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

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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

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

Application Number	TO BE ASSIGNED
Filing Date	Concurrently Herewith
First Named Inventor	Mehmet Oguz BICI et al.
Title	METHOD FOR CODING AND AN APPARATUS
Art Unit	
Examiner Name	
Attorney Docket Number	042933/501133

SIGNATURE of Applicant or Patent Practitioner

Signature	/Guy R. Gosnell/	Date (Optional)	08/21/2017
Name	Guy R. Gosnell	Registration Number	34,610
Title (if Applicant is a juristic entity)	Patent Practitioner		
Applicant Name (if Applicant is a juristic entity)	NOKIA TECHNOLOGIES OY		

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

☐ *Total of _____ forms are submitted.

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

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

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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

(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: 10949

OR

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

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

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

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

NOKIA TECHNOLOGIES OY

☐ 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	[signature]	Date (Optional)	23 January 2015
Name	Director, [illegible]		
Title	Legal and [illegible] Property		

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

☐ Total of forms are submitted.

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

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Jukka Nihtilä
Head, Business Development
Legal & IP

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Filer:	Guy Randall Gosnell/Jan Snider
Attorney Docket Number:	042933/501133

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	10	80	800
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	3	420	1260
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**3660**

Electronic Acknowledgement Receipt	
EFS ID:	30134458
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jan Snider
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	21-AUG-2017
Filing Date:	
Time Stamp:	14:10:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$3660
RAM confirmation Number	082217INTEFSW00000366160605
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	501133_ADS.PDF	1823125 276a150cd441c77925e251aec8fa0763ce09c536	no	9
Warnings:					
Information:					
2		501133_Application.pdf	292402 0d3d2223734a68ad0185fdc36d89f9340313e5e1	yes	58

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	44
	Claims	45	57
	Abstract	58	58

Warnings:					
Information:					
3	Drawings-only black and white line drawings	501133_Drawings.pdf	257901 68dce893aba7cd5c3f4f434c98400f743bcf0ede	no	13
Warnings:					
Information:					
4	Oath or Declaration filed	501133_Declaration.PDF	327213 73b74c8a6c4c004618a63bdc3ee8f3791f1e987e	no	3
Warnings:					
Information:					
5	Power of Attorney	501133_POA.pdf	546249 0d362f6e98aa71f7b1dd5c1d371705c1d6ff437e	no	2

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	38137 dfd0dd5a9235d1a61c73f6b30b1a1d16a20d1693	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3285027		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	042933/501133
	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

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.

Secrecy Order 37 CFR 5.2:

☐ 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
	Mehmet	Oguz	BICI	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Tampere	Country of Residence [i]	FI

Mailing Address of Inventor:

Address 1	Tammelan puistokatu 1-3 D 46
Address 2	

City	Tampere	State/Province	
Postal Code	33500	Country [i]	FI

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jani		LAINEMA	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Tampere	Country of Residence [i]	FI

Mailing Address of Inventor:

Address 1	Kisakentankatu 12 B 6
Address 2	

City	Tampere	State/Province	
Postal Code	33230	Country [i]	FI

Inventor 3 Remove

Legal Name

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	042933/501133
	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kemal		UGUR	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Tampere	Country of Residence [i]	FI

Mailing Address of Inventor:

Address 1	Lapintie 6D 25		
Address 2			
City	Tampere	**State/Province**	
Postal Code	33100	**Country** [i]	FI

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	10949		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	METHOD FOR CODING AND AN APPARATUS		
Attorney Docket Number	042933/501133	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	13	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country [i]

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	042933/501133
	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

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:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	10949		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15/426822	2017-02-07
Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15/426822	Continuation of	13/666680	2012-11-01
Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/666680	Claims benefit of provisional	61/555703	2011-11-04

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	042933/501133
	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	042933/501133
	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	042933/501133
	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	NOKIA TECHNOLOGIES OY		
Mailing Address Information For Applicant:			
Address 1	Karaportti 3		
Address 2			
City	Espoo	**State/Province**	
Country	FI	Postal Code	02610
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	042933/501133
	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Guy R. Gosnell/			Date (YYYY-MM-DD)	2017-08-21
First Name	Guy	Last Name	Gosnell	Registration Number	34,610

Additional Signature may be generated within this form by selecting the Add button. Add

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	Application Number	
Title of Invention	METHOD FOR CODING AND AN APPARATUS	

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METHOD FOR CODING AND AN APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Application No. 15/426,822, filed February 7, 2017, which is a continuation of U.S. Application No. 13/666,680, filed November 1, 2012, which claims priority to U.S. Provisional Application No. 61/555,703, filed November 4, 2011, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] There is provided a method for encoding, a method for decoding, an apparatus, computer program products, an encoder and a decoder.

BACKGROUND INFORMATION

[0003] This section is intended to provide a background or context to the invention that is recited in the claims. The description herein may include concepts that could be pursued, but are not necessarily ones that have been previously conceived or pursued. Therefore, unless otherwise indicated herein, what is described in this section is not prior art to the description and claims in this application and is not admitted to be prior art by inclusion in this section

[0004] A video codec may comprise an encoder which transforms input video into a compressed representation suitable for storage and/or transmission and a decoder that can uncompress the compressed video representation back into a viewable form, or either one of them. The encoder may discard some information in the original video sequence in order to represent the video in a more compact form, for example at a lower bit rate.

[0005] Many hybrid video codecs, operating for example according to the International Telecommunication Union's ITU-T H.263 and H.264 coding standards, encode video information in two phases. In the first phase, pixel values in a certain picture area or "block" are predicted. These pixel values can be predicted, for example, by motion compensation mechanisms, which involve finding and indicating an area in one of the previously encoded video frames (or a later coded video frame) that corresponds closely to the block being coded. Additionally, pixel values can be predicted by spatial mechanisms which involve finding and indicating a spatial region relationship, for example by using pixel values around the block to be coded in a specified manner.

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[0006] Prediction approaches using image information from a previous (or a later) image can also be called as Inter prediction methods, and prediction approaches using image information within the same image can also be called as Intra prediction methods.

[0007] The second phase is one of coding the error between the predicted block of pixels and the original block of pixels. This may be accomplished by transforming the difference in pixel values using a specified transform. This transform may be e.g. a Discrete Cosine Transform (DCT) or a variant thereof. After transforming the difference, the transformed difference may be quantized and entropy encoded.

[0008] By varying the fidelity of the quantization process, the encoder can control the balance between the accuracy of the pixel representation, (in other words, the quality of the picture) and the size of the resulting encoded video representation (in other words, the file size or transmission bit rate).

[0009] The decoder reconstructs the output video by applying a prediction mechanism similar to that used by the encoder in order to form a predicted representation of the pixel blocks (using the motion or spatial information created by the encoder and stored in the compressed representation of the image) and prediction error decoding (the inverse operation of the prediction error coding to recover the quantized prediction error signal in the spatial domain).

[0010] After applying pixel prediction and error decoding processes the decoder combines the prediction and the prediction error signals (the pixel values) to form the output video frame.

[0011] The decoder (and encoder) may also apply additional filtering processes in order to improve the quality of the output video before passing it for display and/or storing as a prediction reference for the forthcoming frames in the video sequence.

[0012] In some video codecs, such as High Efficiency Video Coding Working Draft 4, video pictures may be divided into coding units (CU) covering the area of a picture. A coding unit consists of one or more prediction units (PU) defining the prediction process for the samples within the coding unit and one or more transform units (TU) defining the prediction error coding process for the samples in the coding unit. A coding unit may consist of a square block of samples with a size selectable from a predefined set of possible coding unit sizes. A coding unit with the maximum allowed size can be named as a largest coding unit (LCU) and the video picture may be divided into non-overlapping largest coding units. A largest coding unit can further be split into a combination of smaller coding units, e.g. by recursively splitting the largest

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coding unit and resultant coding units. Each resulting coding unit may have at least one prediction unit and at least one transform unit associated with it. Each prediction unit and transform unit can further be split into smaller prediction units and transform units in order to increase granularity of the prediction and prediction error coding processes, respectively. Each prediction unit may have prediction information associated with it defining what kind of a prediction is to be applied for the pixels within that prediction unit (e.g. motion vector information for inter predicted prediction units and intra prediction directionality information for intra predicted prediction units). Similarly, each transform unit may be associated with information describing the prediction error decoding process for samples within the transform unit (including e.g. discrete cosine transform (DCT) coefficient information). It may be signalled at coding unit level whether prediction error coding is applied or not for each coding unit. In the case there is no prediction error residual associated with the coding unit, it can be considered there are no transform units for the coding unit. The division of the image into coding units, and division of coding units into prediction units and transform units may be signalled in the bitstream allowing the decoder to reproduce the intended structure of these units.

[0013] In some video codecs, motion information is indicated by motion vectors associated with each motion compensated image block. These motion vectors represent the displacement of the image block in the picture to be coded (in the encoder) or decoded (at the decoder) and the prediction source block in one of the previously coded or decoded images (or pictures). In order to represent motion vectors efficiently, motion vectors may be coded differentially with respect to block specific predicted motion vector. In some video codecs, the predicted motion vectors are created in a predefined way, for example by calculating the median of the encoded or decoded motion vectors of the adjacent blocks.

[0014] Another way to create motion vector predictions is to generate a list or a set of candidate predictions from blocks in the current frame and/or co-located or other blocks in temporal reference pictures and signalling the chosen candidate as the motion vector prediction. A spatial motion vector prediction is a prediction obtained only on the basis of information of one or more blocks of the same frame than the current frame whereas temporal motion vector prediction is a prediction obtained on the basis of information of one or more blocks of a frame different from the current frame. It may also be possible to obtain motion vector predictions by

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combining both spatial and temporal prediction information of one or more encoded blocks. These kinds of motion vector predictions are called as spatio-temporal motion vector predictions.

[0015] In addition to predicting the motion vector values, the reference index in the reference picture list can be predicted. The reference index may be predicted from blocks in the current frame and/or co-located or other blocks in a temporal reference picture. Moreover, some high efficiency video codecs employ an additional motion information coding/decoding mechanism, often called merging/merge mode, where all the motion field information, which includes motion vector and corresponding reference picture index for each available reference picture list, may be predicted and used without any modification or correction. Similarly, predicting the motion field information may be carried out using the motion field information of blocks in the current frame and/or co-located or other blocks in temporal reference pictures and the used motion field information is signalled among a list of motion field candidate list filled with motion field information of available blocks in the current frame and/or co-located or other blocks in temporal reference pictures.

[0016] In some video codecs the prediction residual after motion compensation is first transformed with a transform kernel (like DCT) and then coded. The reason for this is that often there still exists some correlation among the residual and transform can in many cases help reduce this correlation and provide more efficient coding.

[0017] Some video encoders utilize Lagrangian cost functions to find optimal coding modes, e.g. the desired Macroblock mode and associated motion vectors. This kind of cost function uses a weighting factor λ to tie together the (exact or estimated) image distortion due to lossy coding methods and the (exact or estimated) amount of information that is required to represent the pixel values in an image area:

$$\text{lects th}\lambda\, R \qquad (1)$$

where C is the Lagrangian cost to be minimized, D is the image distortion (e.g. Mean Squared Error) with the mode and motion vectors considered, and R the number of bits needed to represent the required data to reconstruct the image block in the decoder (including the amount of data to represent the candidate motion vectors).

[0018] Some video codecs such as hybrid video codecs may generate a list of motion vector predictions (MVP) consisting of motion vectors of spatial adjacent blocks (spatial MVP) and/or motion vectors of blocks in a previously decoded frame (temporal MVP). One of the candidate

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motion vectors in the list is signalled to be used as the motion vector prediction of the current block. After the list is generated, some of the motion vector prediction candidates may have the same motion information. In this case, the identical motion vector prediction candidates may be removed to reduce redundancy. During the decoding, if the temporal motion vector prediction information is unavailable due to e.g. loss of reference frame, the decoder may not know if the temporal motion vector prediction candidate in the list is to be removed. This may lead to uncertainty for mapping the decoded candidate index to the candidates whose removal decision is based on comparing motion information with the temporal motion vector prediction. As a result, false assignment of motion vector prediction candidates may occur which may lead to degradation in the picture quality and drift of false motion information throughout the decoding process.

SUMMARY

[0019] The present invention introduces a method for generating a motion vector prediction list for an image block. In some embodiments video codecs employ in a motion prediction candidate list construction a way to reduce the complexity of the implementation. This can be achieved by performing a limited number of motion information comparisons between candidate pairs to remove the redundant candidates rather than comparing every available candidate pair. The decision of whether comparing two candidates may depend on the order of the candidates to be considered for the list and/or coding/prediction mode and/or location of the blocks associated with the candidates. In some embodiments a video codec employs a merge process for motion information coding and creates a list of motion prediction candidates from which one of the candidates is to be signalled as the motion information for the current coding or prediction unit. The motion prediction candidates may consist of several spatial motion predictions and a temporal motion prediction. The spatial candidates are obtained from the motion information of e.g. spatial neighbour blocks.

[0020] According to a first aspect of the present invention there is provided a method comprising:

receiving a block of pixels including a prediction unit; determining a set of spatial motion vector prediction candidates for the block of pixels; the spatial motion vector prediction candidates being provided with motion information;

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selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[0021] According to a second aspect of the present invention there is provided a method comprising:

receiving an encoded block of pixels including a prediction unit;

determining a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[0022] According to a third aspect of the present invention there is provided an apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to:

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receive a block of pixels

including a prediction unit;

determining a set of spatial motion vector prediction candidates for the block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[0023] According to a fourth aspect of the present invention there is provided an apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to:

receive an encoded block of pixels

including a prediction unit;

determining a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates;

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if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[0024] According to a fifth aspect of the present invention there is provided a storage medium having stored thereon a computer executable program code for use by an encoder, said program code comprises instructions for:

receiving a block of pixels including a prediction unit;

determining a set of spatial motion vector prediction candidates for the block of pixels; the spatial motion vector prediction candidates being provided with motion information;

select a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determine a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

exclude the first spatial motion vector prediction candidate from the merge list, if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other

[0025] According to a sixth aspect of the present invention there is provided a storage medium having stored thereon a computer executable program code for use by a decoder, said program code comprises instructions for:

receiving an encoded block of pixels including a prediction unit;

determining a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

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determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[0026] According to a seventh aspect of the present invention there is provided an apparatus comprising:

means for receiving a block of pixels including a prediction unit;

means for determining a set of spatial motion vector prediction candidates for the block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[0027] According to an eighth aspect of the present invention there is provided an apparatus comprising:

means for receiving an encoded block of pixels including a prediction unit;

means for determining a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

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means for selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

means for determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

means for comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

means for excluding the first spatial motion vector prediction candidate from the merge list, if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other.

DESCRIPTION OF THE DRAWINGS

[0028] For better understanding of the present invention, reference will now be made by way of example to the accompanying drawings in which:

[0029] Figure 1 shows schematically an electronic device employing some embodiments of the invention;

[0030] Figure 2 shows schematically a user equipment suitable for employing some embodiments of the invention;

[0031] Figure 3 further shows schematically electronic devices employing embodiments of the invention connected using wireless and wired network connections;

[0032] Figure 4a shows schematically an embodiment of the invention as incorporated within an encoder;

[0033] Figure 4b shows schematically an embodiment of a prediction reference list generation and modification according to some embodiments of the invention;

[0034] Figures 5a and 5b show a flow diagram showing the operation of an embodiment of the invention with respect to the encoder as shown in figure 4a;

[0035] Figure 6a illustrates an example of spatial and temporal prediction of a prediction unit;

[0036] Figure 6b illustrates another example of spatial and temporal prediction of a prediction unit;

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[0037] Figure 7 shows schematically an embodiment of the invention as incorporated within a decoder;

[0038] Figures 8a and 8b show a flow diagram of showing the operation of an embodiment of the invention with respect to the decoder shown in figure 7;

[0039] Figure 9 illustrates an example of a coding unit and some neighbour blocks of the coding unit;

[0040] Figure 10a illustrates an example of a horizontal division of the coding unit;

[0041] Figure 10b illustrates an example of a vertical division of the coding unit;

[0042] Figure 11a illustrates locations of five spatial neighbours A0, A1, B0, B1, B2 for a prediction unit generated as the second prediction unit of a horizontally divided coding unit;

[0043] Figure 11b illustrates locations of five spatial neighbours for a prediction unit generated as the second prediction unit of a vertically divided coding unit; and

[0044] Figure 12 illustrates an example of blocks between some spatial neighbours of a coding unit.

DETAILED DESCRIPTION OF SOME EXAMPLE EMBODIMENTS

[0045] The following describes in further detail suitable apparatus and possible mechanisms for the provision of improving the prediction accuracy and hence possibly reducing information to be transmitted in video coding systems. In this regard reference is first made to Figure 1 which shows a schematic block diagram of an exemplary apparatus or electronic device 50, which may incorporate a codec according to an embodiment of the invention.

[0046] The electronic device 50 may for example be a mobile terminal or user equipment of a wireless communication system. However, it would be appreciated that embodiments of the invention may be implemented within any electronic device or apparatus which may require encoding and decoding or encoding or decoding video images.

[0047] The apparatus 50 may comprise a housing 30 for incorporating and protecting the device. The apparatus 50 further may comprise a display 32 in the form of a liquid crystal display. In other embodiments of the invention the display may be any suitable display technology suitable to display an image or video. The apparatus 50 may further comprise a keypad 34. In other embodiments of the invention any suitable data or user interface mechanism may be employed. For example the user interface may be implemented as a virtual keyboard or

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data entry system as part of a touch-sensitive display. The apparatus may comprise a microphone 36 or any suitable audio input which may be a digital or analogue signal input. The apparatus 50 may further comprise an audio output device which in embodiments of the invention may be any one of: an earpiece 38, speaker, or an analogue audio or digital audio output connection. The apparatus 50 may also comprise a battery 40 (or in other embodiments of the invention the device may be powered by any suitable mobile energy device such as solar cell, fuel cell or clockwork generator). The apparatus may further comprise an infrared port 42 for short range line of sight communication to other devices. In other embodiments the apparatus 50 may further comprise any suitable short range communication solution such as for example a Bluetooth wireless connection or a USB/firewire wired connection.

[0048] The apparatus 50 may comprise a controller 56 or processor for controlling the apparatus 50. The controller 56 may be connected to memory 58 which in embodiments of the invention may store both data in the form of image and audio data and/or may also store instructions for implementation on the controller 56. The controller 56 may further be connected to codec circuitry 54 suitable for carrying out coding and decoding of audio and/or video data or assisting in coding and decoding carried out by the controller 56.

[0049] The apparatus 50 may further comprise a card reader 48 and a smart card 46, for example a UICC and UICC reader for providing user information and being suitable for providing authentication information for authentication and authorization of the user at a network.

[0050] The apparatus 50 may comprise radio interface circuitry 52 connected to the controller and suitable for generating wireless communication signals for example for communication with a cellular communications network, a wireless communications system or a wireless local area network. The apparatus 50 may further comprise an antenna 44 connected to the radio interface circuitry 52 for transmitting radio frequency signals generated at the radio interface circuitry 52 to other apparatus(es) and for receiving radio frequency signals from other apparatus(es).

[0051] In some embodiments of the invention, the apparatus 50 comprises a camera capable of recording or detecting individual frames which are then passed to the codec 54 or controller for processing. In some embodiments of the invention, the apparatus may receive the video image data for processing from another device prior to transmission and/or storage. In some

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embodiments of the invention, the apparatus 50 may receive either wirelessly or by a wired connection the image for coding/decoding.

[0052] With respect to Figure 3, an example of a system within which embodiments of the present invention can be utilized is shown. The system 10 comprises multiple communication devices which can communicate through one or more networks. The system 10 may comprise any combination of wired or wireless networks including, but not limited to a wireless cellular telephone network (such as a GSM, UMTS, CDMA network etc), a wireless local area network (WLAN) such as defined by any of the IEEE 802.x standards, a Bluetooth personal area network, an Ethernet local area network, a token ring local area network, a wide area network, and the Internet.

[0053] The system 10 may include both wired and wireless communication devices or apparatus 50 suitable for implementing embodiments of the invention.

[0054] For example, the system shown in Figure 3 shows a mobile telephone network 11 and a representation of the internet 28. Connectivity to the internet 28 may include, but is not limited to, long range wireless connections, short range wireless connections, and various wired connections including, but not limited to, telephone lines, cable lines, power lines, and similar communication pathways.

[0055] The example communication devices shown in the system 10 may include, but are not limited to, an electronic device or apparatus 50, a combination of a personal digital assistant (PDA) and a mobile telephone 14, a PDA 16, an integrated messaging device (IMD) 18, a desktop computer 20, a notebook computer 22. The apparatus 50 may be stationary or mobile when carried by an individual who is moving. The apparatus 50 may also be located in a mode of transport including, but not limited to, a car, a truck, a taxi, a bus, a train, a boat, an airplane, a bicycle, a motorcycle or any similar suitable mode of transport.

[0056] Some or further apparatuses may send and receive calls and messages and communicate with service providers through a wireless connection 25 to a base station 24. The base station 24 may be connected to a network server 26 that allows communication between the mobile telephone network 11 and the internet 28. The system may include additional communication devices and communication devices of various types.

[0057] The communication devices may communicate using various transmission technologies including, but not limited to, code division multiple access (CDMA), global

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systems for mobile communications (GSM), universal mobile telecommunications system (UMTS), time divisional multiple access (TDMA), frequency division multiple access (FDMA), transmission control protocol-internet protocol (TCP-IP), short messaging service (SMS), multimedia messaging service (MMS), email, instant messaging service (IMS), Bluetooth, IEEE 802.11 and any similar wireless communication technology. A communications device involved in implementing various embodiments of the present invention may communicate using various media including, but not limited to, radio, infrared, laser, cable connections, and any suitable connection.

[0058] With respect to Figure 4a, a block diagram of a video encoder suitable for carrying out embodiments of the invention is shown. Furthermore, with respect to Figures 5a and 5b, the operation of the encoder exemplifying embodiments of the invention specifically with respect to construction of the list of candidate predictions is shown as a flow diagram.

[0059] Figure 4a shows the encoder as comprising a pixel predictor 302, prediction error encoder 303 and prediction error decoder 304. Figure 4a also shows an embodiment of the pixel predictor 302 as comprising an inter-predictor 306, an intra-predictor 308, a mode selector 310, a filter 316, and a reference frame memory 318. In this embodiment the mode selector 310 comprises a block processor 381 and a cost evaluator 382. The encoder may further comprise an entropy encoder 330 for entropy encoding the bit stream.

[0060] Figure 4b depicts an embodiment of the inter predictor 306. The inter predictor 306 comprises a reference frame selector 360 for selecting reference frame or frames, a motion vector definer 361, a prediction list modifier 363 and a motion vector selector 364. These elements or some of them may be part of a prediction processor 362 or they may be implemented by using other means.

[0061] The pixel predictor 302 receives the image 300 to be encoded at both the inter-predictor 306 (which determines the difference between the image and a motion compensated reference frame 318) and the intra-predictor 308 (which determines a prediction for an image block based only on the already processed parts of the current frame or picture). The output of both the inter-predictor and the intra-predictor may be passed to the mode selector 310. The intra-predictor 308 may have more than one intra-prediction modes. Hence, each mode may perform the intra-prediction and provide the predicted signal to the mode selector 310. The mode selector 310 also receives a copy of the image 300.

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[0062] The mode selector 310 determines which encoding mode to use to encode the current block. If the mode selector 310 decides to use an inter-prediction mode it will pass the output of the inter-predictor 306 to the output of the mode selector 310. If the mode selector 310 decides to use an intra-prediction mode it will pass the output of one of the intra-predictor modes to the output of the mode selector 310.

[0063] The output of the mode selector is passed to a first summing device 321. The first summing device may subtract the pixel predictor 302 output from the image 300 to produce a first prediction error signal 320 which is input to the prediction error encoder 303.

[0064] The pixel predictor 302 further receives from a preliminary reconstructor 339 the combination of the prediction representation of the image block 312 and the output 338 of the prediction error decoder 304. The preliminary reconstructed image 314 may be passed to the intra-predictor 308 and to a filter 316. The filter 316 receiving the preliminary representation may filter the preliminary representation and output a final reconstructed image 340 which may be saved in a reference frame memory 318. The reference frame memory 318 may be connected to the inter-predictor 306 to be used as the reference image against which the future image 300 is compared in inter-prediction operations.

[0065] The operation of the pixel predictor 302 may be configured to carry out any known pixel prediction algorithm known in the art.

[0066] The pixel predictor 302 may also comprise a filter 385 to filter the predicted values before outputting them from the pixel predictor 302.

[0067] The operation of the prediction error encoder 302 and prediction error decoder 304 will be described hereafter in further detail. In the following examples the encoder generates images in terms of 16x16 pixel macroblocks which go to form the full image or picture. Thus, for the following examples the pixel predictor 302 outputs a series of predicted macroblocks of size 16x16 pixels and the first summing device 321 outputs a series of 16x16 pixel residual data macroblocks which may represent the difference between a first macro-block in the image 300 against a predicted macro-block (output of pixel predictor 302). It would be appreciated that other size macro blocks may be used.

[0068] The prediction error encoder 303 comprises a transform block 342 and a quantizer 344. The transform block 342 transforms the first prediction error signal 320 to a transform

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domain. The transform is, for example, the DCT transform. The quantizer 344 quantizes the transform domain signal, e.g. the DCT coefficients, to form quantized coefficients.

[0069] The prediction error decoder 304 receives the output from the prediction error encoder 303 and performs the opposite processes of the prediction error encoder 303 to produce a decoded prediction error signal 338 which when combined with the prediction representation of the image block 312 at the second summing device 339 produces the preliminary reconstructed image 314. The prediction error decoder may be considered to comprise a dequantizer 346, which dequantizes the quantized coefficient values, e.g. DCT coefficients, to reconstruct the transform signal and an inverse transformation block 348, which performs the inverse transformation to the reconstructed transform signal wherein the output of the inverse transformation block 348 contains reconstructed block(s). The prediction error decoder may also comprise a macroblock filter (not shown) which may filter the reconstructed macroblock according to further decoded information and filter parameters.

[0070] In the following the operation of an example embodiment of the inter predictor 306 will be described in more detail. The inter predictor 306 receives the current block for inter prediction. It is assumed that for the current block there already exists one or more neighbouring blocks which have been encoded and motion vectors have been defined for them. For example, the block on the left side and/or the block above the current block may be such blocks. Spatial motion vector predictions for the current block can be formed e.g. by using the motion vectors of the encoded neighbouring blocks and/or of non-neighbour blocks in the same slice or frame, using linear or non-linear functions of spatial motion vector predictions, using a combination of various spatial motion vector predictors with linear or non-linear operations, or by any other appropriate means that do not make use of temporal reference information. It may also be possible to obtain motion vector predictors by combining both spatial and temporal prediction information of one or more encoded blocks. These kinds of motion vector predictors may also be called as spatio-temporal motion vector predictors.

[0071] Reference frames used in encoding the neighbouring blocks have been stored to the reference frame memory 404. The reference frames may be short term references or long term references and each reference frame may have a unique index indicative of the location of the reference frame in the reference frame memory. When a reference frame is no longer used as a reference frame it may be removed from the reference frame memory or marked as a non-

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reference frame wherein the storage location of that reference frame may be occupied for a new reference frame. In addition to the reference frames of the neighbouring blocks the reference frame selector 360 may also select one or more other frames as potential reference frames and store them to the reference frame memory.

[0072] Motion vector information of encoded blocks is also stored into the memory so that the inter predictor 306 is able to retrieve the motion vector information when processing motion vector candidates for the current block.

[0073] In some embodiments the motion vectors are stored into one or more lists. For example, motion vectors of uni-directionally predicted frames (e.g. P-frames) may be stored to a list called as list 0. For bi-directionally predicted frames (e.g. B-frames) there may be two lists (list 0 and list 1) and for multi-predicted frames there may be more than two lists. Reference frame indices possibly associated with the motion vectors may also be stored in one or more lists.

[0074] In some embodiments there may be two or more motion vector prediction procedures and each procedure may have its own candidate set creation process. In one procedure, only the motion vector values are used. In another procedure, which may be called as a Merge Mode, each candidate element may comprise 1) The information whether 'block was uni-predicted using only list0' or 'block was uni-predicted using only list1' or 'block was bi-predicted using list0 and list1' 2) motion vector value for list0 3) Reference picture index in list0 4) motion vector value for list1 5) Reference picture index list1. Therefore, whenever two prediction candidates are to be compared, not only the motion vector values are compared, but also the five values mentioned above may be compared to determine whether they correspond with each other or not. On the other hand, if any of the comparisons indicate that the prediction candidates do not have equal motion information, no further comparisons need be performed.

[0075] The motion vector definer 361 defines candidate motion vectors for the current frame by using one or more of the motion vectors of one or more neighbour blocks and/or other blocks of the current block in the same frame and/or co-located blocks and/or other blocks of the current block in one or more other frames. These candidate motion vectors can be called as a set of candidate predictors or a predictor set. Each candidate predictor thus represents the motion vector of one or more already encoded block. In some embodiments the motion vector of the candidate predictor is set equal to the motion vector of a neighbour block for the same list if the

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current block and the neighbour block refer to the same reference frames for that list. Also for temporal prediction there may be one or more previously encoded frames wherein motion vectors of a co-located block or other blocks in a previously encoded frame can be selected as candidate predictors for the current block. The temporal motion vector predictor candidate can be generated by any means that make use of the frames other than the current frame.

[0076] The candidate motion vectors can also be obtained by using more than one motion vector of one or more other blocks such as neighbour blocks of the current block and/or co-located blocks in one or more other frames. As an example, any combination of the motion vector of the block to the left of the current block, the motion vector of the block above the current block, and the motion vector of the block at the up-right corner of the current block may be used (i.e. the block to the right of the block above the current block). The combination may be a median of the motion vectors or calculated by using other formulas. For example, one or more of the motion vectors to be used in the combination may be scaled by a scaling factor, an offset may be added, and/or a constant motion vector may be added. In some embodiments the combined motion vector is based on both temporal and spatial motion vectors, e.g. the motion vector of one or more of the neighbour block or other block of the current block and the motion vector of a co-located block or other block in another frame.

[0077] If a neighbour block does not have any motion vector information a default motion vector such as a zero motion vector may be used instead.

[0078] Figure 9 illustrates an example of a coding unit 900 and some neighbour blocks 901—905 of the coding unit. As can be seen from Figure 9, if the coding unit 900 represents the current block, the neighbouring blocks 901—905 labelled A0, A1, B0, B1 and B2 could be such neighbour blocks which may be used when obtaining the candidate motion vectors.

[0079] Creating additional or extra motion vector predictions based on previously added predictors may be needed when the current number of candidates is limited or insufficient. This kind of creating additional candidates can be performed by combining previous two predictions and/or processing one previous candidate by scaling or adding offset and/or adding a zero motion vector with various reference indices. Hence, the motion vector definer 361 may examine how many motion vector candidates can be defined and how many potential candidate motion vectors exist for the current block. If the number of potential motion vector candidates is smaller than a threshold, the motion vector definer 361 may create additional motion vector predictions.

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[0080] In some embodiments the combined motion vector can be based on motion vectors in different lists. For example, one motion vector may be defined by combining one motion vector from the list 0 and one motion vector from the list 1 e.g. when the neighbouring or co-located block is a bi-directionally predicted block and there exists one motion vector in the list 0 and one motion vector in the list 1 for the bi-directionally predicted block.

[0081] To distinguish the current block from the encoded/decoded blocks the motion vectors of which are used as candidate motion vectors, those encoded/decoded blocks are also called as reference blocks in this application.

[0082] In some embodiments not only the motion vector information of the reference block(s) is obtained (e.g. by copying) but also a reference index of the reference block in the reference picture list may be copied to the candidate list. The information whether the block was uni-predicted using only list0 or the block was uni-predicted using only list1 or the block was bi-predicted using list0 and list1 may also be copied. The candidate list may also be called as a candidate set or a set of motion vector prediction candidates.

[0083] Figure 6a illustrates an example of spatial and temporal prediction of a prediction unit. There is depicted the current block 601 in the frame 600 and a neighbour block 602 which already has been encoded. The motion vector definer 361 has defined a motion vector 603 for the neighbour block 602 which points to a block 604 in the previous frame 605. This motion vector can be used as a potential spatial motion vector prediction 610 for the current block. Figure 6a depicts that a co-located block 606 in the previous frame 605, i.e. the block at the same location than the current block but in the previous frame, has a motion vector 607 pointing to a block 609 in another frame 608. This motion vector 607 can be used as a potential temporal motion vector prediction-611 for the current frame.

[0084] Figure 6b illustrates another example of spatial and temporal prediction of a prediction unit. In this example the block 606 of the previous frame 605 uses bi-directional prediction based on the block 609 of the frame preceding the frame 605 and on the block 612 succeeding the current frame 600. The temporal motion vector prediction for the current block 601 may be formed by using both the motion vectors 607, 614 or either of them.

[0085] The operation of the prediction list modifier 363 will now be described in more detail with reference to the flow diagram of Figures 5a and 5b. The prediction list modifier 363 initializes a motion vector prediction list to default values in block 500 of Figure 5a. The

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prediction list modifier 363 may also initialize a list index to an initial value such as zero. Then, in block 501 the prediction list modifier checks whether there are any motion vector candidates to process. If there is at least one motion vector candidate in the predictor set for processing, the prediction list modifier 363 generates the next motion vector candidate which may be a temporal motion vector or a spatial motion vector. The comparison can be an identicality/equivalence check or comparing the (absolute) difference against a threshold or any other similarity metric.

[0086] In the following, a merge process for motion information coding according to an example embodiment will be described in more detail. The encoder creates a list of motion prediction candidates from which one of the candidates is to be signalled as the motion information for the current coding unit or prediction unit. The motion prediction candidates may consist of several spatial motion predictions and a temporal motion prediction. The spatial candidates can be obtained from the motion information of e.g. the spatial neighbour blocks A0, A1, B0, B1, B2, whose motion information is used as spatial candidate motion predictions. The temporal motion prediction candidate may be obtained by processing the motion of a block in a frame other than the current frame. In this example embodiment, the encoder operations to construct the merge list for the spatial candidates may include the following. The operations may be carried out by the prediction list modifier 363, for example.

[0087] A maximum number of spatial motion prediction candidates to be included in the merge list may be defined. This maximum number may have been stored, for example, to the memory 58 of the apparatus 50, or to another appropriate place. It is also possible to determine the maximum number by using other means, or it may be determined in the software of the encoder of the apparatus 50.

[0088] In some embodiments the maximum number of spatial motion prediction candidates to be included in the merge list is four but in some embodiments the maximum number may be less than four or greater than four.

[0089] In this example the spatial motion prediction candidates are the spatial neighbour blocks A0, A1, B0, B1, B2. The spatial motion vector prediction candidate A1 is located on the left side of the prediction unit when the encoding/decoding order is from left to right and from top to bottom of the frame, slice or another entity to be encoded/decoded. Respectively, the spatial motion vector prediction candidate B1 is located above the prediction unit. third; the spatial motion vector prediction candidate B0 is on the right side of the spatial motion vector

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prediction candidate B1; the spatial motion vector prediction candidate A0 is below the spatial motion vector prediction candidate A1; and the spatial motion vector prediction candidate B2 is located on the same column than spatial motion vector prediction candidate A1 and on the same row than the spatial motion vector prediction candidate B1. In other words, the spatial motion vector prediction candidate B2 is cornerwise neighbouring the prediction unit as can be seen e.g. from Figure 9.

[0090] These spatial motion prediction candidates can be processed in a predetermined order, for example, A1, B1, B0, A0 and B2. The first spatial motion prediction candidate to be selected for further examination is thus A1. Before further examination is performed for the selected spatial motion prediction candidate, it may be determined whether the merge list already contains a maximum number of spatial motion prediction candidates. Hence, the prediction list modifier 363 compares 502 the number of spatial motion prediction candidates in the merge list with the maximum number, and if the number of spatial motion prediction candidates in the merge list is not less than the maximum number, the selected spatial motion prediction candidate is not included in the merge list and the process of constructing the merge list can be stopped 526. On the other hand, if the number of spatial motion prediction candidates in the merge list is less than the maximum number, a further analyses of the selected spatial motion prediction candidate is performed (blocks 504-522).

[0091] For all the spatial motion prediction candidates for which the further analyses is to be performed, some or all of the following conditions below may be tested for determining whether to include the spatial motion prediction candidate in the merge list.

[0092] The prediction list modifier 363 examines 504 if the prediction unit or block covering the spatial motion prediction candidate block is not available for motion prediction. If so, the candidate is not included in the merge list. The reason that the block is not available may be that the block is either coded in intra mode or resides in a different slice or outside of the picture area.

[0093] In addition to the common conditions above, for each spatial motion prediction candidate, if any of the following conditions holds, then the candidate is not included in the merge list, otherwise, it is included.

[0094] The prediction list modifier 363 determines 506 which spatial motion prediction candidate of the set of spatial motion prediction candidates is in question. If the spatial motion prediction candidate is the block A1, one or more of the following conditions may be examined

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508, 510 to determine whether to include this spatial motion prediction candidate in the merge list or not. If the current coding unit 100 is vertically split into two rectangle prediction units 103, 104 as depicted in Figure 10b and the current prediction unit is the second prediction unit 104 in the coding/decoding order (508), this spatial motion prediction candidate is not included in the merge list. If the current coding unit 100 is not vertically split into two rectangle prediction units but it is horizontally split into two rectangle prediction units 101, 102 as depicted in Figure 10a and the current prediction unit is the second prediction unit in the coding/decoding order and the block A1 has the same motion information as the block B1 (510), this spatial motion prediction candidate (block A1) is not included in the merge list. In the example of Figure 10a the second prediction unit is the lower prediction unit 102 of the coding unit 100 and in the example of Figure 10b the second prediction unit is the rightmost prediction unit 104 of the coding unit 100. If none of the conditions above is fulfilled the block A1 is included in the merge list as a spatial motion prediction candidate (524).

[0095] If the spatial motion prediction candidate is the block B1, one or more of the following conditions may be examined 512, 514 to determine whether to include this spatial motion prediction candidate in the merge list or not. If the current coding unit 100 is horizontally split into two rectangle prediction units 101, 102 as depicted in Figure 10a and the current prediction unit is the second prediction unit 104 in the coding/decoding order (512), this spatial motion prediction candidate is not included in the merge list. If the current coding unit 100 is not horizontally split into two rectangle prediction units and if the block B1 has the same motion information than the block A1 (514), this spatial motion prediction candidate (block B1) is not included in the merge list. If none of the conditions above is fulfilled the block B1 is included in the merge list as a spatial motion prediction candidate (524).

[0096] If the spatial motion prediction candidate is the block B0, this spatial motion prediction candidate is not included in the merge list if the block B0 has the same motion information than the block B1 (516). Otherwise, if the number of spatial motion prediction candidates in the merge list is less than the maximum number of spatial motion prediction candidates, this spatial motion prediction candidate (block B0) is included in the merge list (524).

[0097] If the spatial motion prediction candidate is the block A0, this spatial motion prediction candidate is not included in the merge list if the block A0 has the same motion

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information than the block A1 (518). Otherwise, if the number of spatial motion prediction candidates in the merge list is less than the maximum number of spatial motion prediction candidates, this spatial motion prediction candidate (block A0) is included in the merge list (524).

[0098] If the spatial motion prediction candidate is the block B2, this spatial motion prediction candidate is not included in the merge list if the maximum number of spatial motion prediction candidates is four and the other blocks A0, A1, B0, and B1 are all decided to be included in the merge list (520). Otherwise, if the number of spatial motion prediction candidates in the merge list is less than the maximum number of spatial motion prediction candidates, the block B2 is not included in the merge list if the block B2 has the same motion information than the block B1 or the block A1 (522).

[0099] Then, after processing the blocks A1, B1, B0, A0 and B2 and including a subset of them in the merge list based on the above described conditions, no more redundancy check between these candidates are performed and remaining temporal motion prediction candidate and/or other possible additional candidates may be processed.

[00100] Comparing two blocks whether they have the same motion may be performed by comparing all the elements of the motion information, namely 1) The information whether 'the prediction unit is uni-predicted using only reference picture list0' or 'the prediction unit is uni-predicted using only reference picture list1' or 'the prediction unit is bi-predicted using both reference picture list0 and list1' 2) Motion vector value corresponding to the reference picture list0 3) Reference picture index in the reference picture list0 4) Motion vector value corresponding to the reference picture list1 5) Reference picture index in the reference picture list1.

[00101] In some embodiments similar restrictions for comparing candidate pairs can be applied if the current coding unit is coded/decoded by splitting into four or any number of prediction units.

[00102] The maximum number of merge list candidates can be any non-zero value. In the example above the merger list candidates were the spatial neighbour blocks A0, A1, B0, B1, B2 and the temporal motion prediction candidate, but there may be more than one temporal motion prediction candidate and also other spatial motion prediction candidates than the spatial

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neighbour blocks. In some embodiments there may also be other spatial neighbour blocks than the blocks A0, A1, B0, B1, B2.

[00103] It is also possible that the maximum number of spatial motion prediction candidates included in the list can be different than four.

[00104] In some embodiments the maximum number of merge list candidates and maximum number of spatial motion prediction candidates included in the list can depend on whether a temporal motion vector candidate is included in the list or not.

