

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM, INC., AMAZON.COM SERVICES, LLC,

Petitioner

v.

NOKIA TECHNOLOGIES OY,

Patent Owner

Case: IPR2024-00921
U.S. Patent No. 8,077,991

PATENT OWNER’S PRELIMINARY RESPONSE

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U.S. Patent and Trademark Office
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Exhibit	Description
2001	Declaration of Dr. Michael Orchard
2002	CV of Dr. Michael Orchard
2003	JVT-D068 “History of Video Compression” Cliff Reader
2004	JVT-E066 “History of MPEG Video Compression” Cliff Reader
2005	“Entropy Coding for a Hybrid Scheme with Motion Compensation in Subprimary Rate Video Transmission,” Toshio Koga and Mutsumi Ohta, Aug. 1987 IEEE Jour. Select. Areas in Comm., p. 1166-1174

I. INTRODUCTION

Petitioner advances four grounds in the Petition.

As an initial matter, the parties agree that the proper construction of the term “spatial samples” in the Challenged Claims is “pixel values.”¹ This was the only construction proposed by either party in the co-pending ITC Investigation.

Petitioner’s first Ground is based on Koga (Ex-1004). Koga focuses on improving image quality in a hybrid video codec wherein prediction error is coded in either the spatial or transform domain. Prediction error consists of information that can be signaled by an encoder to a decoder such that the decoder can add that information to a predicted block of data to reduce error that occurs during the prediction process. Spatial and transform domains refer to the domains in which values are coded. In video coding, the spatial domain is the native domain of pixel values and the transform domain is a representation of pixel values as transform coefficients. Koga provides a system that switches between coding prediction error using only spatial coding or only transform coding. Koga proposes to first determine whether it would be more efficient to use spatial or transform coding for prediction error. However, in certain intermediate instances, it is unclear which domain is most

¹ The ITC ALJ in 337-TA-1380 adopted this construction. (Ex-2003).

efficient. In these intermediate instances, Koga teaches to code the prediction error signal using transform coding and then apply spatial coding to a residual of a prediction error signal. The benefit described in Koga is a smooth transition between scenarios where a video coder would use either spatial or transform coding. Notably, Koga is not directed to improving coding efficiency of prediction error signals and Koga's prediction error signals include entire blocks of spatial information within coded prediction error signals. Koga also performs spatial coding not to the original difference signal, but to a residual of the prediction error. This requires additional processing on the encoder side to determine this residual prior to spatial coding and does not disclose the Challenged Claims of the '991 Patent. This also conflicts with the inventions claimed in the '991 Patent, which also provides additional flexibility to address outlier values in the difference signal that is not predetermined by transform coding. Petitioner disregards this distinction and dilutes the efficiency gains present in the '991 Patent.

Petitioner's second Ground is based on a combination of Koga (Ex-1004) and Lin (Ex-1005). Petitioner adds Lin to Ground 2 to satisfy certain computing environment limitations, such as the requirement that the method of Claim 1 be performed "by a processor" and the apparatus limitations present in Claim 13. Petitioner's Ground 2 also adds the combination of Koga and Lin to support the

argument that Claim 39 is rendered obvious. Petitioner's argument relies on a combination of the encoding process set out in Koga with a single median filtering method disclosed in Lin. However, Petitioner's argument makes general statements as to why a POSITA would be motivated to combine Koga and Lin and is completely silent on why a POSITA would choose to incorporate only a small facet of Lin into Koga. Additionally, the inclusion of Lin's median filter in Koga would disrupt the overall purpose of Koga, as it would override any situation where coding the prediction error entirely in the spatial domain would be appropriate. This combination frustrates the entire purpose of Koga and a POSITA would not have been motivated to make this combination.

Petitioner's third and fourth Grounds are based on a combination of Koga (Ex-1004) and Narroschke (Ex-1006) and a combination of Koga (Ex-1004), Lin (Ex-1005) and Narroschke (Ex-1006). Petitioner's third and fourth Grounds only address dependent claims and presents no argument to cure the faults of Grounds 1 and 2. Because Grounds 3 and 4 address only dependent claims, and Petitioner's arguments regarding the independent claims fail, these Grounds fail as well.

II. BACKGROUND

A. Technical Background

Video playback involves the rapid display of successive still images which creates the illusion of motion. In video coding, each image can be broken up into smaller segments for coding, typically referred to as blocks. Blocks can vary in size and are made up of an NxM grid of pixels. Pixels are the smallest addressable unit in video coding that can vary in both brightness and color. Modern displays with high definition resolutions, such as 4K, include over 8 million pixels in one frame. Due to the massive pixel count in high resolution video, sending full size images with individual pixel values for each pixel would take an enormous amount of bandwidth. Because of this, video coding is necessary to encode (compress) and decode (decompress) video files for transmission. Video coding utilizes a variety of techniques to code video files that allow for reduced file sizes while maintaining image quality. Ex-1001 at 1:20-27

One main key to compression in video coding is the exploitation of redundancies in the video. The two main types of redundancies are temporal and spatial. Temporal redundancy refers to redundancies between frames and is associated with Inter coding. Spatial redundancy refers to redundancies within a given frame and is associated with Intra coding. Video coders take advantage of

