

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/US2019/063796

International filing date (day/month/year)
27.11.2019

Priority date (day/month/year)
03.12.2018

International Patent Classification (IPC) or both national classification and IPC
INV. H04N19/80 H04N19/30 H04N19/117 H04N19/85

Applicant
DOLBY LABORATORIES LICENSING CORPORATION

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

Moschetti, Fulvio

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. 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>1-18</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-18</u>
Industrial applicability (IA)	Yes: Claims	<u>1-18</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 VIII

1 Clarity

The application does not meet the requirements of Article 6 PCT, because the claims hereafter are not clear.

1.1 Claim 1

In claim 1 the following wordings are not clear:

- "method for generating a reshaping function": a reshaping function in general terms is not clear. In the following examination it is interpreted as a function for remapping pixels. In the context of HDR video coding, the wording has a clear meaning; in the claim, however, the field of application is not specified and therefore the wording is unclear;

- "identifying within the first set of pre-computed reshaping functions a first pre-computed reshaping function with a first reshaping-index parameter lower than the desired reshaping parameter and a second pre-computed reshaping function with a second reshaping-index parameter higher than the desired reshaping parameter,

the desired reshaping parameter being different from any reshaping-index parameters of the pre-computed reshaping functions of the first set";

specifically: a "reshaping index parameter ... lower/higher ... than the input parameter ..." is unclear: a value lower/higher than another undefined value is unclear;

the term "desired reshaped parameter" appears to formulate the claim in terms of a result to be achieved (ISPE 5.35).

The subject-matter of independent claim 1 is therefore unclear and in the following examination it is interpreted as relating to a remapping of the input sources as it is known from HDR codecs.

1.2 Claim 2

In claim 2 the wording "the reshaping-index parameter and the desired reshaping parameter of the respective reshaping functions comprise a device setting of a device for capturing or displaying the input image or the reshaped image" is unclear;

specifically the "setting" of the device is a very vague term that introduces ambiguity about the technical features to which it refers and therefore casts doubts about the scope of protection sought.

1.3 Claim 5

In claim 5 the wording "identifying ... a third pre-computed reshaping function with a third reshaping-index parameter lower than the second input reshaping parameter and a fourth basis reshaping function with a fourth reshaping-index parameter higher than the second input reshaping parameter" is not clear: in particular the terms lower and higher relating to the reshaping index parameters are relative, unspecified and unclear.

1.4 Claim 6

In claim 6 (and 15, *mutatis mutandis*) the wording "computing an interpolating factor based on the desired reshaping parameter, the first reshaping-index parameter, and the second reshaping-index parameter" is not clear since the reshaping index parameters are not defined and therefore it is not clear the scope of protection sought.

2 Prior art

- D1 WO 2017/165494 A2 (DOLBY LABORATORIES LICENSING CORP [US])
28 September 2017 (2017-09-28)
- D2 US 2018/098094 A1 (WEN BIHAN [US] ET AL) 5 April 2018 (2018-04-05)
- D4 SONG QING ET AL: "Hardware-efficient debanding and visual enhancement filter for inverse tone mapped high dynamic range images and videos",
2016 IEEE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (ICIP), IEEE, 25 September 2016 (2016-09-25), pages 3299-3303, XP033017119,
DOI: 10.1109/ICIP.2016.7532970
[retrieved on 2016-08-03]

Re Item V

3 Patentability

3.1 Independent claim 1

Furthermore, the above-mentioned lack of clarity notwithstanding, the subject-matter of independent claim 1 does not involve an inventive step in the sense of Article 33(3) PCT, and the criteria of Article 33(1) PCT are therefore not met.

D1 also relates to the field of tone mapping and, adopting the wording of independent claim 1, discloses:

in an apparatus comprising one or more processors, a method for generating a reshaping function for reshaping an input image in a first codewords representation to a reshaped image in a second codewords representation, the method comprising:

accessing a first set of pre-computed reshaping functions, wherein a pre-computed reshaping function of the first set maps pixel codewords from the first codeword representation to the second codeword representation and each reshaping function is characterized by a reshaping-index parameter identifying the reshaping function;
receiving an input image in the first codeword representation and a desired reshaping parameter identifying the reshaping function to be generated;