[00105] A different number of spatial motion prediction candidates located at various locations in the current frame can be processed. The locations can be the same as or different than A1, B1, B0, A0 and B2.

[00106] The decision of including which spatial motion prediction candidates in the list can be realized in two steps. In the first step, some of the candidates are eliminated by checking whether the candidate block is available and/or the candidate block's prediction mode is intra and/or whether the current block is a second prediction unit of a coding unit coded with two prediction units and the candidate has the same motion with the first prediction unit. In the second step, remaining candidates are examined and some or all of them are included in the merge list. The examination in the second step does not include comparing motion information of each possible candidate pair but includes a subset of the possible comparison combinations.

[00107] The decisions for the candidates can be taken in any order of A1, B1, B0, A0 and B2 or independently in parallel.

[00108] For each candidate and/or a subset of the candidates, the following conditions may also be checked: Whether the candidate block has the same motion as the first prediction unit of the current coding unit when the current coding unit is split into two rectangle prediction units and the current prediction unit is the second prediction unit in the coding/decoding order.

[00109] Additional conditions related to various properties of current and/or previous slices and/or current and/or neighbour blocks can be utilized for determining whether to include a candidate in the list.

[00110] Motion comparison can be realized by comparing a subset of the whole motion information. For example, only the motion vector values for some or all reference picture lists and/or reference indices for some or all reference picture lists and/or an identifier value assigned to each block to represent its motion information can be compared. The comparison can be an

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identicality or an equivalence check or comparing the (absolute) difference against a threshold or any other similarity metric.

[00111] Conditions for deciding whether a candidate is to be included in the list can include motion information comparison with any subset of the candidates as long as not all possible candidate pairs are compared eventually.

[00112] Deciding whether a temporal motion vector candidate is to be included in the list can be based on comparing its motion information with motion information of a subset of the spatial motion vector prediction candidates.

[00113] When comparing motion information of two blocks, motion information of additional blocks can be considered too. For example, when comparing the block B2 and the block A1, all the blocks between the block B2 and the block A1 (illustrated in Figure 12) are checked whether they have the same motion; and when comparing the block B2 and the block B1, all the blocks between the block B2 and the block B1 (illustrated in Figure 12) are checked whether they have the same motion. This embodiment can be implemented so that the right-most block of each prediction unit or all blocks of each prediction unit may store the information of how many consecutive blocks to the above have the same motion information. Also the bottom-most block of each prediction unit or all blocks of each prediction unit may store the information of how many consecutive blocks to the left have the same motion information. Using this information the condition for not including B0 in the list can be realized by checking if the number of consecutive blocks with the same motion to the left of B0 is greater than 0. The condition for not including A0 in the list can be realized by checking if the number of consecutive blocks with same motion to the above of A0 is greater than 0. The conditions for not including B2 can be modified as follows:

[00114] It is not examined whether the block B2 has same motion as the block B1 or whether the block B2 has same motion as the block A1, but how many consecutive blocks exists to the left of the block B1 with the same motion than the block B1 and/or how many consecutive blocks exist above the block A1 with the same motion. If the number of consecutive blocks with the same motion to the left of the block B1 is greater than the number of blocks between B2 and B1, or if the number of consecutive blocks with the same motion above the block A1 is greater than the number of blocks between the block B2 and the block A1, the block B2 is not included in the merge list.

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[00115] If the above implementation is used, the value of how many consecutive blocks to the left/above have the same motion information can be determined by direct comparison of motion information or checking the prediction mode and/or the merge index if the block employs a merge process.

[00116] When coding/decoding the selected merge index, the information whether the merge process is employed for coding/decoding a Skip mode coding unit or an Inter Merge mode prediction unit can be taken into account. For example, if a context adaptive binary arithmetic coder (CABAC) is used for entropy coding/decoding, different contexts can be used for the bins depending on the coding mode (Skip mode or inter merge mode) of the current block. Furthermore, assigning two contexts depending on whether the merge process is employed in a Skip mode coding unit or an inter Merge mode prediction unit can be applied for only the most significant bin of the merge index.

[00117] During the process of removal of redundant candidates, comparison between motion vector predictor candidates can also be based on any other information than the motion vector values. For example, it can be based on linear or non-linear functions of motion vector values, coding or prediction types of the blocks used to obtain the motion information, block size, the spatial location in the frame/(largest) coding unit/macroblock, the information whether blocks share the same motion with a block, the information whether blocks are in the same coding/prediction unit, etc.

[00118] The following pseudo code illustrates an example embodiment of the invention for constructing the merging list.

[00119] Inputs to this process are

- a luma location (xP, yP) specifying the top-left luma sample of the current prediction unit relative to the top-left sample of the current picture;
- variables specifying the width and the height of the prediction unit for luma, nPSW and nPSH; and
- a variable PartIdx specifying the index of the current prediction unit within the current coding unit.

[00120] Outputs of this process are (with N being replaced by A_0, A_1, B_0, B_1 or B_2 and with X being replaced by 0 or 1)

- the availability flags availableFlagN of the neighbouring prediction units,

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- the reference indices refIdxLXN of the neighbouring prediction units,
- the prediction list utilization flags predFlagLXN of the neighbouring prediction units,
- the motion vectors mvLXN of the neighbouring prediction units.

[00121] For the derivation of availableFlagN, with N being A_0, A_1, B_0, B_1 or B_2 and (xN, yN) being (xP−1, yP + nPSH), (xP−1, yP + nPSH−1), (xP + nPSW, yP−1), (xP+nPSW−1, yP−1) or (xP−1, yP−1), the following applies.

- If one of the following conditions is true, the availableFlagN is set equal to 0, both components mvLXN are set equal to 0, refIdxLXN and predFlagLX[xN, yN] of the prediction unit covering luma location (xN, yN) are assigned respectively to mvLXN, refIdxLXN and predFlagLXN.
- N is equal to B_2 and availableFlagA_0 + availableFlagA_1 + availableFlagB_0 + availableFlagB_1 is equal to 4.
- The prediction unit covering luma location (xN, yN) is not available or PredMode is MODE_INTRA.
- N is equal to A1 and PartMode of the current prediction unit is PART_Nx2N or PART_nLx2N or PART_nRx2N and PartIdx is equal to 1.
- N is equal to A1 and PartMode of the current prediction unit is PART_2NxN or PART_2NxnU or PART_2NxnD and PartIdx is equal to 1 and the prediction units covering luma location (xP+nPSW−1, yP−1) (N = B1) and luma location (xN, yN) (Cand. N) have identical motion parameters:
  - mvLX[xP+nPSW−1, yP−1] == mvLX[xN, yN]
  - refIdxLX[xP+nPSW−1, yP−1] == refIdxLX[xN, yN]
  - predFlagLX[xP+nPSW−1, yP−1] == predFlagLX[xN, yN]
- N is equal to B1 and PartMode of the current prediction unit is 2NxN or PART_2NxnU or PART_2NxnD and PartIdx is equal to 1.
- N is equal to B1 and the prediction units covering luma location (xP−1, yP+nPSH−1) (N = A1) and luma location (xN, yN) (Cand. N) have identical motion parameters:
  - mvLX[xP−1, yP+nPSH−1] == mvLX[xN, yN]
  - refIdxLX[xP−1, yP+nPSH−1] == refIdxLX[xN, yN]
  - predFlagLX[xP−1, yP+nPSH−1] == predFlagLX[xN, yN]
- N is equal to B0 and the prediction units covering luma location (xP+nPSW−1, yP−1) (N = B1) and luma location (xN, yN) (Cand. N) have identical motion parameters:

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- mvLX[xP+nPSW−1, yP−1] == mvLX[xN, yN]
- refIdxLX[xP+nPSW−1, yP−1] == refIdxLX[xN, yN]
- predFlagLX[xP+nPSW−1, yP−1] == predFlagLX[xN, yN]
- N is equal to A0 and the prediction units covering luma location (xP−1, yP+nPSH−1) (N = A1) and luma location (xN, yN) (Cand. N) have identical motion parameters:
- mvLX[xP−1, yP+nPSH−1] == mvLX[xN, yN]
- refIdxLX[xP−1, yP+nPSH−1] == refIdxLX[xN, yN]
- predFlagLX[xP−1, yP+nPSH−1] == predFlagLX[xN, yN]
- N is equal to B2 and the prediction units covering luma location (xP+nPSW−1, yP−1) (N = B1) and luma location (xN, yN) (Cand. N) have identical motion parameters:
- mvLX[xP+nPSW−1, yP−1] == mvLX[xN, yN]
- refIdxLX[xP+nPSW−1, yP−1] == refIdxLX[xN, yN]
- predFlagLX[xP+nPSW−1, yP−1] == predFlagLX[xN, yN]
- N is equal to B2 and the prediction units covering luma location (xP−1, yP+nPSH−1) (N = A1) and luma location (xN, yN) (Cand. N) have identical motion parameters:
- mvLX[xP−1, yP+nPSH−1] == mvLX[xN, yN]
- refIdxLX[xP−1, yP+nPSH−1] == refIdxLX[xN, yN]
- predFlagLX[xP−1, yP+nPSH−1] == predFlagLX[xN, yN]
- PartMode of the current prediction unit is PART_NxN and PartIdx is equal to 3 and the prediction units covering luma location (xP−1, yP) (PartIdx = 2) and luma location (xP−1, yP−1) (PartIdx = 0) have identical motion parameters:
- mvLX[xP−1, yP] == mvLX[xP−1, yP−1]
- refIdxLX[xP−1, yP] == refIdxLX[xP−1, yP−1]
- predFlagLX[xP−1, yP] == predFlagLX[xP−1, yP−1]

and the prediction units covering luma location (xP, yP−1) (PartIdx = 1) and luma location (xN, yN) (Cand. N) have identical motion parameters:

- mvLX[xP, yP−1] == mvLX[xN, yN]
- refIdxLX[xP, yP−1] == refIdxLX[xN, yN]
- predFlagLX[xP, yP−1] == predFlagLX[xN, yN]

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- PartMode of the current prediction unit is PART_NxN and PartIdx is equal to 3 and the prediction units covering luma location (xP, yP−1) (PartIdx = 1) and luma location (xP−1, yP−1) (PartIdx = 0) have identical motion parameters:
  - mvLX[xP, yP−1] == mvLX[xP−1, yP−1]
  - refIdxLX[xP, yP−1] == refIdxLX[xP−1, yP−1]
  - predFlagLX[xP, yP−1] == predFlagLX[xP−1, yP−1]

  and the prediction units covering luma location (xP−1, yP) (PartIdx = 2) and luma location (xN, yN) (Cand. N) have identical motion parameters:
  - mvLX[xP−1, yP] == mvLX[xN, yN]
  - refIdxLX[xP−1, yP] == refIdxLX[xN, yN]
  - predFlagLX[xP−1, yP] == predFlagLX[xN, yN]
- Otherwise, availableFlagN is set equal to 1 and the variables mvLX[xN, yN], refIdxLX[xN, yN] and predFlagLX[xN, yN] of the prediction unit covering luma location (xN, yN) are assigned respectively to mvLXN, refIdxLXN and predFlagLXN.

[00122] For the motion vector predictor candidate list generation process, each list candidate can include more information than the motion vector value, such as the reference lists used, the reference frames used in each list and motion vector for each list.

[00123] When all motion vector candidates have been examined, one motion vector is selected to be used as the motion vector for the current block. The motion vector selector 364 may examine different motion vectors in the list and determine which motion vector provides the most efficient encoding result, or the selection of the motion vector may be based on to other criteria as well. Information of the selected motion vector is provided for the mode selector for encoding and transmission to the decoder or for storage when the mode selector determines to use inter prediction for the current block. The information may include the index of the motion vector in the list, and/or motion vector parameters or other appropriate information.

[00124] The selected motion vector and the block relating to the motion vector is used to generate the prediction representation of the image block 312 which is provided as the output of the mode selector. The output may be used by the first summing device 321 to produce the first prediction error signal 320, as was described above.

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[00125] The selected motion vector predictor candidate can be modified by adding a motion vector difference or can be used directly as the motion vector of the block. Moreover, after the motion compensation is performed by using the selected motion vector predictor candidate, the residual signal of the block can be transform coded or skipped to be coded.

[00126] Although the embodiments above have been described with respect to the size of the macroblock being 16x16 pixels, it would be appreciated that the methods and apparatus described may be configured to handle macroblocks of different pixel sizes.

[00127] In the following the operation of an example embodiment of the decoder 600 is depicted in more detail with reference to Figure 7.

[00128] At the decoder side similar operations are performed to reconstruct the image blocks. Figure 7 shows a block diagram of a video decoder 700 suitable for employing embodiments of the invention and Figures 8a and 8b show a flow diagram of an example of a method in the video decoder. The bitstream to be decoded may be received from the encoder, from a network element, from a storage medium or from another source. The decoder is aware of the structure of the bitstream so that it can determine the meaning of the entropy coded codewords and may decode the bitstream by an entropy decoder 701 which performs entropy decoding on the received signal. The entropy decoder thus performs the inverse operation to the entropy encoder 330 of the encoder described above. The entropy decoder 701 outputs the results of the entropy decoding to a prediction error decoder 702 and a pixel predictor 704.

[00129] In some embodiments the entropy coding may not be used but another channel encoding may be in use, or the encoded bitstream may be provided to the decoder 700 without channel encoding. The decoder 700 may comprise a corresponding channel decoder to obtain the encoded codewords from the received signal.

[00130] The pixel predictor 704 receives the output of the entropy decoder 701. The output of the entropy decoder 701 may include an indication on the prediction mode used in encoding the current block. A predictor selector 714 within the pixel predictor 704 determines that an intra-prediction or an inter-prediction is to be carried out. The predictor selector 714 may furthermore output a predicted representation of an image block 716 to a first combiner 713. The predicted representation of the image block 716 is used in conjunction with the reconstructed prediction error signal 712 to generate a preliminary reconstructed image 718. The preliminary reconstructed image 718 may be used in the predictor 714 or may be passed to a filter 720. The

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filter 720, if used, applies a filtering which outputs a final reconstructed signal 722. The final reconstructed signal 722 may be stored in a reference frame memory 724, the reference frame memory 724 further being connected to the predictor 714 for prediction operations.

[00131] Also the prediction error decoder 702 receives the output of the entropy decoder 701. A dequantizer 792 of the prediction error decoder 702 may dequantize the output of the entropy decoder 701 and the inverse transform block 793 may perform an inverse transform operation to the dequantized signal output by the dequantizer 792. The output of the entropy decoder 701 may also indicate that prediction error signal is not to be applied and in this case the prediction error decoder produces an all zero output signal.

[00132] The decoder selects the 16x16 pixel residual macroblock to reconstruct. This residual macroblock is also called as a current block.

[00133] The decoder may receive information on the encoding mode used in encoding of the current block. The indication is decoded, when necessary, and provided to the reconstruction processor 791 of the prediction selector 714. The reconstruction processor 791 examines the indication and selects one of the intra-prediction mode(s), if the indication indicates that the block has been encoded using intra-prediction, or the inter-prediction mode, if the indication indicates that the block has been encoded using inter-prediction.

[00134] For inter-prediction mode the reconstruction processor 791 may comprise one or more elements corresponding to the prediction processor 362 of the encoder, such as a motion vector definer, a prediction list modifier and/or a motion vector selector.

[00135] The reconstruction processor 791 initializes a motion vector prediction list to default values in block 800. As was the case in the encoding part, in this example the spatial motion prediction candidates are the spatial neighbour blocks A0, A1, B0, B1, B2 and these spatial motion prediction candidates are processed in the same predetermined order than in the encoder: A1, B1, B0, A0 and B2. The first spatial motion prediction candidate to be selected for further examination is thus A1. Before further examination is performed for the selected spatial motion prediction candidate, it is examined whether the merge list already contains a maximum number of spatial motion prediction candidates. If the number of spatial motion prediction candidates in the merge list is not less than the maximum number, the selected spatial motion prediction candidate is not included in the merge list and the process of constructing the merge list can be stopped 826. On the other hand, if the number of spatial motion prediction candidates in the

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merge list is less than the maximum number, a further analyses of the selected spatial motion prediction candidate is performed (blocks 804-822).

[00136] The decoder examines 804 if the prediction unit or block covering the spatial motion prediction candidate block is not available for motion prediction. If so, the candidate is not included in the merge list. The reason that the block is not available may be that the block is either coded in intra mode or resides in a different slice or outside of the picture area.

[00137] In addition to the common conditions above, for each spatial motion prediction candidate, if any of the following conditions holds, then the candidate is not included in the merge list, otherwise, it is included.

[00138] The decoder determines 806 which spatial motion prediction candidate of the set of spatial motion prediction candidates is in question. If the spatial motion prediction candidate is the block A1, one or more of the following conditions may be examined 808, 810 to determine whether to include this spatial motion prediction candidate in the merge list or not. If the current coding unit 100 is vertically split into two rectangle prediction units 103, 104 as depicted in Figure 10b and the current prediction unit is the second prediction unit 104 in the coding/decoding order (808), this spatial motion prediction candidate is not included in the merge list. If the current coding unit 100 is not vertically split into two rectangle prediction units but it is horizontally split into two rectangle prediction units 101, 102 as depicted in Figure 10a and the current prediction unit is the second prediction unit in the coding/decoding order and the block A1 has the same motion information as the block B1 (810), this spatial motion prediction candidate (block A1) is not included in the merge list. In the example of Figure 10a the second prediction unit is the lower prediction unit 102 of the coding unit 100 and in the example of Figure 10b the second prediction unit is the rightmost prediction unit 104 of the coding unit 100. If none of the conditions above is fulfilled the block A1 is included in the merge list as a spatial motion prediction candidate (824).

[00139] If the spatial motion prediction candidate is the block B1, one or more of the following conditions may be examined 812, 814 to determine whether to include this spatial motion prediction candidate in the merge list or not. If the current coding unit 100 is horizontally split into two rectangle prediction units 101, 102 as depicted in Figure 10a and the current prediction unit is the second prediction unit 104 in the coding/decoding order (812), this spatial motion prediction candidate is not included in the merge list. If the current coding unit 100 is not

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horizontally split into two rectangle prediction units and if the block B1 has the same motion information than the block A1 (814), this spatial motion prediction candidate (block B1) is not included in the merge list. If none of the conditions above is fulfilled the block B1 is included in the merge list as a spatial motion prediction candidate (824).

[00140] If the spatial motion prediction candidate is the block B0, this spatial motion prediction candidate is not included in the merge list if the block B0 has the same motion information than the block B1 (816). Otherwise, if the number of spatial motion prediction candidates in the merge list is less than the maximum number of spatial motion prediction candidates, this spatial motion prediction candidate (block B0) is included in the merge list (824).

[00141] If the spatial motion prediction candidate is the block A0, this spatial motion prediction candidate is not included in the merge list if the block A0 has the same motion information than the block A1 (818). Otherwise, if the number of spatial motion prediction candidates in the merge list is less than the maximum number of spatial motion prediction candidates, this spatial motion prediction candidate (block A0) is included in the merge list (824).

[00142] If the spatial motion prediction candidate is the block B2, this spatial motion prediction candidate is not included in the merge list if the maximum number of spatial motion prediction candidates is four and the other blocks A0, A1, B0, and B1 are all decided to be included in the merge list (820). Otherwise, if the number of spatial motion prediction candidates in the merge list is less than the maximum number of spatial motion prediction candidates, the block B2 is not included in the merge list if the block B2 has the same motion information than the block B1 or the block A1 (822).

[00143] Then, after processing the blocks A1, B1, B0, A0 and B2 and including a subset of them in the merge list based on the above described conditions, no more redundancy check between these candidates are performed and remaining temporal motion prediction candidate and/or other possible additional candidates may be processed.

[00144] When the merge list has been constructed the decoder may use 828 the indication of the motion vector received from the encoder to select the motion vector for decoding the current block. The indication may be, for example, an index to the merge list.

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[00145] Basically, after the reconstruction processor 791 has constructed the merge list, it would correspond with the merge list constructed by the encoder if the reconstruction processor 791 has the same information available than the encoder had. If some information has been lost during transmission the information from the encoder to the decoder, it may affect the generation of the merge list in the decoder 700.

[00146] The above examples describe the operation mainly in the merge mode but the encoder and decoder may also operate in other modes.

[00147] The embodiments of the invention described above describe the codec in terms of separate encoder and decoder apparatus in order to assist the understanding of the processes involved. However, it would be appreciated that the apparatus, structures and operations may be implemented as a single encoder-decoder apparatus/structure/operation. Furthermore in some embodiments of the invention the coder and decoder may share some or all common elements.

[00148] Although the above examples describe embodiments of the invention operating within a codec within an electronic device, it would be appreciated that the invention as described below may be implemented as part of any video codec. Thus, for example, embodiments of the invention may be implemented in a video codec which may implement video coding over fixed or wired communication paths.

[00149] Thus, user equipment may comprise a video codec such as those described in embodiments of the invention above.

[00150] It shall be appreciated that the term user equipment is intended to cover any suitable type of wireless user equipment, such as mobile telephones, portable data processing devices or portable web browsers.

[00151] Furthermore elements of a public land mobile network (PLMN) may also comprise video codecs as described above.

[00152] In general, the various embodiments of the invention may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. For example, some aspects may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device, although the invention is not limited thereto. While various aspects of the invention may be illustrated and described as block diagrams, flow charts, or using some other pictorial representation, it is well understood that these blocks, apparatus, systems, techniques or methods

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described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, or some combination thereof.

[00153] The embodiments of this invention may be implemented by computer software executable by a data processor of the mobile device, such as in the processor entity, or by hardware, or by a combination of software and hardware. Further in this regard it should be noted that any blocks of the logic flow as in the Figures may represent program steps, or interconnected logic circuits, blocks and functions, or a combination of program steps and logic circuits, blocks and functions. The software may be stored on such physical media as memory chips, or memory blocks implemented within the processor, magnetic media such as hard disk or floppy disks, and optical media such as for example DVD and the data variants thereof, CD.

[00154] The memory may be of any type suitable to the local technical environment and may be implemented using any suitable data storage technology, such as semiconductor based memory devices, magnetic memory devices and systems, optical memory devices and systems, fixed memory and removable memory. The data processors may be of any type suitable to the local technical environment, and may include one or more of general purpose computers, special purpose computers, microprocessors, digital signal processors (DSPs) and processors based on multi core processor architecture, as non limiting examples.

[00155] Embodiments of the inventions may be practiced in various components such as integrated circuit modules. The design of integrated circuits is by and large a highly automated process. Complex and powerful software tools are available for converting a logic level design into a semiconductor circuit design ready to be etched and formed on a semiconductor substrate.

[00156] Programs, such as those provided by Synopsys, Inc. of Mountain View, California and Cadence Design, of San Jose, California automatically route conductors and locate components on a semiconductor chip using well established rules of design as well as libraries of pre stored design modules. Once the design for a semiconductor circuit has been completed, the resultant design, in a standardized electronic format (e.g., Opus, GDSII, or the like) may be transmitted to a semiconductor fabrication facility or "fab" for fabrication.

[00157] The foregoing description has provided by way of exemplary and non-limiting examples a full and informative description of the exemplary embodiment of this invention. However, various modifications and adaptations may become apparent to those skilled in the

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relevant arts in view of the foregoing description, when read in conjunction with the accompanying drawings and the appended claims. However, all such and similar modifications of the teachings of this invention will still fall within the scope of this invention.

[00158] In the following some examples will be provided.

[00159] In some embodiments a method comprises:

receiving a block of pixels including a prediction unit; determining a set of spatial motion vector prediction candidates for the block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[00160] In some embodiments the method comprises including neighbouring blocks of the received block of pixels in the set of spatial motion vector prediction candidates.

[00161] In some embodiments the method comprises constructing the set of spatial motion vector predictions by using motion vectors of one or more encoded blocks in a same frame than the block of pixels.

[00162] In some embodiments the method comprises selecting spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

[00163] In some embodiments the method comprises comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

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[00164] In some embodiments the method comprises prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

[00165] In some embodiments the method comprises

determining a maximum number of spatial motion vector prediction candidates to be included in a merge list; and

limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number .

[00166] In some embodiments the method comprises

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether a prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, performing at least one of the following:

for the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received block of pixels is vertically divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

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for the potential spatial motion vector prediction candidate, which is on the right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for the potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for the potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– all the other potential spatial motion vector prediction candidates have been included in the merge list;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

[00167] In some embodiments the method comprises including a temporal motion prediction candidate into the merge list.

[00168] In some embodiments the method comprises selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the block of pixels.

[00169] In some embodiments a method according to the second aspect comprises:

receiving an encoded block of pixels including a prediction unit;

determining a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

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selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[00170] In some embodiments the method comprises including neighbouring blocks of the received encoded block of pixels in the set of spatial motion vector prediction candidates.

[00171] In some embodiments the method comprises constructing the set of spatial motion vector predictions by using motion vectors of one or more decoded blocks in a same frame than the received encoded block of pixels.

[00172] In some embodiments the method comprises selecting spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

[00173] In some embodiments the method comprises comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

[00174] In some embodiments the method comprises examining whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

[00175] In some embodiments the method comprises

determining a maximum number of spatial motion vector prediction candidates to be included in a merge list; and

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limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

[00176] In some embodiments the method comprises

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether a prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, performing at least one of the following:

for the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received encoded block of pixels is vertically divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for the potential spatial motion vector prediction candidate, which is on the right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

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for the potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for the potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– all the other potential spatial motion vector prediction candidates have been included in the merge list;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

[00177] In some embodiments the method comprises including a temporal motion prediction candidate into the merge list.

[00178] In some embodiments the method comprises selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the received encoded block of pixels.

[00179] In some embodiments an apparatus according to the third aspect comprises a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to:

receive a block of pixels

including a prediction unit;

determining a set of spatial motion vector prediction candidates for the block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

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determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[00180] In some embodiments an apparatus according to the fourth aspect comprises a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to:

receive an encoded block of pixels including a prediction unit;

determine a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

select a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determine a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

exclude the first spatial motion vector prediction candidate from the merge list, if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other

[00181] In some embodiments a storage medium having stored thereon a computer program code a computer executable program code for use by an encoder, said program codes comprise instructions for use by an encoder, said program code comprises instructions for:

receiving a block of pixels including a prediction unit;

determining a set of spatial motion vector prediction candidates for the block of pixels; the spatial motion vector prediction candidates being provided with motion information;

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selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[00182] In some embodiments a storage medium having stored thereon a computer program code a computer executable program code for use by an encoder, said program codes comprise instructions for use by an encoder, said program code comprises instructions for:

receiving an encoded block of pixels including a prediction unit;

determining a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other, excluding the first spatial motion vector prediction candidate from the merge list.

[00183] In some embodiments an apparatus comprises:

means for receiving a block of pixels including a prediction unit;

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means for selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

means for determining a subset of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate;

means for comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

means for excluding the first spatial motion vector prediction candidate from the merge list, if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other.

[00184] In some embodiments an apparatus comprises:

means for receiving an encoded block of pixels including a prediction unit;

means for determining a set of spatial motion vector prediction candidates for the encoded block of pixels; the spatial motion vector prediction candidates being provided with motion information;

means for selecting a first spatial motion vector prediction candidate from the set of spatial motion vector prediction candidates as a potential spatial motion vector prediction candidate to be included in a merge list for the prediction unit;

means for determining a subset of spatial motion vector predictions based on the 58location of the block associated with the first spatial motion vector prediction candidate;

means for comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates;

means for excluding the first spatial motion vector prediction candidate from the merge list, if at least one of the comparisons indicates that the motion vector information of the spatial motion vector prediction candidates correspond with each other.

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Claims:

1. A method comprising:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determining a subset of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of spatial motion vector prediction candidates in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

causing information identifying the one spatial motion vector prediction candidate from the merge list to be transmitted to a decoder or to be stored.

2. The method according to claim 1 further comprising selecting spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

3. The method according to claim 1, further comprising comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

4. The method according to claim 1 further comprising examining whether the block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the

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potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

5. The method according to claim 1, further comprising

determining a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

6. The method according to claim 5 comprising:

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, performing at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

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– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– all the other potential spatial motion vector prediction candidates have been included in the merge list;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

7. The method according to claim 1 further comprising including a temporal motion prediction candidate into the merge list.

8. The method according to claim 1 further comprising selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the block of pixels.

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9. A method comprising:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

selecting a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list constructed by an encoder.

10. The method according to claim 9 further comprising comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

11. The method according to claim 9 further comprising examining whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

12. The method according to claim 9 further comprising

determining a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

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limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

13. The method according to claim 12 further comprising:

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, performing at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial

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motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit; and

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

14. The method according to claim 9 further comprising selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the encoded block of pixels.

15. An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to:

select a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial

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motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determine a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

cause information identifying the one spatial motion vector prediction candidate from the merge list to be transmitted to a decoder or to be stored.

16. The apparatus according to claim 15 wherein the apparatus is further caused to select spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

17. The apparatus according to claim 15, wherein the apparatus is further caused to compare motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

18. The apparatus according to claim 15 wherein the apparatus is further caused to examine whether the block of pixels is divided into a first prediction unit and a second prediction unit; and if so, exclude the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

19. The apparatus according to claim 15, wherein the apparatus is further caused to:

determine a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limit the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number .

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20. The apparatus according to claim 19 wherein the apparatus is further caused to:

examine, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examine whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, perform at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

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for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

21. The apparatus according to claim 15 wherein the apparatus is further caused to include a temporal motion prediction candidate into the merge list.

22. The apparatus according to claim 15 wherein the apparatus is further caused to select one motion vector prediction candidate from the merge list to represent a motion vector prediction for the block of pixels.

23. An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to:

select a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of

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pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determine a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

select a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list constructed by an encoder.

24. The apparatus according to claim 23 wherein the apparatus is further caused to compare motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

25. The apparatus according to claim 23 wherein the apparatus is further caused to examine whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, exclude the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

26. The apparatus according to claim 23 wherein the apparatus is further caused to:

determine a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limit the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

27. The apparatus according to claim 26 wherein the apparatus is further caused to:

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examine if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examine whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, perform at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, exclude the

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potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit; and

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

28. The apparatus according to claim 23 wherein the apparatus is further caused to select one motion vector prediction candidate from the merge list to represent a motion vector prediction for the received encoded block of pixels.

29. A non-transitory computer readable medium having stored thereon a computer executable program code for use by an encoder, said program codes comprising instructions for:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

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comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

causing information identifying the one spatial motion vector prediction candidate from the merge list to be transmitted to a decoder or to be stored.

30. A non-transitory computer readable medium having stored thereon a computer executable program code for use by an encoder, said program codes comprising instructions for:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

selecting a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list constructed by an encoder.

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ABSTRACT

The invention relates to a method for encoding, a method for decoding, an apparatus, computer program products, an encoder and a decoder for video information. The motion vector for a block in a video image is predicted from a set of motion vector prediction candidates determined based on previously-coded motion vectors. A motion vector prediction candidate is included in the set based on the location of the block associated with the first spatial motion vector prediction candidate and in comparison with motion vector prediction candidates already in the set.

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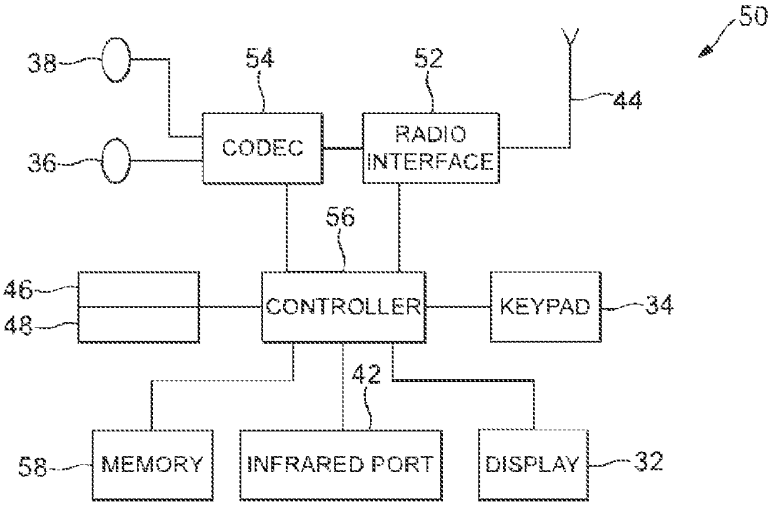

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CODEC
RADIO INTERFACE
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CONTROLLER
KEYPAD
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MEMORY
INFRARED PORT
DISPLAY
32

FIG. 1

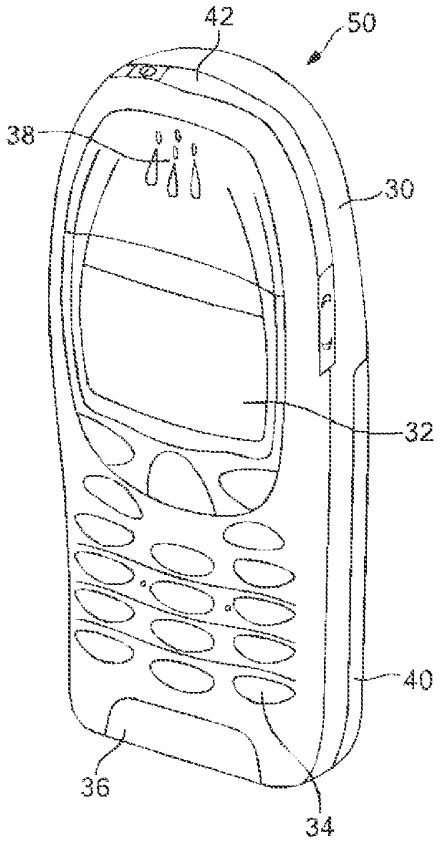

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FIG. 2

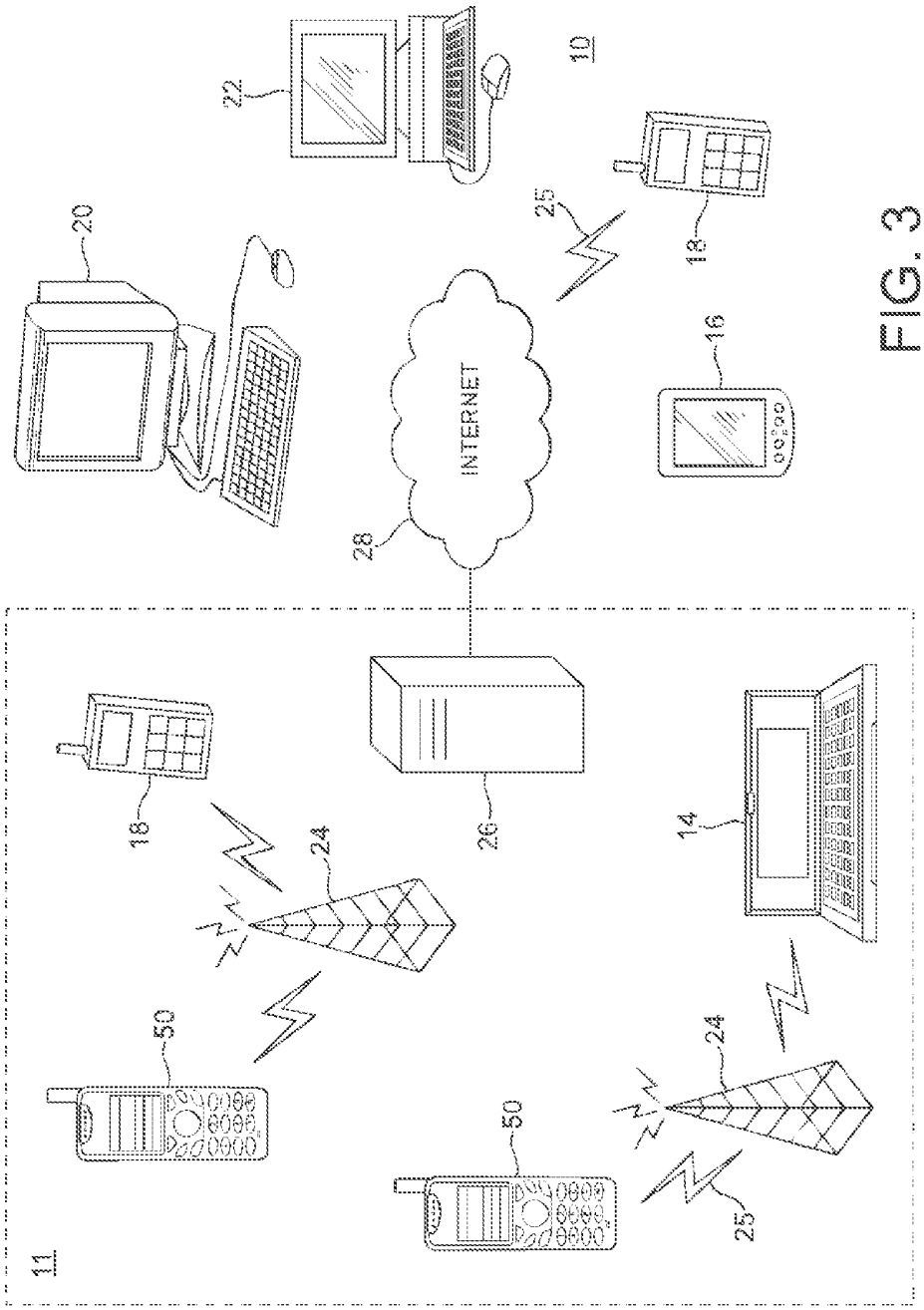


FIG. 3

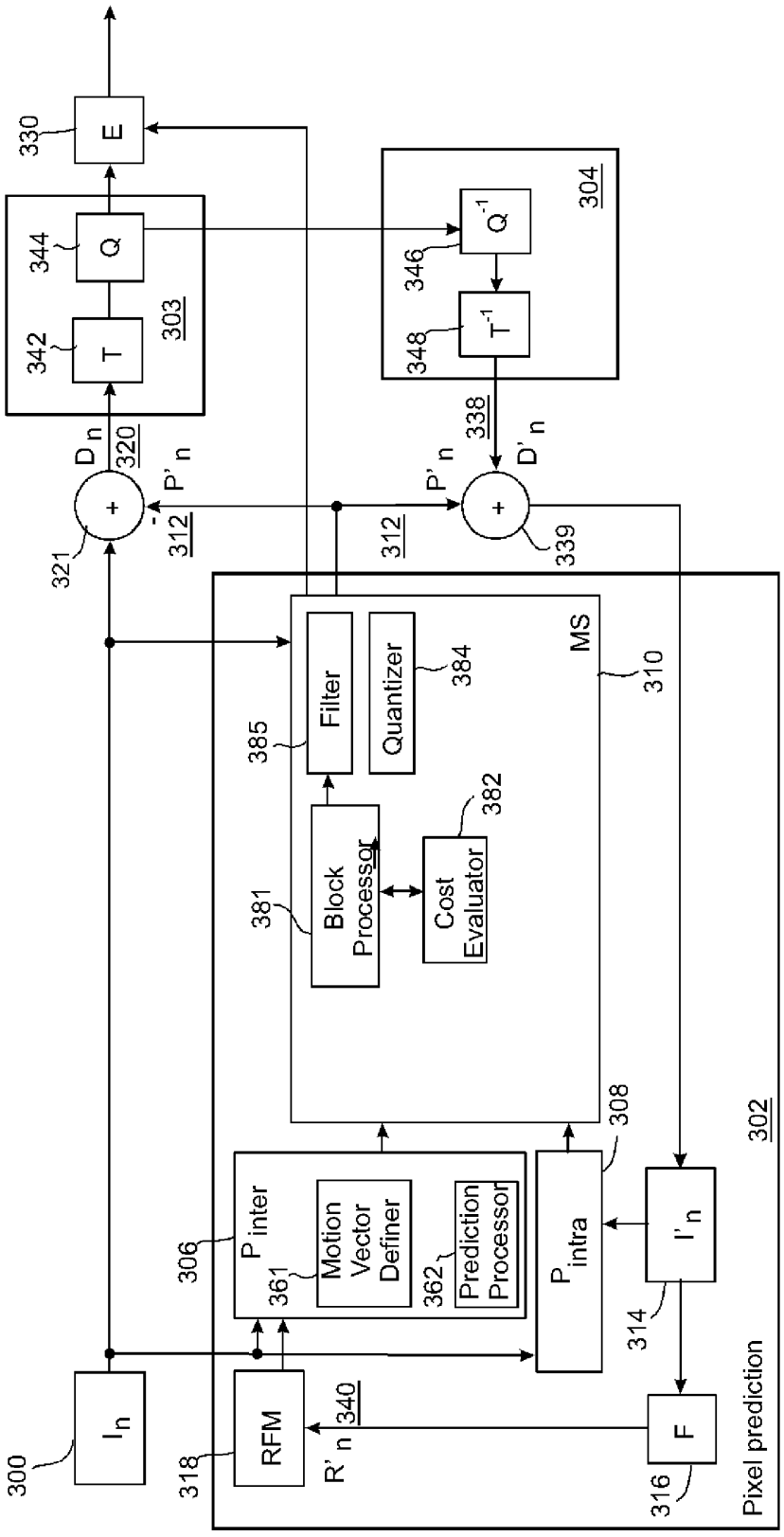

300
I_n
318
RFM
R' n 340
316
F
314
I'_n
P_{intra}
308
306
P_{inter}
361
Motion Vector Definer
362
Prediction Processor
381
Block Processor
382
Cost Evaluator
385
Filter
384
Quantizer
MS
310
Pixel prediction
302
321
D n
320
P' n
312
330
E
342
T
344
Q
303
346
Q^{-1}
348
T^{-1}
304
338
D' n
339

