/03/17 15:23
S96	2	"20090175336"	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
S97	270	S87 and S88 and (S89 S90)	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
S98	43	S92 and S88 and (S89 S90)	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
S99	0	"20130003847"	USPAT	OR	ON	2017/03/18 12:48
S100	1	"20130003847"	US-PGPUB; USPAT	OR	ON	2017/03/18 12:48
S101	1	"8199812".pn.	US-PGPUB; USPAT	OR	ON	2017/03/18 13:19
S102	1678	singl$3 with vertical with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:35
S103	2210	singl$3 with (vertical horizontal) with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:35
S104	819	singl$3 with (vertical and horizontal) with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:36
S105	6	motion$3 with singl$3 with (vertical and horizontal) with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:36
S106	1	(US-8199812-$).did.	USPAT	OR	ON	2017/09/28 22:53
S107	1	S106 and interpolat$3 with referenc$3	US-PGPUB; USPAT	OR	ON	2017/09/28 22:54
S108	1	S106 and interpolat$3 with motion$3	US-PGPUB; USPAT	OR	ON	2017/09/28 22:57
S109	1	S106 and referenc$3 with (block$3 fram$3)	US-PGPUB; USPAT	OR	ON	2017/09/28 23:09
S110	0	(horizontal$3 same vertical$3) with motion$3 with (resampl$3 with reconstruct$3)	USPAT	OR	ON	2018/02/22 13:21
S111	0	(horizontal$3 same vertical$3) with motion$3 with (resampl$3 with reconstruct$3) and filter$3	USPAT	OR	ON	2018/02/22 13:21
S112	1	(horizontal$3 same vertical$3) with motion$3 with (resampl$3 with reconstruct$3) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:22
S113	6	(horizontal$3 same vertical$3) same motion$3 same (resampl$3 with reconstruct$3) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:22
S114	6	(horizontal$3 same vertical$3) same motion$3 same (resampl$3 with reconstruct$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:22
S115	255	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3) and reconstruct$3) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:23
S116	3241	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:23
S117	322	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 and vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:25

S118	323	(horizontal$3 and vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 and vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:25
S119	300	(horizontal$3 with vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 and vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:26
S120	313	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 same vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:26
S121	131	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 same vertical$3) same pixel$3 same motion$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:27
S122	2580	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/02/22 13:28
S123	33269	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/02/22 13:28
S124	81	S121 and (S122 S123)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:28
S125	4486	referenc$3 with motion$3 with (horizontal$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 18:56
S126	5542	referenc$3 with motion$3 with (vertical$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 18:57
S127	107684	(sampl$3 resampl$3) same (construct$3 reconstruct$3)	USPAT	OR	ON	2018/03/28 18:58
S128	330	S125 and S126 and S127	USPAT	OR	ON	2018/03/28 18:58
S129	9098368	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/03/28 18:58
S130	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/03/28 18:58
S131	33534	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/03/28 18:58
S132	42	S128 and S129 and (S130 S131)	USPAT	OR	ON	2018/03/28 18:58
S133	1510	filter$3 with motion$3 with (horizontal$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 19:07
S134	1899	filter$3 with motion$3 with (vertical$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 19:07
S135	131	S133 and S134 and S127	USPAT	OR	ON	2018/03/28 19:07
S136	41	S135 and S129 and (S130 S131)	USPAT	OR	ON	2018/03/28 19:07
S137	947	(one with dimension$3) with filter$3 with horizontal$3	USPAT	OR	ON	2018/03/28 20:12
S138	987	(one with dimension$3) with filter$3 with vertical$3	USPAT	OR	ON	2018/03/28 20:12
S139	102	S137 and S138 and S127	USPAT	OR	ON	2018/03/28 20:12
S140	25	S139 and S129 and (S130 S131)	USPAT	OR	ON	2018/03/28 20:12
S141	1	"20120082241"	USPAT	OR	ON	2018/03/28 20:13
S142	2	"20120082241"	US-PGPUB; USPAT	OR	ON	2018/03/28 20:52
S143	1988	(one with dimension$3) with filter$3 with horizontal$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/28 20:52
S144	2128	(one with dimension$3) with filter$3 with vertical$3	US-PGPUB; USPAT;	OR	ON	2018/03/28 20:52

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S145	107684	(sampl$3 resampl$3) same (construct$3 reconstruct$3)	USPAT	OR	ON	2018/03/29 15:08
S146	1989	(one with dimension$3) with filter$3 with horizontal$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:08
S147	2129	(one with dimension$3) with filter$3 with vertical$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:08
S148	102	S146 and S147 and S145	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:08
S149	9098369	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/03/29 15:09
S150	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/03/29 15:09
S151	33550	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/03/29 15:09
S152	25	S148 and S149 and (S150 S151)	USPAT	OR	ON	2018/03/29 15:09
S153	1	(US-9813738-$).did.	USPAT	OR	ON	2018/03/29 15:10
S154	25	S148 and S149 and (S150 S151)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:16
S155	119394	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:19
S156	4348	375/240.02,240.020.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:20
S157	9098369	@AD<"20120113"	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/29 15:21
S158	107684	(sampl$3 resampl$3) same (construct$3 reconstruct$3)	USPAT	OR	ON	2018/03/29 15:21
S159	1989	(one with dimension$3) with filter$3 with horizontal$3	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2018/03/29 15:21

			EPO; JPO; DERWENT; IBM_TDB			
S160	2129	(one with dimension$3) with filter$3 with vertical$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:21
S161	102	S159 and S160 and S158	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:21
S162	25	S161 and S157 and (S155 S156)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:21
S163	1	(US-8199812-$).did.	USPAT	OR	ON	2018/03/29 16:43
S164	1	S163 and referenc$3 with block$3	US-PGPUB; USPAT	OR	ON	2018/03/29 16:43
S165	1	S163 and bas$3 with block$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:16
S166	66882	filter$3 with (vertical$3)	US-PGPUB; USPAT	OR	ON	2018/03/29 17:28
S167	50939	filter$3 with (horizontal$3)	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S168	45962	filter$3 with motion$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S170	4884	filter$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S171	199	S166 and S167 and S168 and S170	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S172	50	S171 and S157 and (S155 S156)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 17:30
S173	4191	filter$3 with motion$3 with interpolat$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:31
S174	84	S166 and S167 and S173 and S170	US-PGPUB; USPAT	OR	ON	2018/03/29 17:31
S175	12	S174 and S157 and (S155 S156)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 17:31
S176	290	filter$3 with motion$3 with interpolat$3 with horizontal$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:05
S177	425	filter$3 with motion$3 with interpolat$3 with vertical$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:05
S178	273	S176 and S177	US-PGPUB; USPAT	OR	ON	2018/03/29 20:05
S179	119394	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT;	OR	ON	2018/03/29 20:06

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S180	4348	375/240.02,240.020.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 20:06
S181	9098369	@AD<"20120113"	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/29 20:06
S182	106	S178 and S181 and (S179 S180)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 20:06
S183	2	filter$3 with motion$3 with interpolat$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:36
S184	59	filter$3 with motion$3 with interpolat$3 with vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:36
S185	2	S183 and S184	US-PGPUB; USPAT	OR	ON	2018/03/29 20:36
S186	182	filter$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:37
S187	251	filter$3 with vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:37
S188	2	S176 and S177 and S186 and S187	US-PGPUB; USPAT	OR	ON	2018/03/29 20:38
S189	158	S186 and S187	US-PGPUB; USPAT	OR	ON	2018/03/29 20:38
S190	35	S189 and S181 and (S179 S180)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 20:38
S191	2	filter$3 with motion$3 with interpolat$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/02 16:48
S192	965	motion$3 with interpolat$3 with horizontal$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:21
S193	1351	motion$3 with interpolat$3 with vertical$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:21
S194	182	filter$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:22
S195	251	filter$3 with vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:22
S196	2	S192 and S193 and S194 and S195	US-PGPUB; USPAT	OR	ON	2018/04/03 14:22
S197	540	horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:13
S198	646	vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:13
S199	2	S192 and S193 and S197 and S198	US-PGPUB; USPAT	OR	ON	2018/04/03 15:14
S200	79946	motion$3 with horizontal$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S201	120994	motion$3 with vertical$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41

