

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2018/044256

International filing date (day/month/year)
27.07.2018

Priority date (day/month/year)
29.09.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04N1/40

Applicant
RAYTHEON COMPANY

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0
Fax: +49 89 2399 - 4465


Date of completion of this opinion

see form PCT/ISA/210

Authorized Officer

Montanari, Marco

Telephone No. +49 89 2399-0



Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

- the entire international application
- claims Nos. 9, 10, 16, 17

because:

- the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search (*specify*):
- the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 9, 10, 16, 17 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

- the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):
- no international search report has been established for the whole application or for said claims Nos.
- a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:
 - furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
 - furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
 - pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13*ter*.1(a) or (b).
- See Supplemental Box for further details

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-8, 11-15, 18-21</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-8, 11-15, 18-21</u>
Industrial applicability (IA)	Yes: Claims	<u>1-8, 11-15, 18-21</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

and

Re Item VIII

Observations relating to Article 6 PCT, reasoned statement with regard to Article 33 PCT, citations and explanations supporting such statement

1 Reference is made to the following documents:

D1 = US 2011/176726 A1 (LEE SEUNG-YONG [KR] ET AL) 21 July 2011
(2011-07-21)

2 **Claim 1**

2.1 The expression "for each pixel position of the plurality of filter positions for the sensor" (lines 14 - 15) gives the impression that the pixels might not (always) correspond to the filter positions. In the following this expression will be interpreted as "for each filter position".

2.2 The expression "for generating a monochrome image" (line 15) indicates that the pixel value generated for each filter position is not the monochrome image pixel, but just a value "for generating" it. But in this case the claim does not indicate how the monochrome image is generated, contrary to what is set out in its first line, and therefore a lack of clarity arises (Article 6 PCT).

2.3 As to Article 33 PCT, document D1 discloses a method for generating a monochrome image (see e.g. figure 1) wherein an original color image (110) is subject to a mapping function (150) generated from a gradient representing the difference between adjacent pixels in the x and y directions (see paragraph [0039]), i.e. a local gradient.

The image mentioned in D1 is an RGB image, thus if it has been captured by a single sensor camera with mosaic filter it is implicit that it has been de-mosaicked, but in any case, the use of the process disclosed by D1 for a de-mosaicked image is considered to be obvious to the skilled person.

Therefore the claimed subject-matter is considered to differ from D1 in that D1's pixel mapping function is replaced in the claim by a pixel "weighting". However, claim 1 is silent as to the use made of the weight, and therefore any multiplicative coefficient in the formulas of D1 (see e.g. paragraph [0073]) may be considered as a weight "used" for transforming one pixel value into another. Therefore in this interpretation the subject-matter of claim 1 lacks novelty or at least an inventive step (Article 33(2) or (3) PCT).

3 Independent claim 11

Claim 11 apart from minor features comprises the subject-matter of claim 1 in combination claims 2, 3 and 5. The objection set out at point 2.2 above does not apply, however, for the rest the objections raised above and below apply to this claims as well, *mutatis mutandis*.

4 Independent claim 18

This claim relates to a system for generating a monochrome image corresponding to the method of claim 1. Consequently, the objections raised to claim 1 equally apply to claim 18.

5 Dependent claims

5.1 **Claims 2 and 3** relate to common features applied in the image processing chain of virtually any camera. Thus they are not considered to meet the requirement of Article 33(3) PCT.

5.2 In **claim 4** it is not clear why the global gain (which may be considered as equivalent to a contrast change) is applied to 99% of the image data. In the light of the description (paragraph [0037]) it would appear that the remaining 1% may be "defective pixels or glint from the sun that may be ignore (*sic*)". However, the claim is silent about these details and in any case, it is not clear why they should comprise exactly 1% of the total. It is concluded that the claim is not clear and not supported by the description in its present completely general terms (Article 6 PCT).

- 5.3 The median operation set out in **claims 5 and 6** is a well known noise reduction operation. As such, its use to reduce noise is an obvious possibility for the skilled person (Article 33(3) PCT).
- 5.4 The subject-matter of **claim 7** overcomes the objection set out at point 2.2 above, however, it does not overcome the other objections raised to claim 1, as it is immediately apparent.
- 5.5 **Claim 8** is not clear for the following reason. The infrared image data mentioned therein appears to be part of the RGB information received in the first step of the method of claim 1. As such, this feature is not part of the claimed method, but it relates to the (spectral) content of the input image. If this feature has an influence on some feature of the claimed method, this fact should be clearly set out (Article 6 PCT).
- 5.6 In **claim 9** it is not indicated which maximum and which minimum values are subtracted from each of the three sets of RGB data and how this operation allows to compute a local gradient (Article 6 PCT).
- 5.7 In **claim 10** it is not clear which "total gradient" is meant, since this feature lacks an antecedent and / or a definition in the claim.
- 5.8 Corresponding objections apply to **claims 12, 13 and 15 to 17** which correspond to claims 4, 6, and 8 to 10. As to **claim 14**, this claim relates to "bypassing" an operation which has not been set out before, and therefore a lack of clarity arises (claim of a negative feature).
- 5.9 It is immediately apparent that the device features set out in **claims 19 to 21** are well within the skilled person's capabilities and therefore they are not effective to overcome the objection under Article 33 PCT raised to claim 18.

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

- 6 Claims 9, 10, 16 and 17 specify features of the gradient and weight calculations which do not appear to be disclosed by the available prior art documents, however, these features are not clear, for the reasons set out above. Consequently, no meaningful opinion about the requirements of Article 33 PCT can be expressed.

Re Item VII

Certain defects in the international application

- 7 Reference signs in parentheses are not inserted in the claims to increase their intelligibility, Rule 6.2(b) PCT.
- 8 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.