Fig. 4a

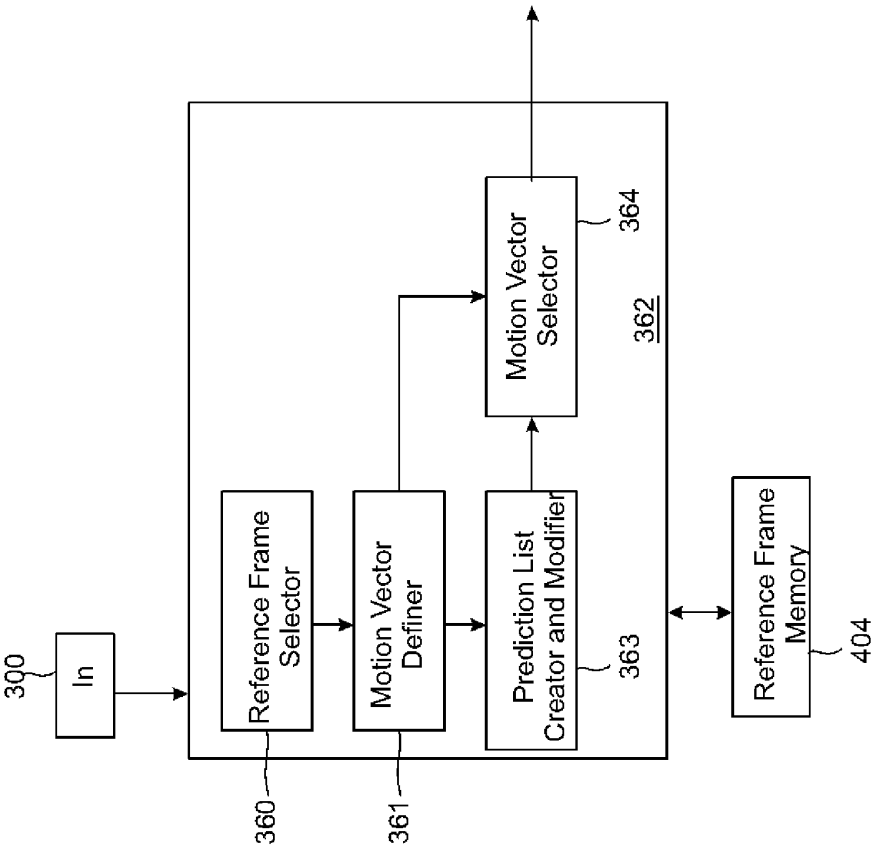

300
In
Reference Frame Selector
Motion Vector Definer
Prediction List Creator and Modifier
363
Motion Vector Selector
364
362
Reference Frame Memory
404
360
361

Fig. 4b

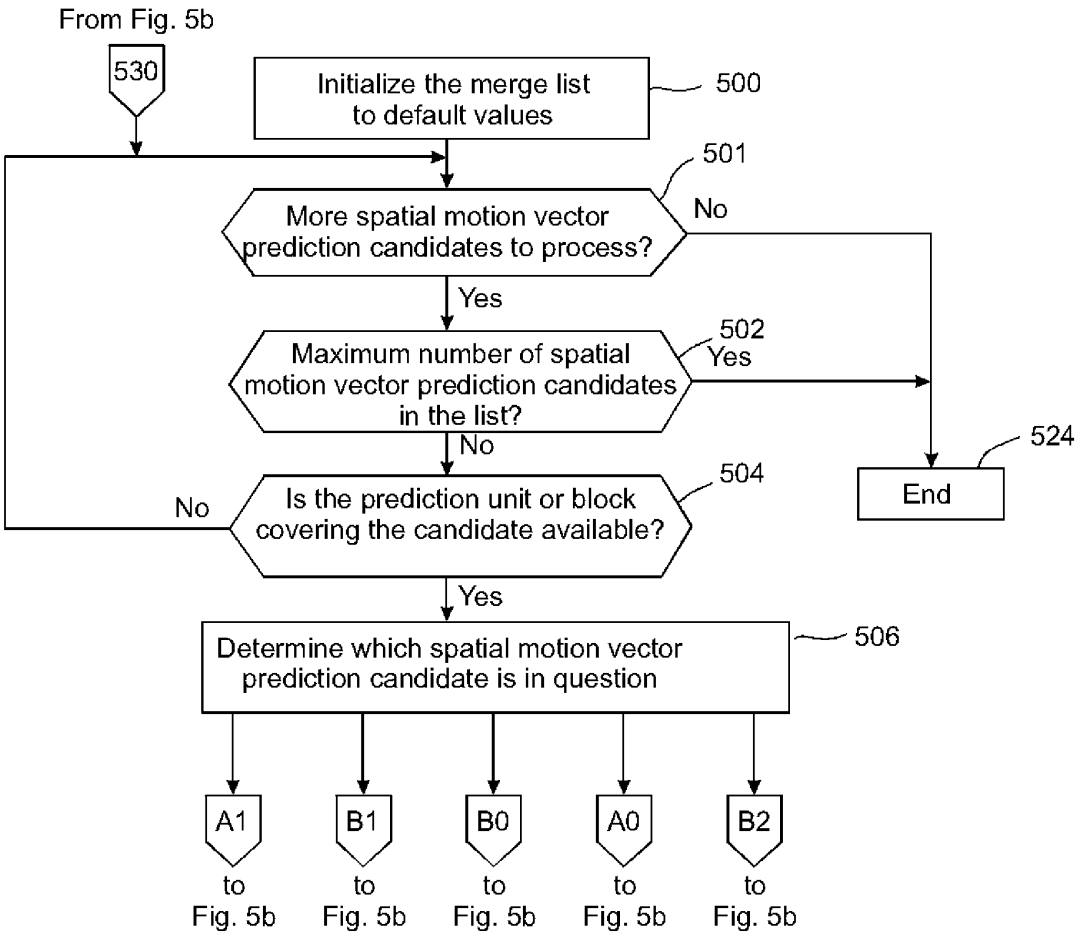

From Fig. 5b
530
Initialize the merge list to default values
500
501
More spatial motion vector prediction candidates to process?
No
Yes
Maximum number of spatial motion vector prediction candidates in the list?
502
Yes
No
524
End
Is the prediction unit or block covering the candidate available?
504
No
Yes
Determine which spatial motion vector prediction candidate is in question
506
A1
B1
B0
A0
B2
to Fig. 5b
to Fig. 5b
to Fig. 5b
to Fig. 5b
to Fig. 5b

Fig. 5a

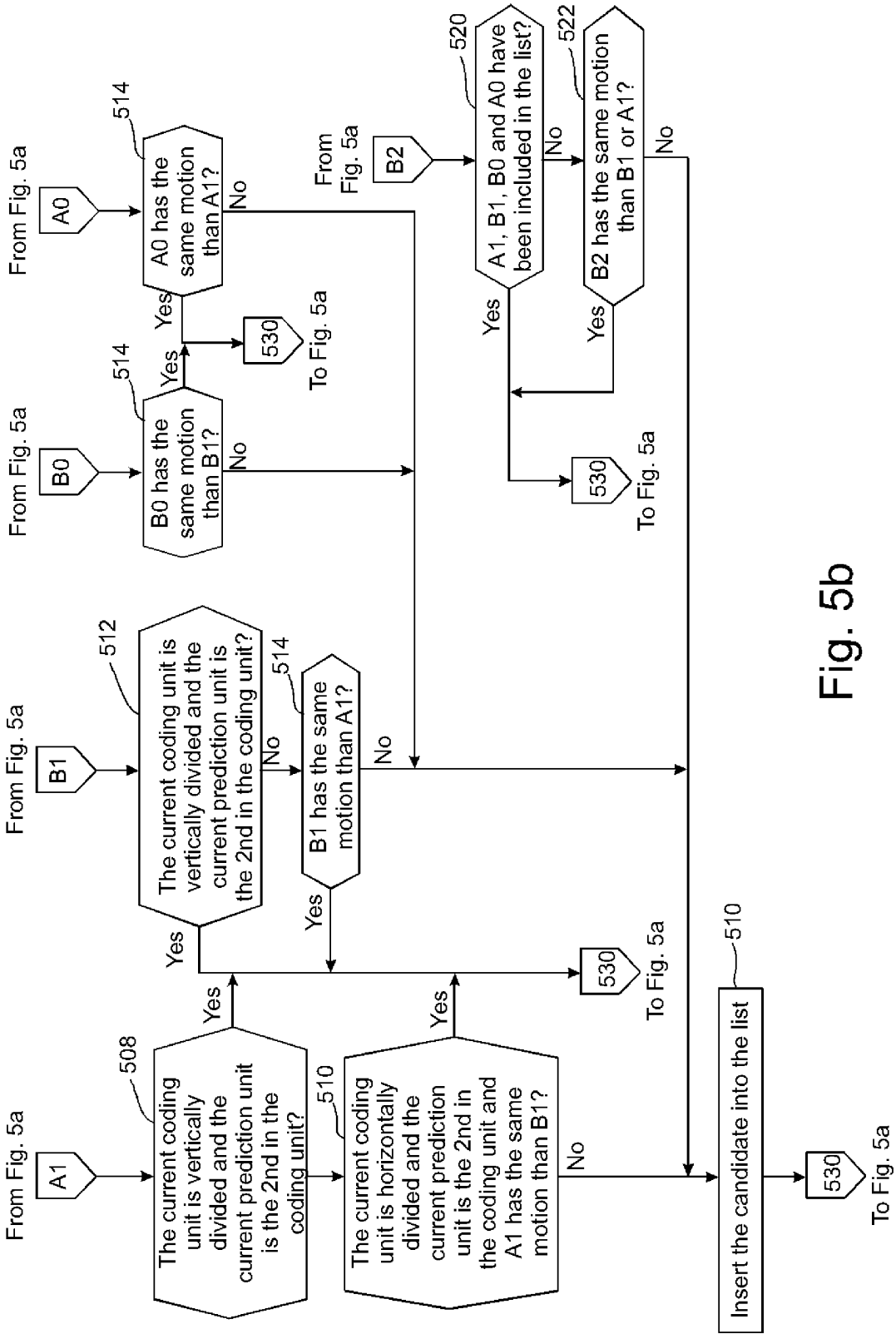


Fig. 5b

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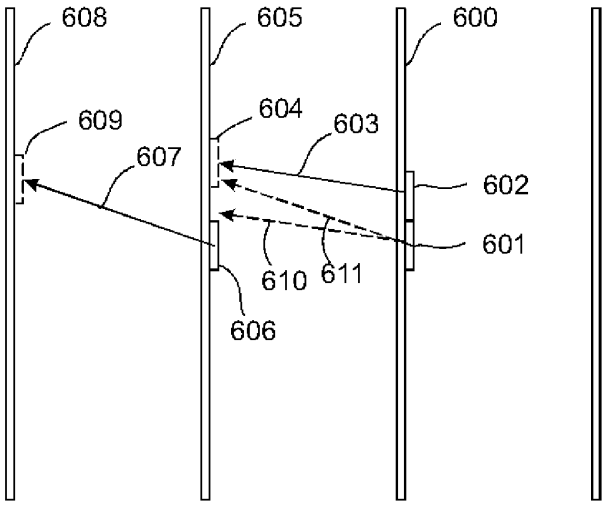

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Fig. 6a

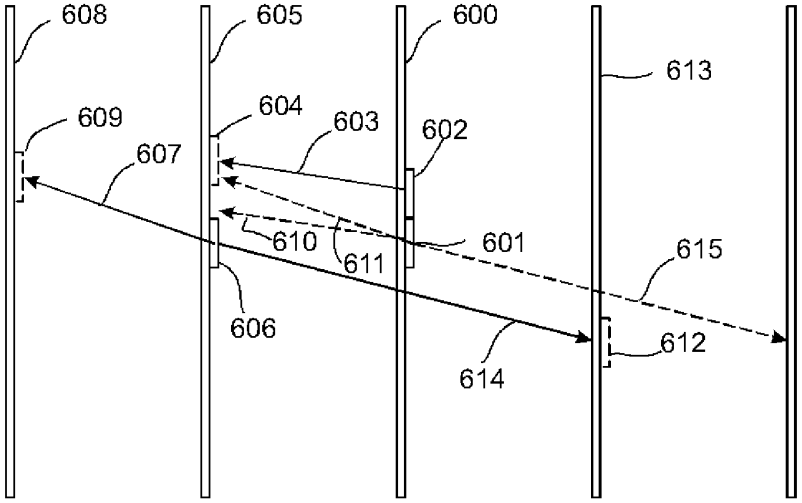

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Fig. 6b

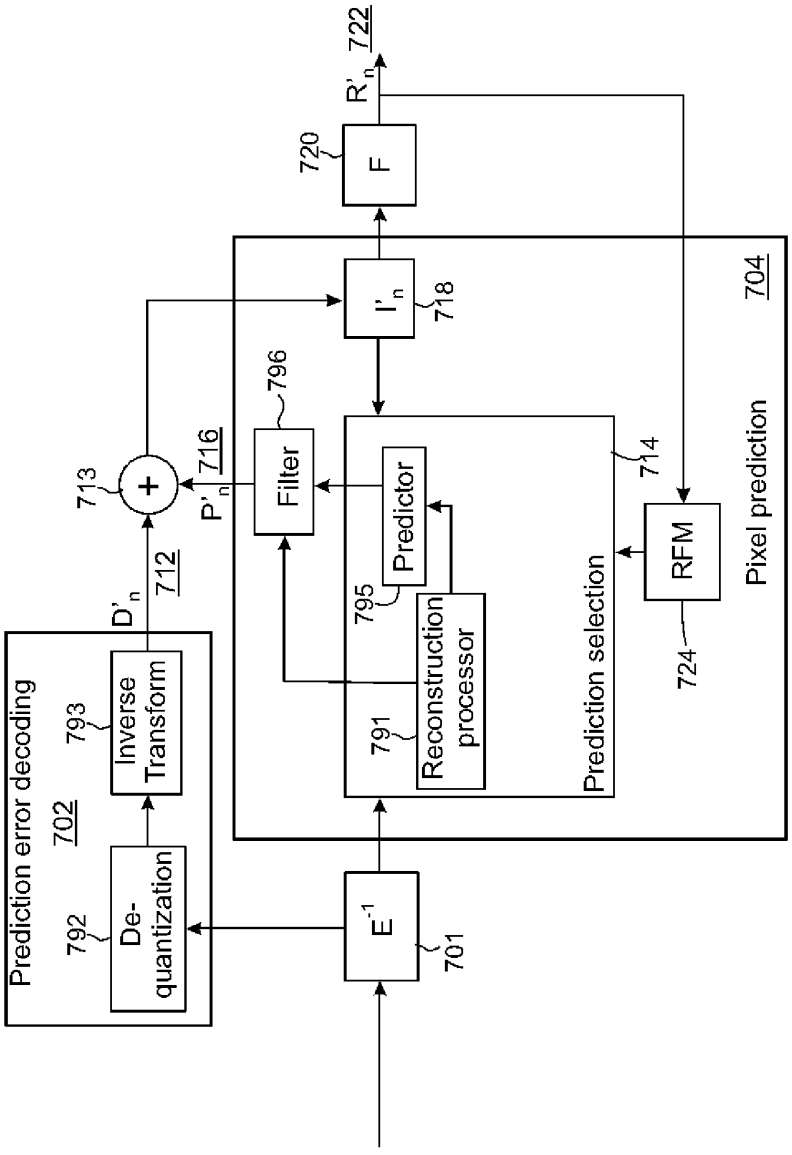

Prediction error decoding
702
792
De-quantization
793
Inverse Transform
D'n
712
713
+
P'n
716
Filter
796
Predictor
795
Reconstruction processor
791
Prediction selection
714
RFM
724
Pixel prediction
704
I'n
718
720
F
R'n
722
E-1
701

Fig. 7

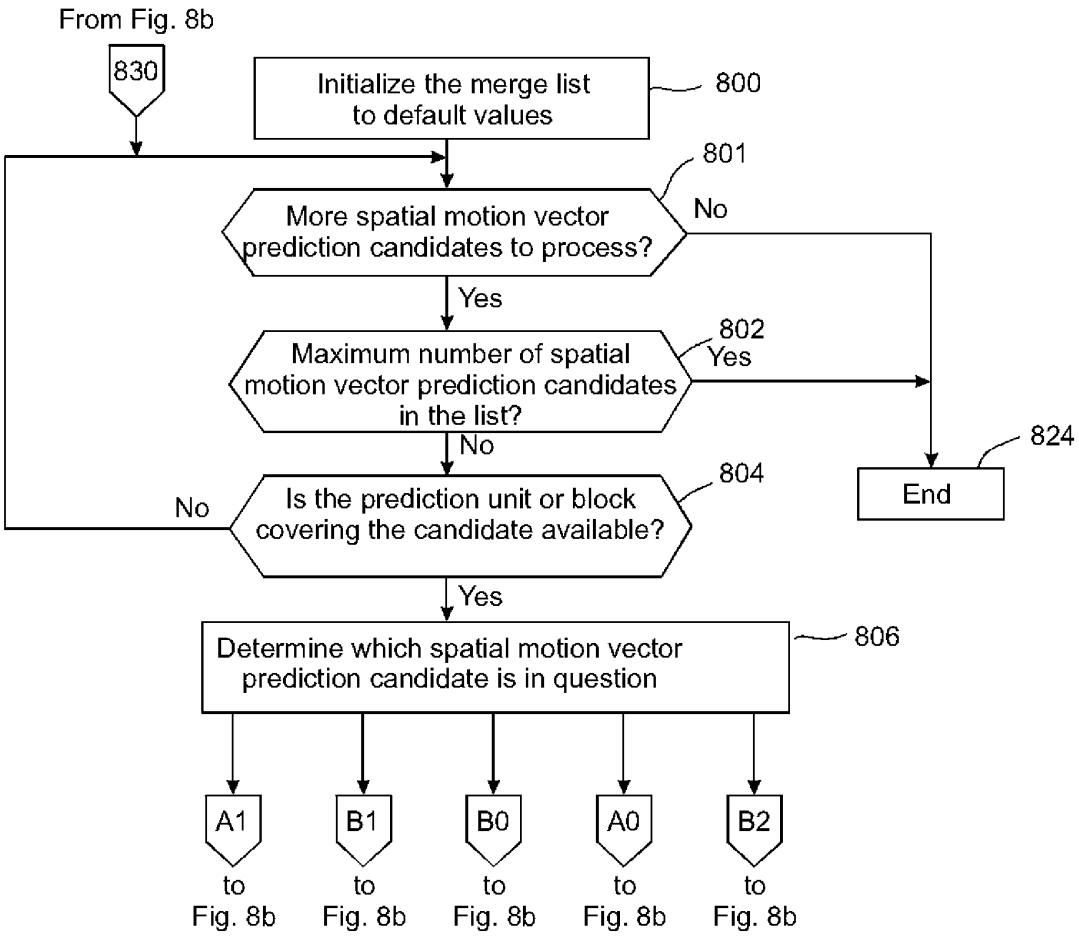

From Fig. 8b
830
Initialize the merge list to default values
800
801
More spatial motion vector prediction candidates to process?
No
Yes
802
Maximum number of spatial motion vector prediction candidates in the list?
Yes
No
824
End
804
Is the prediction unit or block covering the candidate available?
No
Yes
806
Determine which spatial motion vector prediction candidate is in question
A1
B1
B0
A0
B2
to Fig. 8b
to Fig. 8b
to Fig. 8b
to Fig. 8b
to Fig. 8b

Fig. 8a

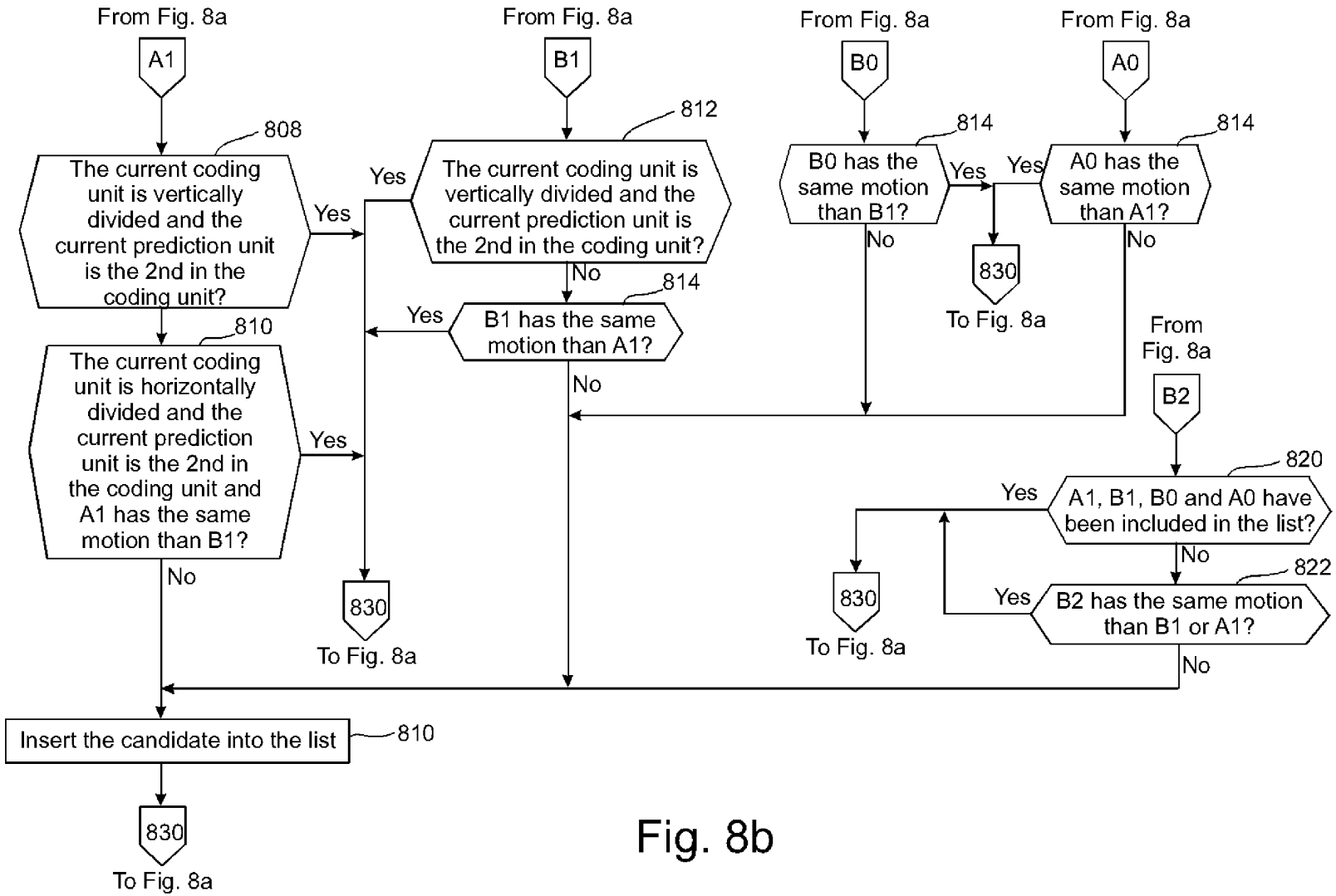


Fig. 8b

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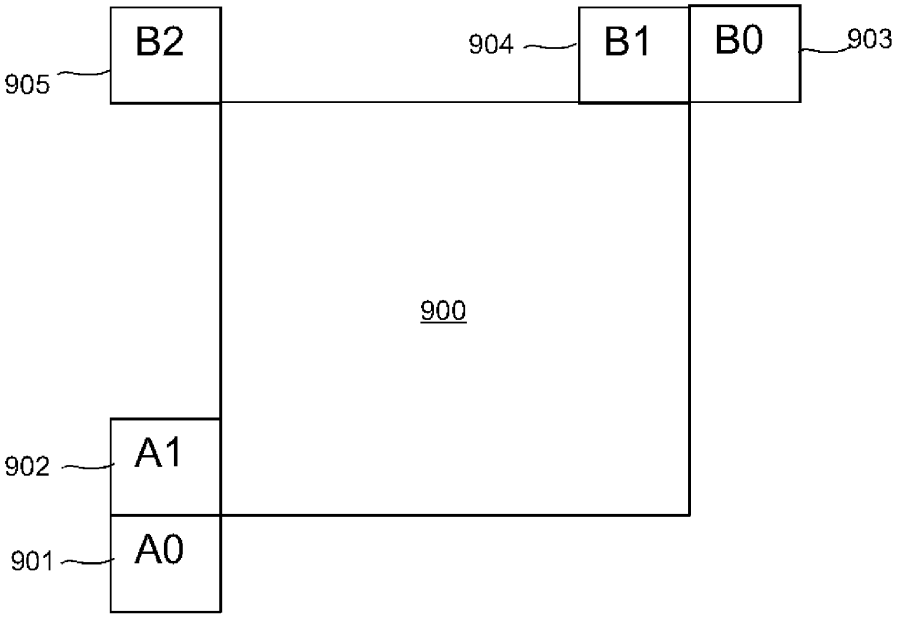


Fig. 9

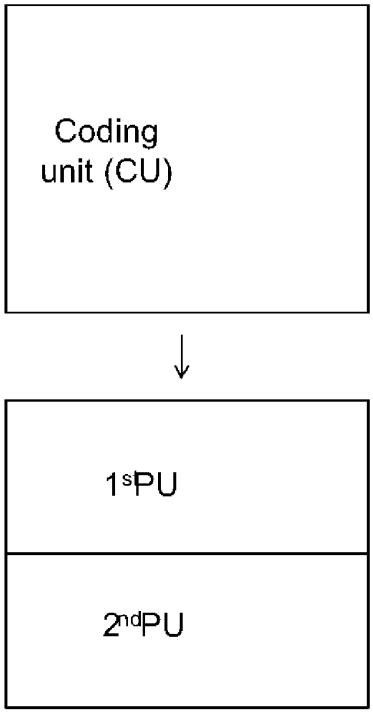


Fig. 10a

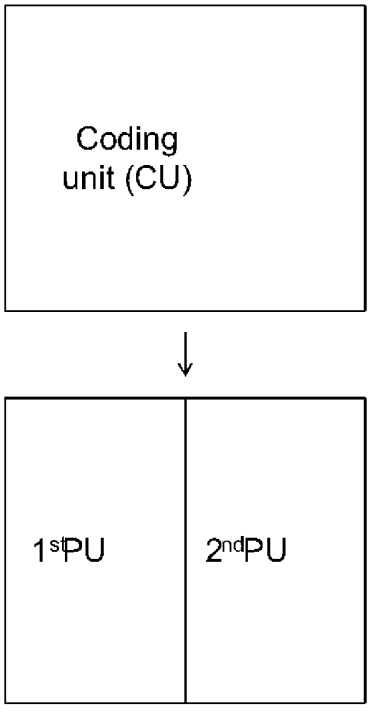


Fig. 10b

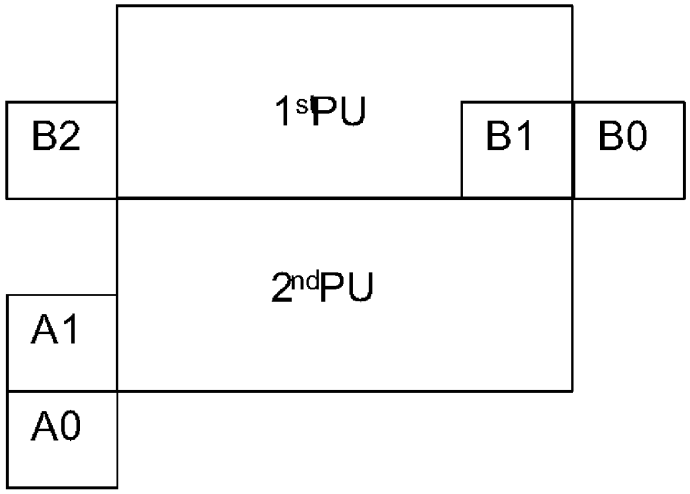


Fig. 11a

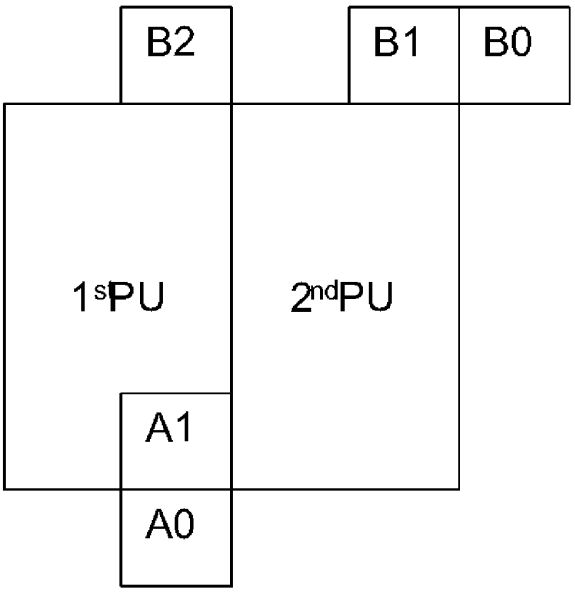


Fig. 11b

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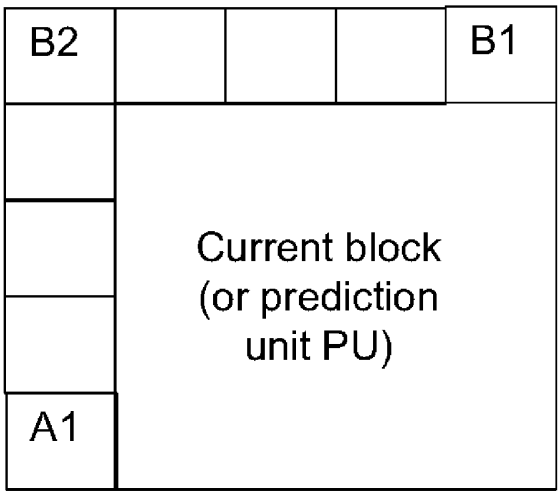


Fig. 12

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000087

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD FOR CODING AND AN APPARATUS

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/666680

filed on November 1, 2012.

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

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

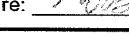
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Mehmet Oguz BICI Date (Optional): Nov - 05 - 2012

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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filed on November 1, 2012.

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I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than **five** (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Jani LAINEMA Date (Optional): NOV-02-2012

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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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WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Kemal UGUR Date (Optional): Nov-02-2012

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/681,725	08/21/2017	2482	3660	042933/501133	30	6

CONFIRMATION NO. 3570

FILING RECEIPT

10949
Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

OC000000093882080

Date Mailed: 08/25/2017

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)

Mehmet Oguz BICI, Tampere, FINLAND;
Jani LAINEMA, Tampere, FINLAND;
Kemal UGUR, Tampere, FINLAND;

Applicant(s)

NOKIA TECHNOLOGIES OY, Espoo, FINLAND;

Power of Attorney: The patent practitioners associated with Customer Number 10949

Domestic Priority data as claimed by applicant

This application is a CON of 15/426,822 02/07/2017 PAT 9743105
which is a CON of 13/666,680 11/01/2012 PAT 9571833
which claims benefit of 61/555,703 11/04/2011

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000091

If Required, Foreign Filing License Granted: 08/24/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/681,725**

Projected Publication Date: 11/30/2017

Non-Publication Request: No

Early Publication Request: No
Title

METHOD FOR CODING AND AN APPARATUS

Preliminary Class

375

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).

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000092

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: 15/681,725

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	600
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))	30 minus 20 =	* 10			OR	x 80 =	800
INDEPENDENT CLAIMS (37 CFR 1.16(h))	6 minus 3 =	* 3				x 420 =	1260
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	3660

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		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	

AMENDMENT B

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

10949 7590 09/21/2017

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

EXAMINER
AYNALEM, NATHNAEL B

ART UNIT	PAPER NUMBER
2488	

NOTIFICATION DATE	DELIVERY MODE
09/21/2017	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):

usptomail@alston.com

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000095

Office Action Summary	Application No. 15/681,725	Applicant(s) BICI ET AL.	
	Examiner NATHNAEL AYNALEM	Art Unit 2488	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 *08/21/2017*.

☐ 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) *1-30* 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) *1-30* 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: _____.

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000096

DETAILED ACTION

This is in response to Application No. 15/681,725 filed on August 21, 2017. The present application is being examined under the pre-AIA first to invent provisions.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

35 U.S.C. 101 requires that a claimed invention must fall within one of the four eligible categories of invention (i.e. process, machine, manufacture, or composition of matter) *and* must not be directed to subject matter encompassing a judicially recognized exception as interpreted by the courts. Three categories of subject matter are found to be judicially recognized exceptions to 35 U.S.C. § 101 (i.e. patent ineligible) (1) laws of nature, (2) physical phenomena, and (3) abstract ideas. To be patent-eligible, a claim directed to a judicial exception must as whole be directed to *significantly more* than the exception itself. Hence, the claim must describe a process or product that applies the exception in a meaningful way, such that it is more than a drafting effort designed to monopolize the exception.

Claim(s) 1-30 are rejected under 35 U.S.C. 101 because the claimed invention is directed to a judicial exception (i.e., an abstract idea) without significantly more. Claim(s) 1-30 are directed to encoding/decoding of image/video data, which corresponds to concepts identified as

abstract ideas by the courts, such as image encoding and decoding in *Recognicorp v. Nintendo* 122 USPQ2d 1377, 1381 (Fed. Cir. 2017). Furthermore, the claim(s) 1-30 do not include additional elements that are sufficient to amount to significantly more than the judicial exception because the additional elements when considered both individually and as an ordered combination do not amount to significantly more than the abstract idea.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the

scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

Claims 1-30 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-30 of U.S. Patent No. 9,571,833. Although the claims at issue are not identical, they are not patentably distinct from each other because the instant claims 1-30 are analogous to claims 1-30 of the cited patent to meet the limitations of the cited patent.

Claims 1-30 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-30 of U.S. Patent No. 9,743,105. Although the claims at issue are not identical, they are not patentably distinct from each other because the instant claims 1-30 are analogous to claims 1-30 of the cited patent to meet the limitations of the cited patent.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHNAEL AYNALEM whose telephone number is (571)270-1482. The examiner can normally be reached on Monday-Friday 7:30 to 5:00 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, Sath V. Perungavoor can be reached on (571)272-7455. 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.

/NATHNAEL AYNALEM/
Primary Examiner, Art Unit 2488

Notice of References Cited	Application/Control No. 15/681,725	Applicant(s)/Patent Under Reexamination BICI ET AL.	
	Examiner NATHNAEL AYNALEM	Art Unit 2488	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-2011/0176013 A1	07-2011	Robertson; Mark	H04N5/145	348/208.4
*	B	US-2012/0230408 A1	09-2012	Zhou; Minhua	H04N19/105	375/240.15
*	C	US-2012/0269270 A1	10-2012	Chen; Ying	H04N19/597	375/240.16
*	D	US-2012/0257678 A1	10-2012	Zhou; Minhua	H04N19/52	375/240.16
*	E	US-2012/0300846 A1	11-2012	SUGIO; Toshiyasu	H04N19/521	375/240.16
*	F	US-2012/0320984 A1	12-2012	Zhou; Minhua	H04N19/50	375/240.16
*	G	US-2013/0003850 A1	01-2013	SUGIO; Toshiyasu	H04N19/105	375/240.16
*	H	US-2013/0004092 A1	01-2013	SASAI; Hisao	H04N19/70	382/233
*	I	US-2013/0070855 A1	03-2013	Zheng; Yunfei	H04N19/105	375/240.16
*	J	US-2013/0083853 A1	04-2013	Coban; Muhammed Zeyd	H04N19/563	375/240.16
*	K	US-2013/0272408 A1	10-2013	CHEN; Ying	H04N19/597	375/240.16
	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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CONFIRMATION NO. 3570

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/681,725	08/21/2017 RULE	375	2488	042933/501133

APPLICANTS

NOKIA TECHNOLOGIES OY, Espoo, FINLAND;

INVENTORS

Mehmet Oguz BICI, Tampere, FINLAND;
Jani LAINEMA, Tampere, FINLAND;
Kemal UGUR, Tampere, FINLAND;

**** CONTINUING DATA ***************************

This application is a CON of 15/426,822 02/07/2017 PAT 9743105
which is a CON of 13/666,680 11/01/2012 PAT 9571833
which claims benefit of 61/555,703 11/04/2011

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

08/24/2017

Foreign Priority claimed	☐ Yes ☑ No	☐ Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met	☐ Yes ☐ No		FINLAND	13	30	6
Verified and Acknowledged	/NATHNAEL B AYNALEM/ Examiner's Signature	Initials				

ADDRESS

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000
UNITED STATES

TITLE

METHOD FOR CODING AND AN APPARATUS

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
3660	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15681725	BICI ET AL.
	Examiner	Art Unit
	NATHNAEL AYNALEM	2488

CPC- SEARCHED		
Symbol	Date	Examiner
H04N19/52 ; H04N19/00684 ; H04N19/00703 ; H04N19/147 ; H04N19/30 ; H04N19/597 ; H04N19/105 ; H04N19/11	9/14/2017	N.A.
H04N19/119 ; H04N19/174 ; H04N19/176 ; H04N19/187 ; H04N19/513 ; H04N19/58 ; H04N19/70	9/14/2017	N.A.

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
375	240.01-240.29	9/14/2017	N.A.

* 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 keyword search	9/14/2017	N.A.
Inventor's name search	9/7/2017	N.A.
Assignee search	9/7/2017	N.A.

