

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,
Petitioner,

v.

ELECTRONICS AND TELECOMMUNICATIONS
RESEARCH INSTITUTE,
Patent Owner.

IPR2021-00827
Patent 9,781,448 B2

Before JAMESON LEE, SALLY C. MEDLEY, and
NATHAN A. ENGELS, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

On April 22, 2021, Unified Patents, LLC (“Petitioner”) filed a petition (Paper 1, “Petition”) requesting *inter partes* review of claims 1 and 3 (“challenged claims”) of U.S. Patent 9,781,448 B2 (Ex. 1001, “the ’448 patent”). Electronics and Telecommunications Research Institute (“Patent Owner”) filed a preliminary response. Paper 7 (“Prelim. Resp.”). Petitioner filed an authorized reply. Paper 11 (“Prelim. Reply”). Patent Owner filed an authorized sur-reply. Paper 12 (“Prelim. Sur-Reply”).

An *inter partes* review may not be instituted unless “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Further, a decision to institute may not institute on fewer than all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018). We determine that Petitioner has not shown a reasonable likelihood of prevailing on any claim.

Accordingly, the Petition is denied, and no *inter partes* review is instituted.

B. *Real Parties-in-Interest*

Petitioner identifies only itself as real party-in-interest. Pet. 1, 1. Patent Owner identifies itself, Dolby Laboratories, Inc., Dolby Laboratories Licensing Corporation, and Access Advance LLC as real parties-in-interest. Paper 4, 2.

Patent Owner contends that the Petition fails to name all real parties-in-interest (“RPIs”) as required by 35 U.S.C. § 312(a)(2). Prelim. Resp. 72–

78. Patent Owner contends that Petitioner also should have named Petitioner's SEP Video Codec Zone members as RPIs. *Id.* Because we determine Petitioner has not demonstrated a reasonable likelihood of prevailing in establishing the unpatentability of any challenged claim, we do not reach this issue.

C. Related Matters

Neither party identifies any related district court litigation or any Board proceeding involving the '448 patent. Paper 1, 1; Paper 4, 2.

D. The '448 patent

The '448 patent is directed to a method and apparatus for performing intra-prediction by applying an adaptive filter to surrounding pixel values of a block to be intra-predicted or the predicted pixel values of a current block.

Ex. 1001, 1:65–2:2. The '448 patent states:

[T]here is provided a method of performing intra-prediction. The method of performing intra-prediction includes determining whether to apply a first filter to a reference pixel value based on information about surrounding blocks of a current block, if, as a result of the determination, the first filter is determined to be applied, applying the first filter to the reference pixel values, performing intra-prediction for the current block based on the reference pixel value, determining whether to apply a second filter to a prediction value for each prediction mode of the current block, predicted by performing the intra-prediction based on the information about the surrounding blocks, and if, as a result of the determination, the second filter is determined to be applied, applying the second filter to the prediction values for each prediction mode.

Id. at 2:11–26. The method is not limited to application in an encoder or a decoder. The '448 patent further states:

In another aspect, there is provided an encoder. The encoder includes a processor and memory connected to the

processor and configured to store pieces of information for driving the processor. The processor is configured to determine whether to apply a first filter to a reference pixel value based on information about surrounding blocks of a current block, if, as a result of the determination, the first filter is determined to be applied, apply the first filter to the reference pixel value, perform intra-prediction for the current block based on the reference pixel value, determine whether to apply a second filter to a prediction value for each prediction mode of the current block, predicted by performing the intra-prediction based on the information about the surrounding blocks, and if, as a result of the determination, the second filter is determined to be applied, apply the second filter to the prediction value for each prediction mode.

Id. at 2:54–3:3.

The '448 patent still further states:

In yet another aspect, there is provided a decoder. The decoder includes a processor and memory connected to the processor and configured to store pieces of information for driving the processor. The processor is configured to determine whether to apply a first filter to a reference pixel value based on information about surrounding blocks of a current block, if, as a result of the determination, the first filter is determined to be applied, apply the first filter to the reference pixel value, perform intra-prediction for the current block based on the reference pixel value, determine whether to apply a second filter to a prediction value for each prediction mode of the current block, predicted by performing the intra-prediction based on the information about the surrounding blocks, and if, as a result of the determination, the second filter is determined to be applied, apply the second filter to the prediction value for each prediction mode.

Id. at 3:4–3:20.

Claims 1 and 3 are each independent and reproduced below:

1. A video decoding apparatus, comprising:
a processor to determine whether to apply a first filter to a reference pixel value of a current block based on at least one of an intra prediction mode of the current block and a size of the current block,

apply the first filter to the reference pixel value if, as a result of the determination, the first filter is determined to be applied, and,

perform intra-prediction for the current block based on the reference pixel value,

wherein when the first filter is determined to be applied, the processor calculates a difference value using the reference pixel values, compares the calculated difference value with a specific threshold and applies the first filter to the reference pixel value based on comparison of the specific threshold and the calculated difference,

when the intra-prediction for the current block is performed, the processor determines whether to apply a second filter to a prediction value of the current block based on at least one of the intra prediction mode of the current block and the size of the current block, and applies the second filter to the prediction value of the current block if, as a result of the determination, the second filter is determined to be applied.

Ex. 1001, 12:2–25.

3. A video encoding apparatus, comprising:
 - a processor to determine whether to apply a first filter to a reference pixel value of a current block based on at least one of an intra prediction mode of the current block and a size of the current block,
 - apply the first filter to the reference pixel value if, as a result of the determination, the first filter is determined to be applied, and,
 - perform intra-prediction for the current block based on the reference pixel value,
 - wherein when the first filter is determined to be applied, the processor calculates a difference value using the reference pixel values, compares the calculated difference value with a specific threshold and applies the first filter to the reference pixel value based on

comparison of the specific threshold and the calculated difference,

when the intra-prediction for the current block is performed, the processor determines whether to apply a second filter to a prediction value of the current block based on at least one of the intra prediction mode of the current block and the size of the current block, and applies the second filter to the prediction value of the current block if, as a result of the determination, the second filter is determined to be applied.