S202	74	S200 and S201 and S197 and S198	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S203	9098574	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S204	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S205	33569	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S206	19	S202 and S203 and (S204 S205)	USPAT	OR	ON	2018/04/03 15:41
S207	30	S202 and S203	USPAT	OR	ON	2018/04/03 17:43
S208	11	S207 not S206	USPAT	OR	ON	2018/04/03 17:43
S209	9	filter$3 with horizontal$3 with resampl$3 with motion$3	US-PGPUB; USPAT	OR	ON	2018/04/03 17:52
S210	66	filter$3 with vertical$3 with resampl$3 with motion$3	US-PGPUB; USPAT	OR	ON	2018/04/03 17:53
S211	6	S209 and S210 and S203	US-PGPUB; USPAT	OR	ON	2018/04/03 17:53
S212	148	S194 same S195	US-PGPUB; USPAT	OR	ON	2018/04/03 17:54
S213	27	S212 and S203 and (S204 S205)	USPAT	OR	ON	2018/04/03 17:54
S214	158	S194 and S195	US-PGPUB; USPAT	OR	ON	2018/04/03 18:09
S215	3	S214 and S203 and (S204 S205) not S213	USPAT	OR	ON	2018/04/03 18:09
S216	65	S214 and S203	USPAT	OR	ON	2018/04/03 18:10

EAST Search History (Interference)

<This search history is empty>

4/10/2018 7:53:51 PM
C:\Users\jlee28\Documents\EAST\Workspaces\14372021.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14372021	BORDES ET AL.
	Examiner	Art Unit
	JIMMY S LEE	2486

CPC- SEARCHED		
Symbol	Date	Examiner
h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33	3/29/2018	J.L.

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
375	240.02,240.020	3/29/2018	J.L.

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST searched (US-PGPUB; USPAT)	3/29/2018	J.L.
CPC searched	3/29/2018	J.L.
USclass searched	3/29/2018	J.L.
IDS searched	3/18/2017	J.L.
assignee searched	3/18/2017	J.L.
Inventors searched	3/18/2017	J.L.
keyword with priority date searched	3/29/2018	J.L.

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/JIMMY S LEE/ Examiner.Art Unit 2486	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Philippe Bordes, *et al.*
Ser. No.:	14/372,021
Filed:	July 13, 2014
For:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
Examiner:	Jimmy S. Lee
Art Unit:	2486
Customer No.:	147897

RESPONSE UNDER 37 CFR §1.111

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

Examiner:

Responsive to the Office Action dated April 18, 2018 having a shortened statutory period for responses which expires on July 18, 2018, Applicants hereby submit the following Amendment with the accompanying remarks. Reconsideration of the application in view of the Amendment is respectfully requested.

Listing and Amendments to the Claims

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

1. (Currently amended) A decoding method of a binary stream to reconstruct a current block of a current image from a reference block of a reference image reconstructed at a different size from the size of said current image, said reconstructed reference image being stored in a decoded picture buffer comprising:

- motion compensating said reference block of said reconstructed reference image by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block,
- decoding, for the current block, a residue block, and
- reconstructing the current block from said residue block and from said motion compensated reference block,

wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

2. (Canceled)

3. (Canceled)

4. (Previously presented) The decoding method according to claim 1, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said decoding method further comprises a decoding step of said filtering coefficients.

5. (Previously presented) The decoding method according to claim 1, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

6. (Currently amended) A coding method of a current block of a current image from a reference block of a reference image reconstructed at a different size from the size of said current image, said reconstructed reference image being stored in a decoded picture buffer comprising:

- motion compensating said reference block of said reconstructed reference image by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block,
- calculating, for the current block, a residue block from said current block and from said motion compensated reference block, and
- coding the residue block in a binary stream,

wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

7. (Canceled)

8. (Canceled)

9. (Previously presented) The coding method according to claim 6, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said coding method further comprises a coding step of said filtering coefficients.

10. (Previously presented) The coding method according to claim 6, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

11. (Currently amended) A decoding device comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;
- motion compensate a reference block of said reconstructed reference image by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block,
- decode, for a current block of said current image, a residue block from a binary stream, and
- reconstruct the current block from said residue block and from said motion compensated reference block, wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

12. (Canceled)

13. (Currently amended) A coding device comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;
- motion compensate a reference block of said reconstructed reference image by applying a single horizontal filter GF_H and a single vertical filter GF_V successively on the lines and on the columns of pixels of said reference block,
- calculate, for a current block of said current image, a residue block from said current block and from said motion compensated reference block, and
- code the residue block in a binary stream, wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is a horizontal motion compensation interpolation filter and SCF_H is a horizontal resampling filter, $MCIF_V$ and SCF_V being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

14. (Canceled)

15. (Previously presented) The decoding device according to claim 11, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said decoding device further comprises a module configured to decode said filtering coefficients.

16. (Previously presented) The decoding device according to claim 11, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

17. (Previously presented) The coding device according to claim 13, wherein the single horizontal filter and the single vertical filter being defined by filtering coefficients, said coding device further comprises a module configured to code said filtering coefficients.

18. (Previously presented) The coding device according to claim 13, wherein said binary stream is a scalable stream comprising a base layer coding low resolution images and at least one enhancement layer coding high resolution images, said current image is one of said high resolution images and said reference image is one of the low resolution images.

Remarks/Arguments

The Office Action mailed April 18, 2018 has been reviewed and carefully considered.

Claims 2-3, 7-8, 12 and 14 have been previously canceled without prejudice. Claims 1, 6, 11 and 13 have been amended. Support for these amendments can be for, for example on page 8, lines 29-32 of the specification as originally filed. No new matter has been introduced. Claims 1, 4-6, 9-11, 13 and 15-18 are now pending in this application.

Rejection under 35 U.S.C. § 103

Claims 1, 5, 6, 10, 11, 13, 16 and 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ye et al. (USP 8199812) in view of Tsai et al (2012/0082241) in view of Robertson et al (2010/0226437) in further view of Sato et al. (USP 6,748,018).

Independent claim 1 recites, *inter alia*:

> .....wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter , $MCIF_V$ and SCF_V being applied jointly and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is an horizontal motion compensation interpolation filter and SCF_H is an horizontal resampling filter, $MCIF_H$ and SCF_H being applied jointly....

The examiner agrees that the above feature is not disclosed by Ye with Tsai (see

bottom of page 4 of the office action). The examiner asserts that Robertson teaches this feature. The Applicant respectfully disagrees. According to Fig 7 of Robertson there are clearly two filters (e.g. one vertical resampling 718 followed by motion compensation 714). This is confirmed by paragraph [0071] which states:

> *The output of the deblocking filter 710, the horizontal resampling component 716 and the vertical resampling component 718 also go to the motion compensation 714 in full or reduced resolution. The result of the decoder 700 is a reduced resolution video for display or transcode.*

In the above paragraph the resampling and the motion compensation are clearly not applied jointly using a single filter contrary to the method of claim 1.

When combining Ye, Tsai and Robertson the skilled person would apply two filters successively as taught by Robertson *horizontal resampling followed by motion compensation.* Apart from Robertson, none of the cited prior art teaches resampling and motion compensation and Robertson fails to teach that resampling and motion compensation are applied using a single filter, i.e. that resampling and motion compensation are applied jointly.