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15681725	BICI ET AL.
	Examiner	**Art Unit**
	NATHNAEL AYNALEM	2488

✓	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	09/14/2017								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
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	28	✓								
	29	✓								
	30	✓								

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L6	46	(Bl Cl near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
L7	461	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
L8	8571	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
L9	644364	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
L10	121	L7 same L9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
L11	27	L8 and L10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
L12	6	L11 AND L6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
L13	474	(LAINEMA near2 Jani).in.	US-PGPUB;	OR	ON	2017/09/14

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L14	4	L11 AND L13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:08
L15	353	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:10
L16	6	L11 AND L15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:10
L17	63838	(Nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:11
L18	7	L17 AND L11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:11
S3	2798	(spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 17:53
S4	559	(spatial or intra) with predict$3 with candidate$1 with list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 17:55
S5	15357	(subset or sub$set) with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2016/09/20 17:57

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			IBM_TDB			
S6	5	S4 same S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 17:58
S7	33	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:02
S8	580	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:17
S9	48	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:18
S10	8	S8 same S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:18
S11	5	S10 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:19
S12	7278	merg$3 near3 list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:20
S13	292	S4 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:20
S14	280	S13 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR	US-PGPUB; USPAT;	OR	ON	2016/09/20 18:23

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		H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S15	722	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:24
S16	8	S9 same S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:25
S17	44	S9 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:26
S18	736	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:28
S19	18	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3) with merg$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S20	4	S18 same S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S21	4	S18 and S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S22	43381	(intra or spatial or spatio adj1 temporal	US-PGPUB;	OR	ON	2016/09/20

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		or inter) near4 predict$3	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			19:14
S23	407	S12 same S22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:14
S24	1072	(motion or vector$1 or mv) with merg$3 with list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:16
S26	323	S23 same S24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:16
S27	3255	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with (spatial or intra) with predict$3 with (motion or vector or mv)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S28	74	S26 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S29	73	S28 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S30	73	S29 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:18
S31	29910	(motion or vector$1 or mv) with list	US-PGPUB;	OR	ON	2016/09/20

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S32	112	S27 same S31	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:20
S33	5698	candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:59
S34	259	S24 and S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:59
S35	152	S24 same S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:00
S37	227453	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S38	6	S35 same S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S39	126	S35 and S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S41	40	(BlCl near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2016/09/20 20:44

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			IBM_TDB			
S43	36069	(intra or inter) near3 predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:45
S44	13	S41 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:46
S46	431	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S47	88	S43 and S46	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S48	11	S33 and S47	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S49	306	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:48
S50	12	S33 and S49	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:49
S51	61847	(nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50
S52	70	S33 and S51	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2016/09/20 20:50

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			JPO; DERWENT; IBM_TDB			
S54	15	S43 and S52	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50
S65	5	"13666680"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/21 12:11
S66	4	"20150010074"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/21 12:30
S67	62	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 12:39
S68	6	"13666680"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 12:48
S69	384	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S70	238369	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S71	93	S69 same S70	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S72	84	S71 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR	US-PGPUB; USPAT;	OR	ON	2017/02/27 13:02

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		H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S73	42	(Bl Cl near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:18
S74	454	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:21
S75	334	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S76	2	S71 and S74	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S77	4	S71 and S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S82	62871	(Nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:31
S83	384	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S84	238820	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/03/04 13:32

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			DERWENT; IBM_TDB			
S85	93	S83 same S84	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S86	84	S85 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S87	5	S86 and S82	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S103	461	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S104	253060	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S105	110	S103 same S104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S106	100	S105 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S107	11172	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2017/09/14 13:46

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			IBM_TDB			
S108	8571	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:47
S109	612	S107 same S108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:47
S110	44755	(spatial$2 or intra) with (vector or mv)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:48
S111	6	S105 and S109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:49
S112	142	S109 same S110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:50
S114	644364	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:09
S115	121	S103 same S114	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:11
S116	6	S109 and S115	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:11
S117	27	S108 and S115	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2017/09/14 14:11

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			JPO; DERWENT; IBM_TDB			

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S56	21002	((block or macroblock or picture or image) with (predict$3 or pu)).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:54
S57	266	((spatial or intra) with (mv or motion adj1 vector$1) with candidate).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:55
S58	818	(candidat$1 with merg$3).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:56
S59	739	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3 with candidat$1).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:57
S60	668	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:58
S61	200	S56 and S57	US-PGPUB; USPAT	OR	ON	2016/09/20 20:58
S62	2	S58 and S59 and S60	US-PGPUB; USPAT	OR	ON	2016/09/20 20:59
S63	11	S59 and S60	US-PGPUB; USPAT	OR	ON	2016/09/20 21:02
S64	1	S61 and S63	US-PGPUB; USPAT	OR	ON	2016/09/20 21:02
S89	920	(candidat$1 with merg$3).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S90	793	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3 with candidat$1).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S91	694	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S92	4	S89 and S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S93	14	S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S94	22196	((block or macroblock or picture or image) with (predict$3 or pu)).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S95	298	((spatial or intra) with (mv or motion adj1 vector$1) with candidate).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32

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S96	230	S94 and S95	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S97	14	S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S98	2	S96 and S97	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S99	1	"12896656"	US-PGPUB; USPAT	OR	ON	2017/03/04 17:38

9/ 14/ 2017 6:13:01 PM
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Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	Bici et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	*1*	of	*3*	Attorney Docket Number	042933/501133

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number - Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages of Relevant Figures Appear
	1	US-2004/0234144 A1	11-25-2004	Sugimoto et al.	
	2	US-2008/0159401 A1	07-03-2008	Lee et al.	
	3	US-2011/0170602 A1	07-14-2011	Lee et al.	
	4	US-2011/0182362 A1	07-28-2011	Kim et al.	
	5	US-2012/0307905 A1	12-06-2012	Kim et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Document Country Code - Number Kind Code (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	English Language Translation Attached
	6	WO 2011/062392 A2	05-26-2011	SK Telecom Co. Ltd.		
	7	WO 2011 115659 A1	09-22-2011	Thomson Licensing		

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
	8	**Bici, O. et al.**, *Non-CE13: Simplification of merge mode*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 7th Meeting: Geneva, CH, 21-30 November, 2011, Document JCTVC-G593; URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/, 13 pages	
	9	**Bross, B. et al.**, *Core Experiment 9: MV Coding and Skip/Merge Operations*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, IT, 14-22 July, 2011; Document JCTVC-F909, 13 pages	
	10	**Bross, Benjamin, et al.**; *"WD4: Working Draft 4 of High-Efficiency Video Coding"*; Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11; 6th Meeting; Torino, IT; 14-22 July 2011; Document JCTVC-F803_d; 232 pages	
	11	**Han, Woo-Jin, et al.**; *"Improved Video Compression Efficiency Through Flexible Unit Representation and Corresponding Extension of Coding Tools"*; Circuits and Systems for Video Technology; IEEE Transactions on 20.12 (2010); 1709-1720	

Examiner Signature		Date Considered	

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

Submitted September 21, 2017

Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	Bici et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	2	of	3	Attorney Docket Number	042933/501133

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
	12	**Huang, Ai-Mei et al.**, *A multistage motion vector processing method for motion-compensated frame interpolation*, Image Processing, IEEE Transactions on 17.5 (2008) 694-708	
	13	**J.-L. Lin, Y.-W. Chen, Y.-W. Huang, S. Lei;** *"CE9: Results of Experiment ROB04";* JCT-VC Doc. JCTVC-F052, Turin; Jul 2011	
	14	**Jeon, Y. et al**., *On MVP list pruning process*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, IT, 14-22 July, 2011, Document JCTVC-F105, 7 pages	
	15	**Nakamura, H. et al.**, *Unification of derivation process for merge mode and MVP*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting; Torino, IT, 14-22 July, 2011; Document JCTVC-F419; URL: http://wftp3.itu.int/AV-ARCH/JCTVC-SITE/2011_07_F_Torino/, 10 pages	
	16	**Oudin, S. et al.**; *"Block Merging for Quadtree-Based Video Coding"*; IEEE Int. Conf. on Multimedia and Expo; July 11-15; 2011; 6 pages	
	17	**Sullivan, G.J.**; *"Overview of the High Efficiency Video Coding (HEVC) Standard"*; IEEE Trans. On Circuits and Systems for Video Technology; Vol. 22, No. 12; December 2012; pp. 1649-1668	
	18	**Tai, Shen-Chuan, et al.**; *"A Multi-Pass True Motion Estimation Scheme with Motion Vector Propagation for Frame Rate Up-Conversion Applications"*; Journal of Display Technology; 4.2 (2008): 188-197	
	19	**Wiegand, Tomas, et al.**; *"WD3: Working Draft 3 of High-Efficiency Video Coding"*; Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11; 5th Meeting; Geneva, CH, 16-23 March, 2011; Document JCTVC-E603; 239 pages	
	20	**Zheng, Y. et al**., *Merge Candidate Selection in 2NxN, Nx2N, and NxN Mode*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, IT, 14-22 July, 2011; Document JCTVC-F302, 6 pages	
	21	International Search Report and Written Opinion from corresponding International Application No. PCT/FI2012/051070, dated March 27, 2013	
	22	Office Action from corresponding Korean Patent Application No. 2014-7015093, dated August 21, 2015	
	23	Office Action from corresponding Canadian Patent Application No. 2,854,495, dated October 7, 2015	

Examiner Signature		Date Considered	

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

Submitted September 21, 2017

Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	Bici et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	*3*	of	*3*	Attorney Docket Number	042933/501133

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
	24	Taiwanese Office Action and Search Report from Taiwanese Patent Application No. 101140777 dated December 2, 2015	
	25	Extended European Search Report for corresponding European Application No. 12845839.5 dated March 21, 2016, 10 pages	
	26	Office Action from Korean Patent Application No. 2014-7015093 dated August 22, 2016	
	27	Office Action for Canadian Application No. 2,854,495 dated September 6, 2016	
	28	Office Action for Chinese Application No. 2012800657775 dated October 9, 2016	
	29	Office Action for U.S. Patent Application No. 13/666,680 dated July 6, 2015, 25 pages.	
	30	Final Office Action for U.S. Patent Application No. 13/666,680 dated March 1, 2016, 35 pages.	
	31	Advisory Action for U.S. Patent Application No. 13/666,680 dated November 7, 2016, 4 pages.	
	32	Notice of Allowance for U.S. Patent Application No. 13/666,680 dated September 30, 2016, 17 pages.	
	33	Notice of Allowance for U.S. Patent Application No. 15/426,822 dated March 10, 2017, 8 pages	

Examiner Signature		Date Considered	

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

Submitted September 21, 2017

Electronic Acknowledgement Receipt

EFS ID:	30438114
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jennifer Son
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	21-SEP-2017
Filing Date:	21-AUG-2017
Time Stamp:	16:32:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		501133IDS.pdf	74116 4e74a015fc7312db0809ae046bcff118e75ef823	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Information Disclosure Statement (IDS) Form (SB08)	2	4
Warnings:			
Information:			
	Total Files Size (in bytes):	74116	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Attorney's Docket No. 042933/501133 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	Bici et al.	Confirmation No.:	3570
Appl No.:	15/681,725	Group Art Unit:	2488
Filed:	August 21, 2017	Examiner:	Nathnael B. Aynalem
For:	METHOD FOR CODING AND AN APPARATUS		

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

INFORMATION DISCLOSURE STATEMENT
CITATION UNDER 37 C.F.R. § 1.97

Attached is a list of documents on form SB08.

It is requested that the Examiner consider these documents and officially make them of record in accordance with the provisions of 37 C.F.R. § 1.97 and Section 609 of the MPEP. By identifying the listed documents, Applicant in no way makes any admission as to the prior art status of the listed documents, but is instead identifying the listed documents for the sake of full disclosure.

Any foreign patents or non-patent literature documents items are attached, except those that were supplied in, or cited by the Office during prosecution of, parent Application No. 15/426,822, filed February 7, 2017, which is a continuation of Application No. 13/666,680, filed November 1, 2012. Since the benefit of this application was claimed under 35 U.S.C. 120, no copies need to be furnished in accordance with 37 C.F.R. 1.98(d); however, copies will be furnished on request.

It is not believed that the $180 Information Disclosure Statement fee is required. However, in the event that the Examiner deems this fee necessary to allow consideration of this Information Disclosure Statement, such fees are hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

/Guy R. Gosnell/

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133

CONFIRMATION NO. 3570

10949
Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

PUBLICATION NOTICE



Title:METHOD FOR CODING AND AN APPARATUS

Publication No.US-2017-0347117-A1
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U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number - Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages of Relevant Figures Appear
	1	US-2007/0189389	08-16-2007	Boisson et al.	
	2	US-2008/0232642	09-25-2008	Chang	
	3	US-2011/0176612	07-21-2011	Tsai et al.	

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	4	CN 101271580 A	09-24-2008	HIMAX Tech Ltd		Abstract corresponds to US 2008/0232642
	5	CN 1757238 A	04-05-2006	Thomson Licensing		Abstract corresponds to US 2007/0189389

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
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Bibliographic data: CN101271580 (A) — 2008-09-24

System and method for 3-d recursive search motion estimation

Inventor(s):

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Classification: - international: *G06T7/20*
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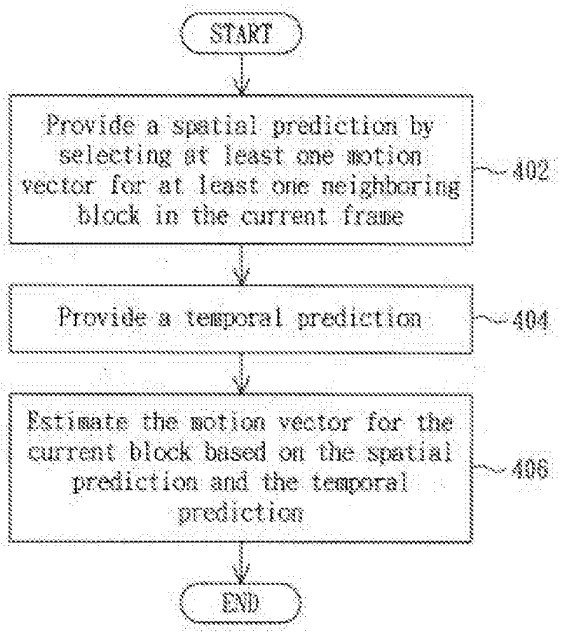
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Abstract of CN101271580 (A)

A method for 3-D recursive search motion estimation is provided to estimate a motion vector for a current block in a current frame. The method includes the following steps. First, provide a spatial prediction by selecting at least one motion vector for at least one neighboring block in the current frame. Then, provide a temporal prediction. After that, estimate the motion vector for the current block based on the spatial prediction and the temporal prediction. The temporal prediction is obtained by selecting at least one most frequent motion vector from a plurality of motion vectors for a plurality of blocks in a corresponding region of a previous frame, wherein the corresponding block encloses a previous block which is location corresponding to the current block in the current frame.



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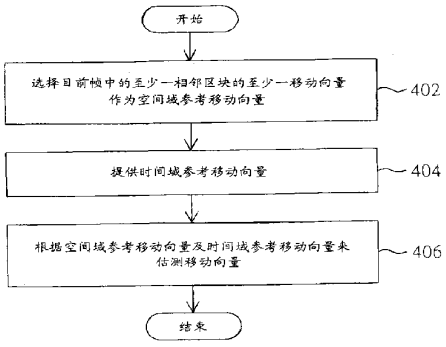
权利要求书 2 页 说明书 5 页 附图 3 页

[54] 发明名称

三维递归运动估测系统及其寻找方法

[57] 摘要

一种三维递归的运动估测寻找方法，用以提供目前帧画面的区块的移动向量，运动估测寻找方法包括下列的步骤。首先，选择目前帧画面中相邻区块的移动向量做为空间域参考移动向量。接着，提供时间域参考移动向量。之后，根据空间域及时间域参考移动向量来估测移动向量。其中，以前一个帧画面中对应区域的多个区块的多个移动向量中最常出现的移动向量做为时间域参考移动向量。对应区域包含先前区块，其与目前区块具有对应的位置。



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1. 一种三维递归的运动估测系统，用以计算一帧画面中一目前区块的一移动向量，该移动量估测系统包括:

一空间域参考移动向量提供单元，用以选择该目前区块周围至少一相邻区块的至少一移动向量来做为并输出一空间域参考移动向量;

一时间域参考移动向量提供单元，用以选择前一个帧画面中一对应区域中多个区块的多个移动向量中至少一最常出现的移动向量来做为并提供一时间域参考移动向量，该对应区域包含一先前区块，该先前区块与该目前区块具有对应的位置；以及

一运动估测单元，用以根据该至少一空间域参考移动向量及该至少一时间域参考移动向量来找出该移动向量。

2. 如权利要求 1 所述的三维运动估测系统，其中该至少一相邻区块为位于该目前区块的左下方或右下方的区块。

3. 如权利要求 1 所述的运动估测系统，其中该时间域参考移动向量提供单元还用以分析该对应区域中全部区块的移动向量的一统计结果，并选择该最常出现的移动向量做为该时间域参考移动向量。

4. 如权利要求 1 所述的运动估测系统，其中该时间域参考移动向量提供单元用以分析该对应区域中多个特定区块的移动向量的一统计结果，并选择该最常出现的移动向量做为该时间域参考移动向量，其中这些特定区块相对于该目前区块的绝对差值求和数值为够小。

5. 如权利要求 3 或 4 所述的运动估测系统，其中只有当该最常出现的移动向量的出现频率够高时以该最常出现的移动向量做为该时间域参考移动向量。

6. 如权利要求 3 或 4 所述的运动估测系统，其中当该时间域参考移动向量提供单元对该统计结果进行分析时加重位于影像边缘的区块的权重。

7. 一种三维递归的运动估测寻找方法，用以提供一目前帧画面的一区块的一移动向量，该运动估测寻找方法包括:

选择一目前帧画面中的至少一相邻区块的至少一移动向量做为一空间域参考移动向量;

提供一时间域参考移动向量；以及

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根据该空间域参考移动向量及该时间域参考移动向量来估测该移动向量；

其中，以前一个帧画面中一对应区域的多个区块的多个移动向量中至少一最常出现的移动向量做为该时间域参考移动向量，该对应区域包含一先前区块，该先前区块与该目前区块具有对应的位置。

8. 如权利要求 7 所述的运动估测寻找方法，其中该至少一相邻区块为位于该目前区块的左下方或右下方的区块。

9. 如权利要求 7 所述的运动估测寻找方法，其中分析该对应区域中全部区块的移动向量的一统计结果，并选择该最常出现的移动向量做为该时间域参考移动向量。

10. 如权利要求 7 所述的运动估测寻找方法，其中分析该对应区域中多个特定区块的移动向量的一统计结果，并选择该最常出现的移动向量做为该时间域参考移动向量，其中这些特定区块相对于该目前区块的绝对差值求和数值为最小。

11. 如权利要求 9 或 10 所述的运动估测寻找方法，其中只有当该最常出现的移动向量的出现频率够高时系以该最常出现的移动向量做为该时间域参考移动向量。

12. 如权利要求 9 或 10 所述的运动估测寻找方法，其中当该时间域参考移动向量提供单元对该统计结果进行分析时加重位于影像边缘的区块的权重。

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三维递归运动估测系统及其寻找方法

技术领域

本发明涉及一种运动估测(Motion Estimation)系统，尤其是涉及一种通过统计时间域参考移动向量 (Temporal Prediction)来进行三维递归(3-Dimensional Recursive)运动估测的运动估测系统。

背景技术

传统上，经由三维递归(3-Dimensional Recursive)运动估测寻找方法可根据空间域参考移动向量(Spatial Prediction)及时间域参考移动向量(temporal Prediction)来找出目前帧画面中多个区块的移动向量。请参考图 1，其示出了传统三维递归运动估测寻找方法的示意图。在图 1 中，区块 112 的时间域参考移动向量通过参考前一个帧画面 100 中对应区块 102 的左下方与右下方的区块 104 与 106 的移动向量，其中对应区块 102 位于与区块 112 对应的位置。

然而，因传统时间域参考移动向量仅参考对应区块 102 的左下方与右下方的区块 104 与 106 的移动向量，一旦其发生错误，欲计算的区块 112 的移动向量很可能会因为根据不正确的时间域参考移动向量而错误。

此外，欲根据上述方法来计算区块 112 的移动向量需储存前一个帧画面 100 中所有区块的移动向量，如此，将导致应用上述方法的系统的内存成本较高。这样一来，如何找出较为精准且实现成本较低的三维递归的运动估测其系统是业界不断致力的方向之一。

发明内容

有鉴于此，本发明提出三维递归(3-Dimensional Recursive)运动估测系统及其寻找方法其可有效地改善上述的问题。

根据本发明提出一种三维递归的运动估测系统，用以计算帧画面中目前区块的移动向量。移动量估测系统包括空间域、时间域参考移动向量及运动估测单元。空间域参考移动向量提供单元用以选择目前区块周围相邻区块的

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移动向量来做为并输出空间域参考移动向量。时间域参考移动向量提供单元用以选择前一个帧画面中对应区域中多个区块的多个移动向量中最常出现的移动向量来做为并提供时间域参考移动向量。对应区域包含先前区块，其与目前区块具有对应的位置。运动估测单元用以根据空间域及时间域参考移动向量来找出移动向量。

根据本发明提出一种三维递归的运动估测寻找方法，用以提供目前帧画面的区块的移动向量，运动估测寻找方法包括下列的步骤。首先，选择目前帧画面中相邻区块的移动向量做为空间域参考移动向量。接着，提供时间域参考移动向量。之后，根据空间域及时间域参考移动向量来估测移动向量。其中，以前一个帧画面中对应区域的多个区块的多个移动向量中最常出现的移动向量做为时间域参考移动向量。对应区域包含先前区块，其与目前区块具有对应的位置。

为让本发明的上述内容能更明显易懂，下文特举一较佳实施例，并结合附图详细说明如下：

附图说明

图 1 示出了传统时间域的参考移动向量选择方法操作下的帧画面的示意图。

图 2 示出了依照本发明较佳实施例的运动估测系统的方块图

图 3 示出了帧画面的示意图。

图 4 示出了本实施例的运动估测方法的流程图。

附图符号说明

100、110、30、40：帧画面

102、104、106、112、32、34、36、42：区块

200：运动估测系统

210：空间域参考移动向量提供单元

220：运动估测单元

230：运动补偿单元

240：时间域参考移动向量提供单元

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310-360、410-460：区域

402-406：操作步骤

具体实施方式

本实施例的三维递归(3-Dimensional Recursive)运动估测系统及其方法划分帧画面为一个或多个区域，并对这些区域中的区块的移动向量分别进行数量统计。本实施例的三维递归运动估测系统及其方法以统计的时间域参考移动向量，并以其找出目前区块的移动向量。其中，统计的时间域参考移动向量例如为各区域中的最常出现的移动向量。

请参考图 2 及图 3，图 2 示出了依照本发明较佳实施例的三维递归运动估测系统的方块图，图 3 示出了图 1 的三维递归运动估测系统的运动示意图。三维递归运动估测系统 10 包括空间域参考移动向量提供单元 210、时间域参考移动向量提供单元 240 及运动估测单元 220。其中运动估测单元 220 例如输出至运动补偿单元 230 以进行运动补偿。在本实施例中，如图 3 所示，各帧画面，如帧画面 30 或 40 被划分为一个或多个区域，例如帧画面 30 及 40 分别被划分为区域 310-360 及 410-460，而其以 2*3 的矩阵排列。其中帧画面 30 及 40 例如分别为先前帧画面及目前帧画面。此外，亦可将帧画面 30 及 40 划分为更多或更少个区域。接下来，以找出区块 32 的移动向量的操作为例做说明。

空间域参考移动向量提供单元 210 用以提供区块 32 的空间域参考移动向量 PS，本实施例的移动向量记录单元 210 例如以与区块 32 相邻的区块的移动向量来做为其空间域参考移动向量 PS，例如，其以区块 32 左下方及右上方的区块，亦即区块 34 及 36 的移动向量做为空间域参考移动向量 PS。此外，本领域的技术人员也可通过其它周知的空间域参考移动向量选择方法来找出空间域参考移动向量 PS。

时间域参考移动向量提供单元 240 用以分析区域 410 中所有区块的移动向量统计结果，并以最常出现的移动向量做为区域 310 中所有区块的时间域参考移动向量，亦即为区块 32 的时间域参考移动向量 PT。本实施例的区域 410 包括区块 42，而区块 42 在区域 410 中的位置与区块 32 在区域 310 中的位置相对应。只有最常出现的移动向量出现的频率超过一临界值，例如为 50% 时以最常出现的移动向量做为时间域参考移动向量 PT。

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或者时间域参考移动向量提供单元240仅对区域410中相关于部分区块的统计结果进行分析，并根据分析结果来找出时间域参考移动向量PT。例如时间域参考移动向量提供单元240仅对区域410中相对于区块32的一误差数值够小的区块的统计结果进行分析。其中，时间域参考移动向量提供单元240例如经由绝对差值求和(Sum of Absolute Differences，SADs)函数来找出区域410中各区块相对于区块32的误差数值。

此外，时间域参考移动向量提供单元240还可增加区域410中多种特定区块的权重，以提升时间域参考移动向量PT的精确度。例如，时间域参考移动向量提供单元240可提升位于影像边界的区块的权重。

而运动估测单元220用以根据空间域参考移动向量PS及时间域参考移动向量PT来产生其移动向量MV。例如，运动估测单元220可根据空间域及时间域参考移动向量PS及PT来找出多个对应的区块，并以其分别与区块32进行区块比对(Block Matching)的方式来找出移动向量MV。

请参考图4，其为示出了本实施例的运动估测方法的流程图，以得到区块32的移动向量MV。首先，如步骤402，接收区块32的空间域参考移动向量PS，其例如为与区块32相邻的区块的移动向量，例如为区块32的左下方及右下方的区块34及36。

接着，如步骤404，接收区块32的时间域参考移动向量PT，其例如根据统计帧画面40的区域410中各区块的移动向量来得到时间域参考移动向量PT。其中区域410例如包括与区块32具有对应位置的区块42。例如，以最常出现的移动向量做为时间域移动向量PT。其中，只有最常出现的移动向量出现的频率超过一临界值，例如为50%时以最常出现的移动向量做为时间域参考移动向量PT。

或者可根据区域410中相关于部分区块的统计结果来得到时间域参考移动向量PT。例如仅对区域410中相对于区块32的一误差数值够小的区块的统计结果进行分析。其中，时间域参考移动向量提供单元240例如经由绝对差值求和函数来找出区域410中各区块相对于区块32的误差数值。

此外，亦可通过提升区域410中的特定区块，例如区域410中位于影像边界的区块的权重以提升对应的时间域参考移动向量的精准性。

之后，如步骤406，运动估测单元220根据区块32的空间域参考移动向量PS及其时间域参考移动向量PT来产生区块32的移动向量MV。例如，可

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根据空间域及时间域参考移动向量PS及PT来找出多个对应的区块，并以其分别与区块32进行区块比对(Block Matching)的方式来找出移动向量MV。

本实施例虽仅以位于区块32的左下方及右下方的区块34及36的移动向量来做为区块32的空间域参考移动向量PS为例作说明，然而，本实施例的运动估测系统200并不局限以上述区块的移动向量来做为空间域参考移动向量PS，而更多、更少或其它位置的区块的移动向量亦可做为空间域参考移动向量PS。

本实施例虽仅以帧画面30及40划分为以2*3的矩阵排列的区域310-360及410-460的操作为例作说明，然而，本实施例的帧画面30及40并不局限于上述的区域划分方法，而更可将帧画面30及40经由其它形式来划分。例如，可将帧画面30及40划分为以2*4矩阵排列的区域或根据其上的物体来将帧画面30及40划分为不规则型态的区域。

本实施例的三维递归运动估测系统及其方法以通过对各区域的移动向量统计结果来得到时间域移动向量PT，并以其找出区块32的移动向量MV。如此，即便在区块42周围的区块的移动向量估计错误，本实施例的时间域移动向量PT及移动向量MV发生错误的机率也可不受影响并具有较高的可靠程度。

此外，由于本实施例的三维递归运动估测系统及其方法将帧画面划分为若干个区域来进行移动向量的统计，并仅需储存与区域数目实质上相等的时间域参考移动向量来对目标区块的移动向量进行估测。如此，本实施例的三维递归运动估测系统的内存成本可有效地降低。

综上所述，虽然本发明已以一较佳实施例揭露如上，但其并非用以限定本发明。本领域技术人员，在不脱离本发明的精神和范围的前提下，可以作若干的更改与修饰。因此，本发明的保护范围以本发明的权利要求为准。

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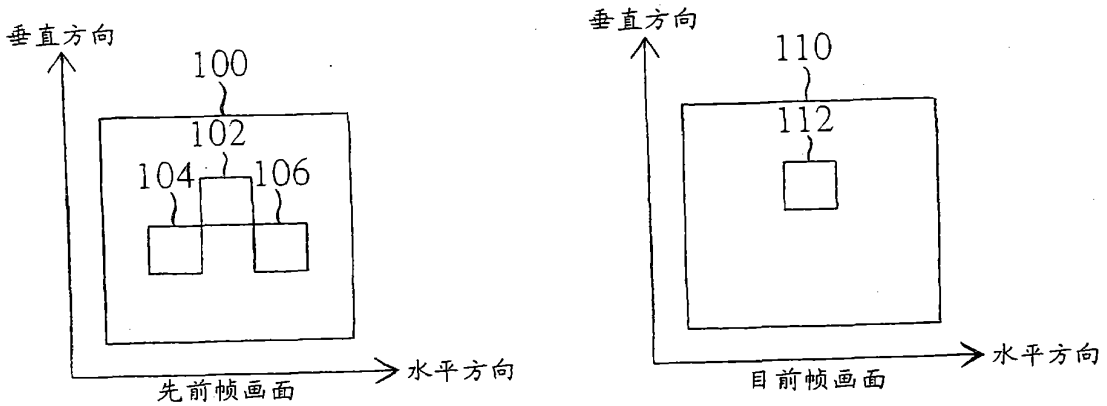


图 1

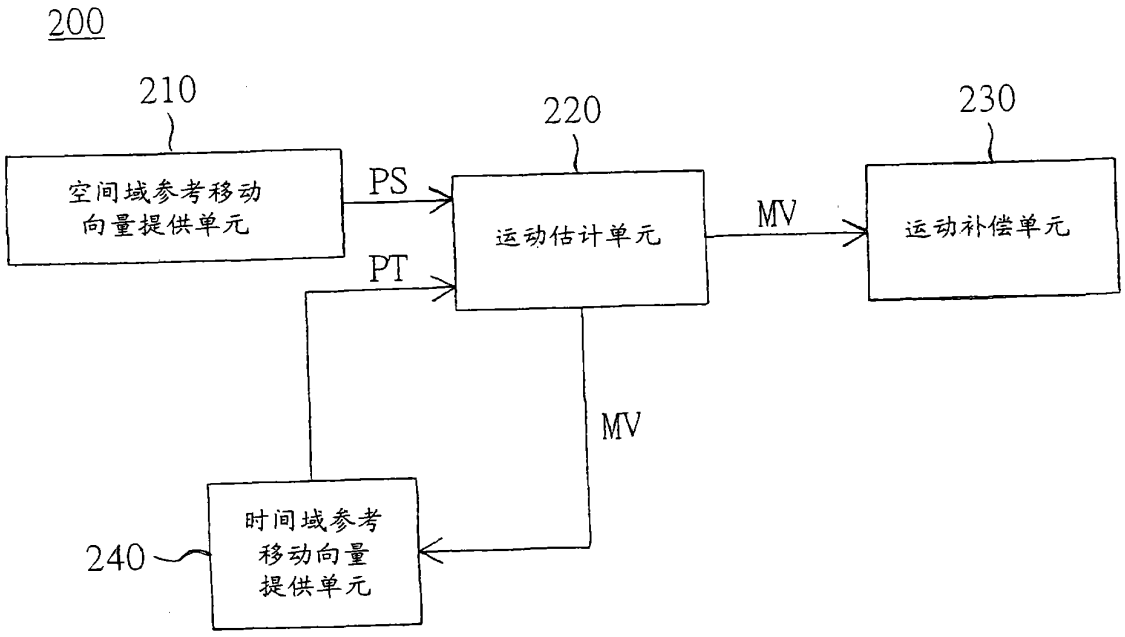


图 2

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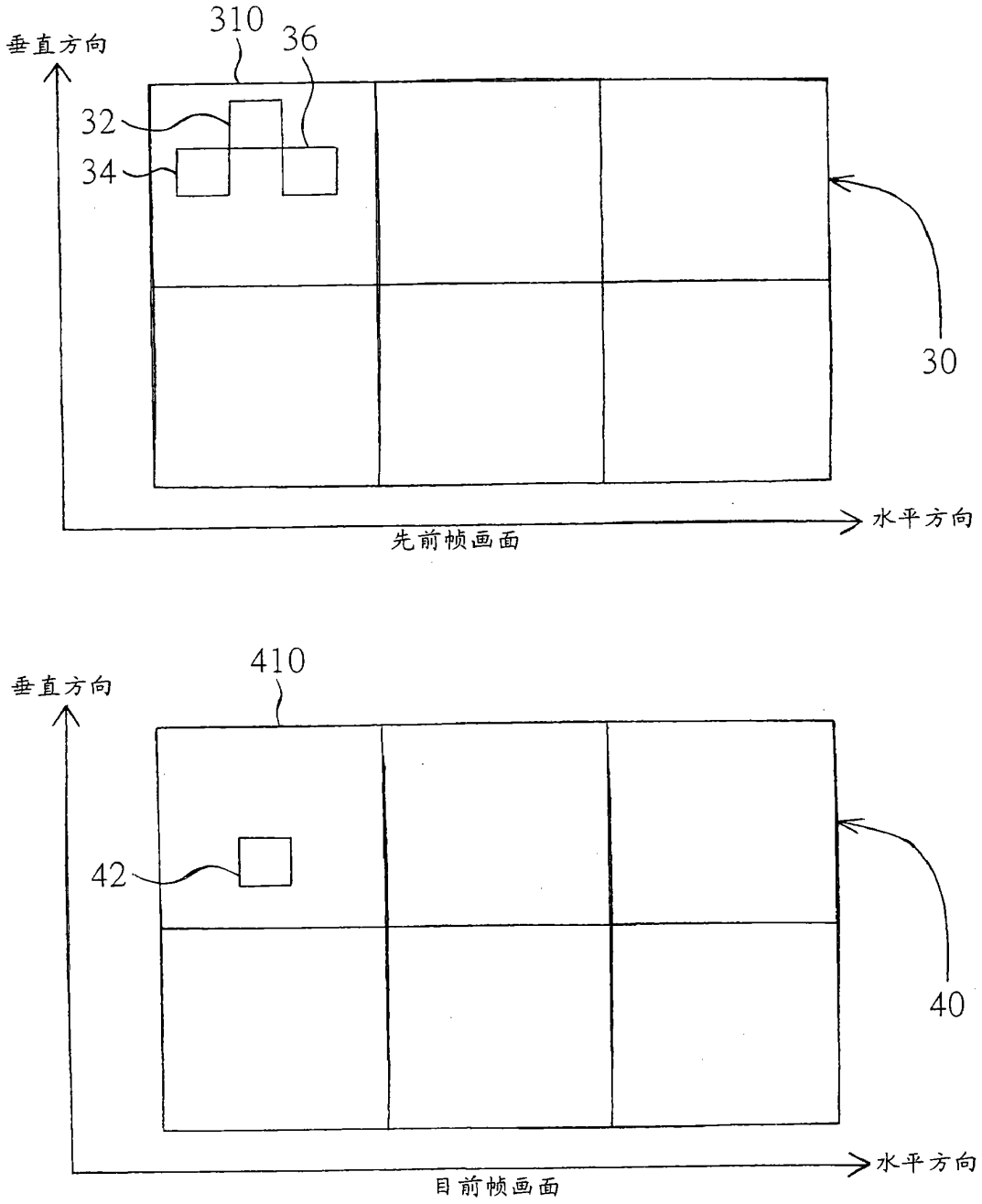


图 3

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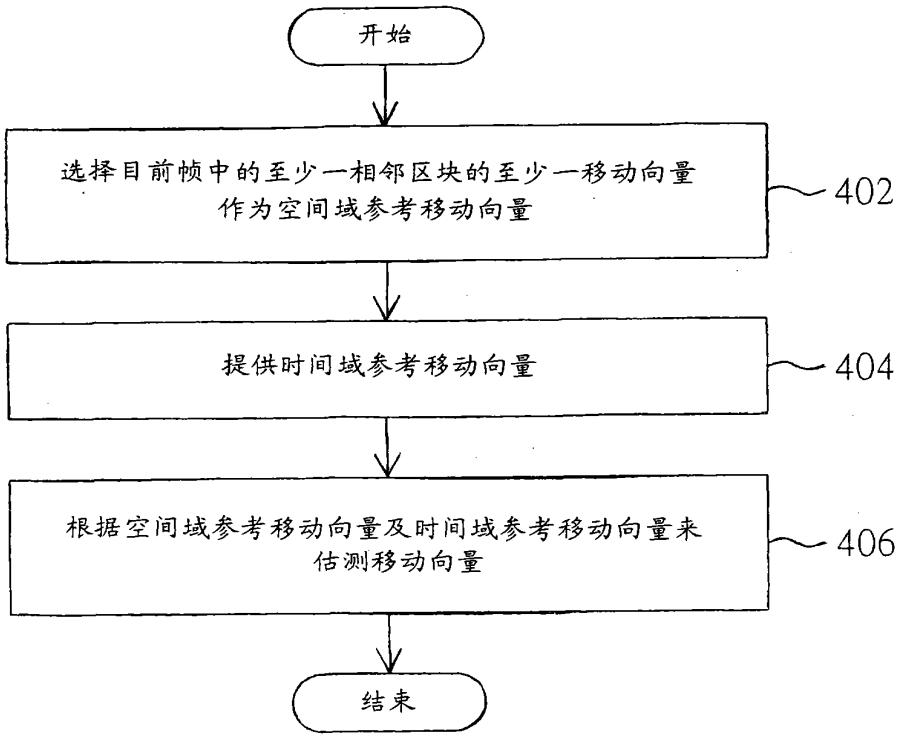


图 4

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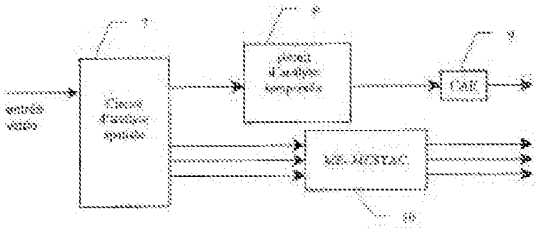
Espacenet

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Method for coding a video image taking into account the part relating to a component of a movement vector

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Applicant(s):	THOMSON LICENSING [FR] ± (THOMSON LICENSING)
Classification:	**- international:** ***G06T9/00; H03M7/40; H04N7/26*** **- cooperative:** **H04N19/105**; **H04N19/517**; **H04N19/61**; **H04N19/615**; **H04N19/63**; H03M7/40; H03M7/4006; H04N19/13
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Abstract not available for CN1757238 (A)
Abstract of corresponding document: FR2852179 (A1)



The method involves estimating movement between a current and reference instants, which correspond to respective current and reference images to provide a vector movement. A high space frequency signal relating to the current image is entropic coded by taking into account a temporal context, based on the vector movement. Parameters exploited for the calculation of the temporal context is parity of vector movement component. An independent claim is also included for a video encoder implementing a video image coding method.