Id. at 12:30–53.

Claims 1 and 3 are identical, except that claim 1 in its preamble recites “A video decoding apparatus,” and claim 3 in its preamble recites “A video encoding apparatus.” *Id.* at 12:2, 12:30.

E. Evidence Relied on by Petitioner

Petitioner relies on the following evidence:¹

References		Date	Exhibit
Moon	U.S. Pub. App. US 2005/0201633 A1	Published Sep. 15, 2005	Ex. 1004
Teng	U.S. Pat. 8,681,867 B2	Issued Mar. 25, 2014, filed Feb. 8, 2006	Ex. 1005
Wilkins	U.S. Pat. 8,326,075 B2	Issued Dec. 4, 2012, filed Dec. 5, 2008	Ex. 1006

¹ The '448 patent issued from Application 14/825,825, filed Aug. 13, 2015, which is a continuation of Application 13/640,014, filed as PCT/KR2011/002514, on April 11, 2011, now Patent 9,549,204. Ex. 1001 at codes (21), (22), (63). The '488 patent also claims foreign priority to KR 10-2010-0032778, filed Apr. 9, 2010, KR 10-2011-0026079, filed Mar. 23, 2011, and KR 10-2011-0032766, filed Apr. 8, 2011. *Id.* at code (30).

Petitioner also relies on the Declaration of Immanuel Freedman, Ph.D. (Ex. 1003).

F. Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims are unpatentable on the following grounds:

Claims Challenged	35 U.S.C. § ²	Basis
1, 3	103	Moon, Wilkins, Teng
1, 3	103	Moon, Teng

II. ANALYSIS

A. Level of Ordinary Skill

Petitioner asserts that one of ordinary skill in the art as of April 9, 2010, would have had “(1) at least an undergraduate degree in electrical engineering or computer engineering or a closely related scientific field, such as physics or computer science, or similar advanced post-graduate education in this area; (2) a working knowledge of video coding techniques; and (3) at least two years of experience with video processing.” Pet. 10 (citing Ex. 1003 ¶¶ 31–32). Patent Owner has not made its own assertion of the level of ordinary skill. Nor has Patent Owner expressed disagreement with Petitioner’s articulation.

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284, 287–88 (2011), revised 35 U.S.C. §§ 102 and 103 effective March 16, 2013. Because the effective filing date of the ’488 patent is prior to March 16, 2013 (Ex. 1001, codes (22), (63)), we refer to the pre-AIA versions of §§ 102, 103.

Petitioner’s use of the qualifier “at least” renders the articulation vague and potentially overlapping with the level of skill of an expert. Also, “similar advanced post-graduate education” is not consistent with an undergraduate degree first introduced in Petitioner’s articulation.

On this record, we adopt Petitioner’s articulation of the level of ordinary skill, but delete the qualifier “at least” for the level of education and for the amount of experience, to keep the level from being vague and overbroad and extending into the level of an expert, and delete “or similar advanced post-graduate education in this area” also to keep the level from potentially extending into the realm of an expert. What remains appears consistent with what is reflected by the content of the applied prior art references. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (the applied prior art may reflect an appropriate level of skill).

For purposes of this Decision, we find the level of ordinary skill in the art corresponds to that of one who had, on or about April 9, 2010, the level of: (1) an undergraduate degree in electrical engineering or computer engineering or a closely related scientific field, such as physics or computer science; (2) a working knowledge of video coding techniques; and (3) two years of experience with video processing.

B. Claim Construction

We use the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b) (2020). The Petition here was filed on April 22, 2021. Paper 1. We apply

the claim construction standard from *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc) (“the *Phillips* standard”).

Claim terms are generally given their ordinary and customary meaning as would be understood by one with ordinary skill in the art in the context of the specification, the prosecution history, other claims, and even extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Phillips*, 415 F.3d at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

The specification may reveal a special definition given to a claim term by the patentee, or the specification or prosecution history may reveal an intentional disclaimer or disavowal of claim scope by the inventor. *Id.* at 1316. If an inventor acts as his or her own lexicographer, the definition must be set forth in the specification with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). The disavowal, if any, can be effectuated by language in the specification or the prosecution history. *Poly-America, L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016).

Only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioner has not proposed a construction for any claim term. However, in applying the prior art to the claims, Petitioner reads the claim

term “prediction value,” appearing in both claims 1 and 3, onto original values which have been reconstructed or restored based in part on values which have been earlier predicted, and original values, of course, are not themselves predicted. Patent Owner proposes an express construction for “prediction value.” Prelim. Resp. 8–16.

A petition is required to set forth “[h]ow the challenged claim is to be construed.” 37 C.F.R. § 42.104(b)(3). Although that does not mean Petitioner must expressly construe each claim term, in this case Petitioner should have provided and explained its own construction of “prediction value,” a critical term in the claims.

“prediction value”

Patent Owner asserts that “prediction value” should be construed to mean “a value generated in an intra-prediction process for determination of a prediction block.” Prelim. Resp. 8. We agree.