Sato does not cure the deficiencies of the above prior art, and therefore the combination of the teachings of these four (4) references fails to render obvious applicant's claimed decoding and coding methods and devices as set forth in independent claims 1, 6, 11 and 13. Reconsideration and withdrawal of the rejection, and early allowance on the merits is earnestly solicited.

Claims 4, 9, 15 and 17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ye et al. (USP 8199812) in view of Tsai et al (2012/0082241) in view of Robertson et al (2010/0226437) in further view of Sato et al. (USP 6,748,018), in further view of Karczewicz et al (2009/0175336).

Karczewicz referred to on page 7 of the office action does not cure the deficiencies of the above prior art. In particular Karczewicz fails to teach or remotely suggest "...*wherein said single vertical filter GF_V applied on a pixel s is such that $GF_V(s)=MCIF_V(SCF_V(s))$, where $MCIF_V$ is a vertical motion compensation interpolation filter and SCF_V is a vertical resampling filter , $MCIF_V$ and SCF_V being applied jointly and wherein said single horizontal filter GF_H applied on a pixel u is such that $GF_H(u)=MCIF_H(SCF_H(u))$, where $MCIF_H$ is an horizontal motion compensation interpolation filter and SCF_H is an horizontal resampling filter, $MCIF_H$ and SCF_H being applied jointly*".

As such, dependent claims 4, 9, 15 and 17 are clearly in condition for allowance based on their dependency from their respective independent claims 1, 6, 11 and 13.

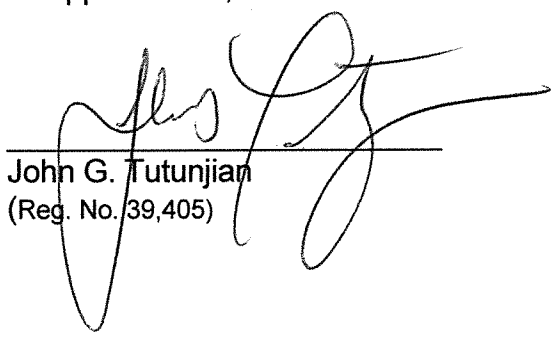
Conclusion

In view of the foregoing, Applicant respectfully requests that the rejections of the claims set forth in the Office Action of April 17, 2018 be withdrawn, that pending claims 1, 4-6, 9-11, 13 and 15-18 be allowed, and that the case proceed to early issuance of Letters Patent in due course.

It is believed that no additional fees or charges are currently due. However, in the event that any additional fees or charges are required at this time in connection with the application, they may be charged to Applicants' representatives Deposit Account No. 50-6977.

Respectfully submitted,

Philippe Bordes, *et al.*



John G. Tutunjian
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Dated: 7/6/18

Electronic Acknowledgement Receipt

EFS ID:	33103331
Application Number:	14372021
International Application Number:	
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Customer Number:	147897
Filer:	John George Tutunjian/Beth Robson
Filer Authorized By:	John George Tutunjian
Attorney Docket Number:	PF120006
Receipt Date:	06-JUL-2018
Filing Date:	13-JUL-2014
Time Stamp:	09:52:40
Application Type:	U.S. National Stage under 35 USC 371

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		PF120006_Response.pdf	521152 b904ab6001ebad32ab556ae9c41cf34b9c1666d9	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	11

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/372,021	Filing Date 07/13/2014	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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

AMENDMENT **07/06/2018**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 12	Minus	** 20	= 0	X $100 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $460 =	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

AMENDMENT

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

SLIE
TAMMY ACREE

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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
14/372,021		2486	74108

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The following fields have been changed to Customer Number 157362 on 10/22/2018 via Private PAIR in view of the certification copied below that authorized the change.

- Correspondence Address

The address for Customer Number 157362 is:
157362
Brian J. Dorini
InterDigital Madison Patent Holdings
4 Research Way
3rd Floor
Princeton, NJ 08543

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

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Signature:	/Patricia A. Verlangieri, Reg. No. 42201/
Name:	Patricia A. Verlangieri
Registration Number:	42201

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NOTICE OF ALLOWANCE AND FEE(S) DUE

157362 7590 11/14/2018

Brian J. Dorini
InterDigital Madison Patent Holdings
4 Research Way
3rd Floor
Princeton, NJ 08543

EXAMINER	
LEE, JIMMY S	
ART UNIT	PAPER NUMBER
2486	

DATE MAILED: 11/14/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	07/13/2014	Philippe Bordes	PF120006	8346

TITLE OF INVENTION: METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	02/14/2019

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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.

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157362 7590 11/14/2018

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(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	07/13/2014	Philippe Bordes	PF120006	8346

TITLE OF INVENTION: METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	02/14/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEE, JIMMY S	2486	375-240020

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 03-09 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

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

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
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.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	07/13/2014	Philippe Bordes	PF120006	8346

157362 7590 11/14/2018

Brian J. Dorini
InterDigital Madison Patent Holdings
4 Research Way
3rd Floor
Princeton, NJ 08543

EXAMINER	
LEE, JIMMY S	

ART UNIT	PAPER NUMBER
2486	

DATE MAILED: 11/14/2018

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B 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 30 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.

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.

Notice of Allowability	Application No. 14/372,021	Applicant(s) Bordes et al.	
	Examiner JIMMY S LEE	Art Unit 2486	AIA 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 7/6/18.
   ☐ 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 See Continuation Sheet . 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 areply 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 _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/JIMMY S LEE/ Examiner, Art Unit 2486	/MOHAMMED S RAHAMAN/ Primary Examiner, Art Unit 2486

Continuation of 3. The allowed claim(s) is/are: 1,4-6,9-11,13 and 15-18

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

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 an interview with John Tutunjian (Reg. No. 39405) on 11/2/2018 @631-844-0080.

The application has been amended as follows:

1. (Currently amended) A decoding method of a binary stream to reconstruct a current block of a current image from a reference block of a reference image reconstructed at a different size from the size of said current image, said reconstructed reference image being stored in a decoded picture buffer comprising:

- motion compensating said reference block of said reconstructed reference image by applying a single horizontal filter GFH and a single vertical filter GFv successively on the lines and on the columns of pixels of said reference block,
- decoding, for the current block, a residue block, and
- reconstructing the current block from said residue block and from said motion compensated reference block,

wherein said single vertical filter GFv applied on a pixel s is such that GFv(s)=MCIFv(SCFv(s)), where MCIFv is a vertical motion compensation interpolation filter and SCFv is a vertical resampling filter, MCIFv and SCFv being applied jointly and wherein said single horizontal filter GFH applied on a pixel u is such that GFH(u)=MCIFH(SCFH(u)), where MCIFH is a horizontal motion compensation interpolation filter and SCFH is a horizontal resampling filter, MCIFvH and SCFvH being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

6. (Currently amended) A coding method of a current block of a current image from a reference block of a reference image reconstructed at a different size from the size of said current image, said reconstructed reference image being stored in a decoded picture buffer comprising:

- motion compensating said reference block of said reconstructed reference image by applying a single horizontal filter GFH and a single vertical filter GFv successively on the lines and on the columns of pixels of said reference block,
- calculating, for the current block, a residue block from said current block and from said motion compensated reference block, and
- coding the residue block in a binary stream,

wherein said single vertical filter GFv applied on a pixel s is such that GFv(s)=MCIFv(SCFv(s)), where MCIFv is a vertical motion compensation interpolation filter and SCFv is a vertical resampling filter, MCIFv and SCFv being applied jointly and wherein said single horizontal filter GFH applied on a pixel u is such that GFH(u)=MCIFH(SCFH(u)), where MCIFH is a horizontal motion compensation interpolation filter and SCFH is a horizontal resampling filter, MCIFvH and SCFvH being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