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H03M 7/40 (2006.01)

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[43] 公开日 2006 年 4 月 5 日

[11] 公开号 CN 1757238A

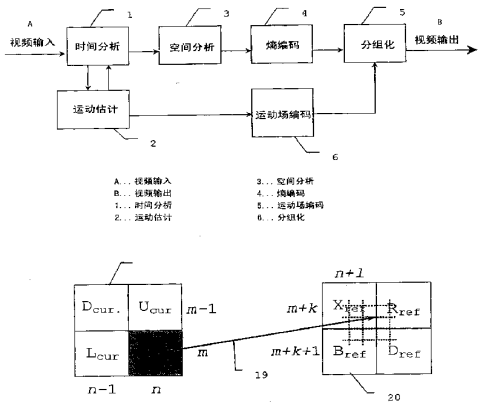
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[32] 2003. 3. 6 [33] FR [31] 03/02840
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[87] 国际公布 WO2004/082293 法 2004.9.23
[85] 进入国家阶段日期 2005.9.1
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权利要求书 2 页 说明书 12 页 附图 4 页

[54] 发明名称

考虑与运动矢量的分量相关的部分来编码视频图像的方法

[57] 摘要

一种对图像序列中的图像进行编码的方法，执行以下步骤：估计与当前图像(11)相对应的当前时间和与参考图像(12)相对应的参考时间之间的运动，以便提供运动矢量(13)，考虑基于运动估计的时间上下文(14、17、20)，对与当前图像有关的高空间频率的信号进行熵编码(10、25、28)，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性(21)。 本发明的应用涉及具有时间预测的视频压缩。



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1、 一种对图像序列中的图像进行编码的方法，包括以下步骤（7、22、23）：对当前图像进行空间分析，以便产生低空间频率的信号和高空间频率的信号，并执行对与当前图像（11）相对应的当前时间和与参考图像（12）相对应的参考时间之间的运动的估计，以便提供运动矢量（13），还包括以下步骤：通过考虑基于运动估计的时间上下文（14、17、20），对与当前图像有关的高空间频率的信号中的至少一个进行熵编码（10、25、28），用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性（21）。

2、 根据权利要求1所述的方法，其特征在于，用于计算时间上下文的参数之一是与运动矢量的分量有关的分数部分（21）。

3、 根据权利要求1所述的方法，其特征在于，对于高空间频率的信号，所考虑的分量是高通空间滤波器方向上的分量。

4、 根据权利要求 1 所述的方法，其特征在于，将时间上下文（14、17、20）与空间上下文（15、18）进行组合。

5、 根据权利要求1所述的方法，其特征在于，时间上下文（14、17、20）是基于利用多于一个参考图像（14、17）的多于一个运动估计（13、16）。

6、 根据权利要求1所述的方法，其特征在于，所述熵编码是一种算术编码。

7、 根据权利要求6所述的方法，其特征在于，算术编码是通过比特平面的编码，以及时间上下文对应于时间参考图像中相同等级的比特平面。

8、 根据权利要求 6 所述的方法，其特征在于，算术编码是 N 元编码，以及时间上下文对应于时间参考图像中相同等级的N比特平面。

9、 根据权利要求1所述的方法，其特征在于，利用通过谱分析产生的信号之一进行运动估计（24、27）。

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10、 根据权利要求 7 所述的方法，其特征在于，通过比特平面进行运动估计（24、27），以及针对一个比特平面的时间上下文基于所述比特平面上的运动估计。

11、 根据权利要求 1 所述的方法，其特征在于，空间分析是小波变换。

12、 一种对根据权利要求 1 所述的编码方法进行了编码的、图像序列中的图像进行解码的方法，包括以下步骤：通过考虑基于运动估计的时间上下文（14、17、20），执行与高空间频率信号中的至少一个有关的熵解码，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性（21）。

13、 根据权利要求 12 所述的解码方法，其特征在于，用于计算时间上下文的参数之一是与运动矢量的分量有关的分数部分（21）。

14、 一种实现了根据权利要求 1 所述的编码方法的视频编码器，包括：空间分析电路（7、22、23），接收视频信号，并产生与最低分辨率相对应的最低空间频率的信号以及针对一个或多个较高分辨率的高空间频率的信号；运动估计电路，用于计算运动矢量，所述视频编码器还包括：电路，考虑基于运动估计的时间上下文（14、17、20），对高空间频率的信号中的至少一个进行熵编码，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性（21）。

15、 一种针对根据权利要求 1 所述的编码方法进行了编码的、图像序列中的图像的视频解码器，包括：熵解码电路，实现了根据运动估计来计算时间上下文的算法，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性（21）。

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考虑与运动矢量的分量相关的部分来编码视频图像的方法

技术领域

本发明涉及一种对图像序列中的视频图像进行编码的方法，包括对图像的空间分析步骤，并依赖于图像间时间预测的使用。更具体地，这是一种基于图像的时间上下文的熵编码，所述图像利用了与运动信息有关的特性。

背景技术

在被称为混合标准的编码标准中，如 MPEG-1、MPEG-2、MPEG-4、h264 等，与大多数 2D+t 子带编码方案（如 MC-EZBC（运动补偿嵌入零块上下文）等）中一样，编码序列的第一步在于：在利用图像内的空间冗余之前，利用连续图像之间的时间冗余。

图 1 示出了根据现有技术的视频编码器方案。

将视频信号传输到时间分析电路 1。运动估计电路 2 与此第一电路相连，以便估计编码器所接收到的两幅图像之间的运动。将运动信息传输到电路 1 和编码电路 6，例如以运动矢量场的形式。将电路 1 的输出传输到空间分析电路 3，空间分析电路 3 从纹理中提取出图像频率系数。随后，熵编码电路 4 对这些系数进行量化和编码。将编码后的信息和运动信息传输到分组产生电路或分组器 5，分组器 5 以视频分组的形式发送视频数据，形成视频数据流。

在子带编码方案的情况下，在混合方案或 MCTF（运动补偿时间滤波）的情况下，时间分析电路 1 执行运动补偿时间预测。具有时间预测的编码算法在于施加运动补偿，以便产生稍后用在编码处理中的预测图像。这些算法基于相同的原理。从被称作参考图像的一幅或多幅在先的已编码图像开始，预测要编码的图像。这是具有预测（P）图像和双向或双预测（B）图像的视频 MPEG 标准中的情况。预测在于利用

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这些参考图像和与当前图像相关联的运动矢量进行运动补偿。随后进行编码的是预测的残余部分，换句话说，当前图像与时间预测图像之间的差别。通常按照像素块来描述运动，并按照像素块来实现运动补偿。

例如，空间分析电路 3 执行小波分解或离散余弦变换。电路 4 的熵编码可以是 VLC（可变长度编码）型的编码或算术类型的编码。

分组化电路（packetization circuit）的功能是将分别来自熵编码电路和运动场编码电路的纹理和运动信息按照其空间和时间频率及其重要性（例如，其在比特平面编码方案中的权重）分割为相关子集合。因此，所获得的二进制流可以独立地在分辨率、帧频率和保真度方面进行缩放。

估计运动场对应于源的分辨率。因此，必须在全分辨率图像上执行通过滤波或预测来进行的编码器的运动补偿步骤及解码器中的逆步骤，以便保持一致。

目前，在视频数据传输中通常采用空间可缩放性，以多种分辨率等级传输和重构图像的可能性，例如 SD（标准清晰度）、CIF 或 QCIF 格式的图像。进行空间-时间分析的传统编码方案（如前述利用小波分解或离散余弦变换的编码方案）适合于这种可缩放性，换句话说，适合于图像的多种分辨率，因此优化了数据压缩。遵循上述体系结构的视频编码器对于纹理而言可以是空间可缩放的，但对于运动则不是。而且，运动信息是不可忽略的。例如，当对低速率 15Hz CIF 序列进行编码时，其表示整个二进制流的大约 30%。因此，通常的体系结构遇到了过于清晰的运动信息，其实质上影响了低分辨率时的压缩性能。

存在用于保留纹理和运动的可缩放性的解决方案。最简单的手段是以允许解码的最低空间分辨率估计运动。因此，初始进行空间分解。于是，保持对存在于连续空间高频之间的时间冗余的利用。为此，已经提出了几种解决方案，其重新引入了传统的时间去相关工具：预测或运动补偿滤波。现在，由于产生了已知为空间变换的‘移位变异’的现象的相位问题，这些传统的技术在变换域中不如像素域中那样有效。事实上，离散小波变换（DWT）和离散余弦变换（DCT）都会使与

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相同像素图案对应的连续图像系数根据运动的方向和幅度、空间滤波器的方向和长度而在符号和绝对值上迥然不同。空间变换所固有的移位变异需要新的运动估计解决方案，由于其使得时间高频不适合于通过预测或滤波进行编码。

发明内容

本发明的目的是克服上述缺陷。本发明的一个主题是一种对图像序列中的图像进行编码的方法，包括以下步骤：对当前图像进行空间分析，以便产生低空间频率的信号和高空间频率的信号，并执行对与当前图像相对应的当前时间和与参考图像相对应的参考时间之间的运动的估计，以便提供运动矢量，其特征在于其通过考虑基于运动估计的时间上下文，对与当前图像有关的高空间频率的信号中的至少一个进行熵编码，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性（parity）。

根据一个特定的实施例，用于计算时间上下文的参数之一是与运动矢量的分量有关的分数部分。

根据一个特定的实施例，对于高空间频率的信号，所考虑的分量是高通空间滤波器方向上的分量。

根据一个特定的实施例，熵编码是算术比特平面（bit plane）编码，以及时间上下文对应于时间参考图像中相同等级的比特平面。

根据一个特定的实施例，算术编码是N元编码，以及时间上下文对应于时间参考图像中相同等级的N比特平面。

本发明的另一主题是一种对根据上述编码方法进行了编码的、图像序列中的图像进行解码的方法，其特征在于其通过考虑基于运动估计的时间上下文，执行与高空间频率信号中的至少一个有关熵解码，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性。

根据一个特定的实施例，所述解码方法的特征在于用于计算时间上下文的参数是与运动矢量的分量有关的分数部分。

本发明的另一主题是一种实现了前述编码方法的视频编码器，包括：空间分析电路，接收视频信号，并产生与最低分辨率相对应的最

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低空间频率的信号以及针对一个或多个较高分辨率的高空间频率的信号；运动估计电路，用于计算运动矢量，所述视频编码器的特征在于包括：电路，考虑基于运动估计的时间上下文，对高空间频率的信号中的至少一个进行熵编码，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性。

本发明的另一主题是一种针对根据上述编码方法进行了编码的、图像序列中的图像的视频解码器，其特征在于包括：熵解码电路，实现了根据运动估计计算时间上下文的算法，用于计算时间上下文的参数之一是与运动矢量的分量有关的奇偶性。

所述方法允许更好地利用连续图像的空间变换的时间冗余，尤其是较高频率，而同时保持了运动和纹理的空间可缩放性。由于运动的多分辨率描述，改进了针对空间可缩放性的每个分辨率的、比率质量方面的压缩性能。

由于未经滤波或预测地使用时间冗余，也改进了解码视频的视觉和客观质量，因为滤波和预测是人工噪声的来源，例如按块进行运动估计时的分块效应。

附图说明

通过以下作为非限制性示例并参照附图而给出的描述，本发明的其他特定特征和优点将变得更加显而易见，其中：

图 1 示出了根据现有技术的编码方案；

图 2 示出了根据本发明的编码电路的简化方框图；

图 3 示出了当前图像的像素(x, y)的时间邻域；

图 4 示出了像素(x, y)的时间和空间邻域；

图 5 示出了像素(x, y)的两个时间邻域；

图 6 示出了像素(m, n)的空间和时间邻域；

图 7 示出了运动矢量的分量的奇偶性和分数部分；

图 8 示出了根据本发明的编码电路的方框图。

具体实施方式

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图 2 示出了实现了根据本发明的编码方法的编码电路。这种情况下，选择小波分解，但并非限制性的。

将视频源传输到 2D 空间分析电路，以参考数字 7 表示，是小波分解电路。其执行空间分解，以便提供多种空间分辨率的子带系数。产生了最低分辨率系数的第一输出与时间分析电路 8 相连。与较高分辨率的子带系数相对应的其他输出与采用了运动补偿空间-时间上下文的算术编码电路或 MC-STAC（运动补偿空间-时间算术编码）电路的输入相连。时间分析电路 8 与基于上下文的算术编码或 CAE 电路 9 相连。MC-STAC 电路的输出对应于多种分辨率。

从视频图像开始，2D 空间小波分解电路产生小波系数图像或子图像，每一个对应于给定的空间频带，直到达到解码所能接受的最低分辨率为止。在空间域内，将图像分解为基带或低频带（LL）和高频带（LH、HL、HH）。

时间分析电路 8 只处理与基带相对应的图像。因此，将来自时间分析电路 7 的最低空间分辨率信号（LL）传输到时间分析电路 8。此电路执行运动估计，然后执行运动补偿时间滤波，也称作 MCTF。时间分析在于根据输入频率的接收图像，产生中间图像，以便获得时间可缩放性。例如，这种分析器电路是 MC-提升型的，稍后将进行解释。例如，时间滤波在于从根据运动补偿在先图像预测出的图像中减去当前图像。

除了与基带相对应的图像以外的其他图像由运动补偿空间-时间上下文算术编码或 MCSTAC 电路 10 进行处理。事实上，最高达原始分辨率的连续分辨率的重构所需的这些子带并不适合于传统滤波或时间预测技术，因而立即对其进行算术编码。为了使用残余的时间冗余，其链接连续的空间高频，此自适应上下文算术编码步骤涉及对运动信息的使用，如此后所解释的那样。

小波系数到空间高频的分配如下：以轮廓分隔零或低幅度系数的大面积连通区域，所述大面积连通区域对应于图像的均匀区域，所述轮廓通常为连续曲线，所述系数的幅度沿着所述轮廓快速地变化，其符号也是如此。

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因此，在现有方案中广泛使用的空间上下文数据允许对系数的幅度和符号进行编码，以便大概地进行再现，因此降低了子带的熵，并提高了压缩比。例如，在 G. Langdon 和 J. Rissanen 发表于 IEEE Transactions on Communications，第 29 卷，第 6 号，第 858～867 页，1981 年 6 月的题为“Compression of black-white images with arithmetic coding”的文章中，描述了基于空间上下文的上下文算术编码的运算算法。因为代替了整个信号的全局性的、概率表的估计和使用依赖于上下文，换句话说，根据邻域的可能配置的分类，局部适配，所以此算术算法是与上下文有关的。此类编码很好地适用于对空间 DCT 或 DWT 的高频系数进行编码，因为其利用了残余局部空间相关。通常，通过组合紧邻邻域的可能值，确定多种上下文。算术编码是自适应的，因为在编码处理期间，从初始值开始，通过学习过程，执行对统计数据的估计。

根据已知方法，上下文时间维度的实现不是非常有效的处理。除了比严格空间上下文具有更高的信息丰度，由于上述移位变异现象，运动矢量所指向的系数数据可能会误导统计数据学习阶段。根据空间变异的动态，像素图案及其变换的空间滤波器、小波或 DCT 系数的位移和长度在原理上将具有不同的幅度和不同的符号。如果按照偶数个总像素进行移位，则变换将是“同相”的；如果按照奇数个总像素进行移位，则变换将是“反相”的等。无论估计运动的子像素精度如何，都将遵循这种推论。正是提出将这种区别信息按照创新的方式附加到空间-时间上下文中，以便使连续高频的统计数据的评估最好地向其条件分频会聚。

所提出的方法在于利用上下文熵编码，其中所述上下文包括时间上下文。

熵编码和算术编码允许将低于一比特的平均代码长度用于高可能值。熵编码的关键点是确定描述了要编码的信号的统计数据的特征的概率表。

首先，将简要地回顾自适应概率表的构成，例如，考虑空间上下文。将考虑比特平面编码的情况。在这种情况下，编码中所考虑的数

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值和上下文是二进制值：0 或 1。

考虑围绕当前像素且刚刚处理过的像素的数值，例如，考虑三个最接近的邻近像素。因此，可得到 2^3=8 个不同的上下文的列表。每个上下文与概率表相关联。这些概率表是自适应的，换句话说在编码的过程中，根据已处理的系数的值进行更新。编码算法通过按照预定的次序遍历图像的系数进行操作。在处理的每一级，上下文以到当前时刻出现的次数以及这些出现中所遇到数值 1（或 0）的次数为特征。因此，在与给定元素的比特平面有关的当前比特的编码期间，如果此元素的上下文是 Cj，递增与 Cj 有关的出现次数，而且如果该比特的数值是 1，则递增遇到数值 1 的次数。按照如下方式计算在上下文 Cj 中获得‘零’或‘壹’的概率：获得零的概率（p_0）等于给定上下文遇到零的次数除以此上下文出现的总数。因此，已知上下文 Cj 中当前比特 x 的概率 p_x，对上下文 Cj 中的这个比特进行编码。

这里，提出了通过利用信号的多种统计数据和作为空间-时间上下文的函数的概率表，进行熵编码。

在先图像以 I_{prec} 来表示，要编码的当前图像以 I_{cur} 来表示。这些图像不必是亮度图像；其可以是小波系数图像、运动场图像等。

在图 3 中，分别以参考数字 12 和 11 来表示这些图像，其代表当前图像的像素(x, y)的时间邻域。在此当前图像的每个像素(x, y)处，作为其时间邻域的函数，对要处理的数据值进行编码。此时间邻域对应于来自前一图像的数据值，位移像素(pd_x, pd_y)的邻域局部以参考数字 14 表示，换句话说，图 3 中以参考数字 13 表示的像素(x, y)的运动矢量所指向的局部。

时间上下文，以 $C(pd_x, pd_y)$ 表示，是时间邻域的数据的函数。为了简化标注，在以下的描述中，将 $C(pd_x, pd_y)$ 表示为 C。根据时间上下文中所考虑的系数数 k，可以得到 2^k 个上下文的列表。对于每个上下文，按照与时间上下文的情况下所描述的相同方式，按照自适应的方式定义概率表。

当然可以针对不同的比特平面，使用不同的运动场，例如，针对第一比特平面，采用粗糙的运动描述，而对于第二比特平面，采用更

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为精细的版本等。

时间上下文的使用可以与空间上下文的使用进行组合。如果形成空间上下文的系数的数表示为 j，以及 k 是形成时间上下文的系数数，则可得到 2^{j+k} 个上下文的列表。

图 4 示出了利用与坐标为(x,y)的像素(x,y)相关联的运动矢量 13 所定义的时间邻域 14，且与此像素(x,y)周围的空间邻域 15 进行组合。

根据相同的原理，可以设想使用多于一个时间上下文，按照与使用多幅参考图像的预测类似的方式，如用在具有双向图像的 MPEG 标准中那样。图 5 示出了当前图像周围的在先图像和在后图像。前向运动矢量（与 MPEG 标准中一样）13 允许定义与在先图像 I_{prec} 相关的时间邻域 14，而后向运动矢量 16 允许定义与在后图像 I_{future} 相关的时间邻域 17。

本发明最重要的方面之一是为了定义空间-时间上下文而采用的参数类型。上述‘移位变异’现象倾向于使上下文算术编解码器‘失去方向’。为了使概率表的自适应不受到这种现象的影响，将作为‘移位变异’的决定因素的参数包括在上下文数据值中。

因此，要考虑的参数是以下参数的全部或一部分：

- 给定数量系数的空间邻域；

- 所考虑的空间子带的另一已编码时间样本的系数的运动补偿时间邻域；

- 位移在所考虑的空间子带的高通滤波方向上的至少一个分量的奇偶性；

- 位移在所考虑的空间子带的高通滤波方向上的至少一个分量的分数部分。

位移整数部分的奇偶性允许其时间和空间邻域同相和反相的情况，位移的分数部分允许得出与位移所产生的‘相位-移位’有关的信息。最后，对于这些参数，有利的是只考虑高通滤波方向上的分量，因为其是区分分量。其是水平细节子带（LH）的垂直分量和垂直细节子带（HL）的水平分量。对角线细节子带（HH）是具有两个滤波方向（分为朝向+45°和-45°）的特殊情况。对于此频带，可以同时考虑两

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个分量，其增加了上下文的数量，或者为了限制此数量，可以使用两个分量的参数的函数。因此，可以考虑如位移的幅度，或者更简单地，两个分量的和，或者只保留具有最高幅度的分量。对于位移幅度，奇偶性与两个相邻像素之间的对角线距离有关。

图 6 示出了在限制每个上下文的邻近系数的个数和 1/4 像素的合理运动精度的情况下的空间-时间邻域的示例。以灰色示出的、位于当前图像的行 m 和列 n 的当前系数(m,n)的空间邻域 18 对应于三个先前处理过的邻近系数 L_{cur}、U_{cur} 和 D_{cur}。时间邻域 20 对应于由指向参考图像的运动矢量 19 指定的四个系数 X_{ref}、B_{ref}、R_{ref} 和 D_{ref}。系数 X_{ref} 位于行 m+k 和列 n+l。

图 7 示出了与位移矢量的分量有关的参数。正交坐标系统 21 上的轴刻度对应于两个像素之间的距离的四分之一。奇偶性与运动矢量的分量有关。在运动矢量末端周围的过采样网格允许确定对应的分数部分，$Fract_{dx}$=dl 以及 $Fract_{dy}$=dk，在图 6 所示示例的水平方向上为分数四分之二，以及垂直方向上为分数四分之一。

dx=l+dl 是矢量的水平分量，dy=k+dk 是矢量的垂直分量。

水平和垂直分量的奇偶性分别为 $Par_x = 1 \bmod 2$ 和 $Par_y = k \bmod 2$。根据是否存在奇偶性或非奇偶性，系数同相或反相。

在比特平面内，对小波系数进行编码。对于每个比特平面，确定系数 L、U 和 D 的重要性以及系数 X、B、R 和 D 的重要性。这通过测量系数值是否大于与要处理的平面有关的比特的权重相对应的数值来实现。还记录分数和奇偶性信息。因此，通常可以由以下的二进制数据流来索引上下文：

L_{cur}	U_{cur}	D_{cur}	$Frac_{dx}$	$Frac_{dy}$	Par_x	Par_y	X_{ref}	B_{ref}	R_{ref}	D_{ref}

将每个分数部分编码为 2 比特（像素的 0 到 3/4）。

在多于一个矢量与系数或像素相关联的情况下，例如，当采用几个参考图像时，当然可以考虑几个矢量的奇偶性和分数参数。

按照传统方式，对传输到时间分析电路 8 的输入的低频频带进行

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此电路的运动估计。

可以根据多种方案来执行 ME-MCSTAC 电路 10 所实现的运动估计方法（ME），例如：

- 在连续的低频频带上的运动估计；
- 直接在高频频带上的运动估计。

第一种情况的实现最为简单。在空间分解的每个步骤中，在将低频再次分为四个子频带之前，在低频上估计运动场。由于源可以与像素域相关，可以通过最小化预测误差，按照传统方式执行此估计。

于是，运动在分辨率上连贯，因为其具有要以 MC-STAC 编码的三个高频频带的维度，并事实上包含所需分辨率的位移信息。

因此，使用以如 CIF 分辨率估计的运动，以 MC-STAC 对水平、垂直和对角线细节三个频带进行编码，用于从 CIF 变为 SD 分辨率。按照类似的方式，以 QCIF 分辨率估计的运动，除了用作对针对 QCIF 分辨率的序列的传统 MCTF 的支持以外，允许以 MC-STAC 对用于从 QCIF 变为 CIF 分辨率的水平、垂直和对角线细节三个频带进行编码。如下所示，图 9 描述了采用这种解决方案的编码器。

可能还需要更加专用于 MC-STAC 应用的运动场。于是，需要估计要进行编码的每个高频频带上的运动；这是第二种情况。由于高频包含比低频少的信息，认为高频上所估计出的场不比低频上所估计出的场重要是合理的。然而，因为上述移位-变异现象，用于估计的判据不再由简单 DFD 最小化构成。所选择的判据是隐含与 MCSTAC 相关联的条件熵的最小化。这种判据对应于矢量的回溯选择，并且在资源和复杂性上，可能代价非常大。但是，这当然是最优判据。另一判据是绝对值的差的最小化。这是允许克服移位-变异的一阶妨碍的非常简单的判据。

也可以在比特平面中实现运动估计。

在一个示例中，时间分析电路 8 依赖于被称为运动补偿提升或 MC-Lift 的已知技术，以便获得具有所需时间分辨率的图像。MC-Lift 在于针对一组图像，构建多种时间分辨率级别。对于每个时间分辨率，除了第一个，通过从较低时间分辨率的图像开始的时间预测来构造图

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像。

图 8 按照更为详细的方式描述了实现根据本发明的方法的设备。

编码器的视频输入与在其输出产生低频带 LL 和高频带 LH、HL 和 HH 的 2D 小波变换（2dWT）电路 22 相连。低频带 LL 与 2D 小波变换电路 23 和运动估计 ME 电路 24 相连。高频带 LH、HL 和 HH 与 MC-STAC 电路 25 相连。第二 2D 小波变换电路 23 在一个输出产生低频带 LLLL，而在另一输出产生高频带 LLLH、LLHL 和 LLHH。低频带 LLLL 与 MCTF 电路 26 和运动估计 ME 电路 27 相连。高频带与第二 MC-STAC 电路 28 相连。

将来自 ME 电路 24 的运动信息传输到 MC-STAC 电路 25，以及将来自 ME 电路 27 的运动信息传输到 MC-STAC 电路 28。

MC-STAC 电路 25 和 28 的输出产生 SD 和 CIF 分辨率的纹理。ME 电路 24 和 27 的输出分别与用于编码运动场的电路 29 和 30 相连，将 SD 运动信息提供给电路 29，将 QCIF 和 CIF 运动信息提供给电路 30。MCTF 电路 26 的输出与基于上下文的算术编码 CAE 电路 31 相连，算术编码 CAE 电路 31 执行熵编码，从而在其输出产生 QCIF 分辨率的已编码纹理。

因此，电路 22 和电路 23 对视频输入信号进行金字塔小波分解。在低频频带上执行上述运动估计。运动补偿空间-时间上下文算术编码 MC-STAC 电路利用在给定空间分辨率的低频频带上计算出的运动估计，对与此低频带相对应的分辨率的高频带进行编码。

由进行运动补偿时间滤波的 MCTF 电路 26 按照传统的方式处理基带 LLLL。

实现了本发明的解码方法和电路对应于前述编码方法和电路。

因此，解码方法依赖于根据所述编码方法进行编码的数据流的信息，计算上下文。针对编码中所选择的多种参数，在当前系数的处理期间已经解码的这些信息允许计算和连续更新上下文的列表，以便计算此系数。

熵解码电路实现了根据前述方法计算概率表和上下文的算法。

所描述的编码是比特平面编码，因此是二进制编码。也可以设想

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采用N元编码（N-ary coding），换句话说，执行N个比特平面的同时编码。因此，除了二进制值（比特平面的二进制值）以外，所采用的上下文考虑包括N个比特的N元数值。由此得到的不同上下文的列表更长，增加了计算的次数，但改进了编码效率。

本说明书涉及‘完全可缩放’方案，换句话说，可同时在空间、时间和保真度上进行缩放的方案，允许任何解码器利用编码流。其他类型的方案，如不具有时间可缩放性，仍然在本发明的范围内。

只描述了在空间高频上利用时间上下文的熵编码，因为空间低频适用于从预测图像开始的时间滤波。当然可以设想在信号的全部空间频率上应用这种熵编码，而不会偏离本发明的范围。

类似地，可以在基带或源图像上进行运动估计。

在分量的整数部分上计算奇偶性。也可以在最接近的整数值上计算奇偶性。

所描述的熵编码是算术编码。根据本发明的方法也可以应用于利用信号的统计属性的其他类型的熵编码，如VLC型的编码。

本发明的应用涉及具有时间预测的视频压缩。

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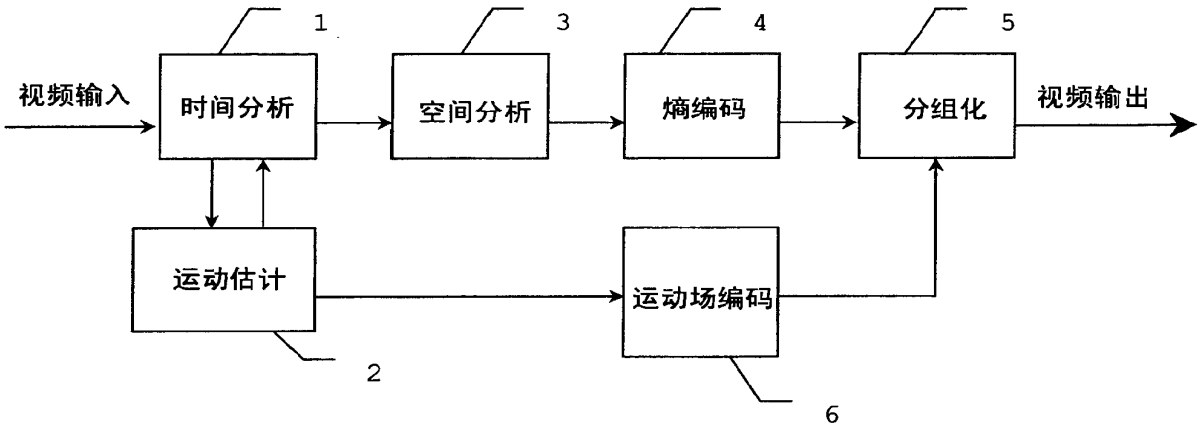


图 1

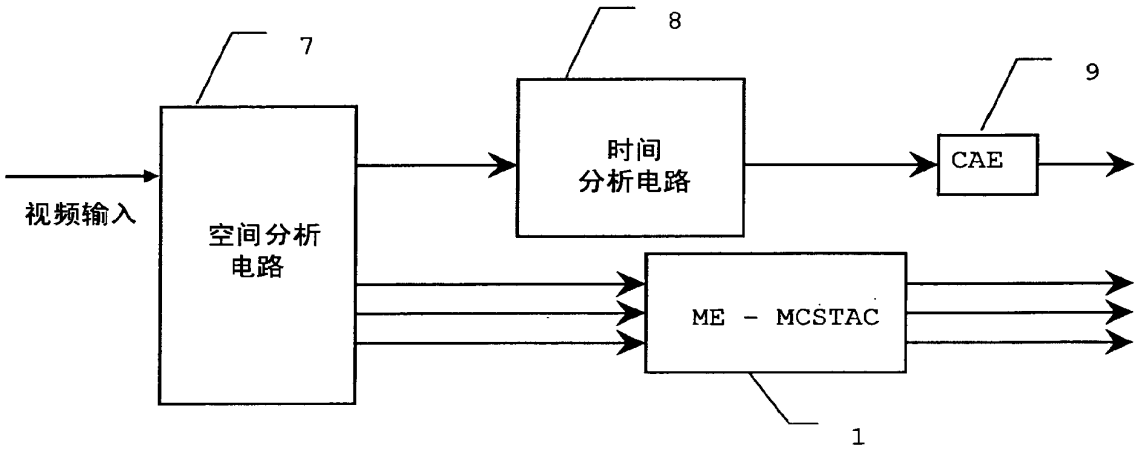


图 2

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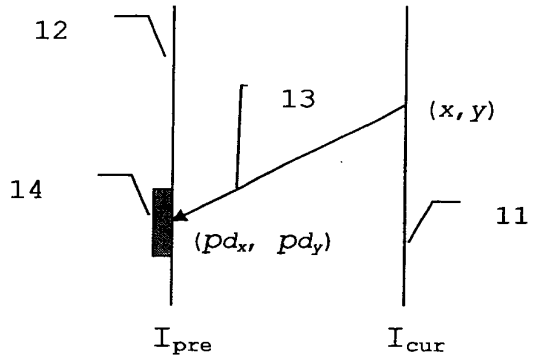


图 3

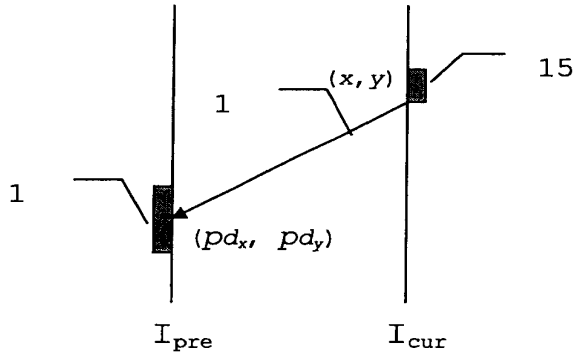


图 4

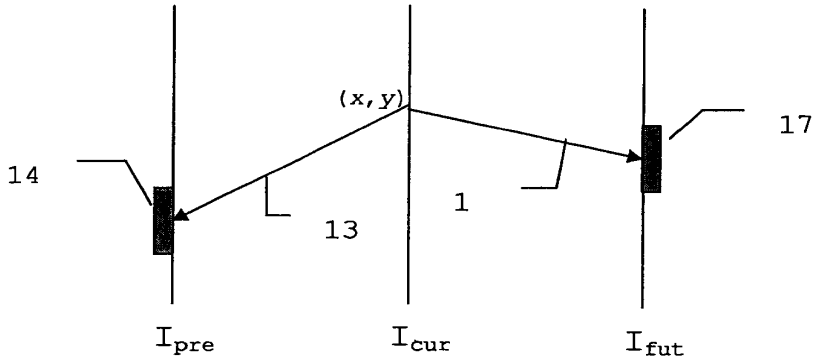


图 5

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000156

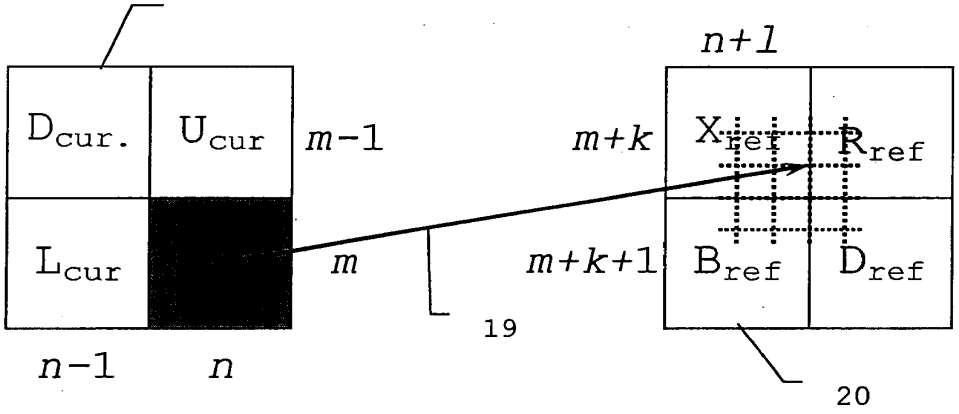


图 6

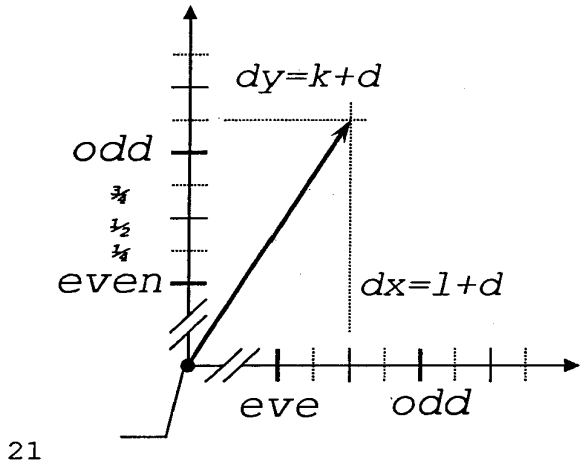


图 7

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000157

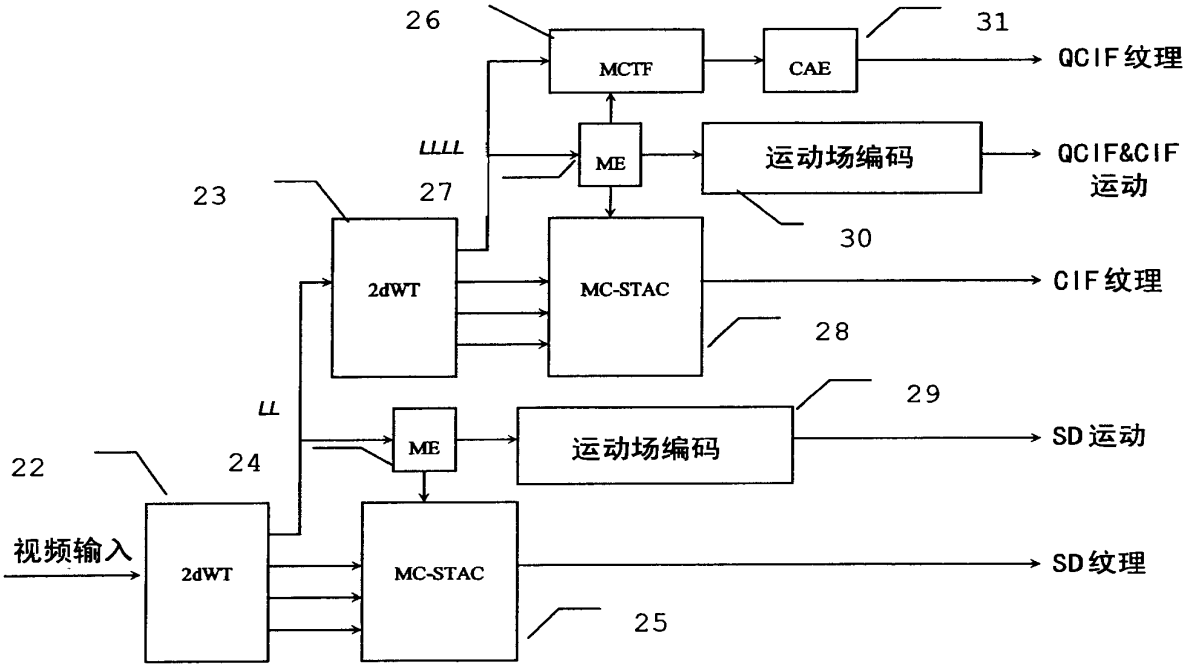


图 8

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000158

Electronic Acknowledgement Receipt

EFS ID:	31309628
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jennifer Son
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	21-DEC-2017
Filing Date:	21-AUG-2017
Time Stamp:	16:22:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		501133_IDS.pdf	46544 9207d1a313b4653f7aafe8ec0bdb516c903c6620	yes	2

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	1	
	Information Disclosure Statement (IDS) Form (SB08)		2	2	
Warnings:					
Information:					
2	Foreign Reference	501133CN101271580_wAbstract.pdf	615517 a7447f13932ea11f0ac6bf3b612483c2d5fba0a3	no	12
Warnings:					
Information:					
3	Foreign Reference	501133CN1757238A_wAbstract.pdf	1104319 9267c4d5797ab3043c384b733b610187515b54d8	no	20
Warnings:					
Information:					
4	Non Patent Literature	501133CNOA_Oct252017.pdf	742926 e5ea5491b31c49a6f880cb741684e5d7ae6d7f5d	no	8
Warnings:					
Information:					
		Total Files Size (in bytes):	2509306		

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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.

Attorney's Docket No. 042933/501133

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	BICI et al.	Confirmation No.:	3570
Appl. No.:	15/681,725	Group Art Unit:	2488
Filed:	August 21, 2017	Examiner:	Nathnael B. Aynalem
For:	METHOD FOR CODING AND AN APPARATUS		

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

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. § 1.97(c)

Attached is a list of documents on form SB08 along with a copy of any cited foreign patent documents and non-patent literature document in accordance with 37 CFR 1.98(a)(2). Also enclosed is a translation or a concise explanation of each non-English language document.

It is requested that the Examiner consider these documents and officially make them of record in accordance with the provisions of 37 C.F.R. § 1.97 and Section 609 of the MPEP. By identifying the listed documents, Applicant in no way makes any admission as to the prior art status of the listed documents, but is instead identifying the listed documents for the sake of full disclosure.

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. § 1.97(c), before final Office Action or Allowance, whichever is earlier.

In accordance with the requirements of 37 C.F.R. § 1.97(c), the following statement as specified in 37 C.F.R. § 1.97(e) is made:

Each item of information contained in this statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three (3) months prior to the filing of this statement.

Respectfully submitted,

/Guy R. Gosnell/

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Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	15681725
Filing Date	21-Aug-2017
First Named Inventor	Mehmet BICI
Attorney Docket Number	042933/501133
Title of Invention	METHOD FOR CODING AND AN APPARATUS

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
Nokia Technologies Oy	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

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as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

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

(●) Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request. ( ) I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: ( ) Small Entity ( ) Micro Entity (●) Regular Undiscounted 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, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: (●) An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 34610 ( ) A sole inventor ( ) A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ( ) A joint inventor; all of whom are signing this request	
Signature	/Guy R. Gosnell/
Name	Guy R. Gosnell

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	15681725
Filing Date:	21-Aug-2017
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Filer:	Guy Randall Gosnell/Jan Snider
Attorney Docket Number:	042933/501133

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 15681725

Filing Date: 21-Aug-2017

Applicant/Patent under Reexamination: BICI

Electronic Terminal Disclaimer filed on March 21, 2018

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	32114388
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jan Snider
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	21-MAR-2018
Filing Date:	21-AUG-2017
Time Stamp:	11:33:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$160
RAM confirmation Number	032118INTEFSW00009545160605
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33404 f79ee63ae30e855023938d2b389784bd969eaf95	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30504 208f0f30f72eef43633d1cc701f6a5bebb245b4b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	63908		

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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.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	15/681,725	Confirmation No.: 3570
Inventor(s):	Bici et al.	
Filed:	August 21, 2017	
Art Unit:	2488	
Examiner:	Nathnael B. Aynalem	
Title:	METHOD FOR CODING AND AN APPARATUS	

Docket No.: 042933/501133
Customer No.: 10949

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

AMENDMENT

In response to the Official Action dated September 21, 2017, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this paper.

Remarks begin on page 17 of this paper.

Amendments to the Claims:

1. (Currently Amended) A method comprising:

selecting, by an encoder of a codec, a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determining, by the encoder of the codec, a subset of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction candidate;

comparing, by the encoder of the codec, motion information of the first spatial motion vector prediction candidate with motion information of spatial motion vector prediction candidates in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

causing information identifying the one spatial motion vector prediction candidate from the merge list to be transmitted to a decoder or to be stored.

2. (Original) The method according to claim 1 further comprising selecting spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

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3. (Original) The method according to claim 1, further comprising comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

4. (Original) The method according to claim 1 further comprising examining whether the block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

5. (Original) The method according to claim 1, further comprising

determining a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

6. (Original) The method according to claim 5 comprising:

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, performing at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received block of pixels is vertically divided into a first prediction unit and a second prediction unit;

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– the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

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– all the other potential spatial motion vector prediction candidates have been included in the merge list;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

7. (Original) The method according to claim 1 further comprising including a temporal motion prediction candidate into the merge list.

8. (Original) The method according to claim 1 further comprising selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the block of pixels.

9. (Currently Amended) A method comprising:

selecting, by a decoder of a codec, a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determining, by the decoder of the codec, a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing, by the decoder of the codec, motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction

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candidate of the set of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

selecting a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list constructed by an encoder.

10. (Original) The method according to claim 9 further comprising comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

11. (Original) The method according to claim 9 further comprising examining whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

12. (Original) The method according to claim 9 further comprising

determining a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

13. (Original) The method according to claim 12 further comprising:

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

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if so, performing at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial

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motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit; and

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

14. (Original) The method according to claim 9 further comprising selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the encoded block of pixels.

15. (Currently Amended) An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus embodied by an encoder of a codec to:

select a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

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determine a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

cause information identifying the one spatial motion vector prediction candidate from the merge list to be transmitted to a decoder or to be stored.

16. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to select spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

17. (Original) The apparatus according to claim 15, wherein the apparatus is further caused to compare motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

18. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to examine whether the block of pixels is divided into a first prediction unit and a second prediction unit; and if so, exclude the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

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19. (Original) The apparatus according to claim 15, wherein the apparatus is further caused to:

determine a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limit the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number .

20. (Original) The apparatus according to claim 19 wherein the apparatus is further caused to:

examine, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examine whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, perform at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

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– the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– all the other potential spatial motion vector prediction candidates have been included in the merge list;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

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21. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to include a temporal motion prediction candidate into the merge list.

22. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to select one motion vector prediction candidate from the merge list to represent a motion vector prediction for the block of pixels.

23. (Currently Amended) An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus embodied by a decoder of a codec to:

select a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determine a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

select a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list constructed by an encoder.

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24. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to compare motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

25. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to examine whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, exclude the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

26. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to:

determine a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limit the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

27. (Original) The apparatus according to claim 26 wherein the apparatus is further caused to:

examine if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examine whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, perform at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

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– the received encoded block of pixels is vertically divided into a first prediction unit and a second prediction unit;

– the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit; and

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for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

28. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to select one motion vector prediction candidate from the merge list to represent a motion vector prediction for the received encoded block of pixels.

29. (Currently Amended) A non-transitory computer readable medium having stored thereon a computer executable program code for use by an encoder of a codec, said program codes comprising instructions for:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

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comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

causing information identifying the one spatial motion vector prediction candidate from the merge list to be transmitted to a decoder or to be stored.

30. (Currently Amended) A non-transitory computer readable medium having stored thereon a computer executable program code for use by ~~an encoder~~ a decoder of a codec, said program codes comprising instructions for:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

selecting a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list constructed by an encoder.

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REMARKS

Claim Rejection Under 35 USC § 101 is Overcome

Claims 1-30 were rejected under 35 U.S.C. § 101 because the claims are allegedly directed to non-statutory subject matter. In particular, the Official Action alleges that "Claim(s) 1-30 are directed to encoding/decoding of image/video data, which corresponds to concepts identified as abstract ideas by the courts, such as image encoding and decoding in *Recognicorp v. Nintendo*, 122 USPQ2d 1377, 1381 (Fed. Cir. 2017)." However, *Recognicorp* does not stand for the proposition that all claims drawn to image encoding and decoding correspond to an abstract idea as seemingly alleged by the Official Action. Instead, *Recognicorp* begins its analysis under Step 2A of *Alice Corp. v. CLS Bank Int'l*, 134 S.Ct. 2347 (2014) by recognizing that "[t]he inquiry often is whether the claims are directed to 'a specific means or method' for improving technology or whether they are simply directed to an abstract end-result." See *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299 (Fed. Cir. 2016).

