

New International Patent Application**DOLBY LABORATORIES LICENSING CORPORATION****PCT Direct Letter – in response to the EESR dated March 14, 2019, regarding the priority application EP 18209740.2**

We hereby request that the application filed herewith be processed under PCT Direct, pursuant to the Notice from the European Patent Office dated 8 March 2017 concerning the processing by the EPO as International Searching Authority of informal comments on earlier search results ("PCT Direct").

In connection with this request, below are our informal comments aimed at overcoming objections raised in the search opinion established by the EPO for European Patent Application number EP 18209740.2, from which the present application claims priority. In this letter we will refer to the patent application EP 18209740.2 as to the previous application and to its claims as to the previous claims.

1. Amendments**PCT claim 1**

New PCT claim 1 is based on previous claim 1 where it has been specified by amendment that:

- a) The reshaping function is 'for reshaping an input image in a first codewords representation to a reshaped image in a second codewords representation'. This is apparent from the same definition of (basis) reshaping function in the previous claim 1.
- b) The *basis* reshaping functions are pre-computed reshaping functions as disclosed in, e.g., par. [00038]: "*In certain applications it may be more practical to maintain a set of pre-computed reshaping functions (to be referred as the "basis reshaping functions")*".
- c) The reshaping-index parameter is 'identifying the reshaping function', as disclosed in, e.g., par [00073]: "*the number of basis backward reshaping functions and the reshaping parameters (for luma and chroma) for each such function, plus an **identification "tag" (or reshaping-index parameter)** for each basis function*", and in, e.g., par. [00038]: "*a set of pre-computed reshaping functions (to be referred as the "basis reshaping functions,"), each one corresponding to specific device settings (e.g., flash mode, exposure time, picture*

mode, and the like), denoted as $r^{(l)}$ ". Therefore, the reshaping-index parameters are identification tags, for example device settings, which uniquely identify the 'basis' or 'pre-computed' reshaping functions. Similarly, the reshaping function generated by the method is identified by a 'desired' reshaping parameter', in the sense that the desired reshaping parameter is a chosen parameter for the method.

- d) 'The desired reshaping parameter being different from any reshaping-index parameters of the pre-computed reshaping functions of the first set' can be derived from par. [00038]: "Thus, in an embodiment, a semi-adaptive reshaping method is proposed, where given a **setting r not in the set** (e.g., $r^{(l)} < r < r^{(l+1)}$), a new reshaping function is generated...", where $r^{(l)}$ and $r^{(l+1)}$ are the reshaping-index parameters of pre-computed/basis reshaping function l and pre-computed/basis reshaping function $l+1$, respectively, and the set refers to the whole set of pre-computed reshaping functions.
- e) The generated reshaping function is generated by interpolating the first pre-computed reshaping function and the second pre-computed reshaping function 'using the desired reshaping parameter;'. This is derivable by the whole disclosure which is about "Interpolation of reshaping functions in HDR imaging" (Title) and in particular from, e.g., equations (22)-(24), (26), (34)-(37), where interpolation between two basis reshaping functions is explicitly disclosed.

The method of PCT claim 1 can be used to generate any type of, backward or forward, reshaping function, thus the limitation *output forward* in the step of generating the *output forward* reshaping function has been deleted without prejudice. Previous claim 1 was already not limited to a method for generating *any specific* reshaping function, thus the deletion of *output forward* from the generating step is consistent with the preamble of previous claim 1.

PCT dependent claims

New PCT claims 2 and 3 are based on, e.g., par. [0038], as cited in the previous section under point c) and, e.g., par. [00061]: "Given a set of L pre-computed backward reshaping functions (the "basis" functions) for a set of different parameters $\{r^{(0)}, r^{(1)}, \dots, r^{(L-1)}\}$ (e.g., **maximum luminance**)..."

PCT claims 5-11 and 13-18 are based on previous claims 3-9 and 10-15, respectively, and brought into conformity with amended claim 1.

New PCT claim 6 additionally specifies that the interpolating factor is '*between zero and one*' as it is unambiguously derivable from the relation of the reshaping-index parameters and the desired reshaping parameter specified in PCT claim 1 and the equation (21) in the description. It has been further specified that the '*interpolation uses the interpolation factor*' to link the features '*interpolation*' and '*interpolation factor*' in the claim.

New PCT claim 10, further specifies a further step of '*interpolating all the reshaping functions in the output set*', as it is unambiguously derivable from the code of Table 2 in the description: the interpolation is performed iteratively for each set of two basis reshaping functions in the larger set L^0 of basis reshaping functions until the error is within a threshold.