11. (Currently amended) A decoding device comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;

- motion compensate a reference block of said reconstructed reference image by applying a single horizontal filter GFH and a single vertical filter GFv successively on the lines and on the columns of pixels of said reference block,

- decode, for a current block of said current image, a residue block from a binary stream, and

- reconstruct the current block from said residue block and from said motion compensated reference block,

wherein said single vertical filter GFv applied on a pixel s is such that GFv(s)=MCIFv(SCFv(s)), where MCIFv is a vertical motion compensation interpolation filter and SCFv is a vertical resampling filter, MCIFv and SCFv being applied jointly and wherein said single horizontal filter GFH applied on a pixel u is such that GFH(u)=MCIFH(SCFH(u)), where MCIFH is a horizontal motion compensation interpolation filter and SCFH is a horizontal resampling filter, MCIF~~v~~H and SCF~~v~~H being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

13. (Currently amended) A coding device comprising at least one circuit configured to:

- access, from a decoded picture buffer, a reference image reconstructed at a size different from the size of a current image;

- motion compensate a reference block of said reconstructed reference image by applying a single horizontal filter GFH and a single vertical filter GFv successively on the lines and on the columns of pixels of said reference block,

- calculate, for a current block of said current image, a residue block from said current block and from said motion compensated reference block, and

- code the residue block in a binary stream,

wherein said single vertical filter GFv applied on a pixel s is such that GFv(s)=MCIFv(SCFv(s)), where MCIFv is a vertical motion compensation interpolation filter and SCFv is a vertical resampling filter, MCIFv and SCFv being applied jointly and wherein said single horizontal filter GFH applied on a pixel u is such that GFH(u)=MCIFH(SCFH(u)), where MCIFH is a horizontal motion compensation interpolation filter and SCFH is a horizontal resampling filter, MCIFvH and SCFvH being applied jointly and wherein no resampled version of said reconstructed reference image is stored in the decoded picture buffer.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance: The claimed invention now relates to more uniformly application jointly of either vertical and horizontal interpolation filtering and resampling to respective single filters in either vertical or horizontal applications. Both of these aspects are not taught by the prior art singly or in combination which renders the claimed invention allowable.

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

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JIMMY S LEE whose telephone number is (571)270-7322. The examiner can normally be reached on Monday thru Friday 10AM-8PM EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on 571-272-7418. 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.

/JIMMY S LEE/

Examiner, Art Unit 2486

/MOHAMMED S RAHAMAN/
Primary Examiner, Art Unit 2486

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/372,021	Bordes et al.
	Examiner	Art Unit
	JIMMY S LEE	2486

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

CLAIMS

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

CLAIM		DATE								
Final	Original	03/17/2017	09/20/2017	03/28/2018	10/30/2018					
	1	✓	✓	✓	=					
	2	-	-	-	-					
	3	-	-	-	-					
	4	✓	✓	✓	=					
	5	✓	✓	✓	=					
	6	✓	✓	✓	=					
	7	-	-	-	-					
	8	-	-	-	-					
	9	✓	✓	✓	=					
	10	✓	✓	✓	=					
	11	✓	✓	✓	=					
	12	-	-	-	-					
	13	✓	✓	✓	=					
	14	-	-	-	-					
	15	✓	✓	✓	=					
	16	✓	✓	✓	=					
	17	✓	✓	✓	=					
	18	✓	✓	✓	=					

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/372,021	Bordes et al.
	Examiner	Art Unit
	JIMMY S LEE	2486

CPC - Searched*		
Symbol	Date	Examiner
h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33	11/02/2018	J.L.

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
375	240.02,240.020	11/02/2018	J.L.

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
EAST searched (US-PGPUB; USPAT)	11/02/2018	J.L.
CPC searched	11/02/2018	J.L.
USclass searched	11/02/2018	J.L.
IDS searched	11/02/2018	J.L.
assignee searched	11/02/2018	J.L.
Inventors searched	11/02/2018	J.L.
keyword with priority date searched	11/02/2018	J.L.

/JIMMY S LEE/ Examiner.Art Unit 2486	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/372,021	Bordes et al.
	Examiner	Art Unit
	JIMMY S LEE	2486

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04N	19/ 117,105,146,172,176,423,439,44,523,59,80,82,152,159,33	11/02/2018	J.L.
375	240.02,240.020	11/02/2018	J.L.

/JIMMY S LEE/ Examiner.Art Unit 2486	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/372,021	Bordes et al.
	Examiner	**Art Unit**
	JIMMY S LEE	2486

CPC						
Symbol					**Type**	**Version**
H04N	/	19	/	117	F	2014-11-01
H04N	/	19	/	172	I	2014-11-01
H04N	/	19	/	44	I	2014-11-01
H04N	/	19	/	82	I	2014-11-01
H04N	/	19	/	423	I	2014-11-01
H04N	/	19	/	523	I	2014-11-01
H04N	/	19	/	59	I	2014-11-01
H04N	/	19	/	439	I	2014-11-01
H04N	/	19	/	105	I	2014-11-01
H04N	/	19	/	146	I	2014-11-01
H04N	/	19	/	176	I	2014-11-01
H04N	/	19	/	80	I	2014-11-01
H04N	/	19	/	159	A	2014-11-01
H04N	/	19	/	152	A	2014-11-01
H04N	/	19	/	33	A	2014-11-01

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

/JIMMY S LEE/ Examiner, Art Unit 2486	02 November 2018	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	12	
/MOHAMMED S RAHAMAN/ Primary Examiner, Art Unit 2486	05 November 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	11	7

U.S. Patent and Trademark Office — Part of Paper No.: 20181004

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/372,021	Bordes et al.
	Examiner	**Art Unit**
	JIMMY S LEE	2486

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04N	/	19	/	117

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
375	240.02

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

/JIMMY S LEE/ Examiner, Art Unit 2486	02 November 2018	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	12	
/MOHAMMED S RAHAMAN/ Primary Examiner, Art Unit 2486	05 November 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	11	7

U.S. Patent and Trademark Office — Part of Paper No.: 20181004

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/372,021	Bordes et al.
	Examiner	**Art Unit**
	JIMMY S LEE	2486

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

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	10	16												
2	4	11	17												
3	5	12	18												
4	6														
5	9														
6	10														
7	11														
8	13														
9	15														

/JIMMY S LEE/ Examiner, Art Unit 2486	02 November 2018	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	12	
/MOHAMMED S RAHAMAN/ Primary Examiner, Art Unit 2486	05 November 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	11	7

Bibliographic Data

Application No: 14/372,021

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /JIMMY S LEE/ Examiner's Signature | Initials

Title: METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
07/13/2014	375	2486	PF120006
RULE			

APPLICANTS

THOMSON LICENSING, Issy de Moulineaux, FRANCE

INVENTORS

Philippe Bordes Laille, FRANCE

Pierre Andrivon Liffre, FRANCE

Philippe Salmon Saint Sulpice La Foret, FRANCE

CONTINUING DATA

This application is a 371 of PCT/EP2013/050399 01/10/2013

FOREIGN APPLICATIONS

FRANCE 250334 01/13/2012

IF REQUIRED, FOREIGN LICENSE GRANTED**

11/10/2014

STATE OR COUNTRY

FRANCE

ADDRESS

Brian J. Dorini
InterDigital Madison Patent Holdings
4 Research Way
3rd Floor
Princeton, NJ 08543
UNITED STATES