Although the court in *Recognicorp* determined that the claims at issue were "simply directed to an abstract end-result", the claims of the present application are directed to 'a specific means or method' for improving technology and, as such, are not directed to an abstract idea. With reference to the underlying *McRO* decision, the *McRO* court also indicated that it was the incorporation of the particular claimed rules that "improved [the] existing technological process," unlike cases such as *Alice* where a computer was merely used as a tool to perform an existing process. An "improvement in computer-related technology" is not limited to improvements in the operation of a computer or a computer network per se, but may also be claimed as a set of "rules" (basically mathematical relationships) that improve computer-related technology by allowing computer performance of a function not previously performable by a computer. An indication that a claim is directed to an improvement in computer-related technology may include a particular solution to a problem or a particular way to achieve a desired outcome defined by the claims, as opposed to merely claiming the idea of a solution or

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outcome (e.g., *McRO's* claims defined a specific way, namely use of particular rules to set morph weights and transitions through phonemes, to solve the problem of producing accurate and realistic lip synchronization and facial expressions in animated characters, and thus were not directed to an abstract idea).

Like the claims at issue in *McRO*, the claims of the present application apply a set of "rules" to In this regard, the independent claims employ a particular set of rules to identify the one spatial motion vector prediction candidate from the merge list to be transmitted to a decoder or to be stored as recited by independent Claims 1, 15 and 29 and to identify a spatial motion vector prediction candidate to be selected from the merge list for use in decoding the encoded block of pixels as recited by independent Claims 9, 23 and 30.

Moreover, the direction of the claims of the present application to 'a specific means or method' is further clarified by the amendments to the independent claims to recite the use of an encoder of a codec with respect to independent Claims 1, 15 and 29 and the use of a decoder of a codec with respect to independent Claims 9, 23 and 30.

For each of the foregoing reasons, the claims, as amended are directed to 'a specific means or method' and, as such, are not properly characterized as an abstract idea.

Even if, for the sake of argument, the claims were considered to be directed to an abstract idea, the second part of the *Alice* analysis requires determining whether any element, or combination of elements, in the claim is sufficient to ensure that the claim amounts to *significantly more* than the abstract idea itself (Step 2B). In evaluating these considerations, the elements of each claim should be considered both "individually" and "as an ordered combination." In the *Eligibility Guidance*, the USPTO emphasized that "it is particularly critical to address the combination of additional elements, because while individually-viewed elements may not appear to add significantly more, those additional elements when viewed in combination may amount to significantly more than the exception." The Official Action fails to provide any

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evaluation of the claim elements both individually and as an ordered combination and, as such, the rejection under 35 U.S.C. § 101 is deficient on this basis as well.

Notably, in the context of the significantly more analysis, the Federal Circuit has newly clarified that allegations about whether a feature is generic or conventional are factual findings even within the § 101 context. For instance, in *Berkheimer v. HP Inc.*, the court stated the following:

> "Whether something is well-understood, routine, and conventional to a skilled artisan at the time of the patent is a factual determination. Whether a particular technology is well-understood, routine, and conventional goes beyond what was simply known in the prior art. The mere fact that something is disclosed in a piece of prior art, for example, does not mean it was well-understood, routine, and conventional."

Berkheimer v. HP Inc. Appeal No. 2017-1437, slip op. at 14. (Fed. Cir. Feb. 8, 2018). Thus, there is a requirement that any rejection alleging that a feature is generic or conventional as a disqualifying factor for an additional element at Step 2B *must* substantiate its factual finding of this nature via some sort of argument or evidence. The Office Action here has not done so.

Finally, the Federal Circuit has made clear, "an inventive concept can be found in the non-conventional and non-generic arrangement of known, conventional pieces." *Bascom Global Internet Services v. AT&T Mobility*, 827 F.3d 1341, 1350 (Fed. Cir. 2016). Here, the claims are non-conventional and non-generic as evidenced by the lack of any prior art-based rejection other than the double patenting rejections addressed below. Accordingly, the logic of *Bascom Global* suggests that the combinations of features recited in the claims amount to significantly more than an abstract idea.

In sum, the pending claims recite eligible subject matter, both because the claims are not "directed to" an abstract idea, and because features recited in the claims amount to significantly more than the identified idea. Thus, the rejection under 35 U.S.C. § 101 is overcome.

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Nonstatutory Double Patenting Rejection is Overcome

Claims 1-30 are also rejected on the ground of nonstatutory double patenting as being unpatentable over Claims 1-30 of U.S. Patent No. 9,571,833 and Claims 1-30 of U.S. Patent No. 9,743,105. Without comment on the propriety of the nonstatutory double patenting rejections, terminal disclaimers are submitted herewith relative to U.S. Patent No. 9,571,833 and U.S. Patent No. 9,743. As noted by the Official Action in the paragraph that bridges pages 3 and 4, the terminal disclaimers overcome the nonstatutory double patenting rejections, the withdrawal of which is respectfully requested.

CONCLUSION

In view of the remarks and amendments presented above, it is respectfully submitted that all of the claims are in condition for allowance. It is respectfully requested that a Notice of Allowance be issued in due course. The Examiner is requested to contact Applicant's undersigned attorney to resolve any remaining issues in order to expedite examination of the present application.

The patentability of the independent claims has been argued as set forth above and thus Applicants will not take this opportunity to argue the merits of the rejection with regard to specific dependent claims. However, Applicants do not concede that the dependent claims are not independently patentable and reserve the right to argue the patentability of dependent claims at a later date if necessary.

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It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefor (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

/Guy R. Gosnell/

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Electronic Patent Application Fee Transmittal

Application Number:	15681725
Filing Date:	21-Aug-2017
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Filer:	Guy Randall Gosnell/Jan Snider
Attorney Docket Number:	042933/501133

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

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

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	1253	1	1400	1400
Miscellaneous:				
		Total in USD ($)		**1400**

Electronic Acknowledgement Receipt	
EFS ID:	32114614
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jan Snider
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	21-MAR-2018
Filing Date:	21-AUG-2017
Time Stamp:	11:44:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1400
RAM confirmation Number	032118INTEFSW00009691160605
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Extension of Time	501133_EOT_3-21-18.PDF	162918 db402f2424293d1a73ccf2ed52746eea96bee0ca	no	2
Warnings:					
Information:					
2		501133_Amend_3-21-18.pdf	192569 39ea50ae672cddada0e195f50e2aca32d1b6a840	yes	21

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	16
	Applicant Arguments/Remarks Made in an Amendment	17	21

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30856 0b62abf79c78a2ae0b4c77f070c6977ac1ee6e64	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	386343		

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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PTO/AIA/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) 042933/501133
Application Number 15/681,725	Filed August 21, 2017
For METHOD FOR CODING AND AN APPARATUS	
Art Unit 2488	Examiner Nathnael B. Aynalem

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

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

		Fee	Small Entity Fee	Micro Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☑	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$ 1400
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

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

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

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 16-0605.

☑ Payment made via EFS-Web.

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.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 34,610.

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

/Guy R. Gosnell/ — Signature

March 21, 2018 — Date

Guy R. Gosnell — Typed or printed name

704-444-1029 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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.

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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 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.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/681,725	Filing Date 08/21/2017	☐ 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 $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $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).				
☐ 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)			
AMENDMENT	03/21/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 6	Minus	*** 6	= 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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ 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.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	Brenda V Harrison
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
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Examiner Initials*	Cite No.	Document Number Number - Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages of Relevant Figures Appear

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	1	CN 101605255 B	05-04-2011	Huawei Tech Co Ltd		Abstract

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
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Bibliographic data: CN101605255 (B) — 2011-05-04

Method and device for encoding and decoding video

Inventor(s): CHANGCAI LAI; XIAOZHEN ZHENG; YONGBING LIN; JIANHUA ZHENG; MINGCHEN HAN ± (LAI CHANGCAI, ; ZHENG XIAOZHEN, ; LIN YONGBING, ; ZHENG JIANHUA, ; HAN MINGCHEN)

Applicant(s): HUAWEI TECH CO LTD ± (HUAWEI TECHNOLOGIES CO., LTD)

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Abstract of CN101605255 (B)

The invention discloses a method and a device for encoding and decoding a video. The method comprises the following steps: executing a selection of an intra frame predictive mode according to available adjacent blocks, writing in the available marks of each adjacent block in a code stream when the selected intra frame encoding mode is a limited DC predictive mode; thus, determining that the limited DC predictive mode is adopted for encoding by a current block at an decoding end, and then analyzing the available marks for indicating whether adjacent blocks are available, and determining available adjacent blocks according to the available marks of the adjacent blocks so as to perform decoding operation according to available adjacent blocks based on the DC predictive mode.; The embodiment of the invention can set availability of left adjacent blocks and upper adjacent blocks of the DC mode when the intra frame encoding mode is the DC predictive mode, thereby ensuring the error recovery performance to improve the performance of encoding and decoding in a video communication system.

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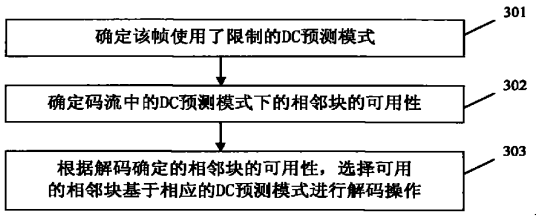
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一种视频编解码的方法及装置

(57)摘要

一种视频编解码的方法及装置，其主要包括：在根据可用的相邻块进行帧内预测模式的选择，当选择的帧内编码模式为限制的DC预测模式，还在码流中写入各个相邻块的可用标识；这样，在解码端确定当前块采用限制的DC预测模式编码，则解析用于指示各相邻块是否可用的可用标识，并可根据所述相邻块的可用标识确定可用的相邻块，进而根据可用的相邻块基于DC预测模式进行解码操作。本发明实施例能够在该帧内编码模式为DC预测模式时，设定DC模式左边及上边相邻块的可用性，从而保证差错恢复性能，以改善视频通信系统中的编解码性能。



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1. 一种视频编码的方法，其特征在于，包括：

判断当前编码块的相邻块是否可用，并根据可用的相邻块进行帧内预测模式的选择；

利用选择的帧内预测模式对当前编码块进行编码操作，且当选择的帧内编码模式为限制的 DC 预测模式时，还在码流中写入各个相邻块的可用标识，其中，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定，所述可用标识用于指示对应的相邻块是否可用。

2. 根据权利要求 1 所述的方法，其特征在于，该方法还包括：

在码流中写入限制的 DC 预测模式的标志，该标志用于指示在 DC 预测模式下是否采用了根据可用的相邻块进行预测值确定的编码方式。

3. 根据权利要求 2 所述的方法，其特征在于，所述的限制的 DC 预测模式的标志写入码流的序列头中，指示该序列中的各帧进行编码时采用的 DC 预测模式为限制的 DC 预测模式；或者，所述的限制的 DC 预测模式的标志写入码流的图像头中，指示该帧进行编码时采用的 DC 预测模式为限制的 DC 预测模式；或者，所述的限制的 DC 预测模式的标志写入码流的条带头中，指示该条带进行编码时采用的 DC 预测模式为限制的 DC 预测模式。

4. 根据权利要求 1、2 或 3 所述的方法，其特征在于，所述判断相邻块是否可用的过程包括：

根据相邻块的差错累积敏感程度判断该相邻块是否可用，所述的差错累积敏感程度是指该相邻块累积差错信息的程度。

5. 根据权利要求 4 所述的方法，其特征在于，所述的根据相邻块的差错累积敏感程度判断该相邻块是否可用的操作包括：

若相邻块为帧内编码块，或者，在若干帧之间该相邻块的变化幅度不超过预定值，或者，该相邻块与当前编码块在同一个宏块中，则确认该相邻块为可用的相邻块。

6. 根据权利要求 1、2 或 3 所述的方法，其特征在于，所述根据可用的相邻块进行帧内预测模式的选择的过程包括：

将需应用到不可用的相邻块的帧内预测模式从备选的帧内预测模式中去除，并将余下的帧内预测模式确定为候选帧内预测模式；

从候选帧内预测模式中选择出当前块的帧内预测模式。

7. 根据权利要求 1、2 或 3 所述的方法，其特征在于，所述在码流中写入各个相邻块的可用标识的过程包括：

将当前块所有的相邻块对应的可用标识均写入码流中；

或者，

将没有与当前块处于同一宏块中的相邻块对应的可用标识写入码流中。

或者，

将相邻块为帧间预测模式且没有与当前块处于同一宏块中的相邻块对应的可用标识写入码流中。

8. 一种视频编码装置，其特征在于，包括：

预测模式选择单元，用于根据当前编码块的可用的相邻块进行帧内预测模式的选择；

编码单元，用于利用所述预测模式选择单元选择的帧内预测模式对当前编码块进行编码操作；且该编码单元中还包括可用标识写入单元，用于在选择的帧内编码模式为限制的

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DC 预测模式时，向码流中写入各个相邻块的可用标识，其中，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定，所述相邻块的可用标识用于指示对应的相邻块是否可用。

9. 根据权利要求 8 所述的装置，其特征在于，所述编码单元还包括限制的 DC 预测模式的标志写入单元，用于在码流中写入限制的 DC 预测模式的标志，该标志用于指示在该 DC 预测模式下是否采用了根据可用的相邻块进行预测值确定的编码方式。

10. 根据权利要求 8 或 9 所述的装置，其特征在于，所述可用标识写入单元具体用于将所有的相邻块对应的可用标识均写入码流中；或者，用于仅将没有与当前块处于同一宏块中的相邻块对应的可用标识写入码流中；或者，用于仅将相邻块为帧间预测模式且没有与当前块处于同一宏块中的相邻块的可用标识写入码流中。

11. 根据权利要求 8 或 9 所述的装置，其特征在于，该装置还包括可用性判断单元，用于根据相邻块的差错累积敏感程度判断该相邻块是否可用，并将判断结果通知所述预测模式选择单元，所述的差错累积敏感程度是指该相邻块累积差错信息的程度。

12. 根据权利要求 8 或 9 所述的装置，其特征在于，所述预测模式选择单元具体包括：

候选预测模式选择单元，用于将需应用到不可用的相邻块的帧内预测模式从备选的帧内预测模式中去除，并将余下的帧内预测模式确定为候选帧内预测模式；

当前块帧内预测模式选择单元，用于从所述候选预测模式选择单元获得的候选帧内预测模式中选择出当前块的帧内预测模式。

13. 一种视频解码的方法，其特征在于，包括：

解析码流过程中，若当前块采用限制的 DC 预测模式编码，则解析用于指示各相邻块是否可用的可用标识，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定；

解码所述可用标识以确定可用的相邻块，并根据可用的相邻块基于 DC 预测模式进行帧内预测。

14. 根据权利要求 13 所述的方法，其特征在于，所述确定当前块采用限制的 DC 预测模式编码的方式包括：

根据码流中设置的标志确定当前块采用限制的 DC 预测模式编码；或者，根据解码端的设置确定当前块采用限制的 DC 预测模式编码。

15. 根据权利要求 14 所述的方法，其特征在于，该方法还包括：

若所述限制的 DC 预测模式的标志从码流的序列头中获得，则确定该序列的各帧中的子块为 DC 预测模式时，采用限制的 DC 预测模式编码；

若所述限制的 DC 预测模式的标志从码流的图像头中获得，则确定该帧中的子块为 DC 预测模式时，采用限制的 DC 预测模式编码；

若所述限制的 DC 预测模式的标志从码流的条带头中获得，则确定该条带中的子块为 DC 预测模式时，采用限制的 DC 预测模式编码。

16. 根据权利要求 13、14 或 15 所述的方法，其特征在于，所述解析用于指示各相邻块是否可用的可用标识的过程包括：

若相邻块与当前块未处于同一宏块中，则解析所述可用标识，并根据该可用标识确定该相邻块的可用性；

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若相邻块与当前块处于同一宏块中，则无需解析所述可用标识，而直接确定该相邻块为可用的相邻块。

17. 根据权利要求 16 所述的方法，其特征在于，该方法还包括：

若相邻块为帧内编码块且与当前块未同一宏块中，则无需解析所述相邻块是否可用的可用标识，而直接确定该相邻块为可用的相邻块。

18. 根据权利要求 13、14 或 15 所述的方法，其特征在于，所述根据可用的相邻块基于 DC 预测模式进行帧内预测的过程包括：

若当前块的左、上相邻块均为可用，则根据该当前块的左相邻块和上相邻块的象素值进行帧内预测，获得相应的预测值；

若仅有当前块的上相邻块为可用，则根据该当前块的上相邻块的象素值进行帧内预测，获得相应的预测值；

若仅有当前块的左相邻块为可用，则根据该当前块的左相邻块的象素值进行帧内预测，获得相应的预测值；

若当前块的左、上相邻块均不可用，则当前块的预测值为 128。

19. 一种视频解码装置，其特征在于，包括：

可用标识获取单元，用于在解析码流过程中，若确定当前块在编码端采用限制的 DC 预测模式编码，则解析获得用于指示各相邻块是否可用的可用标识，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定；

解码单元，用于解码所述可用标识获取单元获取的可用标识以确定可用的相邻块，并根据可用的相邻块基于 DC 预测模式进行解码。

20. 根据权利要求 19 所述的装置，其特征在于，该装置还包括限制的 DC 预测模式确定单元，用于根据码流中设置的限制的 DC 预测模式的标志确定当前块在编码端采用限制的 DC 预测模式编码，或者，根据解码端的设置确定当前块在编码端采用限制的 DC 预测模式编码，通知所述可用标识获取单元。

21. 根据权利要求 19 或 20 所述的装置，其特征在于，该装置还包括判断单元，用于在确定当前块在编码端采用限制的 DC 预测模式编码后，判断相邻块与当前块是否处于同一宏块中，若是，则确定该相邻块为可用的相邻块，并通知所述解码单元，否则，通知所述可用标识获取单元，以解析用于指示各相邻块是否可用的可用标识。

22. 一种视频编解码系统，其特征在于，包括权利要求 8 至权利要求 12 任一项所述的视频编码装置，以及权利要求 19 至权利要求 21 任一项所述的视频解码装置，所述视频编码装置将编码获得的编码码流发送给所述视频解码装置，并由所述视频解码装置解码获得重构图像。

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一种视频编解码的方法及装置

技术领域

[0001] 本发明涉及通信技术领域，尤其涉及一种视频编解码技术。

背景技术

[0002] 在视频通信系统中，视频数据的误码或丢包通常无法避免，为此，需要采用相应的措施提高视频数据的抗误码能力，以使得视频信息能够尽快的从错误中恢复过来，为用户提供较好的主观体验。

[0003] 目前，提供的一种抗误码的实现方案为帧内刷新方法，通过相应的帧内刷新，便可以一定程度实现相应的差错恢复。如图 1 所示，其中的 P 帧使用帧间模式进行编码，而相应的 IR 帧则为刷新帧，该 IR 帧中的部分或全部宏块采用帧内编码模式进行编码，即 IR 帧中的帧内编码宏块（刷新宏块）仅参考该帧的相邻宏块，使用帧内编码模式进行编码。

[0004] 具体地，在刷新帧中的帧内编码宏块可以参考相应的相邻宏块，其中，若相邻宏块与刷新帧中的帧内编码宏块处于同一条带中，则该相邻宏块中的帧内编码宏块和帧间编码宏块均可以作为该刷新帧中的帧内编码宏块的参考宏块。

[0005] 在实现本发明过程中，发明人发现现有技术中至少存在如下问题：

[0006] 上述帧内刷新方法中，若某个刷新宏块的相邻宏块为帧间预测宏块（即 P 宏块），则由于该 P 宏块可能参考之前的 P 帧，所以该 P 宏块将有可能从前面的参考 P 帧中累积相应的传输差错，并会将该差错传递给刷新宏块（即 IR 帧中的 I 宏块），使得刷新宏块也可能会受传输差错的影响，进而降低了帧内刷新方法的差错恢复能力。

发明内容

[0007] 本发明的实施例提供了一种视频编解码的方法及装置，从而可以保证差错恢复性能，提高编解码性能。

[0008] 一种视频编码的方法，包括：

[0009] 判断当前编码块的相邻块是否可用，并根据可用的相邻块进行帧内预测模式的选择；

[0010] 利用选择的帧内预测模式对当前编码块进行编码操作，且当选择的帧内编码模式为限制的 DC 预测模式，还在码流中写入各个相邻块的可用标识，其中，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定，所述相邻块的可用标识用于指示对应的相邻块是否可用。

[0011] 一种视频编码装置，包括：

[0012] 预测模式选择单元，用于根据可用的相邻块进行帧内预测模式的选择；

[0013] 编码单元，用于利用所述预测模式选择单元选择的帧内预测模式对当前编码块进行编码操作；且该编码单元中还包括可用标识写入单元，用于在选择的帧内编码模式为限制的 DC 预测模式时，向码流中写入各个相邻块的可用标识，其中，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定，所述相邻块的可用

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标识用于指示对应的相邻块是否可用。

[0014] 一种视频解码的方法，包括：

[0015] 解析码流过程中，若当前块采用限制的 DC 预测模式编码，则解析用于指示各相邻块是否可用的可用标识，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定；

[0016] 解码所述相邻块的可用标识以确定可用的相邻块，并根据可用的相邻块基于 DC 预测模式进行帧内预测。

[0017] 一种视频解码装置，包括：

[0018] 可用标识获取单元，用于在解析码流过程中，若确定当前块在编码端采用限制的 DC 预测模式编码，则解析获得用于指示各相邻块是否可用的可用标识，所述限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识确定；

[0019] 解码单元，用于解码所述可用标识获取单元获取的相邻块的可用标识以确定可用的相邻块，并根据可用的相邻块基于 DC 预测模式进行解码。

[0020] 一种视频编解码系统，包括上述视频编码装置，以及上述视频解码装置，所述视频编码装置将编码获得的编码码流发送给所述视频解码装置，并由所述视频解码装置解码获得重构图像。

[0021] 由上述本发明的实施例提供的技术方案可以看出，本发明实施例通过在编码端对相邻宏块的可用性的判断，使得编码端能够选择合适的帧内预测模式，并在该帧内编码模式为 DC 预测模式时，能够设定 DC 模式左边及上边相邻块的可用性，使得既可以保证差错恢复性能，还可以有效提高帧内刷新宏块的编码效率，改善编解码性能。

附图说明

[0022] 为了更清楚地说明本发明实施例或现有技术中的技术方案，下面将对实施例或现有技术描述中所需要使用的附图作简单地介绍，显而易见地，下面描述中的附图仅仅是本发明的一些实施例，对于本领域普通技术人员来讲，在不付出创造性劳动性的前提下，还可以根据这些附图获得其他的附图。

[0023] 图 1 为现有技术中的刷新帧示意图；

[0024] 图 2 为本发明实施例提供的编码过程示意图；

[0025] 图 3 为本发明实施例提供的解码过程示意图；

[0026] 图 4 为本发明实施例中应用的 8×8 亮度块的结构示意图；

[0027] 图 5 为本发明实施例提供的编码装置的结构示意图；

[0028] 图 6 为本发明实施例提供的解码装置的结构示意图；

[0029] 图 7 为本发明实施例提供的生成视频码流的装置的结构示意图。

具体实施方式

[0030] 下面将结合本发明实施例中的附图，对本发明实施例中的技术方案进行清楚、完整地描述，显然，所描述的实施例仅仅是本发明一部分实施例，而不是全部的实施例。基于本发明中的实施例，本领域普通技术人员在没有做出创造性劳动前提下所获得的所有其他实施例，都属于本发明保护的范围。

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[0031] 本发明实施例提供了在子块层面实现灵活选择参考块的编码方案，该方案可以但不限于应用于实时视频监控应用领域中。

[0032] 在本发明实施例提供的视频编码方案中，可以根据可用的相邻块进行帧内预测模式的选择；之后，再利用选择的帧内预测模式对当前编码块进行编码操作，其中，若选择的帧内编码模式为限制的 DC 预测模式，则还在码流中写入各个相邻块的可用标识，相应的限制的 DC 预测模式是指采用根据可用的相邻块进行预测值确定的编码方式，相邻块的可用标识则用于指示对应的相邻块是否可用，相应的 DC 预测模式则是指现有技术中的一种帧内预测模式，其可以根据上边相邻块和左边相邻块进行帧内预测。

[0033] 进一步地，可以根据相邻块的差错累积敏感程度判断该相邻块是否可用，以便于根据可用的相邻块进行帧内预测模式的选择，所述的差错累积敏感程度是指该相邻块累积差错信息的程度。

[0034] 需要说明的是，上述在码流中写入各个相邻块的可用标识的过程中，可以将所有的相邻块对应的可用标识均写入码流中；或者，也可以仅将没有与当前块处于同一宏块中的相邻块对应的可用标识写入码流中，以降低码流负载，此时，在解码端也可以对应的将与当前块处于同一宏块中的相邻块确认为可用的相邻块，以进行正常解码操作即可；类似地，也可以仅将相邻块为帧间预测模式且没有与当前块处于同一宏块中的相邻块对应的可用标识写入码流中（即当相邻块为帧内编码块且与当前块不在同一宏块中时，也可不写入所述相邻块的可用性标志），且解码端同样需要采用对应的处理方式以便于进行可靠地解码操作。

[0035] 本发明实施例中，为便于解码端确定是否采用限制的 DC 预测模式，则还可以在码流中写入限制的 DC 预测模式的标志，以便于通过该限制的 DC 预测模式的标志指示在该 DC 预测模式下是否采用了根据可用的相邻块进行预测值确定的编码方式。可选地，该限制的 DC 预测模式的标志可以写入码流的序列头中，以指示该序列中的各帧采用限制的 DC 预测模式进行编码；或者，该限制的 DC 预测模式的标志也可以写入码流的图像头中，用于指示该帧采用限制的 DC 预测模式进行编码；或者，该限制的 DC 预测模式的标志也可以写入码流的条带头中，以用于指示该条带采用限制的 DC 预测模式进行编码，等等。

[0036] 本发明实施例还提供了视频解码的实现方案，该方案包括：解码端解析码流后，若确定当前块采用限制的 DC 预测模式编码，则解析用于指示各相邻块是否可用的可用标识，该限制的 DC 预测模式是指 DC 预测模式下其相邻块的可用性可根据码流中的可用标识符号确定；之后，便可以根据相应的相邻块的可用标识确定可用的相邻块，以根据对应的可用的相邻块基于 DC 预测模式进行解码操作。

[0037] 在上述解码操作过程中，具体可以根据解析获得的码流中设置的限制的 DC 预测模式的标志确定当前块采用限制的 DC 预测模式编码；或者，也根据解码端的设置确定当前块采用限制的 DC 预测模式编码，例如，解码端设置为默认采用限制的 DC 预测模式，或设置符合某特定特征的视频码流采用限制的 DC 预测模式，等等。

[0038] 可选地，对编码端对应，若解码端解析获得的限制的 DC 预测模式的标志是从码流的序列头中获得，则确定该序列的各帧中的 DC 预测模式均采用限制的 DC 预测模式编码；或者，若解析获得的限制的 DC 预测模式的标志从码流的图像头中获得，则确定该帧中的 DC 预测模式采用限制的 DC 预测模式编码；或者，若解析获得的限制的 DC 预测模式的标志从码流

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的条带头中获得，则确定该条带中的 DC 预测模式采用限制的 DC 预测模式编码。

[0039] 在解析用于指示各相邻块是否可用的相邻块的可用标识之前，解码端还可以在确定当前块采用限制的 DC 预测模式编码后，先判断相邻块与当前块是否处于同一宏块中，可选的，也可判断相邻块是否为帧内编码块且与当前块不在同一宏块中，若是，则确定该相邻块为可用的相邻块，并执行后续解码操作，否则，执行相应的解析用于指示各相邻块是否可用的可用标识的过程，以便于基于此进行后续解码操作。

[0040] 本发明实施例还提供了生成视频码流的实现方案，在该方案中，当根据相邻块的可用性选择的帧内编码模式为限制的 DC 预测模式后，则在码流中写入各相邻块的可用标识，该可用标识用于指示对应的相邻块是否可用。

[0041] 可选地，还可以在码流中写入限制的 DC 预测模式的标志，以便于通过该标志指示在该 DC 预测模式下是否采用了根据可用的相邻块进行预测值确定的编码方式。其中，该限制的 DC 预测模式的标志可以但不限于写入码流的序列头中指示该序列中的各帧中的 DC 预测模式采用限制的 DC 预测模式进行编码；或者，该限制的 DC 预测模式的标志也可以但不限于写入码流的图像头中指示该帧中的 DC 预测模式采用限制的 DC 预测模式进行编码；或者，该限制的 DC 预测模式的标志还可以写入码流的条带头中指示该条带进行编码时采用的 DC 预测模式为限制的 DC 预测模式。

[0042] 通过上述方案的实现，使得在编码端能够针对相邻块对差错累积敏感程度的判断，选择合适的帧内预测模式，并在该帧内编码模式为 DC 预测模式时，能够设定 DC 模式左边及上边相邻块的可用性，以便于在保证差错恢复性能的同时，尽量提高帧内刷新块的编码效率（即压缩能力）。

[0043] 下面将结合附图对本发明实施例的具体实现过程进行说明。

[0044] 在编码端，如图 2 所示，相应的编码处理过程具体可以包括：

[0045] 步骤 201，确定当前帧间编码帧需要进行帧内刷新；

[0046] 例如，可以设定在满足预定周期的帧间隔时判断该帧是否需要刷新，或者，也可以通过网络命令等手工指定该帧是否需要刷新；

[0047] 具体地，在该步骤中可以采用的判断当前帧间编码帧是否需要刷新的方式可以根据预先设定的任意条件确定，例如，可以采用现有技术中提供的判断方式进行判断，等等。

[0048] 步骤 202，当确定需要进行帧内刷新时，则需要对当前编码帧进行帧内编码，为此需要根据当前编码帧中的当前编码块（简称当前块）的相邻块的差错累积敏感程度，判断该相邻块的可用性；

[0049] 即根据相邻块的差错累积敏感程度判断确定相应的相邻块的数据是否可以作为当前编码块的参考数据，若可以，则该相邻块可用，否则，该相邻块为不可用；

[0050] 进一步地，可用的相邻块可以为已经编码（若在解码端，则为已经解码）的编码块，且与当前块处在同一个条带中，同时，该当前块还需要为差错累积程度符合预定要求的编码块；例如，若相应的相邻块为帧内编码块，或者，在若干帧之间该相邻块的内容变化比较小（如变化幅度不超过预定值等，具体可以但不限于根据运动矢量或者两帧间相同位置的块的残差判断内容变化的大小），或者，该相邻块与当前编码块在同一个宏块中，则认为该相邻块可用；

[0051] 步骤 203，根据相邻块的可用性在帧内预测模式中进行候选帧内预测模式的确

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定；

[0052] 具体地，可以将需应用到不可用的相邻块的帧内预测模式从备选的帧内预测模式中去除，余下的帧内预测模式为候选帧内预测模式；

[0053] 步骤 204，从获得的候选帧内预测模式中选择出当前块的帧内预测模式。

[0054] 即编码端只能在除所述不可用的帧内预测模式之外的其他几种帧预测模式中选择一种作为当前块的帧内预测模式；

[0055] 步骤 205，根据选择的当前块的帧内预测模式进行编码操作；

[0056] 在编码操作过程中，可以将所选择的当前块的帧内预测模式所对应的语法值，以及相邻块是否可用的信息写入码流中；

[0057] 其中，根据相邻块的差错累积敏感性得到的可用性进行帧内预测方式的选择，且选择了 DC 预测模式作为当前块的帧内预测模式，则称为编码端采用了限制的 DC 预测模式进行编码；若当前块的帧内预测模式采用的是限制的 DC 预测模式，则在编码码流中写入当前块对应的 DC 模式左边及上边相邻块数据可用性标志；若相邻块与当前块在同一个宏块内，则可以不写入所述相邻块的可用性标志，而默认相应的相邻块为可用，可选的，当相邻块为帧内编码块且与当前块不在同一宏块中时，也可不写入所述相邻块的可用性标志，而默认相应的相邻块为可用。

[0058] 可选地，在编码端还可以在码流中写入是否采用限制的 DC 预测模式的指示信息，具体可以在序列头为一个帧序列设置对应的指示，或者，也可以在图像头或条带头中为该帧设置相应的指示。

[0059] 对应的，在解码端，相应的解码处理过程如图 3 所示，可以包括：

[0060] 步骤 301，获取码流后，解析帧间预测帧的图像头，若根据解析结构确定该帧使用了限制的 DC 预测模式，则执行步骤 302；

[0061] 具体可以根据码流中的是否采用限制的 DC 预测模式的指示信息确定当前帧是否使用了限制的 DC 预测模式，例如，可以根据序列头中的为一个帧序列设置对应的指示，或者，图像头中为对应帧设置相应的指示判断当前帧是否采用了限制的 DC 预测模式，或者，条带头中为对应帧设置相应的指示判断当前条带是否采用了限制的 DC 预测模式；或者，也可以根据预先默认的设置确定当前帧是否采用了限制的 DC 预测模式；

[0062] 步骤 302，对于该当前块的帧内预测模式为 DC 预测模式且该帧使用限制的 DC 预测模式，则确定码流中的 DC 预测模式下的相邻块的可用性；

[0063] 具体可以根据码流中的相邻块的可用性标志确定各个相邻块是否可用，即解析码流中的 DC 预测模式下的左边及上边相邻块数据可用性标志，分别得到所述字块 DC 预测模式下的左边相邻块与上边相邻块的可用性；或者，也可以根据相邻块与当前块处是否处于同一个宏块中的信息确认该相邻块是否可用（其中，若处于同一宏块中，则该相邻块可用）；或者，也可以根据相邻块是否为帧内编码块且与当前块不在同一宏块中的信息确认该相邻块是否可用（若相邻块为帧内编码块且与当前块不在同一宏块中则该相邻块可用）。

[0064] 步骤 303，根据解码确定的相邻块的可用性，选择可用的相邻块基于相应的 DC 预测模式进行解码操作。

[0065] 本发明实施例中，在编码端生成码流的过程中，若当前块为帧内编码宏块，则在码

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流中写入该宏块的各子块的帧内预测模式语法单元的值；进一步的在生成码流过程中还可以包括以下至少一项：

[0066] (1) 在每个帧间预测编码帧（P 帧或 B 帧）码流的图象头增加一个用于指示是否采用限制的 DC 预测模式的标志；或者，也可以在码流的序列头中写入一个用于指示是否采用限制的 DC 预测模式的标志，以指示相应序列中的所有帧是否使用限制的 DC 预测模式；当然，若编解码端均默认采用该限制的 DC 预测模式，则无需在码流中设置相应的用于指示是否采用限制的 DC 预测模式的标志，即此时默认是否采用相应的限制的 DC 预测模式。

[0067] (2) 在使用限制的 DC 预测模式的情况下，将帧内预测模式语法单元设置为 DC 预测模式，并在该语法单元后写入相邻块的可用标志，用于标记该 DC 预测模式所对应的左相邻块和上相邻块是否可用；其中，若相邻块与当前块在同一个宏块内，则也可以不在码流中写入该相邻块的可用标志，而默认在该情况下为相邻块为可用，或者，当相邻块为帧内编码块且与当前块不在同一宏块中时，也可不写入所述相邻块的可用性标志，而默认相应的相邻块为可用。

[0068] 本发明实施例具体可以应用于各种视频通信场景中，例如，可以但不限于应用监控视频通信等类似视频通信系统中。

[0069] 为便于对本发明实施例的理解，下面将结合具体的应用实施例对相应的视频编解码过程进行详细说明。

[0070] （一）以 AVS（数字音视频编解码技术标准）为例，对应用实施例中的编码过程进行描述。

[0071] 在编码端，相应的处理过程包括：

[0072] 步骤 1，在确定当前帧间编码帧需要进行帧内刷新后，将图像头中指示当前帧是否进行帧内刷新的指示位设置为对应值；

[0073] 具体地，可以在经过预定的周期帧间隔后确定该帧需要刷新，或者，根据接收到的网络命令确定该帧需要刷新，或者，根据解码反馈信道获得相应的指令确定该帧需要刷新，等等；

[0074] 步骤 2，对于需要进行帧内刷新的当前帧，根据当前编码块的相邻块（通常可以为相邻宏块中的子块，简称为相邻子块）的差错累积敏感程度确定出其中可用的相邻块；

[0075] 步骤 3，根据可用的相邻块进行帧内编码模式下的帧内预测模式选择；

[0076] 具体地，根据左相邻块和上相邻块的可用性的不同，相应的帧内预测模式选择的方式可以分为以下几种情况：

[0077] (1) 左相邻块为差错累积敏感，即不可用的相邻块，上相邻块为差错累积不敏感即可用的相邻块

[0078] 在该情况下，无法参考所述左相邻块进行帧内编码，即如图 4 所示，其中的 ci 不可用而 ri 可用，其中 i = 1-8，为此，需要使用左相邻块作为参考块的三种帧内预测模式：Intra_8×8_Horizontal、Intra_8×8_Down_Left 和 Intra_8×8_Down_Right 等将不会被选择作为当前块的帧内预测模式，即不能选择这几种帧内预测模式对当前块进行帧内预测，而且，相应的 DC 预测模式也不能使用左相邻块的数据作为参考数据，此时，DC 预测模式下的预测值可以为：

[0079] predMatrix[x,y] = (r[x]+2×r[x+1]+r[x+2]+2) >> 2(x,y = 0 ~ 7)；

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[0080] 基于上述情况，在对当前块进行帧内编码过程中只能在垂直预测模式和 DC 预测模式之间进行优化选择，若选择垂直预测模式，则在编码帧内预测模式语法单元时，将该语法单元设置为垂直预测模式，若选择 DC 预测模式，则在将帧内预测模式语法单元设置为 DC 预测模式后，还在该语法单元后面写入 2 个比特的相邻块的可用标志，例如写入的 2 个比特的可用标志位为“10”，用于指示 DC 预测模式的左相邻块不可用而上相邻块可用；

[0081] (2) 上相邻块可用，左相邻宏块不可用

[0082] 在该情况下，无法参考上相邻块进行帧内编码，即参照图 4 所示，相应的 Ci 可用而 Ri 不可用，此时，需要使用上相邻块作为参考块的三种帧内预测模式：Intra_8×8_Vertical，Intra_8×8_Down_Left，Intra_8×8_Down_Right 等将不会被选择作为当前块的帧内预测模式，即不能选择这几种帧内预测模式对当前块进行帧内预测，而且，DC 预测模式也不能使用上相邻块的数据作为参考数据，此时，DC 预测模式（即限制的 DC 预测模式）下的预测值可以为：

[0083] predMatrix[x，y] = (c[y]+2×c[y+1]+c[y+2]+2) >> 2(x，y = 0 ～ 7)；

[0084] 在该情况下，在对当前块进行帧内编码过程中只能在水平预测模式所述的 DC 预测模式之间进行优化选择，若选择水平预测模式，则在编码帧内预测模式语法单元时，将该语法单元设置为水平预测模式；若选择 DC 预测模式，则在将帧内预测模式语法单元设置为 DC 预测模式后，还在该语法单元后面写入 2 个比特的相邻块的可用标志，例如可以设置为“01”，以表示该 DC 预测模式的左相邻块可用，上相邻块不可用；

[0085] (3) 左相邻块和上相邻块均不可用

[0086] 在该情况下，在对当前块进行帧内编码过程中无法参考所述左相邻块及上相邻块，即参照图 4 所示，Ci 可用而 Ri 不可用，此时相应的 Intra_8×8_Horizontal，Intra_8×8_Vertical，Intra_8×8_Down_Left，Intra_8×8_Down_Right 等四种帧内预测模式均无法选择，而且，DC 预测模式也不能使用左相邻块及上相邻块的数据作为参考数据，此时，DC 预测模式下的预测值 predMatrix[x，y] = 128；

[0087] 可见，在该情况下，只能使用所述 DC 预测模式进行帧内预测，具体地，在编码帧内预测模式语法单元时，在将该语法单元设置为 DC 预测模式后，还需要在该语法单元后面写入 2 个比特的相邻块的可用标志，例如可以设置为“00”，以表明该 DC 预测模式下的左相邻块及上相邻块均不可用；

[0088] (4) 左相邻块和上相邻块均可用

[0089] 在该情况下，在对当前块进行帧内编码过程中可以从所有帧内预测模式中进行选择，而且，DC 预测模式下可以使用左相邻块及上相邻块的数据作为参考数据，此时，DC 预测模式下的预测值可以为：

[0090] predMatrix[x，y] = ((r[x]+2×r[x+1]+r[x+2]+2) >> 2+(c[y]+2×c[y+1]+c[y+2]+2) >> 2) >> 1；

[0091] 在编码帧内预测模式语法单元时，需要将该语法单元设置为所选的帧内预测模式，其中，若选择的为 DC 预测模式，则在将帧内预测模式语法单元设置为 DC 预测模式后，还可以在该语法单元后面写入 2 个比特的相邻块的可用标志，例如可以设置的 2 个比特的可用标志位为“11”，以表明该 DC 预测模式下的左相邻块和上相邻块均为可用；

[0092] 在该步骤 3 中，若左相邻块与当前编码块在同一个宏块中，则也可以不设置相应

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的相邻块的可用标志，而默认相应的相邻块可用，即此时可以不必在码流中写入该相邻块的可用标志；例如，对于4个8×8的子块，可以将第一个子块的左相邻块及上相邻块均写入相邻块的可用性的码流标志符号（即相邻块的可用标志），第二个子块写入上相邻块的可用标志，左相邻块默认可用，第三个子块写入左相邻块的可用标志，上相邻块默认可用，第四个子块左相邻块和上相邻块均默认可用；