Claims 1 and 3 each recite:

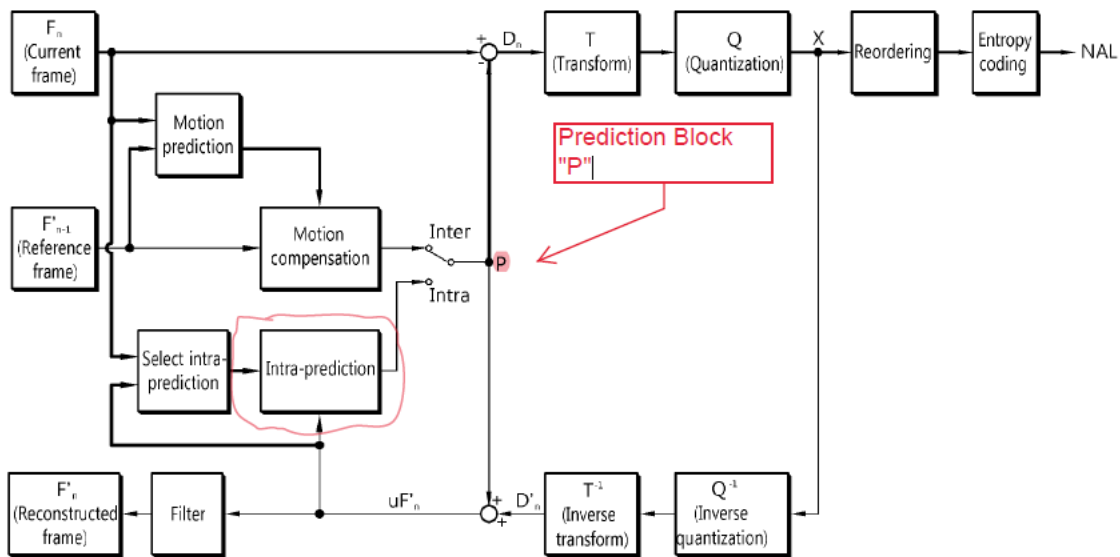
when the intra-prediction for the current block is performed, the processor determines whether to apply a second filter to a prediction value of the current block . . . , and applies the second filter to the prediction value of the current block if, as a result of the determination, the second filter is determined to be applied

Ex. 1001, 12:18–25, 12:46–53 (emphasis added). The language links “prediction value” to intra-prediction such that it is a predicted value generated inside an intra-prediction process performed on a current block to determine a prediction block for the current block.

The Specification of the ’448 patent supports this reading by conveying that intra-prediction concludes with the final determination and outputting of prediction block “P” from the box in Figure 1 that is labeled

“Intra-prediction.” Ex. 1001, 5:6–6:4, Fig. 1. For clarity, we reproduce Figure 1 below, with color annotation (“Intra-prediction” box circled in red, and prediction block “P” colored in red with textual annotation):

FIG. 1



The above Figure is a color annotated version of Figure 1 of the '448 patent, which is a block diagram of a described encoder. Ex. 1001, 3:30–31.

We agree with Patent Owner that “prediction value” means “a value generated in an intra-prediction process for determination of a prediction block.” Values generated in post intra-prediction stages which use the prediction block as partial input, such as (1) residual or difference block D_n calculated by subtracting prediction block P from the current block (Ex. 1001, 4:33–34), or (2) reconstruction block uF'_n calculated by adding prediction block P back to restored difference macroblock D'_n (Ex. 1001, 4:43–54), are not and cannot be prediction values. Residual or difference

block D_n and reconstruction block uF'_n are generated outside of the intra-prediction process while using completely determined prediction block P as partial input. Indeed, reconstruction block uF'_n is a restored approximation of the original block F_n as it existed prior to the performance of any intra prediction. Ex. 1001, 4:52–55; *see also* Ex. 1009, 186.³

The Specification further supports this construction by not referring to anything subsequent to the production of prediction block P as a part of intra prediction. We agree with Patent Owner that the '448 patent makes clear that intra prediction for a current block does not extend beyond computation of the final prediction block P. Prelim. Resp. 12–13. The '448 patent states: “If, as a result of the determination, the filter is determined to have been applied to the prediction value, the encoder applies the filter to the prediction value at step S205. Accordingly, the prediction of the current block is completed,” Ex. 1001, 9:13–17.

For this decision, no other term requires an express construction.⁴

C. *Alleged Obviousness of
Claims 1 and 3 over Moon, Wilkins, and Teng*

1. *Law on Obviousness*

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is

³ Iain E.G. Richardson, *H.264 and MPEG-4 Video Compression*, John Wiley & Sons Ltd. (2003).

⁴ We need not determine whether the preamble of claims 1 and 3 is limiting because, as discussed below, Petitioner has not adequately accounted for the limitations in the body of claims 1 and 3.

resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations, including commercial success, long-felt but unsolved needs, failure of others, and unexpected results (“the *Graham* factors”). *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).

2. *Overview of Moon*

Moon relates to encoding and decoding of motion picture data and a filter for removing a blocking effect. Ex. 1004 ¶ 3. Moon explains that because coding is performed in block units, a blocking effect arises where discontinuity occurs at boundaries between blocks. *Id.* ¶ 6. Moon states that a blocking effect is a type of image quality degradation, where discontinuity on block boundaries occurs regularly like laid tiles as compression rate increases. *Id.* ¶ 9. Moon describes that to remove such blocking effect, filters are used and filters are classified into loop filters and post filters. *Id.* Loop filters output a filtered frame which is then used as a reference frame for the next frame. *Id.* ¶ 10. According to Moon, “[p]ost filters are located on the rear portions of encoders and can be designed independently of decoders.” *Id.*

Figure 1 of Moon shows a block diagram of an encoder and is reproduced below:

FIG. 1

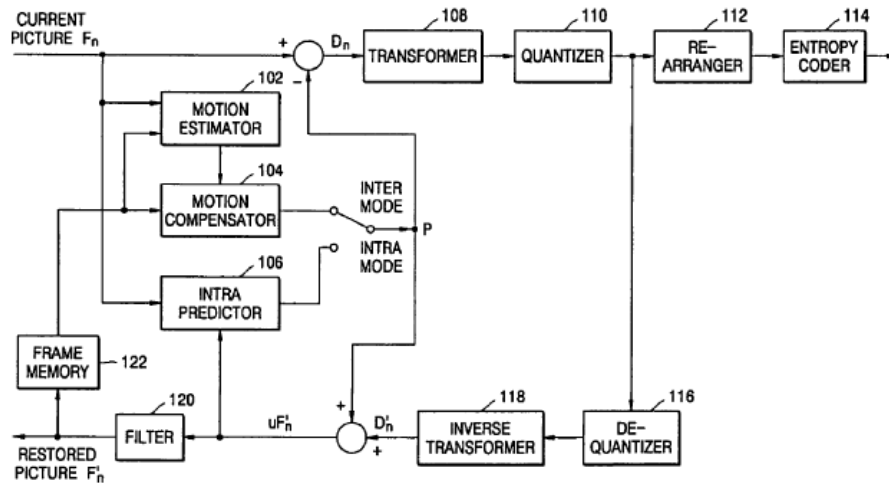


Figure 1 illustrates an encoder including motion estimator unit 102, motion compensator 104, intra predictor 106, transformer 108, quantizer 110, re-arranger 112, entropy decoder 114, de-quantizer 116, inverse transformer 118, filter 120, and frame memory 122. *Id.* ¶ 39. The input to filter 20 is a reconstructed or restored block uF'_n – not any output of intra predictor 106. *Id.* ¶ 48. The filtered restored picture is then stored in frame memory 122 “and is then used to perform an interprediction on a picture that follows the current picture.” *Id.*

Moon also describes, regarding filter 120, selectively applying the filtering depending on the circumstance. *Id.* ¶¶ 56, 85–87. Moon describes that whether to apply filtering depends on a boundary strength (Bs parameter) of the block. *Id.* ¶¶ 85–87. Moon provides a table showing conditions that correspond to various Bs parameters:

Condition	Bs
Any one of two blocks is in intra mode and any one of the two blocks is located on a boundary of a macroblock	4
Any one of two blocks is in intra mode	3
Any one of two blocks has a residual signal	2
MV >= one-sample interval and motion compensation is performed using difference reference frames	1
Others	0

Id. ¶ 85. Moon states that a “Bs parameter of 0 indicates that there is no need for filtering.” *Id.* ¶ 87.

3. *Overview of Teng*

Teng explains: “[W]hen a video frame is divided into video blocks for video coding, the edge of one coded video block may appear discontinuous with the adjacent edge of another coded video block. When this occurs, the decoded video frame may appear ‘blocky,’ which is highly undesirable.” Ex. 1005, 2:5–8. Teng further explains:

In order to remove such “blockiness,” filtering can be performed on the block boundaries of the video blocks to “smooth” the transitions between adjacent video blocks. Deblocking filters generally refer to filters that are used to smooth the transitions between adjacent video blocks to reduce or eliminate blockiness artifacts.

Ex. 1005, 2:11–16. Teng states that it provides for “selective deblock filtering.” *Id.* at 2:42. Teng further describes that deblock filtering may be selectively performed while a video block is being coded, after a video frame is predicted, or both. *Id.* at 2:16–21, 2:48–52. Teng, however, does not describe that post filtering is applied to obtain final output values of intra prediction. Figure 1 illustrates an exemplary video coding device of Teng and is reproduced below:

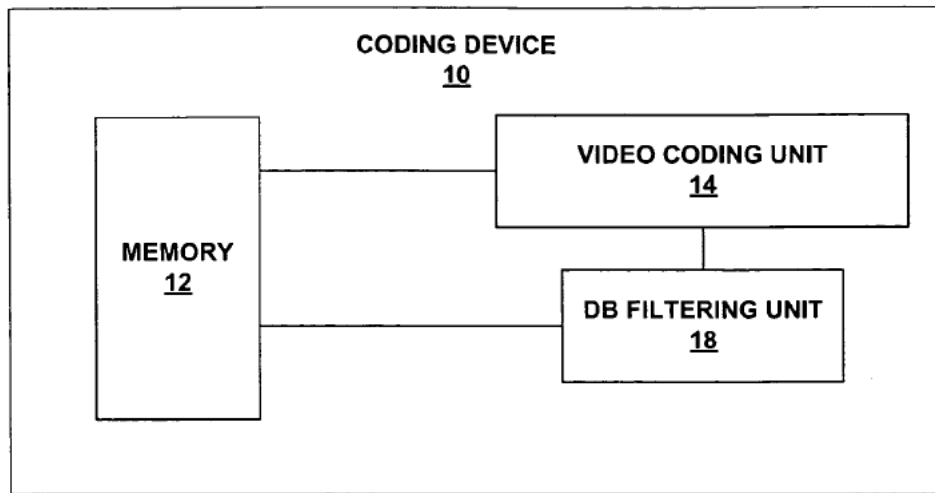


FIG. 1

Figure 1 is a block diagram of Teng's video coding device 10. *Id.* at 5:35. Teng states: "Coding device 10 may comprise any of a wide variety of devices that can be used to encode or decode video sequences." *Id.* at 5:36–38. Teng further describes: "Examples of coding device 10 generally include any computer, such as a server, a workstation or any other desktop computing device, or a mobile computing device such as a laptop computer or a personal digital assistant (PDA)." *Id.* at 5:38–42.

Teng describes that its techniques may be implemented in hardware, software, firmware, or any combination thereof. *Id.* at 14:10–11. Teng further describes: "The program code may be stored on memory in the form of computer readable instructions. In that case, a processor such as a DSP may execute instructions stored in memory in order to carry out one or more of the deblock filtering techniques." *Id.* at 14:22–25.