FILING FEE RECEIVED

$1,900

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	223	(("THOMSON") near3 ("LICENSING")).AANM.	USPAT	OR	ON	2017/03/06 12:54
S2	60	(("BORDES") near3 ("Philippe")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:54
S3	11	(("ANDRIVON") near3 ("Pierre")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:55
S4	23	(("SALMON") near3 ("Philippe")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/06 12:55
S5	9076723	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/06 12:56
S6	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/06 16:26
S7	30224	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/06 16:27
S8	39	(sampl$3 resampl$3) same (construct$3 reconstruct$3) with siz$3 same horizontal$3 same vertical$3	USPAT	OR	ON	2017/03/09 12:47
S9	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S10	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S11	30277	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/09 12:48
S12	1	S8 and S9 and (S10 S11)	USPAT	OR	ON	2017/03/09 12:48
S13	1	"20130077883"	USPAT	OR	ON	2017/03/09 12:48
S14	50519	horizontal$3 same vertical$3 same motion$3	USPAT	OR	ON	2017/03/09 18:00
S15	961	(horizontal$3 same vertical$3) with filter$3 same motion$3	USPAT	OR	ON	2017/03/09 18:00
S17	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/09 18:00
S18	286	375/240.$.ccls. and S17 and S15	USPAT	OR	ON	2017/03/09 18:00
S19	270	(horizontal$3 same vertical$3) with filter$3 same motion$3 with compensat$3	USPAT	OR	ON	2017/03/09 18:01
S20	138	375/240.$.ccls. and S17 and S19	USPAT	OR	ON	2017/03/09 18:01
S21	5	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstrut$3) same motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 16:09
S22	6	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 16:10
S23	9077264	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/10 16:10
S24	2	375/240.$.ccls. and S23 and S22	USPAT	OR	ON	2017/03/10 16:10
S25	35	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 reconstruct$3) same4 motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 17:38
S26	14	(horizontal$3 same vertical$3) with filter$3 with (resampl$3	USPAT	OR	ON	2017/03/10

		reconstruct$3) same2 motion$3 with compensat$3				17:38
S27	3	375/240.$.ccls. and S23 and S26	USPAT	OR	ON	2017/03/10 17:38
S28	7	375/240.$.ccls. and S23 and S25 NOT S27	USPAT	OR	ON	2017/03/10 17:40
S29	0	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 with reconstruct$3)	USPAT	OR	ON	2017/03/10 19:39
S30	0	(horizontal$3 same vertical$3) with filter$3 with (resampl$3 same reconstruct$3)	USPAT	OR	ON	2017/03/10 19:40
S31	69	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3)	USPAT	OR	ON	2017/03/10 19:40
S32	0	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3) with motion$3 with compensat$3	USPAT	OR	ON	2017/03/10 19:40
S33	4	(horizontal$3 same vertical$3) with filter$3 and (resampl$3 same reconstruct$3) with motion$3	USPAT	OR	ON	2017/03/10 19:41
S34	2	375/240.$.ccls. and S23 and S33	USPAT	OR	ON	2017/03/10 19:41
S35	32445	(horizontal$3 and vertical$3) with (sampl$3 resampl$3 filter$3)	USPAT	OR	ON	2017/03/14 23:02
S36	190148	(interpolat$4 extrapolat$4 downsampl$3 upsampl$3 resampl$3)	USPAT	OR	ON	2017/03/14 23:03
S37	84268	motion$3 with (estimat$3 compnesat$4 determin$5)	USPAT	OR	ON	2017/03/14 23:03
S38	2097	S35 and S36 and S37	USPAT	OR	ON	2017/03/14 23:03
S39	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S40	30324	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S41	483	S40 and S39	USPAT	OR	ON	2017/03/14 23:04
S42	9077739	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/14 23:04
S43	14	S42 and S41 and S38	USPAT	OR	ON	2017/03/14 23:04
S44	69138	((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3)with (sampl$3 resampl$3 filter$3)	USPAT	OR	ON	2017/03/15 12:44
S45	84268	motion$3 with (estimat$3 compnesat$4 determin$5)	USPAT	OR	ON	2017/03/15 13:06
S46	311	((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3) with (sampl$3 resampl$3 filter$3) with S45	USPAT	OR	ON	2017/03/15 13:06
S47	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S48	30324	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S49	483	S48 and S47	USPAT	OR	ON	2017/03/15 13:06
S50	9077739	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/15 13:06
S51	1	S50 and S49 and S46	USPAT	OR	ON	2017/03/15 13:06
S52	90	"375".clas. and h04n19/$.cpc. and S50 and S46	USPAT	OR	ON	2017/03/15 13:48
S53	89	S52 not S51	USPAT	OR	ON	2017/03/15 13:48
S54	1885	(horizontal$3 and vertical$3) with S45	USPAT	OR	ON	2017/03/15 13:49
S55	9	S54 and S49 and S50	USPAT	OR	ON	2017/03/15 13:49
S56	190148	(interpolat$4 extrapolat$4 downsampl$3 upsampl$3 resampl$3)	USPAT	OR	ON	2017/03/15 14:39

S57	5168	(horizontal$3 and vertical$3) with S56	USPAT	OR	ON	2017/03/15 14:39
S58	17	S57 and S49 and S50	USPAT	OR	ON	2017/03/15 14:40
S59	1	(US-8199812-$).did.	USPAT	OR	ON	2017/03/15 16:51
S60	1	S59 and motion$3 with compensat$4	USPAT	OR	ON	2017/03/15 16:51
S61	1	"20080165848"	USPAT	OR	ON	2017/03/15 16:54
S62	1	S59 and residu$3 with block	USPAT	OR	ON	2017/03/15 17:25
S63	1	S59 and residu$3 with block same (cod$3 encod$3 decod$3)	USPAT	OR	ON	2017/03/15 17:25
S66	1	S59 and reconstruct$3 with residu$3	USPAT	OR	ON	2017/03/15 22:26
S67	1	S59 and reconstruct$3 with block$3	USPAT	OR	ON	2017/03/15 22:27
S68	1	S59 and reconstruct$3	USPAT	OR	ON	2017/03/15 22:30
S69	1	"5614952".pn.	USPAT	OR	ON	2017/03/17 01:18
S70	31	(cod$3 encod$3 decod$3) and reconstruct$3 with (resampl$3 upsampl$3 downsampl$3) with ((horizontal$3 and vertical$3) 2D two with dimension$3 "2" with dimension$3)	USPAT	OR	ON	2017/03/17 01:30
S71	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S72	30369	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S73	483	S72 and S71	USPAT	OR	ON	2017/03/17 01:30
S74	9077741	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/17 01:30
S75	0	S73 and S74 and S70	USPAT	OR	ON	2017/03/17 01:30
S76	27	S74 and S70	USPAT	OR	ON	2017/03/17 01:31
S77	19	(horizontal$3 and vertical$3) with reconstruct$3 with (resampl$3 upsampl$3 downsampl$3)	USPAT	OR	ON	2017/03/17 01:35
S78	18	S77 and S74	USPAT	OR	ON	2017/03/17 01:35
S79	696	(horizontal$3 and vertical$3) with (resampl$3 upsampl$3 downsampl$3)	USPAT	OR	ON	2017/03/17 01:56
S80	39	(horizontal$3 and vertical$3) with (resampl$3 upsampl$3 downsampl$3) with referenc$3	USPAT	OR	ON	2017/03/17 01:56
S83	0	S80 and S74 and S73	USPAT	OR	ON	2017/03/17 01:57
S84	37	S80 and S74	USPAT	OR	ON	2017/03/17 01:57
S85	0	"20130003847"	USPAT	OR	ON	2017/03/17 13:28
S86	1	"20130003847"	US-PGPUB; USPAT	OR	ON	2017/03/17 13:29
S87	659	filter$3 with coefficient$3 with (horizontal$3 and vertical$3) and decod$3	USPAT	OR	ON	2017/03/17 15:17
S88	9077741	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
S89	2570	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
S90	30369	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2017/03/17 15:18
S91	270	S87 and S88 and (S89 S90)	USPAT	OR	ON	2017/03/17