[0093] 步骤4，根据选择的帧内预测模式进行相应的编码操作，生成码流。

[0094] （二）再以AVS为例，对应用实施例中的解码过程进行描述。

[0095] 下面将首先对解码端接收到的码流的格式进行说明，其中，PB（即P帧和B帧）图像头的格式如表1所示，宏块的格式如表2所示：

[0096] 表1

[0097]

pb_picture_header(){	描述符
Pb_picture_start_code	f(32)
bbv_delay	u(16)
picture_coding_type	u(2)
If(picture_coding_type ==‘01’ ‖ picture_coding_type ==‘11’)	
limitedDC_prediction_flag	u(1)
picture_distance	u(8)
.....	
Next_start_code()	
}	

[0098] 在表1中，limitedDC_prediction_flag（限制的DC预测模式标志），可以为1位无符号整数，用于表示当前帧是否采用了限制的DC预测模式；

[0099] 例如，可以在将该limitedDC_prediction_flag设置为1时，表示当前帧采用了限制的DC预测模式，此时，若该帧的亮度或色度块的编码模式为帧内DC预测模式，则其相邻块的可用性可以由left_ref_lumaDC available，up_ref_lumaDC_available，left_ref_chromaDC_available及up_ref_chromaDC_available标志确定；对应的，可以在将该limitedDC_prediction_flag设置为0时，则表示当前帧未采用限制的DC预测模式，此时，相应的当前帧可以但不限于采用现有技术中定义的DC预测模式；反之亦可。

[0100] 表2

[0101]

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macroblock(){	描述符
if((pictureType! = O&&PictureType! = 3) ‖ (PictureStructure == O&&MbIndex >= MbWidth×MbHeight/2))	
mb_type	ue(v)
if(MbType ! =′ P_Skip′ &&MbType ! =′ B_Skip′){	
if(MbType ==′ B_8×8′){	
for(i = 0 ;i < 4 ;i++)	
mb_part_type	u(2)
}	
if(MbType ==′ I_8×8′){	
for(i = 0 ;i < 4 ;i++){	
pred_mode_flag	u(1)
if(! pred_mode_flag)	
intra_luma_pred_mode	u(2)
If(limitedDCenable && intra_luma_pred_mode ==’2’){	
If(i == 0){	

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left_ref_lumaDC_available	u(1)
up_ref_lumaDC_available	u(1)
}	
If(i == 1)	
up_ref_lumaDC_available	u(1)
If(i == 2)	
left_ref_lumaDC_available	u(1)
}	
}	
if(profile_id ! = " Jiankong profile" &&chroma_format ! = ' 00')	
intra_chroma_pred_mode	ue(v)
If(limitedDCenable && intra_chroma_pred_mode ==' 0'){	
left_ref_chromaDC_available	u(1)
up_ref_chromaDC_available	u(1)
}	

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if(chroma_format == ' 10')	ue(v)		
intra_chroma_pred_mode_422			
.....			
}			

[0102] 在表 2 中，设置的各个相邻块可用标志的含义如下：

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[0103] left_ref_lumaDC_available(亮度DC预测模式左相邻块可用标志),用于表示亮度DC预测模式左相邻块是否可用,例如,可以采用1表示该亮度DC预测模式左相邻块可用,对应的采用0表示该亮度DC预测模式左相邻块不可用,反之亦可;

[0104] up_ref_lumaDC_available(亮度DC预测模式上相邻块可用标志),用于表示亮度DC预测模式上相邻块是否可用,例如,可以采用1表示该亮度DC预测模式上相邻块可用,对应的采用0表示该亮度DC预测模式上相邻块不可用,反之亦可;

[0105] left_ref_chromaDC_available(色度DC预测模式左相邻块可用标志),用于表示色度DC预测模式左相邻块是否可用,例如,可以采用1表示该色度DC预测模式左相邻块可用,对应的采用0表示该色度DC预测模式左相邻块不可用,反之亦可;

[0106] up_ref_chromaDC_available(色度DC预测模式上相邻块可用标志),用于表示色度DC预测模式上相邻块是否可用,例如,可以采用1表示该色度DC预测模式上相邻块可用,对应的采用0表示该色度DC预测模式上相邻块不可用,反之亦可。

[0107] 在解码端,相应的可用的参考样本的确定方式如下:

[0108] 假设当前块所属的图像样本矩阵为I,I可以表示亮度或色度矩阵,如果当前帧内预测块(当前块)与其参考样本所在的块(相邻块)在同一个宏块中,则该参考样本为可用,即相应的相邻块可用,否则,该参考样本的可用性可以按照如下方式确定:

[0109] (1)若当前图像为前向或双向预测编码帧且limitedDC_prediction_flag为1,则表示当前帧在编码过程中采用了限制的DC预测模式,此时,参考样本的可用性确定方式如下:

[0110] 当帧内预测块为亮度块且IntraLumaPredMode等于2时,相应的上相邻块和左相邻块的可用性包括:对于帧内预测块的上相邻块,在up_ref_lumaDC_available等于1时,相应的图像样本为可用,在up_ref_lumaDC_available等于0时,相应的图像样本为不可用;对于帧内预测块的左相邻块,则当left_ref_lumaDC_available等于1时,相应的图像样本为可用,当left_ref_lumaDC_available等于0时,相应的图像样本为不可用;

[0111] 当帧内预测块为色度块且lntraChromaPredMode等于0时,相应的上相邻块和左相邻块的可用性包括:对于帧内预测块的上相邻块,则在up_ref_chromaDC_available等于1时,图像样本为可用,在up_ref_chromaDC_available等于0时,该图像样本为不可用;对于帧内预测块的左相邻块,则当left_ref_chromaDC_available等于1时,相应的图像样本为可用,当left_ref_chromaDC_available等于0时,相应的图像样本为不可用。

[0112] (2)若当前图像为前向预测编码帧且limitedDC_prediction_flag为0,则当图像样本所在的块不存在或尚未解码时,相应的图像样本为不可用,否则,相应的图像样本为可用。

[0113] 以上只是具体的应用实例,并不构成对本发明实施例的限定。

[0114] 参照图4,进一步地,完整的解码处理过程可以包括以下步骤:

[0115] 步骤1,获取码流,解析视频帧的图像头,获得当前帧是否采用限制的DC预测模式的标志;

[0116] 相应的限制的DC预测模式的标志可以在码流的序列头中,用于指示一个帧序列中的各帧采用的预测模式;或者,也可以在码流的图像头中,用于指示该帧是否使用限制的DC预测模式;或者,也可以在码流的条带头中,用于指示该条带是否使用限制的DC预测模

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式；或者，也可以默认是否采用相应的限制的 DC 预测模式，如约定视频码流均采用限制的 DC 预测模式，或者，约定具有特定特征的视频码流采用了限制的 DC 预测模式，等等；

[0117] 步骤 2，若当前帧采用了限制的 DC 预测模式，则获得所述 DC 预测模式语法单元的后的相邻块可用标志，以解码确定所述相邻块的可用性；

[0118] 相应的相邻块的可用标志可以为单独的若干个比特符号，也可以与其它符号复合得到；

[0119] 若相邻块与当前块处在同一个宏块中，则可以直接确认该相邻块为可用，而无需考虑相应的相邻块的可用标志；或者，对于相邻块与当前块处在同一个宏块中的情况，相应的相邻块的可用性仍然可以根据码流中的相邻块的可用标志确定；若相邻块为帧内编码块且与当前块不在同一宏块中时，可不用解析所述标识而确定该相邻块为可用的相邻块，或者，对于相邻块为帧内编码块且与当前块不在同一宏块中时的情况，相应的相邻块的可用性仍然可以根据码流中的相邻块的可用标志确定。

[0120] 步骤 3，根据所述相邻块的可用标志，获得可用的相邻块；

[0121] 步骤 4，根据可用的相邻块基于 DC 预测模式进行相应的帧内预测操作，具体的预测方式包括：

[0122] (1) 若左、上相邻块均为可用，则根据该当前块的左相邻块和上相邻块的象素值进行帧内预测，获得相应的预测值：

[0123] 即预测值 predMatrix[x，y] = ((r[x]+2×r[x+1]+r[x+2]+2) >> 2+(c[y]+2×c[y+1]+c[y+2]+2) >> 2) >> 1，其中，x、y 为当前块的坐标值，x，y = 0 ～ 7，r、c 分别用于指示该相邻块为当前块的上边块或左边块，>>指右移符号；

[0124] (2) 若仅有上相邻块为可用，则根据该当前块的上相邻块的象素值进行帧内预测，获得相应的预测值：

[0125] 即预测值 predMatrix[x，y] = (r[x]+2×r[x+1]+r[x+2]+2) >> 2；

[0126] (3) 若仅有左相邻块为可用，则根据该当前块的左相邻块的象素值进行帧内预测，获得相应的预测值：

[0127] 即预测值 predMatrix[x，y] = (c[y]+2×c[y+1]+c[y+2]+2) >> 2；

[0128] (4) 若左、上相邻块均不可用，则：

[0129] 预测值 predMatrix[x，y] = 128，x，y = 0 ～ 7。

[0130] 步骤 5，根据相应的预测值便可以进行相应的解码操作。

[0131] 通过上述实施例的应用，使得在视编解码过程中，能够很好地兼顾编码效率与解码端的帧内刷新的差错恢复能力，有效提高编解码性能。

[0132] 本领域普通技术人员可以理解实现上述实施例方法中的全部或部分流程，是可以通过计算机程序来指令相关的硬件来完成，所述的程序可存储于一计算机可读取存储介质中，该程序在执行时，可包括如上述各方法的实施例的流程。其中，所述的存储介质可为磁碟、光盘、只读存储记忆体 (Read-Only Memory，ROM) 或随机存储记忆体 (Random Access Memory，RAM) 等。

[0133] 本发明实施例还提供了一种视频编码装置，其具体实现结构如图 5 所示，具体可以包括：

[0134] 预测模式选择单元 501，用于根据当前编码块的可用的相邻块进行帧内预测模式

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的选择；

[0135] 该预测模式选择单元 501 具体可以包括以下单元：

[0136] 候选预测模式选择单元 5011，用于将需应用到不可用的相邻块的帧内预测模式从备选的帧内预测模式中去除，并将余下的帧内预测模式为候选帧内预测模式；

[0137] 当前块帧内预测模式选择单元 5012，用于从所述候选预测模式选择单元获得的候选帧内预测模式中选择出当前块的帧内预测模式。

[0138] 编码单元 502，用于利用所述预测模式选择单元 501 选择的帧内预测模式对当前编码块进行编码操作；且该编码单元中还包括可用标识写入单元 5021，用于在选择的帧内编码模式为限制的 DC 预测模式时，向码流中写入各个相邻块的可用标识，其中，相应的限制的 DC 预测模式是指采用根据可用的相邻块进行预测值确定的编码方式，相应的相邻块的可用标识用于指示对应的相邻块是否可用。

[0139] 在上述装置中，可用标识写入单元 5021 具体可以但不限于将所有的相邻块对应的可用标识均写入码流中；或者，用于仅将没有与当前块处于同一宏块中的相邻块对应的可用标识写入码流中；或者，用于仅将相邻块为帧间预测模式且没有与当前块处于同一宏块中的相邻块对应的可用标识写入码流中（即当相邻块为帧内编码块且与当前块不在同一宏块中时，也可不写入所述相邻块的可用性标志），等等。

[0140] 可选地，该装置还可以包括可用性判断单元 503，用于根据相邻块的差错累积敏感程度判断该相邻块是否可用，并将判断结果通知所述预测模式选择单元 501，所述的差错累积敏感程度是指该相邻块累积差错信息的程度。

[0141] 可选地，该编码单元 502 还可以包括限制的 DC 预测模式的标志写入单元 5022，用于在码流中写入限制的 DC 预测模式的标志，该标志用于指示在该 DC 预测模式下是否采用了根据可用的相邻块进行预测值确定的编码方式，以便于解码端可以获知编码端采用的预测模式。

[0142] 本发明实施例还提供了一种视频解码装置，其具体实现结构如图 6 所示，具体可以包括：

[0143] 可用标识获取单元 601，用于在解析码流后，若确定当前块在编码端采用限制的 DC 预测模式编码，则解析获得用于指示各相邻块是否可用的相邻块的可用标识，所述限制的 DC 预测模式是指采用根据可用的相邻块进行预测值确定的编码方式；

[0144] 解码单元 602，用于解码所述可用标识获取单元 601 获取的相邻块的可用标识以确定可用的相邻块，并根据可用的相邻块基于 DC 预测模式进行解码。

[0145] 在该装置中，还可以包括限制的 DC 预测模式确定单元 603，用于根据码流中设置的限制的 DC 预测模式的标志确定当前块在编码端采用限制的 DC 预测模式编码，或者，根据解码端的设置确定当前块在编码端采用限制的 DC 预测模式编码，通知所述可用标识获取单元 601。

[0146] 可选地，该装置还可以包括判断单元 604，用于在确定当前块在编码端采用限制的 DC 预测模式编码后，判断相邻块与当前块是否处于同一宏块中，若是，则确定该相邻块为可用的相邻块，并通知相应的解码单元 602，否则，通知相应的可用标识获取单元 601，以便于该可用标识获取单元 601 解析用于指示各相邻块是否可用的相邻块的可用标识，进行后续解码操作；可选地，若相邻块为帧内编码块且与当前块未同一宏块中，也可以在不解析相邻

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块是否可用的可用标识的情况下，而直接确定该相邻块为可用的相邻块。

[0147] 该解码装置的具体解码处理过程前面实施例中已经描述，在此不再一一详述。

[0148] 本发明实施例还提供了一种生成视频码流的装置，其具体实现结构如图 7 所示，主要包括：

[0149] 预测模式识别单元 701，用于识别根据相邻块的可用性选择的帧内编码模式是否为限制的 DC 预测模式，所述限制的 DC 预测模式是指采用根据可用的相邻块进行预测值确定的编码方式；

[0150] 码流生成单元 702，用于所述预测模式识别单元 701 确定选择的为限制的 DC 预测模式后，在码流中写入各相邻块的可用标识，该可用标识用于指示对应的相邻块是否可用。

[0151] 本发明实施例还提供了一种视频编解码系统，其可以包括上述视频编码装置，及上述视频解码装置，相应的视频编码装置将编码获得的编码码流发送给对应的视频解码装置，并由该视频解码装置解码获得重构图像，以获得视频编码装置发送来的视频图像信息。

[0152] 综上所述，本发明实施例中，由于通过在编码端针对相邻宏块对传输差错累积敏感程度的判断，选择合适的帧内预测模式，且当该帧内编码模式为 DC 预测模式时，能够通过设定相应的相邻块的可用标志指示 DC 预测模式的左相邻块及上相邻块的可用性，从而可以在保证 DC 预测模式的差错恢复性能的同时，提高该 DC 预测模式的编码效率。

[0153] 以上所述，仅为本发明较佳的具体实施方式，但本发明的保护范围并不局限于此，任何熟悉本技术领域的技术人员在本发明揭露的技术范围内，可轻易想到的变化或替换，都应涵盖在本发明的保护范围之内。因此，本发明的保护范围应该以权利要求的保护范围为准。

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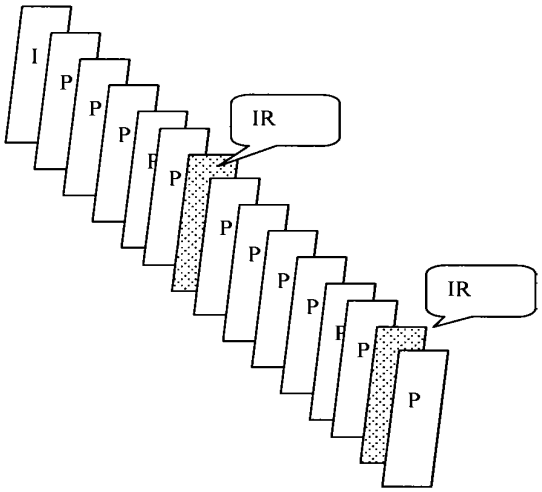


图 1

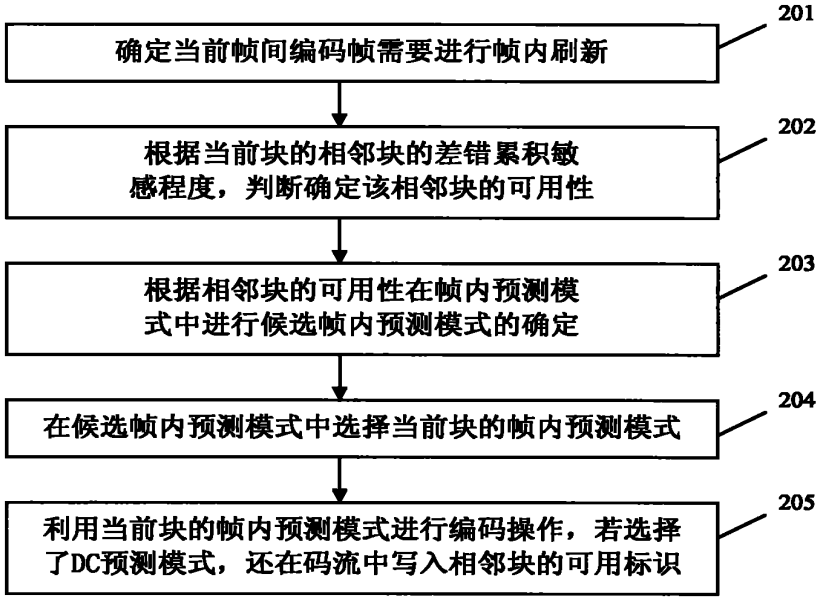


图 2

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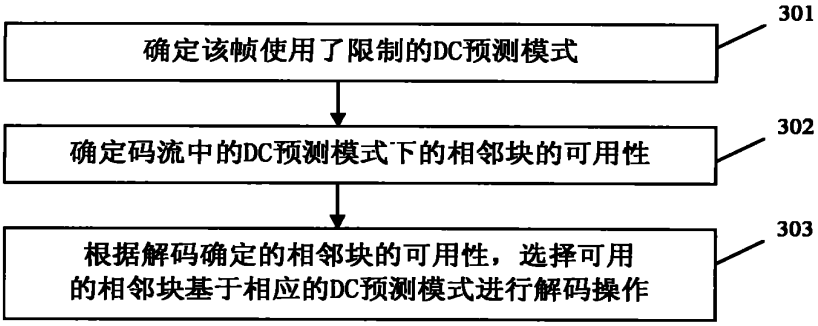


图 3

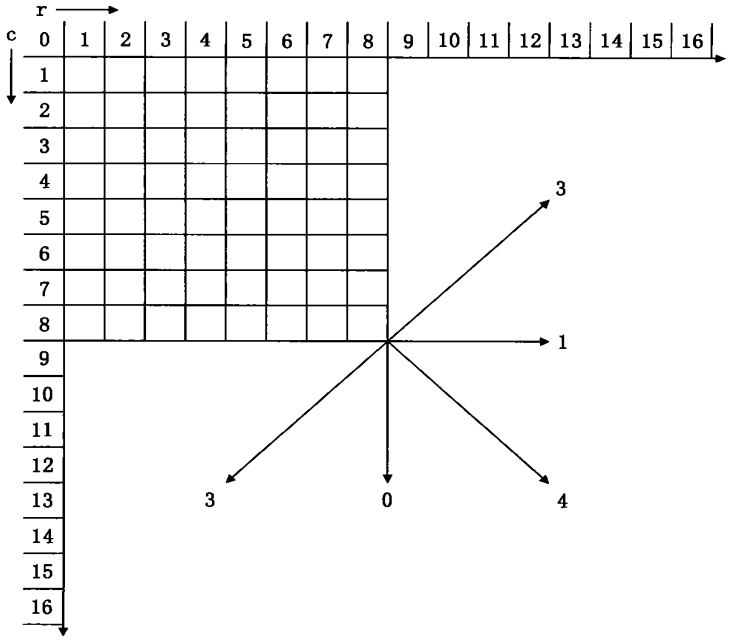


图 4

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图 5

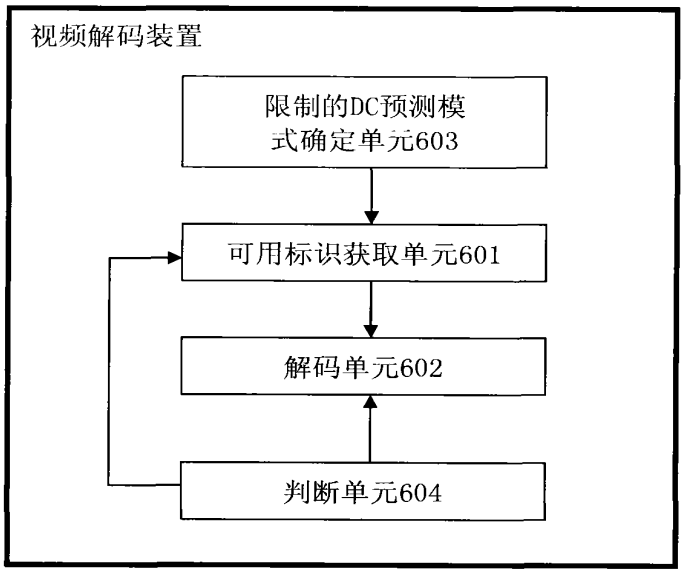


图 6

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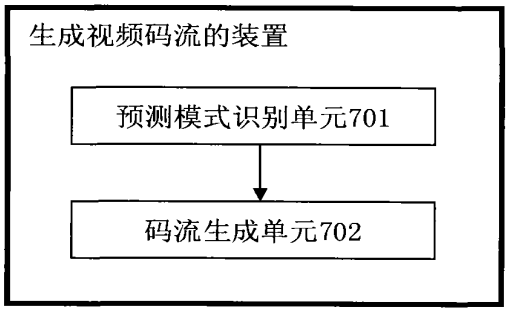


图 7

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000222

Electronic Acknowledgement Receipt

EFS ID:	32552077
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Brian C. Ellsworth/Jennifer Son
Filer Authorized By:	Brian C. Ellsworth
Attorney Docket Number:	042933/501133
Receipt Date:	07-MAY-2018
Filing Date:	21-AUG-2017
Time Stamp:	16:10:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		501133_IDS.pdf	47546 86c150cf3c3dc1571a34abe53e769a17f626f1be	yes	2

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	1	
	Information Disclosure Statement (IDS) Form (SB08)		2	2	
Warnings:					
Information:					
2	Foreign Reference	501133_CN101605255B.pdf	1404482 9bce8397dfe444ae9797bedda27c0ef06e530340	no	24
Warnings:					
Information:					
3	Non Patent Literature	501133_INOA_Apr112018.pdf	213740 d6807195a2c4b757fe291becedf8e499e3addc82	no	7
Warnings:					
Information:					
		Total Files Size (in bytes):	1665768		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Attorney's Docket No. 042933/501133 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	BICI et al.	Confirmation No.:	3570
Appl. No.:	15/681,725	Group Art Unit:	2488
Filed:	August 21, 2017	Examiner:	Nathnael B. Aynalem
For:	METHOD FOR CODING AND AN APPARATUS		

Submitted via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. § 1.97(c)

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. § 1.97(c), before Final Office Action or Allowance, whichever is earlier.

Attached is a list of documents on form PTO-SB08.

It is requested that the Examiner consider these documents and officially make them of record in accordance with the provisions of 37 C.F.R. § 1.97 and Section 609 of the MPEP. By identifying the listed documents, Applicant in no way makes any admission as to the prior art status of the listed documents, but is instead identifying the listed documents for the sake of full disclosure.

Also attached is a translation or a concise explanation of each non-English language document.

In accordance with the requirements of 37 C.F.R. § 1.97(c), the following statement as specified in 37 C.F.R. § 1.97(e) is made:

Each of the items of information contained in this statement was first cited in a communication from a foreign patent office in a counterpart foreign application, not more than three (3) months prior to the filing of this statement.

Applicant notes, in accordance with 37 C.F.R. § 1.704(d), that the communication was not received by any individual designated by 37 C.F.R. § 1.56(c) more than thirty (30) days prior to the filing of this Information Disclosure Statement.

Respectfully submitted,

/Guy R. Gosnell/

Guy R. Gosnell
Registration No. 34,610

Customer No. 10949
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101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Charlotte Office (704) 444-1000
Fax Charlotte Office (704) 444-1111

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

10949 7590 05/30/2018

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NORTH CAROLINA 28280-4000
UNITED STATES OF AMERICA

EXAMINER
AYNALEM, NATHNAEL B

ART UNIT	PAPER NUMBER
2488	

DATE MAILED: 05/30/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

TITLE OF INVENTION: METHOD FOR CODING AND AN APPARATUS

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	08/30/2018

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

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

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PART B - FEE(S) TRANSMITTAL

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

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

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

10949 7590 05/30/2018
Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NORTH CAROLINA 28280-4000
UNITED STATES OF AMERICA

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

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

TITLE OF INVENTION: METHOD FOR CODING AND AN APPARATUS

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	08/30/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
AYNALEM, NATHNAEL B	2488	375-240160

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

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

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

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

1 _____
2 _____
3 _____

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

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

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

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

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

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

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

❑ A check is enclosed.

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

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

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ 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. _____

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UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

10949 7590 05/30/2018

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NORTH CAROLINA 28280-4000
UNITED STATES OF AMERICA

EXAMINER	
AYNALEM, NATHNAEL B	
ART UNIT	**PAPER NUMBER**
2488	

DATE MAILED: 05/30/2018

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.

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000228

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 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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. 15/681,725	Applicant(s) BICI et al.	
	Examiner NATHNAEL AYNALEM	Art Unit 2488	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 amendment filed on 03/21/2018.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3. ☑ The allowed claim(s) is/are 1-30 . 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 _____.

/NATHNAEL B AYNALEM/
Primary Examiner, Art Unit 2488

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Response to Amendment/Arguments

Applicant's amendment/arguments with respect to pending clams 1-30 filed on March 21, 2018 have been fully considered. In view of applicant's arguments and a Terminal Disclaimer filed on March 21, 2018, the rejection of all the pending claims has been withdrawn. Thus, the current application is in condition for allowance.

Terminal Disclaimer

The terminal disclaimer filed on March 21, 2018 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Patent No. 9,743,105 and 9,571, 833 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Interpretation - 35 USC § 112

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.

Claims 1 and 9 are interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because it uses a generic placeholder "an encoder of a codec" and "a decoder of a codec" coupled with functional language 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, claims 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: paragraph [0048].

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).

Allowable Subject Matter

Claims 1-30 are allowed.

The following is an examiner's statement of reasons for allowance: the claims are allowable due to a Terminal Disclaimer filed on March 21, 2018 to overcome a rejection on the ground of nonstatutory double patenting, and a persuasive arguments regarding the rejection under 35 U.S.C. 101 of the pending claims. *See Remarks dated 03/21/2018, pp. 17-19*

Furthermore, none of the cited prior arts (*See* PTO-892) teach the feature of "*selecting, by an encoder of a codec, a first spatial motion vector prediction candidate* from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where *the merge list is constructed* based on motion information of the spatial motion vector prediction candidates and is utilized *to identify motion vector prediction candidates* of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit; *determining, by the encoder of the codec, a subset of spatial motion vector prediction candidates based on a location of the block* associated with the first spatial motion vector prediction candidate; *comparing, by the encoder of the codec, motion information of the first spatial motion vector prediction candidate with motion information of spatial motion vector prediction candidates in the determined subset of spatial motion vector*

prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and *causing information identifying the one spatial motion vector prediction candidate from the merge list* to be transmitted to a decoder or to be stored," as recited in claim 1 and analogously recited in claims 9, 15, 23, 29 and 30.

Dependent claims 2-8, 10-14, 16-22 and 24-28 are allowed based on their dependency from allowed claims 1, 9, 15 and 23.

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 NATHNAEL AYNALEM whose telephone number is (571)270-1482. The examiner can normally be reached on M-F 9AM-5:30 PM ET.

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, SATH PERUNGAVOOR can be reached on 571-272-7455. 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.

/NATHNAEL B AYNALEM/
Primary Examiner, Art Unit 2488

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	**Art Unit**
	NATHNAEL AYNALEM	2488

CPC						
Symbol					**Type**	**Version**
H04N	/	19	/	521	F	2014-11-01
H04N	/	19	/	52	I	2014-11-01
H04N	/	19	/	176	A	2014-11-01
H04N	/	19	/	182	A	2014-11-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	30	
/NATHNAEL B AYNALEM/ Primary Examiner, Art Unit 2488	17 May 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20180517

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	**Art Unit**
	NATHNAEL AYNALEM	2488

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04N	/	19	/	513
H04N	/	19	/	11
H04N	/	19	/	176
H04N	/	19	/	182
H04N	/	19	/	52

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 30	
/NATHNAEL B AYNALEM/ Primary Examiner, Art Unit 2488 (Primary Examiner)	17 May 2018 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office — Part of Paper No.: 20180517

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	Art Unit
	NATHNAEL AYNALEM	2488

☐ 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	10	19	19	28	28								
2	2	11	11	20	20	29	29								
3	3	12	12	21	21	30	30								
4	4	13	13	22	22										
5	5	14	14	23	23										
6	6	15	15	24	24										
7	7	16	16	25	25										
8	8	17	17	26	26										
9	9	18	18	27	27										

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	30	
/NATHNAEL B AYNALEM/ Primary Examiner, Art Unit 2488	17 May 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office

Part of Paper No.: 20180517

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	Art Unit
	NATHNAEL AYNALEM	2488

CPC - Searched*		
Symbol	Date	Examiner
H04N19/52 ; H04N19/00684 ; H04N19/00703 ; H04N19/147 ; H04N19/30 ; H04N19/597 ; H04N19/105 ; H04N19/11	05/17/2018	N.A.
H04N19/119 ; H04N19/174 ; H04N19/176 ; H04N19/187 ; H04N19/513 ; H04N19/58 ; H04N19/70	05/17/2018	N.A.

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
375	240.01-240.29	05/17/2018	N.A.

* 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 keyword search	05/17/2018	N.A.
Inventor's name search	05/17/2018	N.A.
Assignee search	05/17/2018	N.A.

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	General Interference Search of the claims (USPGPUB ,USPAT)	05/17/2018	NA

/NATHNAEL B AYNALEM/ Primary Examiner, Art Unit 2488	

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	3	"15426822"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:05
L2	49	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:12
L3	498	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:12
L4	373	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:12
L5	630	2 or 3 or 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:12
L6	27215	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with (list$3 or candidate$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
L7	9169	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
L8	826	L7 same L6	US-PGPUB;	OR	ON	2018/05/17

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			19:13
L9	686827	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
L10	159	L8 same L9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
L11	832047	(transmit$4 or transmission or send$3 or signaling or signaled or output$4) with (predict$3 or mv or vector or candidate or list or merg$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
L12	140	L10 and L11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
L13	7	L12 and 5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
L14	65090	nokia.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:16
L15	11	12 and 14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:16
S3	2798	(spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2016/09/20 17:53

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			IBM_TDB			
S4	559	(spatial or intra) with predict$3 with candidate$1 with list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 17:55
S5	15357	(subset or sub$set) with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 17:57
S6	5	S4 same S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 17:58
S7	33	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:02
S8	580	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:17
S9	48	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:18
S10	8	S8 same S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:18
S11	5	S10 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:19
S12	7278	merg$3 near3 list	US-PGPUB; USPAT;	OR	ON	2016/09/20 18:20

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			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S13	292	S4 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:20
S14	280	S13 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:23
S15	722	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:24
S16	8	S9 same S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:25
S17	44	S9 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:26
S18	736	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:28
S19	18	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3) with merg$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S20	4	S18 same S19	US-PGPUB;	OR	ON	2016/09/20

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			18:29
S21	4	S18 and S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S22	43381	(intra or spatial or spatio adj1 temporal or inter) near4 predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:14
S23	407	S12 same S22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:14
S24	1072	(motion or vector$1 or mv) with merg$3 with list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:16
S26	323	S23 same S24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:16
S27	3255	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with (spatial or intra) with predict$3 with (motion or vector or mv)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S28	74	S26 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S29	73	S28 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2016/09/20 19:17

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		H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	IBM_TDB			
S30	73	S29 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:18
S31	29910	(motion or vector$1 or mv) with list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:20
S32	112	S27 same S31	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:20
S33	5698	candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:59
S34	259	S24 and S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:59
S35	152	S24 same S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:00
S37	227453	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S38	6	S35 same S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2016/09/20 20:03

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			IBM_TDB			
S39	126	S35 and S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S41	40	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:44
S43	36069	(intra or inter) near3 predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:45
S44	13	S41 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:46
S46	431	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S47	88	S43 and S46	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S48	11	S33 and S47	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S49	306	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:48
S50	12	S33 and S49	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2016/09/20 20:49

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			JPO; DERWENT; IBM_TDB			
S51	61847	(nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50
S52	70	S33 and S51	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50
S54	15	S43 and S52	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50
S65	5	"13666680"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/21 12:11
S66	4	"20150010074"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/21 12:30
S67	62	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 12:39
S68	6	"13666680"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 12:48
S69	384	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S70	238369	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or	US-PGPUB; USPAT;	OR	ON	2017/02/27 13:02

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		examin$3) with predict$3	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S71	93	S69 same S70	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S72	84	S71 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S73	42	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:18
S74	454	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:21
S75	334	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S76	2	S71 and S74	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S77	4	S71 and S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S82	62871	(Nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/03/04 13:31

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			DERWENT; IBM_TDB			
S83	384	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S84	238820	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S85	93	S83 same S84	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S86	84	S85 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S87	5	S86 and S82	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S103	461	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S104	253060	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S105	110	S103 same S104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S106	100	S105 AND ((H04N19/52 OR	US-PGPUB;	OR	ON	2017/09/14

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		H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			13:30
S107	11172	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:46
S108	8571	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:47
S109	612	S107 same S108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:47
S110	44755	(spatial$2 or intra) with (vector or mv)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:48
S111	6	S105 and S109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:49
S112	142	S109 same S110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:50
S114	644364	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:09
S115	121	S103 same S114	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2017/09/14 14:11

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			JPO; DERWENT; IBM_TDB			
S116	6	S109 and S115	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:11
S117	27	S108 and S115	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:11
S120	46	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S121	461	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S122	8571	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S123	644364	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S124	121	S121 same S123	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S125	27	S122 and S124	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S126	6	S125 AND S120	US-PGPUB; USPAT;	OR	ON	2017/09/14 18:07

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			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S127	474	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:08
S128	4	S125 AND S127	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:08
S129	353	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:10
S130	6	S125 AND S129	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:10
S131	63838	(Nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:11
S132	7	S131 AND S125	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:11
S133	37	"2011062392"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 15:55
S134	2	"9363530".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 15:56

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S135	1	"15681725"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 16:00
S136	27215	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with (list$3 or candidate$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:14
S137	9169	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:22
S138	826	S137 same S136	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:22
S140	686827	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:24
S141	159	S138 same S140	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:25
S142	142	S141 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:25
S143	832047	(transmit$4 or transmission or send$3 or signaling or signaled or output$4) with (predict$3 or mv or vector or candidate or list or merg$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:32
S144	140	S141 and S143	US-PGPUB; USPAT; USOCR;	OR	ON	2018/05/17 17:33

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			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S145	135	S144 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:33

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L16	4304	((select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with (list$3 or candidate$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:19
L17	84872	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:19
L18	4682	((select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3 or identify$3 or estimat$3 or recogni$5) with predict$3 with (list$3 or candidate$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:23
L19	1917	17 and 18	US-PGPUB; USPAT	OR	ON	2018/05/17 19:23
L20	801	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:25
L21	41	L20 and 19	US-PGPUB; USPAT	OR	ON	2018/05/17 19:25
L22	115096	((transmit$4 or transmission or send$3 or signaling or signaled or output$4) with (predict$3 or mv or vector or candidate or list or merg$3)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:25
L23	19	21 and 22	US-PGPUB; USPAT	OR	ON	2018/05/17 19:26
S56	21002	((block or macroblock or picture or image) with (predict$3 or pu)).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:54
S57	266	((spatial or intra) with (mv or motion adj1 vector$1) with candidate).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:55
S58	818	(candidat$1 with merg$3).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:56
S59	739	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3 with	US-PGPUB; USPAT	OR	ON	2016/09/20 20:57

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		candidat$1).clm.				
S60	668	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:58
S61	200	S56 and S57	US-PGPUB; USPAT	OR	ON	2016/09/20 20:58
S62	2	S58 and S59 and S60	US-PGPUB; USPAT	OR	ON	2016/09/20 20:59
S63	11	S59 and S60	US-PGPUB; USPAT	OR	ON	2016/09/20 21:02
S64	1	S61 and S63	US-PGPUB; USPAT	OR	ON	2016/09/20 21:02
S89	920	(candidat$1 with merg$3).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S90	793	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3 with candidat$1).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S91	694	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S92	4	S89 and S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S93	14	S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S94	22196	((block or macroblock or picture or image) with (predict$3 or pu)).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S95	298	((spatial or intra) with (mv or motion adj1 vector$1) with candidate).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S96	230	S94 and S95	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S97	14	S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S98	2	S96 and S97	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S99	1	"12896656"	US-PGPUB; USPAT	OR	ON	2017/03/04 17:38

5/17/2018 7:26:58 PM
C:\Users\naynalem\Documents\EAST\Workspaces\13666680.wsp

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Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	Bici et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	*1*	of	*3*	Attorney Docket Number	042933/501133

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number - Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages of Relevant Figures Appear
	1	US-2004/0234144 A1	11-25-2004	Sugimoto et al.	
	2	US-2008/0159401 A1	07-03-2008	Lee et al.	
	3	US-2011/0170602 A1	07-14-2011	Lee et al.	
	4	US-2011/0182362 A1	07-28-2011	Kim et al.	
	5	US-2012/0307905 A1	12-06-2012	Kim et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Document Country Code - Number Kind Code (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	English Language Translation Attached
	6	WO 2011/062392 A2	05-26-2011	SK Telecom Co. Ltd.		
	7	WO 2011 115659 A1	09-22-2011	Thomson Licensing		

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
	8	**Bici, O. et al.**, *Non-CE13: Simplification of merge mode*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 7th Meeting: Geneva, CH, 21-30 November, 2011, Document JCTVC-G593; URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/, 13 pages	
	9	**Bross, B. et al.**, *Core Experiment 9: MV Coding and Skip/Merge Operations*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, IT, 14-22 July, 2011; Document JCTVC-F909, 13 pages	
	10	**Bross, Benjamin, et al.**; *"WD4: Working Draft 4 of High-Efficiency Video Coding"*; Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11; 6th Meeting; Torino, IT; 14-22 July 2011; Document JCTVC-F803_d; 232 pages	
	11	**Han, Woo-Jin, et al.**; *"Improved Video Compression Efficiency Through Flexible Unit Representation and Corresponding Extension of Coding Tools"*; Circuits and Systems for Video Technology; IEEE Transactions on 20.12 (2010); 1709-1720	

Examiner Signature	/NATHNAEL AYNALEM/	Date Considered	05/17/2018

*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.

Submitted September 21, 2017

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

Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	Bici et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	2	of	3	Attorney Docket Number	042933/501133

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
	12	**Huang, Ai-Mei et al.**, *A multistage motion vector processing method for motion-compensated frame interpolation*, Image Processing, IEEE Transactions on 17.5 (2008) 694-708	
	13	**J.-L. Lin, Y.-W. Chen, Y.-W. Huang, S. Lei;** *"CE9: Results of Experiment ROB04";* JCT-VC Doc. JCTVC-F052, Turin; Jul 2011	
	14	**Jeon, Y. et al**., *On MVP list pruning process*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, IT, 14-22 July, 2011, Document JCTVC-F105, 7 pages	
	15	**Nakamura, H. et al.**, *Unification of derivation process for merge mode and MVP*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting; Torino, IT, 14-22 July, 2011; Document JCTVC-F419; URL: http://wftp3.itu.int/AV-ARCH/JCTVC-SITE/2011_07_F_Torino/, 10 pages	
	16	**Oudin, S. et al.**; *"Block Merging for Quadtree-Based Video Coding"*; IEEE Int. Conf. on Multimedia and Expo; July 11-15; 2011; 6 pages	
	17	**Sullivan, G.J.**; *"Overview of the High Efficiency Video Coding (HEVC) Standard"*; IEEE Trans. On Circuits and Systems for Video Technology; Vol. 22, No. 12; December 2012; pp. 1649-1668	
	18	**Tai, Shen-Chuan, et al.**; *"A Multi-Pass True Motion Estimation Scheme with Motion Vector Propagation for Frame Rate Up-Conversion Applications"*; Journal of Display Technology; 4.2 (2008): 188-197	
	19	**Wiegand, Tomas, et al.**; *"WD3: Working Draft 3 of High-Efficiency Video Coding"*; Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11; 5th Meeting; Geneva, CH, 16-23 March, 2011; Document JCTVC-E603; 239 pages	
	20	**Zheng, Y. et al**., *Merge Candidate Selection in 2NxN, Nx2N, and NxN Mode*, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, IT, 14-22 July, 2011; Document JCTVC-F302, 6 pages	
	21	International Search Report and Written Opinion from corresponding International Application No. PCT/FI2012/051070, dated March 27, 2013	
	22	Office Action from corresponding Korean Patent Application No. 2014-7015093, dated August 21, 2015	
	23	Office Action from corresponding Canadian Patent Application No. 2,854,495, dated October 7, 2015	

Examiner Signature	/NATHNAEL AYNALEM/	Date Considered	05/17/2018

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Submitted September 21, 2017

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Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	Bici et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	*3*	of	*3*	Attorney Docket Number	042933/501133

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
	24	Taiwanese Office Action and Search Report from Taiwanese Patent Application No. 101140777 dated December 2, 2015	
	25	Extended European Search Report for corresponding European Application No. 12845839.5 dated March 21, 2016, 10 pages	
	26	Office Action from Korean Patent Application No. 2014-7015093 dated August 22, 2016	
	27	Office Action for Canadian Application No. 2,854,495 dated September 6, 2016	
	28	Office Action for Chinese Application No. 2012800657775 dated October 9, 2016	
	29	Office Action for U.S. Patent Application No. 13/666,680 dated July 6, 2015, 25 pages.	
	30	Final Office Action for U.S. Patent Application No. 13/666,680 dated March 1, 2016, 35 pages.	
	31	Advisory Action for U.S. Patent Application No. 13/666,680 dated November 7, 2016, 4 pages.	
	32	Notice of Allowance for U.S. Patent Application No. 13/666,680 dated September 30, 2016, 17 pages.	
	33	Notice of Allowance for U.S. Patent Application No. 15/426,822 dated March 10, 2017, 8 pages	

Examiner Signature	/NATHNAEL AYNALEM/	Date Considered	05/17/2018

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Submitted September 21, 2017

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Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	BICI et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	*1*	of	*1*	Attorney Docket Number	042933/501133

U. S. PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Document Country Code - Number Kind Code (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	English Language Translation Attached
/N.A./	1	CN 101605255 B	05-04-2011	Huawei Tech Co Ltd		Abstract

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
/N.B.A./	2	Office Action for corresponding Indian Application No. 4092/CHENP/2014 dated April 11, 2018 with English Translation, 7 pages	YES

Examiner Signature	/NATHNAEL AYNALEM/	Date Considered	05/17/2018

*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.