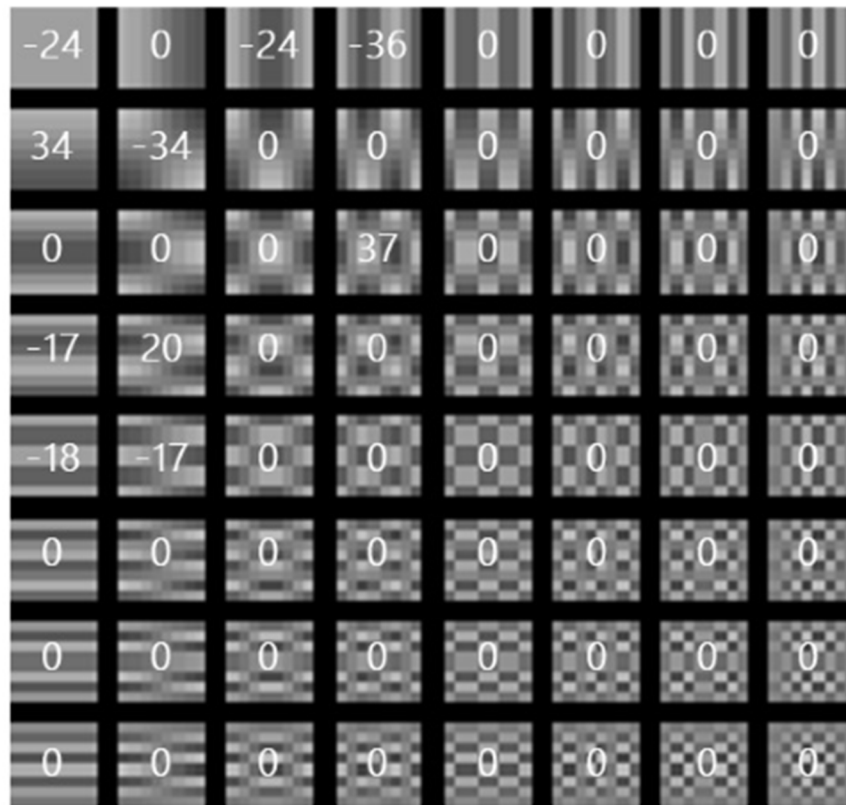
these redundancies by transmitting information referencing previously decoded information rather than retransmitting that same information for a new frame or block. One method of video coding that relies on temporal redundancy is called motion compensated prediction. In motion compensated prediction an encoder codes and transmits a motion vector to the decoder. The decoder receives the motion vector and uses the motion vector to generate a “prediction” from the pixel values of a corresponding region from a previously decoded reference frame. The corresponding region to generate a prediction from is located by the decoder by following the motion vector provided by the encoder. However, motion compensated prediction is not always a perfect match and can introduce errors in the decoding process. To address these errors, video encoders also provide prediction error information. The prediction error information represents values that are to be added to a predicted block to create an output block that more accurately represents the original input image. Prediction error is typically referred to as a prediction error signal or residual information. Ex-1001 at 1:28-48

The '991 Patent relates to an improved method of coding prediction error using both spatial and transform coding. The '991 Patent claims a coded prediction error signal including spatial samples maintained in the spatial (pixel value) domain

and transform coefficients. The spatial samples are capable of representing the outlier values that may be lost through the use of transform coding alone.

1. Transform Coding

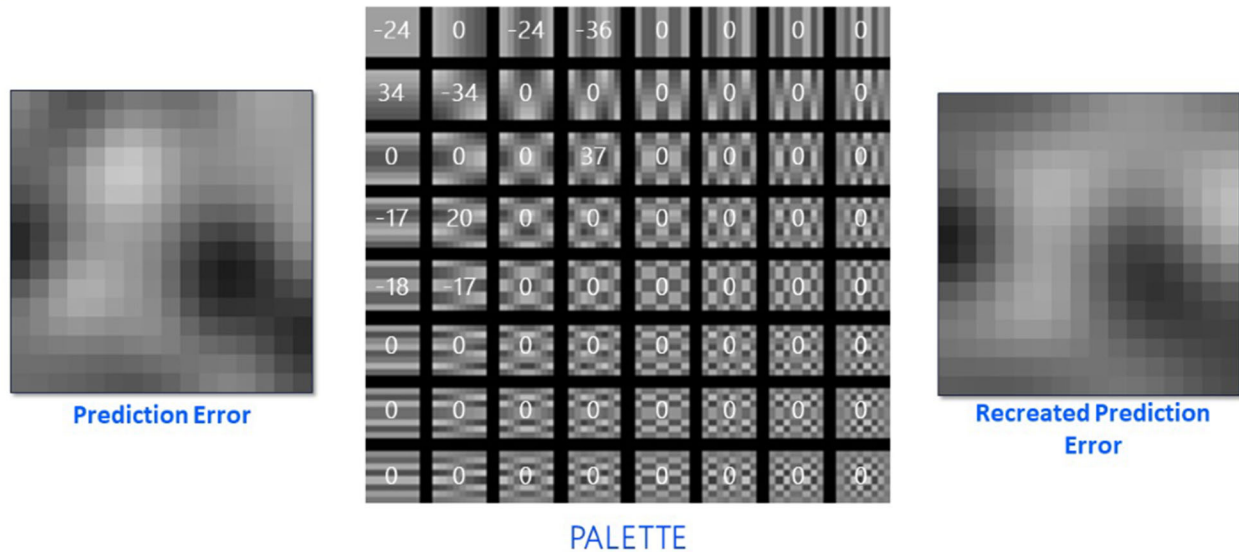
Transform coding refers to a process of creating transform coefficients that, when applied to basis functions, represent values in an array. In the context of video coding, transform coding can be used to represent all NxM prediction error values for a given block of a video frame in a compressed manner through the use of a corresponding NxM array of coefficient values, each of which is a multiplier for one of the basis values of the transform. This is done by assigning a transform coefficient to each basis function as shown below. Ex-1001 at 2:25-38.



Ex-2001 ¶ 46.