(see paragraph 21, disclosing the usage of reshaping functions in the passage from a first dynamic range to a second dynamic range);

identifying within the first set of pre-computed reshaping functions a first pre-computed reshaping function with a first reshaping-index parameter lower than the desired reshaping parameter and a second pre-computed reshaping function with a second reshaping-index parameter higher than the desired reshaping parameter, the desired reshaping parameter being different from any reshaping-index parameters of the pre-computed reshaping functions of the first set;

(see paragraphs 34-39 disclosing the generation of reshaping functions and figures 1B-1D; D1 does not disclose the usage of a "reshaping index parameter lower than the input reshaping parameter": this feature, while being highly unclear (see section 1.1 in the present search opinion), does not appear to add any inventive contribution, since the usage of parameters is obvious (if not implicit) in the process of tone mapping, as the one disclosed in D1);

generating the reshaping function by interpolating the first pre-computed reshaping function and the second pre-computed reshaping function using the desired reshaping parameter (see output elements in the apparatuses of figures 1B-1D);
applying the generated reshaping function to the input image to generate the reshaped image in the second codeword representation; and
coding the reshaped image to generate a coded reshaped image (see figures 1B-1D).

3.2 Dependent claims

Because of the lack of clarity of independent claim 1, the subject-matter of the relevant dependent claims is also unclear.

However, notwithstanding the lack of clarity, and as a service for the applicants, only for those dependent claims whose subject-matter has not been mentioned in section 1, (namely those dependent claims that do not present further clarity problems), hereafter are comments about their patentability. Specifically:

claim 3 relates to the fact that the device setting comprises one of: a luminance, a maximum luminance, an exposure time, a picture mode, or a flash mode of the device: the idea of changing the settings in a display for relevant adaptation is well known to any person skilled in the art;

claim 4 relates to the fact that "a backward reshaping function is based on the output forward reshaping function": this is disclosed in paragraph 21;

claim 7 relates to the computation of the interpolation factor using the formula:

$$\alpha = \frac{r^{(l+1)} - r}{r^{(l+1)} - r^{(l)}},$$

wherein α denotes the interpolating factor, r denotes the input reshaping parameter.

Given the fact that the interpolation factor is not defined, this can be also read onto the cdf (reshaping) parameter of D1 (see $c(\alpha)$ of paragraph 202) and therefore the formula is similar to formula 69 of D1. The applicants are invited to further specify the terms used in the formula of claim 5 in order to clearly differentiate it from the disclosure of D1 (and D2, formula 2 in paragraph 77).

claim 8 relates to the fact that the forward reshaping function is represented using K polynomial segments: this is disclosed in D1 (see paragraph 106);

claim 9 relates to the usage of multiple-regression coefficients for the output reshaping function: this is disclosed in D1, see paragraphs 110-113;

claim 10: the process of refining the functions by employing a database of images is obvious for the person skilled in the art of standardization, since it is part of the usual procedure;

claim 11 specifies that the first signal representation form comprises a high-dynamic range representation and the second signal representation form comprises a standard dynamic range representation: this is obvious since the scope of protection is tone mapping forward and backward (see also paragraphs 21-22);

claim 12 relates to the fact that the first and second signal format comprise a color format or a color space: this is disclosed in D1 (see paragraph 33 or 37-38);

Claim 13 relates to the usage of pivot points in polynomial representation: this is part of the common general knowledge of the person skilled in the art (see e.g. section 2.2.1 of D4 "...The piecewise polynomial iTMO in [4] is selected. Assume that there are K segments in the iTMO curve in total. The pivot points, i.e., the points at the boundary of segments...").

3.3 Claims 15-16

The technical features of these claims correspond, mutatis mutandis, to the technical features of claims 6-7 and therefore they are not clear and not inventive for the same reasons as for claims 6-7, mutatis mutandis.

3.4 Claims 14, 17 and 18

Independent claims 14, 17 and 18 respectively relate to a decoding method (claim 14), a computer-readable storage medium having stored thereon a computer program (claim 17) and to an apparatus (claim 18) for performing the method of claim 1: these claims are therefore not clear and not inventive for the same reasons as for independent claim 1, mutatis mutandis

Item VII

Certain defects in the international application

In order to meet the requirements of Rule 5.1(a)(ii) PCT, the relevant prior art, i.e. documents D1-D2, should be acknowledged by reference and briefly discussed in the introductory part of the description.

The independent claims are not in the two-part form with respect to D1, in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).