4. *Overview of Wilkins*

Wilkins discloses a loop filter that removes or reduces blocking artifacts. Ex. 1006, 2:41–42. Loop filter 34 is shown in Figures 1 and 2. *Id.*

at 2:41–45, 4:13–14, Fig. 1, 2. The output of loop filter 34 is provided to intra/inter prediction stage 18 (Figure 1) and intra/inter prediction stage 23 (Figure 2) for performing intra/inter prediction. *Id.* at Figs. 1, 2.

Wilkins also discloses a post-loop filter. *Id.* at 4:14–17; Fig. 2 (deblocking filter 33). Deblocking filter 33, however, is disposed subsequent to reconstruction stage 31. *Id.* at 4:10–17; Fig. 2. Wilkins states: “At the reconstruction stage 31, the prediction macroblock can be added to the derivative residual to create a reconstructed macroblock.” *Id.* at 4:10–13. Thus, it is not the prediction macroblock from intra/inter prediction stage 23 that is provided to deblocking filter 33, but a reconstructed macroblock from reconstruction stage 31. *Id.* at 4:10–17, Fig. 2. Figure 2 of Wilkins shows a video decompression system (*id.* at 2:22–23) and is reproduced below:

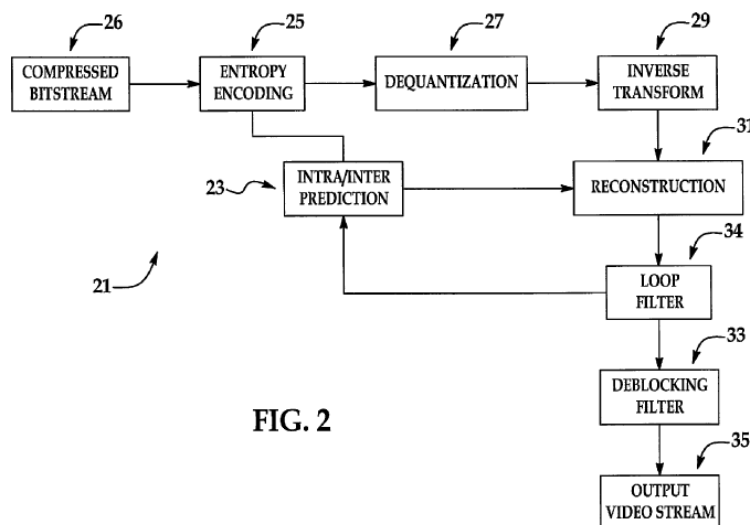


FIG. 2

Figure 2 shows decoder 21 which has a structure similar to the reconstruction path of encoder 14 of Figure 1 (not shown). *Id.* at 3:59–67.

Further, Wilkins describes modifying the strength of a loop filter, e.g., loop filter 34. *Id.* at 3:1–3. In that regard, Wilkins states: “A filter that is too strong may cause blurring and loss of detail. A filter that is too weak

may not adequately suppress discontinuities between adjacent blocks.” *Id.* at 3:3–6. Specifically, Wilkins discloses application of strength modifier 60 to provide additional loop filter control, based in part on whether intra prediction of the current block is performed in “split mode” or non “split mode.”⁵ *Id.* at 2:27–31, Fig. 4, 5.

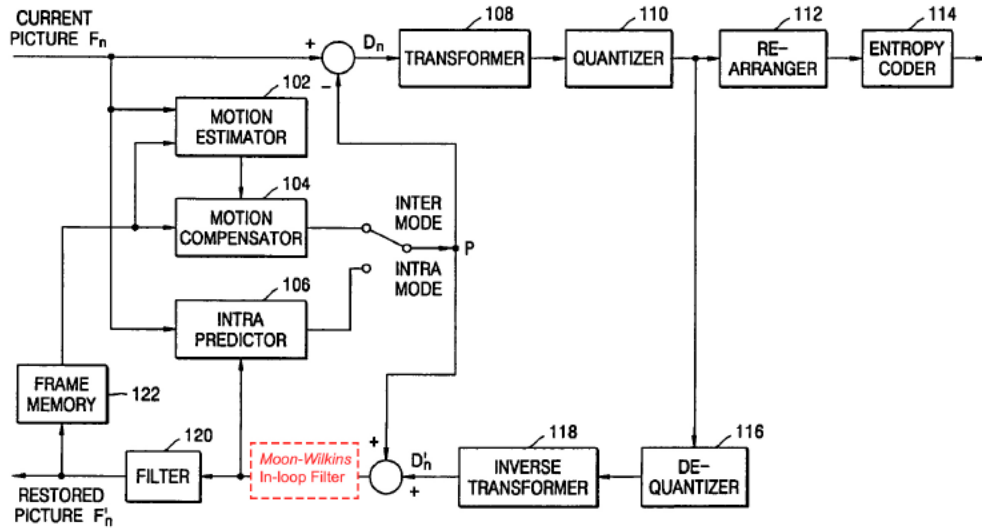
5. *Petitioner’s Combination of Moon, Teng, and Wilkins*

Petitioner asserts that the disclosures of Moon, Teng, and Wilkins all relate to both encoding and decoding. *Id.* at 21 (citing Ex. 1004 ¶ 3; Ex. 1005, 6:10–13; Ex. 1006, 3:7–10, 3:59–63). Petitioner explains:

The proposed combination relies on the video coding apparatus of *Moon*, modified by the addition of *Wilkins*’s additional filtering criterion and in-loop deblocking filter. In particular, in the proposed combination, *Moon*’s filtering criteria (as embodied in filtering decision Table 1) is augmented by the additional filtering criteria of *Wilkins* based on the size of the current block and used to selectively apply both the post-loop filter of *Moon* and the in-loop filter of *Wilkins*. The video coding apparatus would include a processor such as *Teng*’s processor to perform the filter decision. *Teng*’s processor is particularly appropriate for implementing the conditional filtering decision because *Teng*’s disclosed processor is programmed to determine whether to apply a deblocking filter (such as, in the proposed combination, based on the criteria of *Moon* and *Wilkins*).