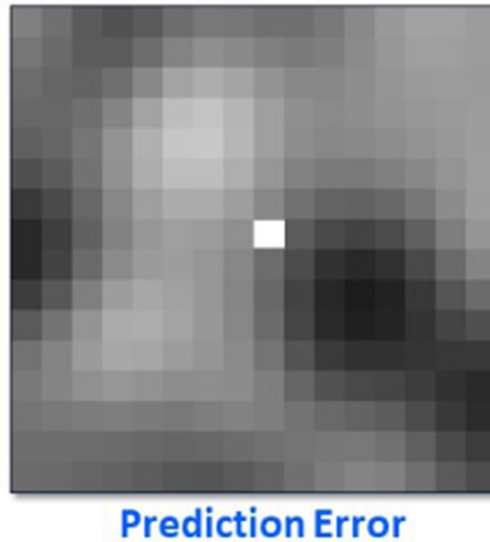
In this example, each checkered region of the figure represents a different basis function and the associated number is the weight applied to the basis function that allows the original block of pixel values to be coded and subsequently reconstructed.. Transform coding has the benefit of being able to provide a close approximation of a block with only using a few coefficients as opposed to sending a value for each individual prediction error value. The example below shows an original block on the left, the transform coefficients for said block, and the recreation of the block on the right. While the recreation is close, it is not entirely perfect

because the transform coefficients have been quantized in order to reduce the number precision needed to represent the coefficients. Ex-2001 ¶ 47.



However, transform coding fails to provide efficient compression when there are outlier values in the prediction error to be coded. This is because it takes a greater number of transform coefficients to correctly represent an outlier block with the basis functions. For example, if an incoming block had an outlier value as represented by the white pixel below, far more transform coefficients would be needed to get a reasonable approximation of the block when recreated. This presents the encoder with two options: (1) to encode a large number of transform coefficients, thereby accurately representing the outlier but drastically increasing the size of the bitstream, or (2) to encode the block using a smaller number of coefficients,

effectively ignoring the outlier, to maintain a feasible bitstream size but creating artifacts in the process. Ex-2001 ¶ 48.



This increase in the number of transform coefficients necessary to recreate the block thus defeats the efficiency purpose of using transforms in the first place.

2. Entropy Coding

Entropy coding is a form of lossless coding regularly used by video coding systems. Entropy coding allows for the representation of various signals to be coded as bits for transmission from the encoder to the decoder. A lossless coding method, such as entropy coding, provides a perfect recreation of the original signal when the signal is decoded. This means that there are no differences between the incoming signal to be coded and the output signal of the decoder. Entropy encoding merely

creates a representation of the incoming signal as bits, and entropy decoding reverses this process.

3. Prediction Error Coding

Traditionally, prediction error was coded using transform coding, which allows for the efficient representation of a block of values using only a few transform coefficients. However, transform coding “deteriorates when the prediction error to be transformed become less correlated.” Ex-1001 at 2:29-32. Practically, this means that if there are outlier values in the prediction error signal, transform coding won’t be very efficient as it requires the inclusion of far more transform coefficients to accurately signal the prediction error. This results in either a decrease in picture quality or a decrease in the efficiency of transform coding the prediction error.

The inventor of the ’991 Patent recognized this issue with using only transform coding for prediction error and conceived of a solution to efficiently address outlier values which is described and claimed in the ’991 Patent. The ’991 Patent teaches that the outlier values can be identified and spatially coded in addition to transform coding the non-outlier values as illustrated, for example, in Figure 4.. Ex-2001 ¶ 49; Ex-1001, Fig. 4.