						15:18
S92	98	filter$3 with coefficient$3 with (horizontal$3 and vertical$3) same decod$3	USPAT	OR	ON	2017/03/17 15:18
S94	43	S92 and S88 and (S89 S90)	USPAT	OR	ON	2017/03/17 15:18
S95	1	"20090175336"	USPAT	OR	ON	2017/03/17 15:23
S96	2	"20090175336"	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
S97	270	S87 and S88 and (S89 S90)	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
S98	43	S92 and S88 and (S89 S90)	US-PGPUB; USPAT	OR	ON	2017/03/17 15:24
S99	0	"20130003847"	USPAT	OR	ON	2017/03/18 12:48
S100	1	"20130003847"	US-PGPUB; USPAT	OR	ON	2017/03/18 12:48
S101	1	"8199812".pn.	US-PGPUB; USPAT	OR	ON	2017/03/18 13:19
S102	1678	singl$3 with vertical with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:35
S103	2210	singl$3 with (vertical horizontal) with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:35
S104	819	singl$3 with (vertical and horizontal) with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:36
S105	6	motion$3 with singl$3 with (vertical and horizontal) with filter$3	US-PGPUB; USPAT	OR	ON	2017/09/20 13:36
S106	1	(US-8199812-$).did.	USPAT	OR	ON	2017/09/28 22:53
S107	1	S106 and interpolat$3 with referenc$3	US-PGPUB; USPAT	OR	ON	2017/09/28 22:54
S108	1	S106 and interpolat$3 with motion$3	US-PGPUB; USPAT	OR	ON	2017/09/28 22:57
S109	1	S106 and referenc$3 with (block$3 fram$3)	US-PGPUB; USPAT	OR	ON	2017/09/28 23:09
S110	0	(horizontal$3 same vertical$3) with motion$3 with (resampl$3 with reconstruct$3)	USPAT	OR	ON	2018/02/22 13:21
S111	0	(horizontal$3 same vertical$3) with motion$3 with (resampl$3 with reconstruct$3) and filter$3	USPAT	OR	ON	2018/02/22 13:21
S112	1	(horizontal$3 same vertical$3) with motion$3 with (resampl$3 with reconstruct$3) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:22
S113	6	(horizontal$3 same vertical$3) same motion$3 same (resampl$3 with reconstruct$3) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:22
S114	6	(horizontal$3 same vertical$3) same motion$3 same (resampl$3 with reconstruct$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:22
S115	255	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3) and reconstruct$3) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:23
S116	3241	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3	US-PGPUB; USPAT	OR	ON	2018/02/22 13:23
S117	322	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 and vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:25
S118	323	(horizontal$3 and vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 and vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:25
S119	300	(horizontal$3 with vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 and vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:26
S120	313	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3 downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 same vertical$3) same pixel$3)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:26
S121	131	(horizontal$3 same vertical$3) same motion$3 same ((upsampl$3	US-PGPUB;	OR	ON	2018/02/22

		downsampl$3 resampl$3 sampl$3)) and filter$3 with ((horizontal$3 same vertical$3) same pixel$3 same motion$3)	USPAT			13:27
S122	2580	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/02/22 13:28
S123	33269	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/02/22 13:28
S124	81	S121 and (S122 S123)	US-PGPUB; USPAT	OR	ON	2018/02/22 13:28
S125	4486	referenc$3 with motion$3 with (horizontal$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 18:56
S126	5542	referenc$3 with motion$3 with (vertical$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 18:57
S127	107684	(sampl$3 resampl$3) same (construct$3 reconstruct$3)	USPAT	OR	ON	2018/03/28 18:58
S128	330	S125 and S126 and S127	USPAT	OR	ON	2018/03/28 18:58
S129	9098368	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/03/28 18:58
S130	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/03/28 18:58
S131	33534	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/03/28 18:58
S132	42	S128 and S129 and (S130 S131)	USPAT	OR	ON	2018/03/28 18:58
S133	1510	filter$3 with motion$3 with (horizontal$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 19:07
S134	1899	filter$3 with motion$3 with (vertical$3)	US-PGPUB; USPAT	OR	ON	2018/03/28 19:07
S135	131	S133 and S134 and S127	USPAT	OR	ON	2018/03/28 19:07
S136	41	S135 and S129 and (S130 S131)	USPAT	OR	ON	2018/03/28 19:07
S137	947	(one with dimension$3) with filter$3 with horizontal$3	USPAT	OR	ON	2018/03/28 20:12
S138	987	(one with dimension$3) with filter$3 with vertical$3	USPAT	OR	ON	2018/03/28 20:12
S139	102	S137 and S138 and S127	USPAT	OR	ON	2018/03/28 20:12
S140	25	S139 and S129 and (S130 S131)	USPAT	OR	ON	2018/03/28 20:12
S141	1	"20120082241"	USPAT	OR	ON	2018/03/28 20:13
S142	2	"20120082241"	US-PGPUB; USPAT	OR	ON	2018/03/28 20:52
S143	1988	(one with dimension$3) with filter$3 with horizontal$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/28 20:52
S144	2128	(one with dimension$3) with filter$3 with vertical$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/28 20:52
S145	107684	(sampl$3 resampl$3) same (construct$3 reconstruct$3)	USPAT	OR	ON	2018/03/29 15:08
S146	1989	(one with dimension$3) with filter$3 with horizontal$3	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2018/03/29 15:08

			EPO; JPO; DERWENT; IBM_TDB			
S147	2129	(one with dimension$3) with filter$3 with vertical$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:08
S148	102	S146 and S147 and S145	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:08
S149	9098369	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/03/29 15:09
S150	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/03/29 15:09
S151	33550	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/03/29 15:09
S152	25	S148 and S149 and (S150 S151)	USPAT	OR	ON	2018/03/29 15:09
S153	1	(US-9813738-$).did.	USPAT	OR	ON	2018/03/29 15:10
S154	25	S148 and S149 and (S150 S151)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:16
S155	119394	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:19
S156	4348	375/240.02,240.020.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:20
S157	9098369	@AD<"20120113"	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/29 15:21
S158	107684	(sampl$3 resampl$3) same (construct$3 reconstruct$3)	USPAT	OR	ON	2018/03/29 15:21
S159	1989	(one with dimension$3) with filter$3 with horizontal$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:21
S160	2129	(one with dimension$3) with filter$3 with vertical$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:21
S161	102	S159 and S160 and S158	US-PGPUB;	OR	ON	2018/03/29

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			15:21
S162	25	S161 and S157 and (S155 S156)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 15:21
S163	1	(US-8199812-$).did.	USPAT	OR	ON	2018/03/29 16:43
S164	1	S163 and referenc$3 with block$3	US-PGPUB; USPAT	OR	ON	2018/03/29 16:43
S165	1	S163 and bas$3 with block$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:16
S166	66882	filter$3 with (vertical$3)	US-PGPUB; USPAT	OR	ON	2018/03/29 17:28
S167	50939	filter$3 with (horizontal$3)	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S168	45962	filter$3 with motion$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S170	4884	filter$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S171	199	S166 and S167 and S168 and S170	US-PGPUB; USPAT	OR	ON	2018/03/29 17:29
S172	50	S171 and S157 and (S155 S156)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 17:30
S173	4191	filter$3 with motion$3 with interpolat$3	US-PGPUB; USPAT	OR	ON	2018/03/29 17:31
S174	84	S166 and S167 and S173 and S170	US-PGPUB; USPAT	OR	ON	2018/03/29 17:31
S175	12	S174 and S157 and (S155 S156)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 17:31
S176	290	filter$3 with motion$3 with interpolat$3 with horizontal$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:05
S177	425	filter$3 with motion$3 with interpolat$3 with vertical$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:05
S178	273	S176 and S177	US-PGPUB; USPAT	OR	ON	2018/03/29 20:05
S179	119394	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 20:06
S180	4348	375/240.02,240.020.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2018/03/29 20:06