Pet. 20. Petitioner further explains: “As applied to the system of *Moon*, such a modification would result in an additional (conditional) filter being applied to the reconstructed block before it is used for the purpose of intra-prediction, as shown in the diagram below from Dr. Freedman’s Declaration. *Freedman Decl.* at ¶ 55.” *Id.* at 22. The referenced diagram illustrating what results from Petitioner’s proposed combination is reproduced below:

⁵ Dr. Freedman testifies that a distinction based on split-mode or non-split mode equates to a distinction based on block size. Ex. 1003 ¶ 53.



The Figure is Petitioner’s depiction of the resulting structure based on its proposed combination of Moon, Teng, and Wilkins. Pet. 22–23.

6. *Apply a filter to a prediction value of the current block*

Both claims 1 and 3 recite a processor that “when the intra-prediction for the current block is performed, . . . determines whether to apply a second filter to a prediction value of the current block” and “applies the second filter to the prediction value of the current block if, as a result of the determination, the second filter is determined to be applied.” Ex. 1001, 2:18–25, 2:46–53. In Section II.B., we have construed “prediction value” to mean **“a value generated in an intra-prediction process for determination of a prediction block.”**

Petitioner identifies Moon’s filter 120, i.e., filter 120 in the proposed combination of Moon, Teng, and Wilkins in the immediate above-reproduced Figure, as the claimed second filter. Pet. 47–48. Moon’s filter 120, however, does not filter any prediction value of the current block. Rather, what is filtered by Moon’s filter 120 is reconstructed or restored block uF'_n . Ex. 1004, Fig. 1. In Petitioner’s proposed combination of Moon, Teng, and Wilkins, what is filtered by filter 120 is version of reconstructed

or restored block uF'_n which has been filtered once through a loop filter added on the basis of Wilkins (shown in the immediate above-reproduced Figure in red dotted lines). Pet. 22–23. As explained above in our claim construction analysis in Section II.B., however, a reconstructed or restored block (filtered or not filtered) does not include prediction values for the current block. In Moon, uF'_n is generated at a stage in the coding process subsequent to the generation and complete determination of prediction block P. Ex. 1004, Fig. 1. Indeed, Moon states: “The restored current picture is stored in the frame memory 122, and is then used to perform an inter-prediction on a picture that follows the current picture. *If the restored picture passes through the filter 120, it becomes the original picture* that additionally includes several encoding errors.” *Id.* ¶ 48 (emphasis added).

Petitioner makes no explanation as to why reconstructed or restored block uF'_n would include prediction values for the current block, such that filter 120 is applied to a “prediction value” of the current block. Petitioner has not made a sufficient showing for a processor that “when the intra-prediction for the current block is performed, . . . determines whether to apply a second filter to a prediction value of the current block” and “applies the second filter to the prediction value of the current block if, as a result of the determination, the second filter is determined to be applied.”

7. *Based on at least one of an intra prediction mode of the current block and size of the current block*

Both claims 1 and 3 recite “a processor to determine whether to apply a first filter to a reference pixel value of a current block *based on at least one of an intra prediction mode of the current block and a size of the current block.*” Ex. 1001, 12:3–6 (emphasis added). Both claims 1 and 3 also recite “the processor determines whether to apply a second filter to a prediction

value of the current block *based on at least one of the intra prediction mode of the current block and the size of the current block.*” *Id.* at 12:19–22 (emphasis added).

For reasons discussed below, Petitioner has not made a sufficient showing for either condition on which application of the first and second filter is based, i.e., (1) an intra prediction mode of the current block, and (2) a size of the current block.

a) *based on an intra prediction mode of the current block*

The ’448 patent explains that there are nine different intra prediction modes for intra predicting a 4x4 block, and four intra prediction modes for intra predicting a 16x16 macroblock. *Id.* at 5:7–19. For example, the nine different modes for intra predicting a 4x4 block are illustrated in Figure 4, reproduced below:

FIG. 4

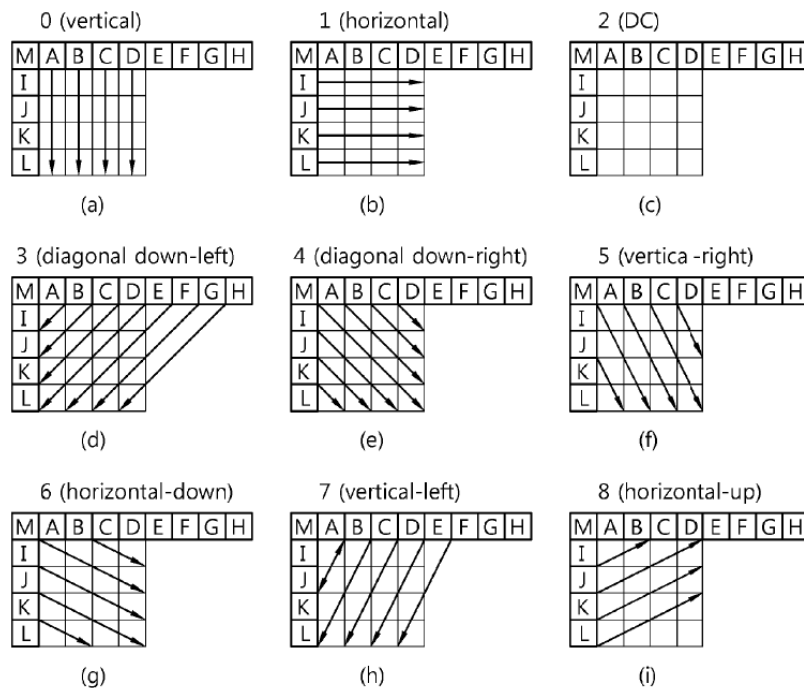


Figure 4 shows nine intra prediction modes for a 4x4 block. *Id.* at 3:36–37, 5:61–6:4.