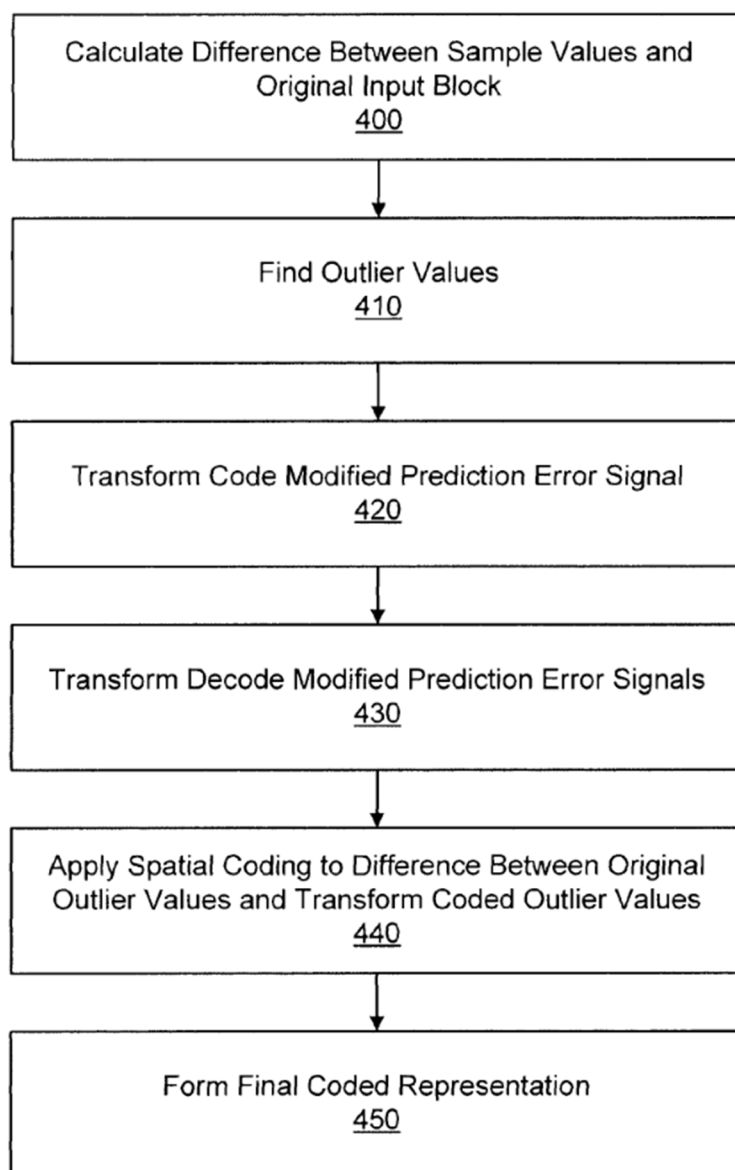


FIG. 4

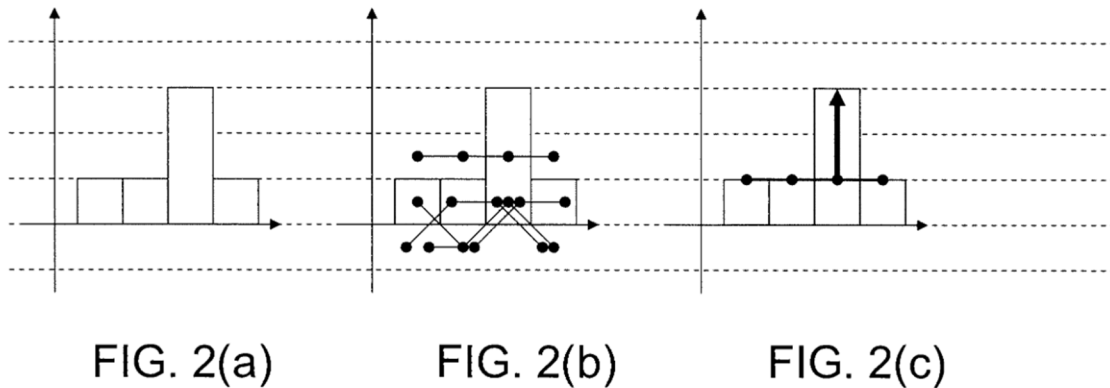
The '991 Patent provides a novel method of coding prediction error that allows for the efficiency of transform coding to be recognized even where the

prediction error is not well correlated through the use of spatially coding outlier values. This benefit is illustrated in Figure 2 of the '991 Patent.

FIG. 2(a) is an example of four scalar values that are to be coded or decoded and representing the prediction error signal between the original image and the prediction image. In FIG. 2(b), the four weighted basis functions from FIG. 1 are summed to the prediction error signal (1.5 times the first, 0.5 times the second, -0.5 times the third and -0.5 times the fourth basis function). In FIG. 2(c) it is demonstrated how the same prediction error signal can be reconstructed by summing up only the first basis function and a single spatial sample represented by an arrow. In this example, compression efficiency improvement can be expected as the signal is represented by a single transform coefficient and a single spatial samples instead of fours transform coefficients weighting the four Hadamard basis functions (as shown in FIG. 2(b)).

Ex-1001, 4:44-58.

In other words, Figure 2(b) shows that the use of transform coding alone requires sending four coefficient values to represent the signal, while Figure 2(c) demonstrates that the same values can be accurately signaled with one coefficient and one spatially coded outlier value. Ex-2001 ¶ 50.



The '991 Patent repeatedly describes this benefit of spatially coding the outlier values beginning with the abstract:

In various embodiments, the effects of pixel “outliers” are removed from the transform and are coded separately as a spatially coded pixel prediction, thereby improving the coding gain of the transform.

And continuing throughout the specification, describing the example provided in Figure 2, representing the “difference signal [1 1 3 1] to be coded” where “[3] is an outlier.” ’991 Patent at 5:51-65. And the “difference between the original outlier samples ([3]) and the transform coded outlier value ([1]) is then spatial coded.” *Id.* This focus on the outlier values teaches to address such values by using individualized spatial coding where necessary in the prediction error signal. This is reflected in the specification at columns 3 and 4. Ex-2001 ¶¶ 51-52.

B. The '991 Patent's Prosecution History

The '991 Patent claims priority to a provisional application filed in April 2007. The '991 Patent (App. No. 12/101,019 (now Patent No. 8,077,991) during prosecution was subject to one Office Action and response before being allowed. According, Patent Owner addresses the file history of the '991 Patent below.

1. Application No. 12/101,019 (the "'019 Application")

The original claims of the '019 Application were rejected in a non-final rejection on May 12, 2011 over 35 U.S.C. § 101 and 112. Examiner stated, regarding the rejection of claims 1-12, 22-29, and 39 that "a statutory 'process' under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing." '991 File History at 56. Examiner also stated that "Claims 13-21 and 30-38 define a computer based structural organization embodying functional descriptive material. However, the claims do not define a computer readable medium or memory and is thus non-statutory for that reason." *Id.* at 56-57. Claim 30 was also rejected for a lack of antecedent basis.

Patent Owner corrected these formalities through an amendment filed on August 11, 2011. Examiner accepted these amendments, and a notice of allowance was filed on September 16, 2011.

2. Prior Art Cited in Prosecution

The chart below summarizes the art of record during the prosecution of the '991 Patent.

Reference	Inventors / Authors	'991 FH
U.S. Pat. No. 6,498,810	Kim et al.	† ²
U.S. Pat. No. 5,598,214	Kondo et al.	†
U.S. Pat. No. 4,125,861	Mounts et al.	†
JP02002152049A	Pelly	†
“Using Convex Set Techniques for Combined Pixel Frequency Domaincoding of Time-Varying Images” IEEE Journal on Selected Areas in Communications, IEEE Services Center, vol. SAC-05, no. 7, 1 August 1987, pages 1127-1139	Santago P. et al.	¥
Joint Adaptive Space and Frequency Basis Selection IMAGE Processing, 1997, vol. 3, October 26, 2997, pages 702-705	Smith J. et al	¥
On Transform Coding Motion-Compensated Difference Images IEE Proceedings I. Solid-State & Electron Devices, Institution of Electrical Engineers. Vol. 139, no. 3 part 1, June 1, 1992 pages 372-376	Clarke R. J.	¥

² Key: † Cited by examiner ‡ Discussed in office actions ¥ Cited by applicant or disclosed in specification

Reference	Inventors / Authors	'991 FH
Overview of the H.264/AVC video coding standard IEEE Transactions on Circuits and Systems for Video Technology, IEEE Service Center, vol. 13, no.7, July 1, 2003, pages 560-576.	Wigand T. et al.	¥

C. The Asserted Prior Art

Petitioner relies on 3 prior art references in its petition. Petitioner relies on Koga alone, a combination of Koga and Lin, and a combination of Koga, Lin, and Narroschke. Petitioner's proposed combinations do not address the shortcomings of Koga alone as it pertains to the independent claims (Claims 1, 13 and 39) and therefore fail to render obvious the independent Challenged Claims.