Submitted May 7, 2018

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

Substitute for form SB08 (Revised 07/09)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	15/681,725
				Filing Date	August 21, 2017
				First Named Inventor	BICI et al.
				Art Unit	2488
				Examiner Name	Nathnael B. Aynalem
Sheet	*1*	of	*1*	Attorney Docket Number	042933/501133

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number - Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages of Relevant Figures Appear
/N.B.A./	1	US-2007/0189389	08-16-2007	Boisson et al.	
/N.B.A./	2	US-2008/0232642	09-25-2008	Chang	
/N.B.A./	3	US-2011/0176612	07-21-2011	Tsai et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Document Country Code - Number Kind Code (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	English Language Translation Attached
/N.A./	4	CN 101271580 A	09-24-2008	HIMAX Tech Ltd		Abstract corresponds to US 2008/0232642
/N.A./	5	CN 1757238 A	04-05-2006	Thomson Licensing		Abstract corresponds to US 2007/0189389

OTHER 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, page(s) , volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
/N.A./	6	Office Action for Chinese Application No. 201280065777.5 dated October 25, 2017 with English Translation, 8 pages	YES

Examiner Signature	/NATHNAEL AYNALEM/	Date Considered	05/17/2018

*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.

Submitted December 21, 2017

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

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	15/681,725	Confirmation No.: 3570
Inventor(s):	Bici et al.	
Filed:	August 21, 2017	
Art Unit:	2488	
Examiner:	Nathnael B. Aynalem	
Title:	METHOD FOR CODING AND AN APPARATUS	

Docket No.: 042933/501133
Customer No.: 10949

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

The Notice of Allowability includes reasons for allowance. While the reasons for allowance are applicable with respect to some of the claims including independent Claims 1, 15 and 29 and their respective dependent claims, the language referenced by the reasons for allowance does not apply to all of the independent claims. For example, the language referenced by the reasons for allowance does not appear in independent Claims 9, 23 and 30 and, as such, is not relevant or at least less relevant with respect to these independent claims and their respective dependent claims.

Respectfully submitted,

/Guy R. Gosnell/

Guy R. Gosnell
Registration No. 34,610

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ALSTON & BIRD LLP
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LEGAL02/38357575v1

Electronic Acknowledgement Receipt

EFS ID:	33561762
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jan Snider
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	28-AUG-2018
Filing Date:	21-AUG-2017
Time Stamp:	14:55:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Post Allowance Communication - Incoming	501133_Comments.pdf	145481 b626f61d03ce4491e1f362f6becb2e0221371413	no	1

Warnings:

Information:	
Total Files Size (in bytes):	145481

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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.

PART B - FEE(S) TRANSMITTAL

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

10949 7590 05/30/2018
Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NORTH CAROLINA 28280-4000
UNITED STATES OF AMERICA

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.

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

TITLE OF INVENTION: METHOD FOR CODING AND AN APPARATUS

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	08/30/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
AYNALEM, NATHNAEL B	2488	375-240160

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

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

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

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

1 Alston & Bird LLP
2
3

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

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

(A) NAME OF ASSIGNEE: NOKIA TECHNOLOGIES OY

(B) RESIDENCE: (CITY and STATE OR COUNTRY): ESPOO, FINLAND

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

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

☒ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

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

☐ A check is enclosed.

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

☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 160605 (enclose an extra copy of this form).

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

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ 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 /Guy R. Gosnell/ Date August 28, 2018

Typed or printed name Guy R. Gosnell Registration No. 34,610

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000264

Electronic Patent Application Fee Transmittal

Application Number:	15681725
Filing Date:	21-Aug-2017
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Filer:	Guy Randall Gosnell/Jennifer Son
Attorney Docket Number:	042933/501133

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
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:	33563833
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jennifer Son
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	28-AUG-2018
Filing Date:	21-AUG-2017
Time Stamp:	16:14:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1000
RAM confirmation Number	082918INTEFSW00002997160605
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

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)	501133_IssueFee.pdf	265073 86a33ec9c37f2210185da4622fa0d7c7d54d5609	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30451 0e6be2bcc10f22cc9f3a5b955af10c814482313a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	295524		

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New Applications Under 35 U.S.C. 111

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

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

New International Application Filed with the USPTO as a Receiving Office

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	10/02/2018	10091524	042933/501133	3570

10949 7590 09/12/2018

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

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 0 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):

Mehmet Oguz BICI, Tampere, FINLAND;
NOKIA TECHNOLOGIES OY, Espoo, FINLAND;
Jani LAINEMA, Tampere, FINLAND;
Kemal UGUR, Tampere, FINLAND;

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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/681,725	Filing Date 08/21/2017	☐ 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

AMENDMENT	09/27/2018	(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))	* 30	Minus	** 30	= 0	X $100 =	0
	Independent (37 CFR 1.16(h))	* 6	Minus	***6	= 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.

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This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PTO/SB/30EFS (07-09)
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15/681,725	Filing Date	2017-08-21	Docket Number (if applicable)	042933/501133	Art Unit	2488
First Named Inventor	Bici et al.			Examiner Name	Nathanel B. Aynalem		

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

SUBMISSION REQUIRED UNDER 37 CFR 1.114

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

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

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

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

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

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 160605

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

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PTO/SB/30EFS (07-09)
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Signature of Registered U.S. Patent Practitioner			
Signature	/Guy R. Gosnell/	Date (YYYY-MM-DD)	2018-09-27
Name	Guy R. Gosnell	Registration Number	34610

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.

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

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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.

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REMARKS

This Amendment is being filed to amend the claims so as to provide, among other things, improved clarify. Allowance of the amended claims is respectfully requested for at least the same reasons that the prior version of the claims were found to be allowable.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefor (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

/Guy R. Gosnell/

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Amendments to the Claims:

1. (Currently Amended) A method comprising:

selecting, by an encoder of a codec, a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determining, by the encoder of the codec, a subset of the set of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction candidate;

comparing, by the encoder of the codec, motion information of the first spatial motion vector prediction candidate with motion information of spatial motion vector prediction candidates in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

causing information identifying the one spatial motion vector prediction candidate from the merge list to be ~~transmitted to a decoder or to be stored~~ signaled in a bitstream.

2. (Original) The method according to claim 1 further comprising selecting spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

3. (Original) The method according to claim 1, further comprising comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

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4. (Original) The method according to claim 1 further comprising examining whether the block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

5. (Original) The method according to claim 1, further comprising

determining a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

6. (Original) The method according to claim 5 comprising:

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, performing at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

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for a potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

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– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

7. (Original) The method according to claim 1 further comprising including a temporal motion prediction candidate into the merge list.

8. (Original) The method according to claim 1 further comprising selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the block of pixels.

9. (Currently Amended) A method comprising:

selecting, by a decoder of a codec, a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determining, by the decoder of the codec, a subset of the set of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing, by the decoder of the codec, motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction candidate of the ~~set~~ determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

selecting a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list ~~constructed by an encoder~~.

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10. (Original) The method according to claim 9 further comprising comparing motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

11. (Original) The method according to claim 9 further comprising examining whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

12. (Original) The method according to claim 9 further comprising

determining a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limiting the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

13. (Original) The method according to claim 12 further comprising:

examining, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examining whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, performing at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is vertically divided into a first prediction unit and a second prediction unit;

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– the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit; and

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, excluding the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

– all the other potential spatial motion vector prediction candidates have been included in the merge list;

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– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

– the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

14. (Original) The method according to claim 9 further comprising selecting one motion vector prediction candidate from the merge list to represent a motion vector prediction for the encoded block of pixels.

15. (Currently Amended) An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus embodied by an encoder of a codec to:

select a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determine a subset of the set of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

cause information identifying the one spatial motion vector prediction candidate from the merge list to be ~~transmitted to a decoder or to be stored~~ signaled in a bitstream.

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16. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to select spatial motion vector prediction candidates from the set of spatial motion vector prediction candidates as the potential spatial motion vector prediction candidate in a predetermined order.

17. (Original) The apparatus according to claim 15, wherein the apparatus is further caused to compare motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

18. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to examine whether the block of pixels is divided into a first prediction unit and a second prediction unit; and if so, exclude the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

19. (Original) The apparatus according to claim 15, wherein the apparatus is further caused to:

determine a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limit the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number .

20. (Original) The apparatus according to claim 19 wherein the apparatus is further caused to:

examine, if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examine whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

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if so, perform at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial

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motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

21. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to include a temporal motion prediction candidate into the merge list.

22. (Original) The apparatus according to claim 15 wherein the apparatus is further caused to select one motion vector prediction candidate from the merge list to represent a motion vector prediction for the block of pixels.

23. (Currently Amended) An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus embodied by a decoder of a codec to:

select a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

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determine a subset of the set of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

select a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list ~~constructed by an encoder~~.

24. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to compare motion information of the potential spatial motion vector prediction candidate with motion information of at most one other spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates.

25. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to examine whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, exclude the potential spatial motion vector prediction candidate from the merge list if the prediction unit is the second prediction unit.

26. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to:

determine a maximum number of spatial motion vector prediction candidates to be included in the merge list; and

limit the number of spatial motion vector prediction candidates in the merge list smaller or equal to the maximum number.

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27. (Original) The apparatus according to claim 26 wherein the apparatus is further caused to:

examine if the number of spatial motion vector prediction candidates in the merge list smaller than the maximum number;

if so, examine whether the prediction unit to which the potential spatial motion vector prediction candidate belongs is available for motion prediction;

if so, perform at least one of the following:

for a potential spatial motion vector prediction candidate on a left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is vertically divided into a first prediction unit and a second prediction unit;
- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and if the prediction unit is the second prediction unit, and the potential spatial motion vector prediction candidate has essentially similar motion information than a spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- the received encoded block of pixels is horizontally divided into a first prediction unit and a second prediction unit, and the prediction unit is the second prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit;

for a potential spatial motion vector prediction candidate, which is on a right side of the potential spatial motion vector prediction candidate above the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial

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motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;

for a potential spatial motion vector prediction candidate, which is below the potential spatial motion vector prediction candidate on the left side of the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit; and

for a potential spatial motion vector prediction candidate cornerwise neighbouring the prediction unit, exclude the potential spatial motion vector prediction candidate from the merge list if any of the following conditions are fulfilled:

- all the other potential spatial motion vector prediction candidates have been included in the merge list;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate above the prediction unit;
- the potential spatial motion vector prediction candidate has essentially similar motion information than the spatial motion vector prediction candidate on the left side of the prediction unit.

28. (Original) The apparatus according to claim 23 wherein the apparatus is further caused to select one motion vector prediction candidate from the merge list to represent a motion vector prediction for the received encoded block of pixels.

29. (Currently Amended) A non-transitory computer readable medium having stored thereon a computer executable program code for use by an encoder of a codec, said program codes comprising instructions for:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels, where the

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merge list is constructed based on motion information of the spatial motion vector prediction candidates and is utilized to identify motion vector prediction candidates of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit;

determining a subset of the set of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

causing information identifying the one spatial motion vector prediction candidate from the merge list to be ~~transmitted to a decoder or to be stored~~ signaled in a bitstream.

30. (Currently Amended) A non-transitory computer readable medium having stored thereon a computer executable program code for use by a decoder of a codec, said program codes comprising instructions for:

selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the encoded block of pixels, where the merge list is constructed based on motion information of the spatial motion vector prediction candidates;

determining a subset of the set of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;

comparing motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates; and

selecting a spatial motion vector prediction candidate from the merge list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is

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selected from the merge list using information that was received identifying a respective spatial motion vector prediction candidate from the merge list ~~constructed by an encoder~~.

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	15/681,725	Confirmation No.: 3570
Inventor(s):	Bici et al.	
Filed:	August 21, 2017	
Art Unit:	2488	
Examiner:	Nathnael B. Aynalem	
Title:	METHOD FOR CODING AND AN APPARATUS	

Docket No.: 042933/501133
Customer No.: 10949

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

AMENDMENT

Concurrent with the filing of the Petition to Withdraw from Issue and Request for Continued Examination, please amend the application as follows:

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this paper.

Remarks begin on page 17 of this paper.

Electronic Patent Application Fee Transmittal

Application Number:	15681725
Filing Date:	21-Aug-2017
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Filer:	Guy Randall Gosnell/Jan Snider
Attorney Docket Number:	042933/501133

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
PETITION FEE- 37 CFR 1.17(H) (GROUP III)	1464	1	140	140
RCE- 1ST REQUEST	1801	1	1300	1300
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1440**

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Decision Date : September 27, 2018

In re Application of :

Mehmet BICI

DECISION ON PETITION

UNDER CFR 1.313(c)(2)

Application No : 15681725

Filed : 21-Aug-2017

Attorney Docket No : 042933/501133

This is an electronic decision on the petition under 37 CFR 1.313(c)(2), filed September 27, 2018, to withdraw the above-identified application from issue after payment of the issue fee.

The petition is **GRANTED.**

The above-identified application is withdrawn from issue for consideration of a submission under 37 CFR 1.114 (request for continued examination). See 37 CFR 1.313(c)(2).

Petitioner is advised that the issue fee paid in this application cannot be refunded. If, however, this application is again allowed, petitioner may request that it be applied towards the issue fee required by the new Notice of Allowance.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

This application file is being referred to Technology Center AU 2488 for processing of the request for continuing examination under 37 CFR 1.114 .

Office of Petitions

Electronic Acknowledgement Receipt	
EFS ID:	33850191
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jan Snider
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	27-SEP-2018
Filing Date:	21-AUG-2017
Time Stamp:	15:14:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1440
RAM confirmation Number	092818INTEFSW00001966160605
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	31461 83388e463475de3d2f76071ccdcab914eca6e164	no	2
Warnings:					
Information:					
2	Request for Continued Examination (RCE)	501133_RCE_9-27-18.PDF	697597 8e5f9f3a8e7175fb0ac0b20b945ef1a3808325fe	no	3
Warnings:					
Information:					
3		501133_Amend_9-27-18.pdf	136831 d3c69d555c6ec1c818c453e60c28b3ee33fdfab6	yes	17

Multipart Description/PDF files in .zip description

Document Description	Start	End
Applicant Arguments/Remarks Made in an Amendment	17	17
Claims	2	16
Amendment Submitted/Entered with Filing of CPA/RCE	1	1

Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	32107 e9803f56214ca76dc893a019de6685a3ff920a64	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	897996		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Doc Code: PET.AUTO Document Description: Petition automatically granted by EFS-Web	PTO/SB/140 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**PETITION TO WITHDRAW AN APPLICATION FROM ISSUE AFTER PAYMENT OF THE ISSUE FEE UNDER 37 CFR 1.313(c)**
Application Number	15681725
Filing Date	21-Aug-2017
First Named Inventor	Mehmet BICI
Art Unit	2488
Examiner Name	NATHNAEL AYNALEM
Attorney Docket Number	042933/501133
Title	METHOD FOR CODING AND AN APPARATUS

An application may be withdrawn from issue for further action upon petition by the applicant. To request that the Office withdraw an application from issue, applicant must file a petition under this section including the fee set forth in § 1.17(h) and a showing of good and sufficient reasons why withdrawal of the application from issue is necessary.

APPLICANT HEREBY PETITIONS TO WITHDRAW THIS APPLICATION FROM ISSUE UNDER 37 CFR 1.313(c).

A grantable petition requires the following items:
(1) Petition fee; and
(2) One of the following reasons:
(a) Unpatentability of one or more claims, which must be accompanied by an unequivocal statement that one or more claims are unpatentable, an amendment to such claim or claims, and an explanation as to how the amendment causes such claim or claims to be patentable;
(b) Consideration of a request for continued examination in compliance with § 1.114 (for a utility or plant application only); or
(c) Express abandonment of the application. Such express abandonment may be in favor of a continuing application, but not a CPA under 37 CFR 1.53(d).

Petition Fee

○	Small Entity
○	Micro Entity
◉	Regular Undiscounted

Reason for withdrawal from issue

○ One or more claims are unpatentable ◉ Consideration of a request for continued examination (RCE) (List of Required Documents and Fees) ○ Applicant hereby expressly abandons the instant application (any attorney/agent signing for this reason must have power of attorney pursuant to 37 CFR 1.32(b)).
RCE request,submission, and fee. ☐ I certify, in accordance with 37 CFR 1.4(d)(4) that : The RCE request ,submission, and fee have already been filed in the above-identified application on ☒ Are attached.
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application. ○ An attorney or agent registered to practice before the Patent and Trademark Office, acting in a representative capacity. ○ A sole inventor ○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ○ A joint inventor; all of whom are signing this e-petition

Signature	/Guy R. Gosnell/
Name	Guy R. Gosnell
Registration Number	34610

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

10949 7590 10/25/2018

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

EXAMINER
AYNALEM, NATHNAEL B

ART UNIT	PAPER NUMBER
2488	

DATE MAILED: 10/25/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

TITLE OF INVENTION: METHOD FOR CODING AND AN APPARATUS

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	$1000.00	$0	01/25/2019

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

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

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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)

10949 7590 10/25/2018

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

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.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

TITLE OF INVENTION: METHOD FOR CODING AND AN APPARATUS

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	$1000.00	$0	01/25/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
AYNALEM, NATHNAEL B	2488	375-240160

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. _____

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UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

10949 7590 10/25/2018

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

EXAMINER	
AYNALEM, NATHNAEL B	
ART UNIT	**PAPER NUMBER**
2488	

DATE MAILED: 10/25/2018

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.

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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. 15/681,725	Applicant(s) BICI et al.	
	Examiner NATHNAEL AYNALEM	Art Unit 2488	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 Request for Continued Examination filed on 09/27/2018.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3. ☑ The allowed claim(s) is/are 1-30 . 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 _____.

/NATHNAEL AYNALEM/
Primary Examiner, Art Unit 2488

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 allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). 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, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on September 27, 2018 has been entered.

Response to Amendment/Arguments

Applicant's amendment/arguments with respect to pending clams 1-30 filed on March 21, 2018 have been fully considered. In view of applicant's arguments and a Terminal Disclaimer filed on March 21, 2018, the rejection of all the pending claims has been withdrawn. Thus, the current application is in condition for allowance.

Terminal Disclaimer

The terminal disclaimer filed on March 21, 2018 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Patent

No. 9,743,105 and 9,571, 833 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Interpretation - 35 USC § 112

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.

Claims 1 and 9 are interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because it uses a generic placeholder "an encoder of a codec" and "a decoder of a codec" coupled with functional language 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, claims 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: paragraph [0048].

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).

Allowable Subject Matter

Claims 1-30 are allowed.

The following is an examiner's statement of reasons for allowance: the claims are allowable due to a Terminal Disclaimer filed on March 21, 2018 to overcome a rejection on the ground of nonstatutory double patenting, and a persuasive arguments regarding the rejection under 35 U.S.C. 101 of the pending claims. *See Remarks dated 03/21/2018, pp. 17-19*

Furthermore, none of the cited prior arts (*See* PTO-892) teach the feature of "*selecting, by an encoder of a codec, a first spatial motion vector prediction candidate* from a set of spatial motion vector prediction candidates for a block of pixels as a potential spatial motion vector prediction candidate to be included in a merge list for a prediction unit of the block of pixels,

where *the merge list is constructed* based on motion information of the spatial motion vector prediction candidates and is utilized *to identify motion vector prediction candidates* of which one spatial motion vector prediction candidate from the merge list is signaled as the motion information for the prediction unit; *determining, by the encoder of the codec, a subset of the set of spatial motion vector prediction candidates based on a location of the block* associated with the first spatial motion vector prediction candidate; *comparing, by the encoder of the codec, motion information of the first spatial motion vector prediction candidate with motion information of spatial motion vector prediction candidates in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates*; and *causing information identifying the one spatial motion vector prediction candidate from the merge list* to be signaled in a bitstream," as recited in claim 1 and analogously recited in claims 9, 15, 23, 29 and 30.

Dependent claims 2-8, 10-14, 16-22 and 24-28 are allowed based on their dependency from allowed claims 1, 9, 15 and 23.

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 NATHNAEL AYNALEM whose telephone number is (571)270-1482. The examiner can normally be reached on M-F 9AM-5:30 PM ET.

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, SATH PERUNGAVOOR can be reached on 571-272-7455. 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.

/NATHNAEL AYNALEM/
Primary Examiner, Art Unit 2488

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	Art Unit
	NATHNAEL AYNALEM	2488

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04N19/52 ; H04N19/00684 ; H04N19/00703 ; H04N19/147 ; H04N19/30 ; H04N19/597 ; H04N19/105 ; H04N19/11	10/05/2018	N.A.
H04N19/119 ; H04N19/174 ; H04N19/176 ; H04N19/187 ; H04N19/513 ; H04N19/58 ; H04N19/70	10/05/2018	N.A.

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
375	240.01-240.29	10/05/2018	N.A.

* 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 keyword search	10/05/2018	N.A.
Inventor's name search	10/05/2018	N.A.
Assignee search	10/05/2018	N.A.

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	General Interference Search of the claims (USPGPUB ,USPAT)	10/05/2018	NA

/NATHNAEL B AYNALEM/ Primary Examiner, Art Unit 2488	

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	**Art Unit**
	NATHNAEL AYNALEM	2488

CPC						
Symbol					**Type**	**Version**
H04N	/	19	/	521	F	2014-11-01
H04N	/	19	/	52	I	2014-11-01
H04N	/	19	/	182	A	2014-11-01
H04N	/	19	/	176	A	2014-11-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	30	
/NATHNAEL AYNALEM/ Primary Examiner, Art Unit 2488	05 October 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20181005

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	**Art Unit**
	NATHNAEL AYNALEM	2488

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04N	/	19	/	513
H04N	/	19	/	11
H04N	/	19	/	176
H04N	/	19	/	182
H04N	/	19	/	52

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 30	
/NATHNAEL AYNALEM/ Primary Examiner, Art Unit 2488 (Primary Examiner) 05 October 2018 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/681,725	BICI et al.
	Examiner	Art Unit
	NATHNAEL AYNALEM	2488

☐ 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	10	19	19	28	28								
2	2	11	11	20	20	29	29								
3	3	12	12	21	21	30	30								
4	4	13	13	22	22										
5	5	14	14	23	23										
6	6	15	15	24	24										
7	7	16	16	25	25										
8	8	17	17	26	26										
9	9	18	18	27	27										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	30	
/NATHNAEL AYNALEM/ Primary Examiner, Art Unit 2488	05 October 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office Part of Paper No.: 20181005

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	934	(select$3 or choos$3 or chos$2 or elect$3 or pick$3) with (mvp or mv or moiton adj2 vector) with (list$3 or candidate$1) with candidat$2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:11
L4	51930	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1 or mvp) with (subset$1 or sub adj1 set$1 or part$1 or sub)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:14
L5	33	3 same 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:15
L6	33411	(compar$3 or evaluat$3 or verif$7 or check$3 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1 or mvp) with (subset$1 or sub adj1 set$1 or part$1 or sub)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:16
L7	18	3 same 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:16
L8	41673	(compar$3 or evaluat$3 or verif$7 or check$3 or examin$3 or comparison or match$3) with (predict$3 or candidate$1 or mv or vector$1 or mvp) with (subset$1 or sub adj1 set$1 or part$1 or sub)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:17
L9	22	3 same 8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:18
L10	146	3 and 8	US-PGPUB;	OR	ON	2018/10/05

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			13:29
L11	133	10 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:29
L12	7368	merg$3 near2 list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:30
L13	59	11 and 12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:30
L14	41909	(compar$3 or evaluat$3 or verif$7 or check$3 or examin$3 or comparison or match$3) with (predict$3 or candidate$1 or mv$1 or vector$1 or mvp$1 or imvc$1 or pmvc$1) with (subset$1 or sub adj1 set$1 or part$1 or sub)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:37
L15	45	12 same 14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:38
L16	11	3 and 15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 13:38
L17	20266	(compar$3 or evaluat$3 or verif$7 or check$3 or examin$3 or comparison or match$3) with (predict$3 or candidate$1 or mv$1 or vector$1 or mvp$1 or imvc$1 or pmvc$1) with (subset$1 or sub adj1 set$1 or part$1 or sub or limit$2) with (available or candidate$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 14:23
L18	268	merg$3 same 17	US-PGPUB; USPAT; USOCR;	OR	ON	2018/10/05 14:24

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			FPRS; EPO; JPO; DERWENT; IBM_TDB			
L19	25	3 and 18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 14:24
L20	88	3 and 17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 14:30
L21	77	20 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 14:30
L22	56994	(spatial or intra) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 15:07
L23	2293	14 and 22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 15:07
L24	10748	(compar$3 or evaluat$3 or verif$7 or check$3 or examin$3 or comparison or match$3) with (predict$3 or candidate$1 or mv$1 or vector$1 or mvp$1 or imvc$1 or pmvc$1) with (subset$1 or sub adj1 set$1 or sub or limit$2) with (available or candidate$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 15:08
L25	434	24 and 22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 15:08
L26	332	25 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2018/10/05 15:08

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		H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	DERWENT; IBM_TDB			
L27	26885	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with (vector or mv or mvp$1 or mvc$1) with (list$3 or candidate$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 15:10
L28	176	26 and 27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 15:10
L29	202	((("BICI") near3 ("Mehmet")) OR (("LAINEMA") near3 ("Jani")) OR (("UGUR") near3 ("Kemal"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2018/10/05 16:20
L32	28	24 and 29	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2018/10/05 16:20
L33	2076	((("NOKIA") near3 ("TECHNOLOGIES") near3 ("OY"))).AS,AANM.	USPAT	OR	ON	2018/10/05 16:24
L34	10	24 and 33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/05 16:25
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S5	15357	(subset or sub$set) with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 17:57
S6	5	S4 same S5	US-PGPUB; USPAT;	OR	ON	2016/09/20 17:58

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			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S7	33	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:02
S8	580	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:17
S9	48	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:18
S10	8	S8 same S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:18
S11	5	S10 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:19
S12	7278	merg$3 near3 list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:20
S13	292	S4 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:20
S14	280	S13 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/09/20 18:23

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		H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	DERWENT; IBM_TDB			
S15	722	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:24
S16	8	S9 same S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:25
S17	44	S9 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:26
S18	736	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with (spatial or intra) with predict$3 with candidate$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:28
S19	18	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3) with merg$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S20	4	S18 same S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S21	4	S18 and S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 18:29
S22	43381	(intra or spatial or spatio adj1 temporal or inter) near4 predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2016/09/20 19:14

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			JPO; DERWENT; IBM_TDB			
S23	407	S12 same S22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:14
S24	1072	(motion or vector$1 or mv) with merg$3 with list	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:16
S26	323	S23 same S24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:16
S27	3255	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with (spatial or intra) with predict$3 with (motion or vector or mv)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S28	74	S26 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S29	73	S28 AND ((H04N19/176 OR H04N19/52 OR H04N19/593 OR H04N19/105 OR H04N19/513 OR H04N19/139 OR H04N19/70 OR H04N19/503 OR H04N19/44 OR H04N19/463 OR H04N19/597 OR H04N19/61 OR H04N19/159 OR H04N19/51 OR H04N19/56 OR H04N19/107 OR H04N19/587 OR H04N19/174 OR H04N19/577).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:17
S30	73	S29 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:18
S31	29910	(motion or vector$1 or mv) with list	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2016/09/20 19:20

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			JPO; DERWENT; IBM_TDB			
S32	112	S27 same S31	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:20
S33	5698	candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:59
S34	259	S24 and S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 19:59
S35	152	S24 same S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:00
S37	227453	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S38	6	S35 same S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S39	126	S35 and S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:03
S41	40	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:44
S43	36069	(intra or inter) near3 predict$3	US-PGPUB; USPAT;	OR	ON	2016/09/20 20:45

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			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S44	13	S41 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:46
S46	431	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S47	88	S43 and S46	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S48	11	S33 and S47	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:47
S49	306	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:48
S50	12	S33 and S49	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:49
S51	61847	(nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50
S52	70	S33 and S51	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50

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S54	15	S43 and S52	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/20 20:50
S65	5	"13666680"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/21 12:11
S66	4	"20150010074"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/09/21 12:30
S67	62	(spatial or intra) with predict$3 with candidate$1 with list with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 12:39
S68	6	"13666680"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 12:48
S69	384	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S70	238369	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S71	93	S69 same S70	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:02
S72	84	S71 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/02/27 13:02

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		H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	DERWENT; IBM_TDB			
S73	42	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:18
S74	454	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:21
S75	334	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S76	2	S71 and S74	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S77	4	S71 and S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/27 13:22
S82	62871	(Nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:31
S83	384	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S84	238820	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S85	93	S83 same S84	US-PGPUB;	OR	ON	2017/03/04

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			13:32
S86	84	S85 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S87	5	S86 and S82	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/04 13:32
S103	461	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S104	253060	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S105	110	S103 same S104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S106	100	S105 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:30
S107	11172	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:46
S108	8571	merg$3 near3 list$3	US-PGPUB; USPAT;	OR	ON	2017/09/14 13:47

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			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S109	612	S107 same S108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:47
S110	44755	(spatial$2 or intra) with (vector or mv)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:48
S111	6	S105 and S109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:49
S112	142	S109 same S110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 13:50
S114	644364	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:09
S115	121	S103 same S114	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:11
S116	6	S109 and S115	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:11
S117	27	S108 and S115	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 14:11

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S120	46	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S121	461	(spatial or intra) with predict$3 with candidate$1 with (exclud$3 or without or eliminat$3 or skip$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S122	8571	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S123	644364	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S124	121	S121 same S123	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S125	27	S122 and S124	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S126	6	S125 AND S120	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:07
S127	474	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:08
S128	4	S125 AND S127	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/09/14 18:08

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			DERWENT; IBM_TDB			
S129	353	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:10
S130	6	S125 AND S129	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:10
S131	63838	(Nokia).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:11
S132	7	S131 AND S125	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/14 18:11
S136	27215	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with (list$3 or candidate$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:14
S137	9169	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:22
S138	826	S137 same S136	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:22
S140	686827	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:24
S141	159	S138 same S140	US-PGPUB; USPAT; USOCR;	OR	ON	2018/05/17 17:25

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			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S142	142	S141 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:25
S143	832047	(transmit$4 or transmission or send$3 or signaling or signaled or output$4) with (predict$3 or mv or vector or candidate or list or merg$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:32
S144	140	S141 and S143	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:33
S145	135	S144 AND ((H04N19/52 OR H04N19/00684 OR H04N19/00703 OR H04N19/147 OR H04N19/30 OR H04N19/597 OR H04N19/105 OR H04N19/11 OR H04N19/119 OR H04N19/174 OR H04N19/176 OR H04N19/187 OR H04N19/513 OR H04N19/58 OR H04N19/70).CPC. OR (375/240.01-240.29).CCLS.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 17:33
S147	49	(BICI near3 (Mehmet Oguz)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:12
S148	498	(LAINEMA near2 Jani).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:12
S149	373	(UGUR near3 Kemal).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:12
S150	630	S147 or S148 or S149	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2018/05/17 19:12

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			JPO; DERWENT; IBM_TDB			
S151	27215	(select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with (list$3 or candidate$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S152	9169	merg$3 near3 list$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S153	826	S152 same S151	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S154	686827	(compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S155	159	S153 same S154	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S156	832047	(transmit$4 or transmission or send$3 or signaling or signaled or output$4) with (predict$3 or mv or vector or candidate or list or merg$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S157	140	S155 and S156	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S158	7	S157 and S150	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:13
S159	65090	nokia.as.	US-PGPUB; USPAT;	OR	ON	2018/05/17 19:16

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			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S160	11	S157 and S159	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/05/17 19:16

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L35	4545	((select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with (list$3 or candidate$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/10/05 16:27
L36	87670	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/10/05 16:27
L37	1864	35 and 36	US-PGPUB; USPAT	OR	ON	2018/10/05 16:27
L38	1227	(candidat$1 with merg$3).clm.	US-PGPUB; USPAT	OR	ON	2018/10/05 16:28
L39	129	L38 and 37	US-PGPUB; USPAT	OR	ON	2018/10/05 16:28
S56	21002	((block or macroblock or picture or image) with (predict$3 or pu)).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:54
S57	266	((spatial or intra) with (mv or motion adj1 vector$1) with candidate).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:55
S58	818	(candidat$1 with merg$3).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:56
S59	739	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3 with candidat$1).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:57
S60	668	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/09/20 20:58
S61	200	S56 and S57	US-PGPUB; USPAT	OR	ON	2016/09/20 20:58
S62	2	S58 and S59 and S60	US-PGPUB; USPAT	OR	ON	2016/09/20 20:59
S63	11	S59 and S60	US-PGPUB;	OR	ON	2016/09/20 21:02

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			USPAT			
S64	1	S61 and S63	US-PGPUB; USPAT	OR	ON	2016/09/20 21:02
S89	920	(candidat$1 with merg$3).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S90	793	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3) with predict$3 with candidat$1).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S91	694	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S92	4	S89 and S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:31
S93	14	S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S94	22196	((block or macroblock or picture or image) with (predict$3 or pu)).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S95	298	((spatial or intra) with (mv or motion adj1 vector$1) with candidate).clm.	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S96	230	S94 and S95	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S97	14	S90 and S91	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S98	2	S96 and S97	US-PGPUB; USPAT	OR	ON	2017/03/04 14:32
S99	1	"12896656"	US-PGPUB; USPAT	OR	ON	2017/03/04 17:38
S162	4304	((select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3) with predict$3 with (list$3 or candidate$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:19
S163	84872	((compar$3 or evaluat$3 or verif$7 or check$3 or search$3 or differenc$2 or examin$3 or comparison) with (predict$3 or candidate$1 or mv or vector$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:19
S164	4682	((select$3 or choos$3 or chos$2 or determin$3 or calculat$3 or elect$3 or pick$3 or decid$3 or identify$3 or estimat$3 or recogni$5) with predict$3 with (list$3 or candidate$1)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:23
S165	1917	S163 and S164	US-PGPUB; USPAT	OR	ON	2018/05/17 19:23
S166	801	(candidate$1 with list with (exclud$3 or without or eliminat$3 or remov$3)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:25

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S167	41	S166 and S165	US-PGPUB; USPAT	OR	ON	2018/05/17 19:25
S168	115096	((transmit$4 or transmission or send$3 or signaling or signaled or output$4) with (predict$3 or mv or vector or candidate or list or merg$3)).clm.	US-PGPUB; USPAT	OR	ON	2018/05/17 19:25
S169	19	S167 and S168	US-PGPUB; USPAT	OR	ON	2018/05/17 19:26

10/ 5/ 2018 5:24:30 PM
C:\ Users\ naynalem\ Documents\ EAST\ Workspaces\ 13666680.wsp

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	15/681,725	Confirmation No.: 3570
Inventor(s):	Bici et al.	
Filed:	August 21, 2017	
Art Unit:	2488	
Examiner:	Nathnael B. Aynalem	
Title:	METHOD FOR CODING AND AN APPARATUS	

Docket No.: 042933/501133
Customer No.: 10949

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

The Notice of Allowability dated October 25, 2018 includes reasons for allowance. As previously noted, while the reasons for allowance are applicable with respect to some of the claims including independent Claims 1, 15 and 29 and their respective dependent claims, the language referenced by the reasons for allowance does not apply to all of the independent claims. For example, the language referenced by the reasons for allowance does not appear in independent Claims 9, 23 and 30 and, as such, is not relevant or at least less relevant with respect to these independent claims and their respective dependent claims.

Respectfully submitted,

/Guy R. Gosnell/

Guy R. Gosnell
Registration No. 34,610

Customer No. 10949
ALSTON & BIRD LLP
Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Charlotte Office (704) 444-1000
Fax Charlotte Office (704) 444-1111
LEGAL02/38732850v1

Electronic Acknowledgement Receipt

EFS ID:	34956958
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Janet Snider
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	25-JAN-2019
Filing Date:	21-AUG-2017
Time Stamp:	08:35:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Post Allowance Communication - Incoming	501133_Comments_1-25-19.pdf	144695 003c931177 4f62c860293b5ca6b4c0a4744762df	no	1

Warnings:

Information:	
Total Files Size (in bytes):	144695

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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.

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)

10949 7590 10/25/2018

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000



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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.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

TITLE OF INVENTION: METHOD FOR CODING AND AN APPARATUS

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	$1000.00	$0 Previously paid 8-29-18	01/25/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
AYNALEM, NATHNAEL B	2488	375-240160

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 Alston & Bird LLP
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)
NOKIA TECHNOLOGIES OY	ESPOO, FINLAND

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)*

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☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 160605

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 /Guy R. Gosnell/ Date January 25, 2019

Typed or printed name Guy R. Gosnell Registration No. 34,610

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

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United States Patent and Trademark Office

- Sales Receipt -

Adjustment date: 01/29/2019 HVUONG2

08/29/2018 INTEFSW 00002997 160605 15681725

01 FC:1501 1000.00 CR

United States Patent and Trademark Office

- Sales Receipt -

01/29/2019 HVUONG2 00000001 160605 15681725

01 FC:1501 1000.00 DA

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10949 7590 10/25/2018
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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	08/21/2017	Mehmet Oguz BICI	042933/501133	3570

TITLE OF INVENTION: METHOD FOR CODING AND AN APPARATUS

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	$1000.00	$0	01/25/2019

Previously paid
8-29-18

EXAMINER	ART UNIT	CLASS-SUBCLASS
AYNALEM, NATHNAEL B	2488	375-240160

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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 Alston & Bird LLP
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)
NOKIA TECHNOLOGIES OY	ESPOO, FINLAND

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

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Authorized Signature /Guy R. Gosnell/ Date January 25, 2019

Typed or printed name Guy R. Gosnell Registration No. 34,610

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

Amazon.com, Inc., Amazon.com Services LLC - Ex. 1052, Page 000339

Electronic Acknowledgement Receipt

EFS ID:	34959346
Application Number:	15681725
International Application Number:	
Confirmation Number:	3570
Title of Invention:	METHOD FOR CODING AND AN APPARATUS
First Named Inventor/Applicant Name:	Mehmet Oguz BICI
Customer Number:	10949
Filer:	Guy Randall Gosnell/Jennifer Son
Filer Authorized By:	Guy Randall Gosnell
Attorney Docket Number:	042933/501133
Receipt Date:	25-JAN-2019
Filing Date:	21-AUG-2017
Time Stamp:	11:37:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	501133IssueFee.pdf	208833 a827cf80f5082263f1244c59f64560b49c5ed0b9	no	1

Warnings:

Information:	
Total Files Size (in bytes):	208833

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New Applications Under 35 U.S.C. 111

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New International Application Filed with the USPTO as a Receiving Office

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UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/681,725	03/19/2019	10237574	042933/501133	3570

10949 7590 02/27/2019

Nokia Corporation and Alston & Bird LLP
c/o Alston & Bird LLP
Bank of America Plaza, 101 South Tryon Street
Suite 4000
Charlotte, NC 28280-4000

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 0 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):

Mehmet Oguz BICI, Tampere, FINLAND;
NOKIA TECHNOLOGIES OY, Espoo, FINLAND;
Jani LAINEMA, Tampere, FINLAND;
Kemal UGUR, Tampere, FINLAND;

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

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
15/681,725	10237574	2488	96985

PAIR Correspondence Address/Fee Address Change

The following fields have been changed to Customer Number 00197 on 10/03/2019 via Private PAIR in view of the certification copied below that authorized the change.

- Maintenance Fee Address

The address for Customer Number 00197 is:
00197
CPA GLOBAL LIMITED
2318 Mill Road 12th Floor
ALEXANDRIA, VA 22314

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:	/Guy R. Gosnell/
Name:	Guy R. Gosnell
Registration Number:	34610