			IBM_TDB			
S181	9098369	@AD<"20120113"	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/29 20:06
S182	106	S178 and S181 and (S179 S180)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 20:06
S183	2	filter$3 with motion$3 with interpolat$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:36
S184	59	filter$3 with motion$3 with interpolat$3 with vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:36
S185	2	S183 and S184	US-PGPUB; USPAT	OR	ON	2018/03/29 20:36
S186	182	filter$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:37
S187	251	filter$3 with vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/03/29 20:37
S188	2	S176 and S177 and S186 and S187	US-PGPUB; USPAT	OR	ON	2018/03/29 20:38
S189	158	S186 and S187	US-PGPUB; USPAT	OR	ON	2018/03/29 20:38
S190	35	S189 and S181 and (S179 S180)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/03/29 20:38
S191	2	filter$3 with motion$3 with interpolat$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/02 16:48
S192	965	motion$3 with interpolat$3 with horizontal$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:21
S193	1351	motion$3 with interpolat$3 with vertical$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:21
S194	182	filter$3 with horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:22
S195	251	filter$3 with vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 14:22
S196	2	S192 and S193 and S194 and S195	US-PGPUB; USPAT	OR	ON	2018/04/03 14:22
S197	540	horizontal$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:13
S198	646	vertical$3 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:13
S199	2	S192 and S193 and S197 and S198	US-PGPUB; USPAT	OR	ON	2018/04/03 15:14
S200	79946	motion$3 with horizontal$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S201	120994	motion$3 with vertical$3	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S202	74	S200 and S201 and S197 and S198	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S203	9098574	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S204	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S205	33569	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/04/03 15:41
S206	19	S202 and S203 and (S204 S205)	USPAT	OR	ON	2018/04/03

						15:41
S207	30	S202 and S203	USPAT	OR	ON	2018/04/03 17:43
S208	11	S207 not S206	USPAT	OR	ON	2018/04/03 17:43
S209	9	filter$3 with horizontal$3 with resampl$3 with motion$3	US-PGPUB; USPAT	OR	ON	2018/04/03 17:52
S210	66	filter$3 with vertical$3 with resampl$3 with motion$3	US-PGPUB; USPAT	OR	ON	2018/04/03 17:53
S211	6	S209 and S210 and S203	US-PGPUB; USPAT	OR	ON	2018/04/03 17:53
S212	148	S194 same S195	US-PGPUB; USPAT	OR	ON	2018/04/03 17:54
S213	27	S212 and S203 and (S204 S205)	USPAT	OR	ON	2018/04/03 17:54
S214	158	S194 and S195	US-PGPUB; USPAT	OR	ON	2018/04/03 18:09
S215	3	S214 and S203 and (S204 S205) not S213	USPAT	OR	ON	2018/04/03 18:09
S216	65	S214 and S203	USPAT	OR	ON	2018/04/03 18:10
S217	559	motion near2 compensation with horizontal$6 same3 motion near2 compensation with vertical$6 same3 interpolat$6	US-PGPUB; USPAT	OR	ON	2018/04/10 11:28
S218	9098784	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/04/10 11:29
S219	2581	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/04/10 11:29
S220	33631	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/04/10 11:29
S221	185	S217 and S218 and (S219 S220)	USPAT	OR	ON	2018/04/10 11:29

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2093	(("THOMSON") near3 ("LICENSING")).AANM.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:45
L2	91	(("BORDES") near3 ("Philippe")).INV.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:45
L3	35	(("ANDRIVON") near3 ("Pierre")).INV.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:45
L4	26	(("SALMON") near3 ("Philippe")).INV.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:45
L5	9104053	@AD<"20120113"	US-PGPUB; USPAT	OR	ON	2018/11/02 15:46
L6	35753	h04n19/117,105,146,172,176,423,439,44,523,59,80,82,152,159,33.cpc.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:46
L7	2585	375/240.02,240.020.ccls.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:46
L8	2667	motion$3 with compensat$3 with horizontal$3	US-PGPUB; USPAT	OR	ON	2018/11/02 15:47
L9	3500	motion$3 with compensat$3 with vertical$3	US-PGPUB; USPAT	OR	ON	2018/11/02 15:47

L11	6548	reconstruct$3 with block with residu$3	US-PGPUB; USPAT	OR	ON	2018/11/02 15:47
L12	64271	residu$3 with block$3	US-PGPUB; USPAT	OR	ON	2018/11/02 15:47
L13	123	vertical$3 with interpolat$4 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/11/02 15:48
L14	76	horizontal$3 with interpolat$4 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/11/02 15:48
L15	1	8 and 9 and 11 and 12 and 13 and 14	US-PGPUB; USPAT	OR	ON	2018/11/02 15:49
L16	1	8 same 9 same 11 same 12 same 13 same 14	US-PGPUB; USPAT	OR	ON	2018/11/02 15:49
L17	351	motion$3 with compensat$3 with horizontal$3.clm.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:49
L18	1	17 same 9 same 11 same 12 same 13 same 14	US-PGPUB; USPAT	OR	ON	2018/11/02 15:49
L19	76	horizontal$3 with interpolat$4 with resampl$3	US-PGPUB; USPAT	OR	ON	2018/11/02 15:54
L20	9	vertical$3 with interpolat$4 with resampl$3.clm.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:54
L21	6940	residu$3 with block$3.clm.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:54
L22	1220	reconstruct$3 with block with residu$3.clm.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:54
L23	564	motion$3 with compensat$3 with vertical$3.clm.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:54
L24	1	17 same 19 same 20 same 21 same 22 same 23	US-PGPUB; USPAT	OR	ON	2018/11/02 15:55
L25	170	motion$3 with compensat$3 with vertical$3 with pixel$3.clm.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:55
L26	132	motion$3 with compensat$3 with horizontal$3 with pixel$3.clm.	US-PGPUB; USPAT	OR	ON	2018/11/02 15:55
L27	0	26 same 19 same 20 same 21 same 22 same 25	US-PGPUB; USPAT	OR	ON	2018/11/02 15:56

11/ 2/ 2018 3:57:09 PM
C:\ Users\ jlee28\ Documents\ EAST\ Workspaces\ 14372021.wsp

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

157362 7590 11/14/2018

Brian J. Dorini
InterDigital Madison Patent Holdings
4 Research Way
3rd Floor
Princeton, NJ 08543

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	07/13/2014	Philippe Bordes	PF120006	8346

TITLE OF INVENTION: METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	02/14/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEE, JIMMY S	2486	375-240020

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 03-09 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 Tutunjian & Bitetto, P.C.
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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: INTERDIGITAL MADISON PATENT HOLDINGS

(B) RESIDENCE: (CITY and STATE OR COUNTRY): PARIS, FRANCE

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-1433

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

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
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.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date February 13, 2019

Typed or printed name John G. Tutunjian Registration No. 39,405

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	14372021
Filing Date:	13-Jul-2014
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Filer:	John George Tutunjian/Beth Robson
Attorney Docket Number:	PF120006