1. Koga (Ex. 1004)

U.S. Pat. No. 4,723,161 ("Koga") issued from U.S. Patent App. No. 841,175 and is titled "Method and Arrangement of Coding Digital Image Signals Utilizing Interframe Correlation" and names Toshio Koga as inventor.

Koga has a priority date of 1985, which is before any video coding standard existed. At the time of Koga's application, there was a dispute in early standardization efforts as to whether prediction error is better coded spatially or using transform coding. The inventor of Koga and submitted a proposal to the first

ITU standard, H.261, that coded prediction error entirely in the spatial domain. However, it was around this time that the standards setting organizations recognized the benefits of transform coding over spatial coding for the prediction error and transform coding became the de facto method of coding prediction error. As a response to this, the inventor of Koga conceived of a method to switch between transform coding and spatially coding the prediction error signal. This method provided that, under very specific conditions, the prediction error signal undergoes transform coding and then a residual derived therefrom undergoes spatial coding. This transitional coding was necessary to implement a system that uses either spatial or transform coding, because when switching between the two, video quality would abruptly change. Ex-2001 ¶¶ 38-41.

In order to take advantage of the merits of both methods, if the orthogonal transformation is selectively applied according to the displacement speed of an object image to be transmitted, then the picture image quality changes abruptly upon changing to a mode wherein orthogonal transformation is not used, and vice versa. As a consequence this technique has not proven successful.

Ex. 1004 at 3:59-66; Ex-2001 ¶42.

The inventions described in Koga are only beneficial in a system where the prediction error switches between being coded entirely in the spatial domain and entirely in the transform domain. Koga's goal is not to improve coding efficiency of

the prediction error signal, but to allow spatial coding to be implemented as an alternative to transform coding. Indeed, Koga never mentions coding efficiency as a goal of the invention and, most importantly as it relates to the '991 Patent, never mentions the identification and spatial coding of outlier values. In fact, an implementation of Koga's coding method would compound the issues associated with outlier values in a prediction error signal. This is because the transform coding and subsequent quantization of the difference signal prior to spatial coding governs which values are spatially coded. This does not leave room for addressing the outlier values as the transform coding acts upon the signal first. Ex-2001 ¶¶ 44, 53-58.

2. Lin (Ex-1005)

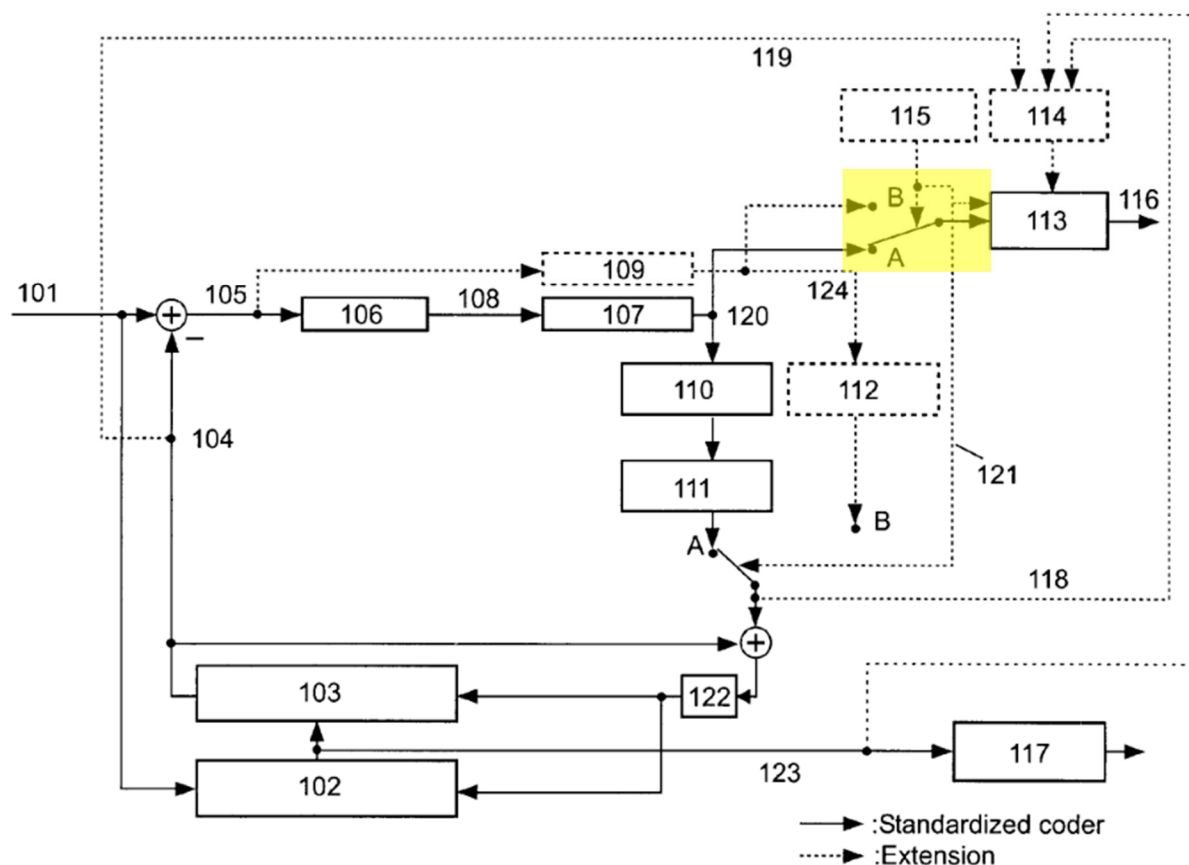
U.S. Patent Publication No. 2006/0268990 ("Lin") was published on Nov. 30, 2006 and names Chih-Lung Lin, Minghui Xia, Pohsiang Hsu, and Shou-Jen Wu as inventors. Lin is directed to "technology relate[d] to video compression, and more specifically, to adaptive video encoding using a perceptual model." Ex-1005 at 1. Lin focuses on the use of various quantization techniques to perform a median filtering to blocks and "classifies blocks of video data according to content of the blocks, and adaptively encodes the blocks based at least in part upon the block classification." Ex-1005 at 28. Lin purports to improve coding efficiency through