For the condition that application of the first and second filter is based on an intra prediction mode of the current block, Petitioner relies on the disclosure of Moon. Pet. 16–17. Specifically, Petitioner asserts:

Moon further teaches that deblocking filters are selectively applied based on a set of criteria that involves calculating a boundary strength parameter, Bs, which is calculated, in part, based on the intra prediction mode, as shown in Table 1 below:

Condition	Bs
Any one of two blocks is in intra mode and any one of the two blocks is located on a boundary of a macroblock	4
Any one of two blocks is in intra mode	3
Any one of two blocks has a residual signal	2
MV >= one-sample interval and motion compensation is performed using difference reference frames	1
Others	0

Moon at [0085]-[0087]. As shown in Table 1, the Bs parameter is calculated based on the intra prediction mode, and whether blocks are located on the boundary of a macroblock, along with the residual signal and the motion compensation parameters. According to *Moon*, if the Bs value is greater than 0 (i.e., 1, 2, 3, or 4), filtering is applied with varying strength. *Id.* at [0087]. If the Bs value is equal to 0, no filtering is applied. *Id.* (“The Bs parameter of 0 indicates that there is no need for filtering.”). Thus, *Moon* teaches selectively applying deblocking filters based on a set of criteria that includes the intra prediction mode.

Id.

We are unpersuaded that Moon sufficiently teaches determining whether to apply a deblocking filter based on an intra prediction mode of the current block. The table referred to by Petitioner and reproduced above makes no distinction among multiple intra prediction modes that may be applied to a current block. In other words, based on this table, all intra

prediction modes are equivalent and they do not lead to a difference in whether to apply a deblocking filter.

b) based on a size of the current block

To satisfy determining whether to apply a filter based on a size of the current block, Petitioner relies on Wilkins's disclosure of determining a filter strength modifier 60 based in part on whether a block is processed in "split mode" or "non-split mode." Pet. 36–38. Wilkins explains that a macroblock can be processed as a 16x16 block (non-split mode) or 16 4x4 sub-blocks (split mode). Ex. 1006, 5:41–43. On that basis, Petitioner asserts that "*Wilkins's* split mode [and non-split mode] thus indicates a block size." Pet. 36. Also on that basis, Petitioner asserts that "*Wilkins* teaches the filter modifiers provide additional control of the filter strength as a function of block size." *Id.* at 28. However, for reasons discussed below, we are not sufficiently persuaded by Petitioner's assertion that in Wilkins filtering is selectively applied based on a size of the current block.

Wilkins consistently indicates that filtering decisions are applied at the macroblock level. Ex. 1006, 6:39–51, 2:49–51, Fig. 5. For instance, Wilkins states:

As illustrated in FIG. 5, for example, a different strength modifier 60 can be applied to intra-coded *macroblocks* rather than inter-coded *macroblocks* (i.e. F1-F2 vs. F3-F11). Further, a different strength modifier 60 can be applied to intra-coded non-split mode *macroblocks* rather than intra-coded split-mode *macroblocks* (i.e. F1 vs F2).

Id. at 8:2–9 (emphasis added). Wilkins further describes: "In the disclosed embodiments, block-based video compression operates on fixed-shape groups of neighboring pixels, called a macroblock." *Id.* at 2:49–51. Wilkins additionally states: "To adjust [filter] strength modifier 60 at the

macroblock level, delta values 1–8 can be encoded in the bitstream.” *Id.* at 6:39–40. On this record, we agree with Patent Owner that:

Wilkins always applies a corresponding filter strength modifier to the *macroblock* as a whole. *Wilkins* never tailors filtering criteria such as strength modifiers to individual *sub-blocks* within macroblocks, and never adjusts a strength modifier based on the “size” of the block that is to be filtered (since *Wilkins* only determines strength modifiers for entire macroblocks, which have a fixed size).

Prelim. Resp. 54. Similarly, on this record, we agree with Patent Owner that “the size of the ‘current block’ to which *Wilkins* applies the filtering criteria in *Wilkins*’s Figure 5 is always the same, namely the fixed size of the ‘macroblock.’” *Id.* at 55. Petitioner has not sufficiently shown that in *Wilkins* a different choice of filtering or not filtering is adopted for a 4x4 sub-block than for a 16x16 megablock.

8. *Wilkins*’s split mode / non-split mode
identification does not determine whether to apply a filter

As noted above, to satisfy determining whether to apply a filter based on a size of the current block, Petitioner relies on *Wilkins*’s disclosure of determining a filter strength modifier 60 based in part on whether a block is processed in “split mode” or “non-split mode.” Pet. 36–38. Specifically, the Petition states: “[I]n the proposed combination, *Moon*’s filtering criteria (as embodied in filtering decision Table 1) is augmented by the additional filtering criteria of *Wilkins* based on the size of the current block and used to selectively apply both the post-loop filter of *Moon* and the in-loop filter of *Wilkins*.” *Id.* at 20 (emphasis added).