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt

EFS ID:	35135641
Application Number:	14372021
International Application Number:	
Confirmation Number:	8346
Title of Invention:	METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE
First Named Inventor/Applicant Name:	Philippe Bordes
Customer Number:	157362
Filer:	John George Tutunjian/Beth Robson
Filer Authorized By:	John George Tutunjian
Attorney Docket Number:	PF120006
Receipt Date:	13-FEB-2019
Filing Date:	13-JUL-2014
Time Stamp:	11:42:41
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	021319INTEFSW11435601
Deposit Account	501433
Authorized User	Beth Robson

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

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

37 CFR 1.492(a) (Basic national fee only)

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)	PF120006_Issue_Fee_Transmittal.pdf	125876 f8fbf5ccb3cc88581208f87238a7c850e196b20f	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:					
2	Fee Worksheet (SB06)	fee-info.pdf	30495 47d03b98ee070153abf23ab7c945458ec31f11ee	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	156371		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/372,021	04/02/2019	10250877	PF120006	8346

157362 7590 03/13/2019

Brian J. Dorini
InterDigital Madison Patent Holdings
4 Research Way
3rd Floor
Princeton, NJ 08543

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 862 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):

Philippe Bordes, Laille, FRANCE;
THOMSON LICENSING, Issy de Moulineaux, FRANCE;
Pierre Andrivon, Liffre, FRANCE;
Philippe Salmon, Saint Sulpice La Foret, FRANCE;

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www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
14/372,021	10250877	2486	9200

OC000000127602314

Correspondence Address/Fee Address Change

The following fields have been set to Customer Number 14868 on 08/10/2021

- **Correspondence Address**

The address of record for Customer Number 14868 is:

14868
Patent Docketing
200 Bellevue Parkway, Suite 300
Attention: Docketing
Wilmington, DE 19809

PTO/SB/44 (09-07)
Approved for use through 03/31/2023. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 10,250,877

APPLICATION NO.: 14/372,021

ISSUE DATE : April 2, 2019

INVENTOR(S) : Bordes, et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Page 2 Col. 2 (Other Publications)	Line 14	Delete "reslilience"," and insert --resilience",--".
Figure 7	Line 6	Delete "int(SXref" and insert --int(SXref--.
Figure 7	Line 7	Delete "Sxcur) - Xref" and insert --Sxcur) - Xref--.
Figure 11	Line 6	Delete "int(SXref" and insert --int(SXref--.
Col. 1	Line 6	Delete "365" and insert --371--
Col. 7	Line 57	Delete "MCIFy " and insert --MCIFV--.
Col. 7	Line 57	Delete "GFS" and insert --GFV--.
Col. 9	Line 48	Delete "GFS" and insert --GFV--.
Col. 10	Line 24	Delete "ITO" and insert --ITQ--.
Col. 11	Line 22	Delete "ITO" and insert --ITQ--.
Col. 11	Line 24	Delete "ITO" and insert --ITQ--.
Col. 11	Line 24	Delete "ITO" and insert --ITQ--.

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

Tutunjian & Bitetto, P.C.
401 Broadhollow Road, Suite 402
Melville, NY 11747

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 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: Attention Certificate of Corrections Branch, 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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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.
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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)).
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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.
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
14/372,021	01/13/2023 04:48:57 PM ET	PF120006

Title of Invention

METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

Application Information

APPLICATION TYPE	Utility - U.S. National Stage under 35 USC 371	PATENT #	10250877
CONFIRMATION #	8346	FILED BY	Fern Kuhner
PATENT CENTER #	61437191	AUTHORIZED BY	John Tutunjian
CUSTOMER #	14868	FILING DATE	07/13/2014
INTL. APPLICATION #	-	INTL. FILING DATE	-
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Philippe Bordes

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 7008	E20231CG49340089	Fern Kuhner

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
501433	37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post Issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges); 37 CFR 1.492 (National application filing, search, and examination fees)

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1811	CERTIFICATE OF CORRECTION	160.00	1	160.00
			TOTAL AMOUNT:	$160.00

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

described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

P.O. Box 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

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CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	John Tutunjian

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2012P0008WOUS_COC.pdf	2	Request for Certificate of Correction	174 KB
2012P0008WOUS_COC_Transmittal.pdf	1	Transmittal Letter	20 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)

2012P0008WOUS_COC.pdf	52BA0ADAC21A9917DC9BF26EF942B844C9AEE32C5DEABEE0641427826B84767C65CA384FB629A4106230F572A214DF7CB9F362DC1F7D93AC5B5FBC63A866D9C7
2012P0008WOUS_COC_Transmittal.pdf	CEFB04E54F50A994C89B2F74D5D09D73F5D7E23260E42DC6960162B8E81FCD565B85F70603BE664DE843C3D06DF98004B81359CE546CE0084AD861A382ED6E13

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Philippe Bordes, et. al.

Ser. No.: 14/372,021

Filed: July 13, 2014

For: METHOD AND DEVICE FOR CODING AN IMAGE BLOCK, CORRESPONDING DECODING METHOD AND DECODING DEVICE

Examiner: Jimmy S. Lee

Art Unit: 2486

Customer No.: 147897

CERTIFICATE OF CORRECTION

Commissioner for Patents
Office of Data Management Attention: Certificates of Correction Branch
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant submits herewith USPTO form PTO/SB/44 to correct typographical errors in Letters Patent No. 10,250,877 in connection with the above-identified application.

The Director is hereby authorized to charge any fee(s) deemed necessary to Deposit Account No 50-1433.

Respectfully submitted,

/John G. Tutunjian/
Attorney for Applicant
John G. Tutunjian, Esq.
(Reg. No. 39,405)

401 Broadhollow Road, Suite 402
Melville, NY 11747
(631) 844-0080
Dated: January 13, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 10,250,877 B2
APPLICATION NO. : 14/372021
DATED : April 2, 2019
INVENTOR(S) : Bordes et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page

Item (56) Page 2 Column 2 (Other Publications) Line 14 Delete "reslilience"," and insert --resilience",--.

In the Drawings

Figure 7 and on the Title Page, the illustrative figure, Line 6 Delete "int(SXref" and insert --int(SXref--.

Figure 7 and on the Title Page, the illustrative figure, Line 7 Delete "Sxcur) - Xref" and insert --Sxcur) - Xref--.

Figure 11 Line 6 Delete "int(SXref" and insert --int(SXref--.

In the Specification

Column 1 Line 6 Delete "365" and insert --371--.

Column 7 Line 57 Delete "MCIFy" and insert --MCIFV--.

Column 7 Line 57 Delete "GFS" and insert --GFV--.

Column 9 Line 48 Delete "GFS" and insert --GFV--.

Column 10 Line 24 Delete "ITO" and insert --ITQ--.

Column 11 Line 22 Delete "ITO" and insert --ITQ--.

Signed and Sealed this
Seventh Day of February, 2023

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office

Column 11 Line 24 Delete “ITO” and insert --ITQ--.

Column 11 Line 24 Delete “ITO” and insert --ITQ--.

AO 120 (Rev. 08/10)

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

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

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

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
5:23-CV-493-FL	9/1/2023	Eastern District of North Carolina

PLAINTIFF	DEFENDANT
IntrDigital, Inc. et al	Lenovo Group Limited et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,250,877 B2	4/2/2019	Interdigital Madison Patent Holdings
2	8,674,859 B2	3/18/2014	Thomson Licensing
3	9,674,556 B2	6/6/2017	Thomson Licensing
4	9,173,054 B2	10/27/2015	IntrDigital Patent Holdings, Inc.
5	8,737,933 B2	5/27/2014	Interigital Patent Holdings, Inc.

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

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

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

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Peter A. Moore, Jr., Clerk of Court	Donna Rucker	9/1/2023

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