adaptive filtering that adjusts based on the block to be filtered and smooths out the signal for compression.

Petitioner relies on Lin as a disclosure of a “computing environment” to satisfy the processor and apparatus claim limitations. Pet. 22.

3. Narroschke (Ex-1006)

U.S. Patent Publication No. 2011/0038410 was filed on Dec. 22, 2006 and published on Feb. 17, 2011, and lists Matthias Narroschke and Hans-Georg Musmann as inventors. Narroschke is directed to “a method of coding and decoding ... data signals using adaptive coding of the prediction error.” Ex-1006 at 1. Narroschke discloses a method of coding the prediction error signal that centers on “deciding whether to transform the prediction error signal into the frequency domain, or to maintain the prediction error signal in the spatial domain.” *Id.* at [0004]. Narroschke’s method of coding the prediction error signal is either entirely in the transform domain, or entirely in the spatial domain, as evident by the switching mechanism depicted in Fig. 1:



Ex-1006 at Figure 1 (annotated).

Narroschke teaches to use “an adaptively controlled mechanism 115 to switch between the frequency and the spatial domain.” Ex-1006 at [0026]. Narroschke repeatedly makes the distinction that either transform or spatial coding is used for the prediction error, but not both. *See* Ex-1006 at [0004], [0006], [0008], [0015], [0019], [0026], [0027], [0029].

D. POSITA

Patent Owner has applied Petitioner's POSITA for the sake of this Response. (Pet., 25-26.) This Response does not depend on this skill level. PO reserves the right to argue in favor of different level of skill should trial be instituted.

E. Claim Construction

1. “spatial samples”

Petitioner and Patent Owner agreed at an International Trade Commission investigation that the term “spatial samples” should be construed as meaning “pixel values.” Ex. 1010 at 1. This is consistent with how the '991 Patent describes “spatial samples.” Ex. 1001 2:64-3:2 (“spatial samples (i.e., pixel values)”). Patent owner agrees with Petitioner's remarks regarding this construction. Pet. 27.

2. “spatial coding”

Patent Owner does not contest Petitioner's construction for the sake of this POPR, but reserves the right to challenge this construction in the event of institution.

3. “difference signal” (Claims 1 and 39)

Patent Owner disagrees with Petitioner's construction of “difference signal” to mean “prediction error signal” as Petitioner's construction is unnecessary and adds ambiguity to the term. Patent Owner believes no construction is necessary for the term “difference signal” as the term is already defined in the Challenged Claims. However, if the Board finds that a construction is necessary, Patent Owner believes

the correct construction should be “a signal which represents differences between sample values of a predicted block of data and values for an original input block.” Patent Owner believes that this more detailed construction will reduce the likelihood of further disputes regarding this term’s meaning. Ex-2001 ¶ 63.

As an initial matter, Petitioner’s construction is unnecessary. The claims discuss two signals, (1) a difference signal, and (2) a coded prediction error signal. The difference signal is claimed as “representing differences between sample values of a predicted block of data and values for an original input block.” The coded prediction error signal is the output of claim 1 and is the result of combining multiple representations of the difference signal. Petitioner acknowledges, the term “difference signal” is already described in Claims 1 and 19 yet gives no explanation as to why a construction is necessary. Pet. 28 (citing Ex-1001 at Claims 1, 19). The description within Claims 1 and 19 is consistent with the specification. Ex-1001 at 3:13-22. The specification states that the difference signal represents “differences between sample values of a predicted block of data and values for an original input block.” *Id.* The ’991 Patent explains that this difference signal is used in the process of generating a coded prediction error signal but is a distinct concept. *Id.* The term “difference signal” is easily understood from the context of the claims and the specification. Ex-2001 ¶ 64

Petitioner's construction also introduces uncertainty into the claim term. While Petitioner relies on a citation to the background section to describe a prior art prediction error signal, Petitioner's construction does not include this language. Pet. 28 (citing Ex-1001, at 1:37-40). Petitioner claims that this section of the specification confirms that the difference signal "corresponds to the well-known concept of a prediction error signal." Pet. 28. In doing so, Petitioner ignores the fact that the cited portion of the specification relates to prior art systems and is silent regarding the difference signal. Pet. 28 (citing Ex-1001 at 1:37-40). At most, the specification provides a similar, but not identical, description of prior art prediction error signals and the claimed difference signal. The specification makes clear that the claimed prediction error signal is created through a combination of "[t]he first and second representation [of the difference signal]." Ex-1001 at 3:13-22. Petitioner's proposed construction provides no insight as to what a "prediction error signal" is in the context of the Challenged Claims. As such, Patent Owner believes that, if a construction is necessary, Patent Owner's more detailed construction be adopted.