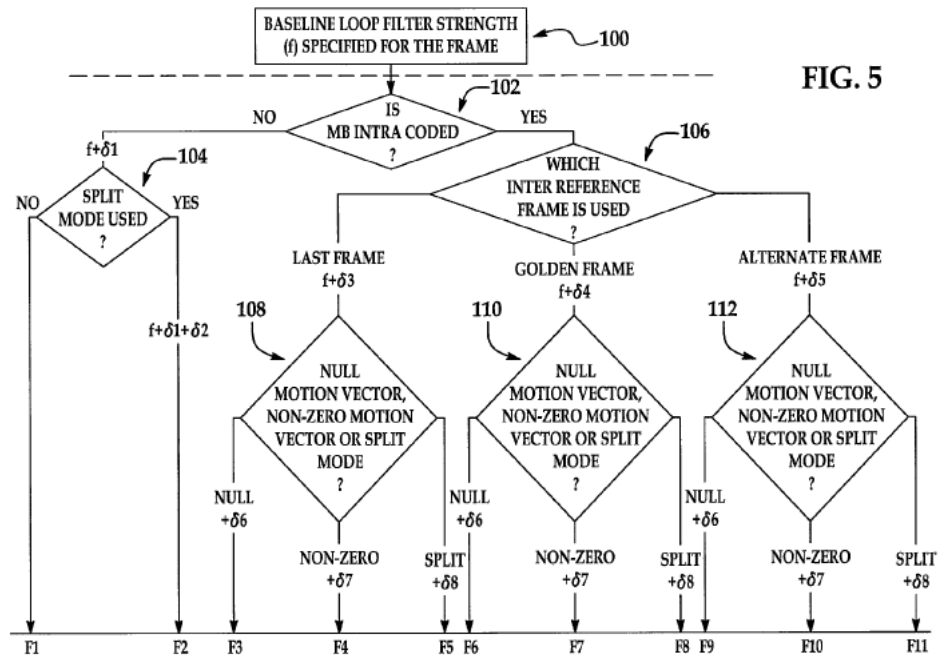
We are not sufficiently persuaded by Petitioner’s assertion that a person of ordinary skill in the art would have augmented *Moon*’s table of filtering criteria to include *Wilkins*’s identification of the “split mode” or

“non-split mode” condition. As noted above, Moon states, with respect to its Table 1, that a “Bs parameter of 0 indicates that there is no need for filtering.” Ex. 1004 ¶ 87. Where “Bs” is greater than zero, depending on other criteria, filtering still may not be applied. *Id.* ¶¶ 90–92. Wilkins’s filtering scheme as shown in its Figure 5, however, is different in kind. At the outset, Wilkins’s scheme begins with the recognition and acceptance that a baseline loop filter of certain strength “f” is applied for filtering. Ex. 1006, Figure 5 (box 100). Wilkins states:

Referring to Fig. 5, at block 100, a baseline loop filter strength f can be selected for the frame that defines the behavior of adaptive loop filter 34. Accordingly, baseline filter strength f will be specified at the frame level in the encoded bitstream. By specifying the baseline filter strength f at the frame level, overhead can be reduced since very few bits can be used to specify a single baseline filter value f for a whole frame.

Id. at 6:27–34. Wilkins further explains that to provide a filter strength modifier at the macroblock level, delta values 1–8 can be encoded in the bitstream, and then added to baseline filter strength f. *Id.* at 6:39–41.

Wilkins further describes: “Application of the deltas according to the flowchart of FIG. 5 gives rise to 11 different strength modifiers 60 identified as F1–F11.” *Id.* at 6:46–48. Figure 5 of Wilkins is reproduced below:



Wilkins’s Figure 5 is a flow chart diagram of a method for selecting a filter strength modifier. *Id.* at 2:30–31. Petitioner points to no disclosure in Wilkins of any of the eleven filter strength modifiers F1–F11 completely eliminating baseline filter strength f . Thus, Petitioner’s augmenting of Moon’s Table 1 by adding a Bs value of “0” (indicating no filtering) to the table to correspond to non-split mode (Pet. 39) is lacking in rational underpinning and evidently based on inappropriate hindsight reasoning.

9. Conclusion

For the foregoing reasons, Petitioner has not shown a reasonable likelihood that it would prevail in establishing unpatentability of either claim 1 or claim 3 as obvious over Moon, Teng, and Wilkins.

*D. Alleged Obviousness of
Claims 1 and 3 over Moon and Teng*

1. Petitioner's Combination of Moon and Teng

In this alleged ground of unpatentability, Petitioner foregoes all reliance on Wilkins and relies solely on Moon and Teng. In so doing, Petitioner no longer attempts to meet the “based on . . . [a or the] size of the current block” recitation of claims 1 and 3 and addresses only the “based on . . . [an or the] intra prediction mode . . . of the current block” recitation. Pet. 63. That is because only one of the two recitations need to be met, given the “at least one” modifier preceding the two recitations. Ex. 1001, 12:4–6, 12:21–22, 12:32–34, 12:49–50. Further, Petitioner no longer relies on Wilkins, but on Teng, to add a loop filter to Moon. *Id.*

*2. Deficiencies of Petitioner's Application
of Moon and Teng to Claims 1 and 3*

Because Petitioner no longer relies on Wilkins in this alleged ground of unpatentability, the deficiencies noted above in Section II.C. in the proposed combination of Moon, Teng, and Wilkins, stemming from Wilkins, no longer exist. However, two deficiencies concerning Moon are equally applicable here. First, as explained above in Section II.C.6., Moon's filter 120 does not filter any prediction value as is required by both claims 1 and 3. Second, as explained above in Section II.C.7, Moon does not determine whether to apply a filter based on a prediction mode of the current block as is required by both claims 1 and 3 (given that Petitioner does not assert the alternative condition, i.e., based on a size of the current block).

3. *Conclusion*

For the foregoing reasons, Petitioner has not shown a reasonable likelihood that it would prevail in establishing unpatentability of either claim 1 or claim 3 as obvious over Moon and Teng.

III. CONCLUSION

Petitioner has not shown a reasonable likelihood that it would prevail in establishing unpatentability of any challenged claim of the '448 patent.

IV. ORDER

It is

ORDERED that the Petition is *denied*, and no *inter partes* review is instituted on any claim over any alleged ground of unpatentability.

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