New PCT claim 12 is based on par. [0039]: "*While, for better clarity, Table 1 may refer to images in each pair as SDR and HDR images, the same methodology can be applied when generating reshaping functions using any type of different signal representation **formats**. For example, within an image database, in each pair, the images may differ in the EOTF function (e.g., gamma versus PQ), bit-depth (e.g., 8-bit vs 10-bit), color gamut, color format (e.g., 4:4:4 vs 4:2:0), color space, and the like.*"

2. Patentability

2.1 Clarity

The alleged unclear '*method for generating a reshaping function*' has been specified to be 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*'. Therefore, it is clear that the reshaping function is used in the field of re-mapping an image from one code representation (e.g. a first dynamic range representation) to another code representation (e.g. a second dynamic range representation).

As explained in sections 1, b) and 1, c) the mathematical term 'basis' has been replaced by 'pre-computed', for clarity, and the reshaping-index parameters are identifying (as reflected in the new amendment) the corresponding pre-computed reshaping functions. These reshaping-index

parameters can be, e.g., any device setting, wherein the device is used, for example, to reproduce or display the input or reshaped image (see new PCT claim 2). Any parameter can be used to uniquely identify the corresponding pre-computed reshaping function. It is not essential to the scope of claim 1 and thus to put in practice the teaching of PCT claim 1, to specify what the reshaping-index parameters and the desired reshaping parameter indicate. Rather, a skilled person would understand that each pre-computed reshaping function in the set is associated to a reshaping-index parameter and that interpolation uses two reshaping functions of the set, each associated to a different reshaping-index parameter, and a received desired reshaping parameter. The desired reshaping parameter has a value between the values of the reshaping-index parameters identifying the two reshaping functions used for interpolation, and different from any other values of the reshaping-index parameters identifying the reshaping functions of the set. In other words, the skilled person would clearly understand how to perform the method from the wording of the claim alone, thus all alleged clarity objections on previous claim 1 are now moot.

Similar arguments are valid for the clarity objections on previous claims 3 and 4 (now PCT claims 5 and 6, respectively) which relate to the same alleged unclear definition of the reshaping-index parameters and/or alleged unclear mathematical relation between them. Therefore, the alleged unclarity objections on previous claims 3 and 4 (now PCT claims 5 and 6, respectively) are also moot.

The alleged unclear features '*first representation form*' and '*second representation form*' of previous claim 8 and 9 (now PCT claims 10 and 11, respectively) have been amended in '*first representation format*' and '*second representation format*' for consistency with the wording of the description in, e.g., par. [00039]. The formats are further specified in new PCT claim 12.

2.2 General considerations

PCT claim 1 is directed to 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 reshaping function is generated by interpolation of a first pre-computed reshaping function and a second pre-computed reshaping function. The first pre-computed reshaping function and the second pre-computed reshaping function are part of a set of pre-computed reshaping functions which map pixel codewords from the first codeword

representation to the second codewords representation. Each pre-computed reshaping function is identified by a reshaping-index parameter. Therefore, the first pre-computed reshaping function is identified by a first reshaping parameter and the second pre-computed reshaping function is identified by a second reshaping parameter. The interpolation uses a desired reshaping parameter which identifies the reshaping function to be generated. The desired reshaping parameter has a value between a value of the first reshaping index parameter and a value of the second reshaping index parameter. The desired reshaping parameter has a different value from the values of any reshaping-index parameters in the set. Since interpolation can be performed by using the pre-computed reshaping functions, the reshaping index parameters and the desired reshaping parameter, the generation of the reshaping function can be simplified because the method of claim 1 requires only to access a set of pre-computed reshaping functions and to receive a parameter which is not comprised in the set of parameters identifying the pre-computed reshaping functions. In other words, the interpolation is defined by the first and second pre-computed reshaping functions, their corresponding 'reshaping-index parameters' and the 'desired reshaping parameter'. This is advantageous in an apparatus comprising, e.g., a decoder or encoder, with limited computational and storage resources which may not be able to handle more complex interpolation methods and/or to store a large set of reshaping functions/parameters.

2.3 Novelty and inventive step

None of the cited prior art document discloses a method in which a set of pre-computed reshaping functions is accessed, and a desired reshaping parameter is received, and interpolation is made between two functions of the set identified by a first reshaping-index parameter and a second reshaping-index parameter having respective values higher and lower than the desired reshaping parameter.

In D1, par. [0202], equation (69) and D2, par. [00077], formula 2, interpolation appears to be related to a cumulative density function (CDF) and not to a reshaping function. Furthermore, equation (69) of D1 and formula (2) of D2 appear to be related to parameters of the same function or curve. In other words, both D1 and D2 do not appear to consider two functions for interpolations and to generate a (new) reshaping functions from two "neighboring" pre-computed reshaping functions.

It is concluded that new PCT claim 1, corresponding decoding claim 14 and all other claims dependent on these two independent claims are novel and inventive over the cited prior art.

3. Request

We respectfully request that the International Search Authority (ISA) take into account the results of the early search under Rule 4.12, PCT and that a full refund (100% refund) of the search fee, pursuant OJ 2017, A95, Article 1, be issued.