Ex-2001 ¶ 65

Additionally, Petitioner's reliance on Claims 2 and 14 as support for its position is incorrect. Petitioner states that "substituting outlier values in the difference signal results in a 'modified prediction error signal.'" Pet at 28 (citing Ex-

1001 at 5:24-65, Fig. 4). However, this description in the specification does nothing to equate the difference signal and the prediction error signal. The difference signal is used to derive the prediction error signal. As such, any substitution of outlier values in the difference signal would inherently result in a modified prediction error signal. This does not mean the two are equal. This is made clear throughout the specification and the claims specifically refer to both a “difference signal” and a “prediction error signal.” *See e.g.*, Ex-1001 at Claim 1. The inventor of the ’991 Patent specifically chose to claim these distinct terms rather than use the term “prediction error signal” throughout. Petitioner’s construction is unnecessary and plays no role in determining validity based on the asserted Grounds. Ex-2001 ¶ 66

4. “the difference signal” (Claims 13 and 14)

For purposes of this Preliminary Response Patent Owner agrees with Petitioner’s construction of “the difference signal” in Claims 13 and 14.

5. “outlier values”

Patent Owner believes no construction is necessary for the term “outlier values.” Petitioner acknowledges that a POSITA would understand the meaning of the term “outlier values” but introduces ambiguity with the proposed construction of “values for pixels that significantly differ from those for neighboring pixels.” Ex-2001 ¶69.

Claim terms containing “significantly” are often found to be terms of degree. *See Arctic Cat Inc. v. Polaris Indus. Inc.*, 2017 WL 11679225 (D. Minn. Dec. 20, 2017) (analyzing the term “significantly above” as a term of degree). Although terms of degree are not “inherently indefinite,” they do require “‘objective boundaries for those of skill in the art’ when read in light of the specification and the prosecution history.” *Id.* at *6. Where the specification does not provide insight into this boundary, claim terms containing “significantly” are often found to be indefinite. *See Princeton Digital Image Corp. v. Amazon.com, Inc.*, 2019 WL 351258 (D. Del. Jan. 29, 2019) (finding the term “significantly smaller than the combined probability of occurrence of all the signal values represented by the first group” to be indefinite). Petitioner’s construction adds a term of degree to the claim language. This term of degree has no definitive support in the specification because it is not a part of the original claim language. As such, Petitioner’s proposed construction may cause any claim containing the term “outlier values” to be considered indefinite. Courts should not adopt a construction that renders a claim indefinite.

Patent Owner made the choice to use the term “outlier values” over a mathematically precise description because, in the video coding context, different encoders may have different thresholds for the classification of outlier values. The

specification explains that the threshold of outlier values can vary depending on the circumstances of the encoder. Ex-2001 ¶ 69.

At 410, outlier values are found. In this case, the amplitude depends on the expected accuracy of the coded representation; smaller amplitude representations qualify as outliers if one is targeting high bitrate good quality representation, and only high amplitude representations qualify if one is targeting a lower bitrate, lower quality representation.

Ex-1001 at 5:32-37.

This is because different encoders may have different priorities for computational and bandwidth efficiency, for example, a 4K HD stream may value bandwidth savings over computational savings on the encoder, while a home security camera may value computational efficiency. Because Petitioner acknowledges that a POSITA would understand the term “outlier values,” it is improper to adopt a construction that may render the claim indefinite. Although this construction is not necessary, it does not affect the validity of the Challenged Claims.

Ex-2001 ¶ 69.

6. Second Recitations of “a first component”

Patent Owner accepts Petitioner’s construction for the second recitations of “a first component” in claims 1 and 13.

**7. “the non-outlier values used to replace the outlier values”
(Claim 19)**

Patent Owner accepts Petitioner’s construction for the term “the non-outlier values used to replace the outlier values” in Claim 19.

III. ARGUMENT

**F. Petitioner Has Not Established A Reasonable Likelihood That The
Challenged Claims Are Unpatentable In Light Of Grounds 1 and
2.**

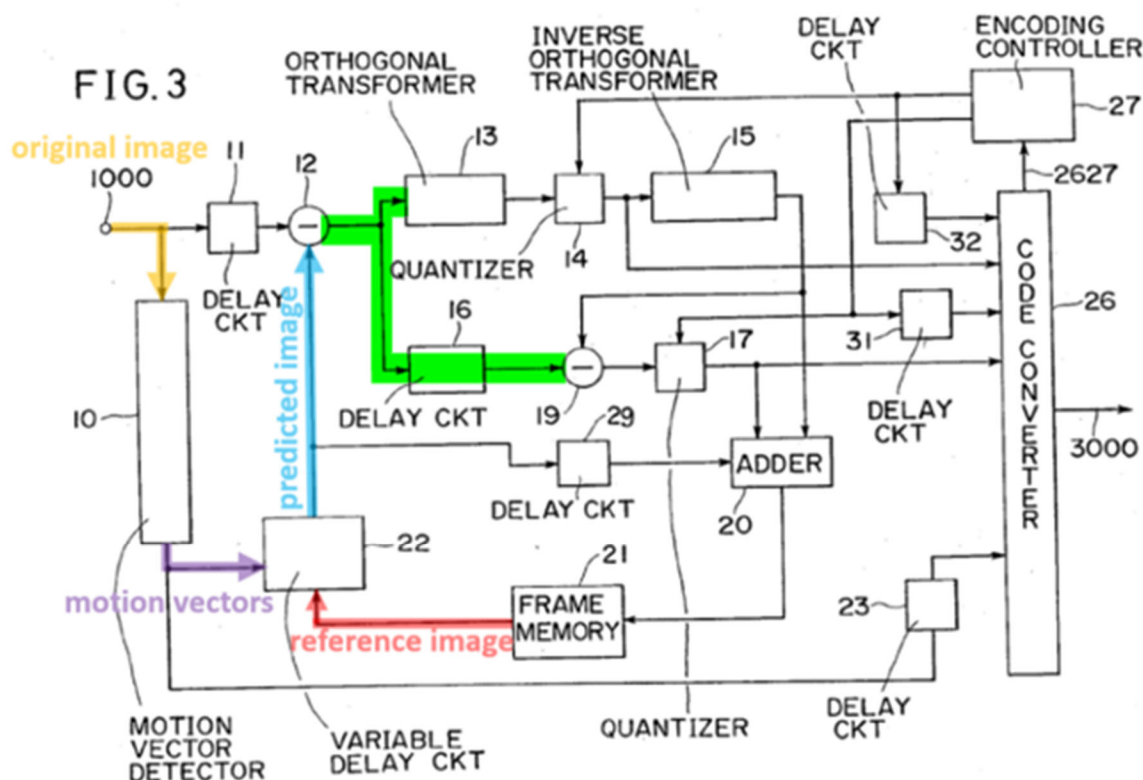
Petitioner has failed to show that Claim 1 is obvious over Koga and therefore failed to show that all claims depending from Claim 1 (Claims 5, 6, and 8-12) are obvious. Petitioner’s reliance on Lin only addresses the hardware limitations found within Claims 1 and 13 and falls to the same distinction as present in Claim 1. Additionally, Petitioner has failed to show that a POSITA would be motivated to combine Koga and Lin to arrive at Claim 39.

1. Claim 1 is not Rendered Obvious in Light of Koga

Petitioner’s reliance on Koga to prove its first invalidity ground against the ’991 Patent fails. Petitioner’s argument is flawed because it inconsistently applies disclosures of Koga to the term “difference signal” found in the Challenged Claims.

- a) **Claim 1[a] calculating, by a processor, a difference signal representing differences between sample values of a predicted block of data and values for an original input block;**

Petitioner first points to the prediction error signal calculated at subtracter 12 to satisfy the difference signal claimed in 1[a]. Pet. 31. Petitioner states that Koga discloses that “subtracter 12 determines the difference between the two signals applied thereto, and outputs prediction error signals which are applied to the delay circuit 16.” Ex-1004 at 4:57-61. Petitioner equates this prediction error signal to the claimed “difference signal representing differences between sample values of a predicted block of data and values for an original input block.” Ex-1001 Claim 1. This is because the inputs to subtracter 12 are the original input signal 1000 and the predicted image coming from delay circuit 22. Ex-1004 at 4:42-61. Petitioner’s annotated Figure 3 is reproduced below with additional green highlighting demonstrating the path of this difference signal. Ex-2001 ¶ 76.



Pet. 34 (Citing Ex-1004 Fig. 3 (further annotated)).

As can be seen above, the prediction error signal created at subtracter 12 is sent to the orthogonal transformer 13 for transform coding and sent to subtracter 19. Petitioner argues that Koga discloses creating a difference signal at subtracter 12. However, Petitioner mischaracterizes the path of this signal as it relates to spatial coding ultimately pointing to a distinct signal as satisfying this same claim element. Ex-2001 ¶77.

Petitioner's annotation left out a key component of how Koga processes this first representation. As seen above in the added orange highlighting, the first representation goes not only to the code converter, but also feeds into subtracter 19. Subtracter 19's inputs are the original prediction error signal and the first representation of the difference signal. Petitioner's analysis fails to address how the subtraction of the prediction error signal and the first representation result in the original prediction error signal being spatially coded. Ex-2001 ¶ 78.

3. 1[c] performing, by a processor, spatial coding to the difference signal, thereby creating a second representation of a first component of the difference signal;

Petitioner points to the output of subtracter 19 to satisfy the “difference signal” limitation. As explained above, Petitioner has already equated the difference signal with the prediction error signal produced at Koga's subtracter 12. Petitioner's argument is logically flawed because the output of subtracter 19 is not the original prediction error signal created at subtracter 12. Instead, the output of subtracter 19 is “the difference between the outputs of the delay circuit 16 and the inverse orthogonal transformer 15.” Ex-1004 5:4-16. Subtracter 19 creates a residual of the prediction error signal but does not maintain the original prediction error signal for spatial coding. This is distinct from the claimed “performing, by a processor, spatial coding to *the difference signal*, thereby creating a second representation of a first

component of the difference signal.” Ex-1001 Claim 1 (emphasis added). The difference signal of this claim limitation has antecedent basis reaching back to the originally created difference signal. This limitation does not involve a difference signal created from the product of transform coding. Ex-2001 ¶ 79.

Petitioner acknowledges this, stating that the output of subtracter 19 are spatial samples which are spatially coded:

Figure 3 discloses the spatial coding of spatial samples produced at subtracter 19. The spatial samples produced at subtracter 19 are quantized at quantizer 17 and then entropy coded at the code converter 26 without transformation.

Pet. 39.

However, Claim 1 does not require that spatial samples be spatially coded but rather the original difference signal. Petitioner’s description of Koga requires additional complexity on the encoding side through performing transform coding to the difference signal, inverse transform coding that difference signal, and subtracting the inverse transformed difference signal from the original difference signal to arrive at a third difference signal. This third difference signal is then coded in the spatial domain. The ’991 Patent does not require this additional complexity as it is able to perform the necessary spatial coding on the original difference signal. Ex-2001 ¶ 79.

Petitioner's argument is premised on a wide application of "difference signal" to multiple distinct signals disclosed by Koga. In doing so, Petitioner fails to show that limitation 1[c] is disclosed by Koga and Petitioner has made no argument that this limitation would be obvious to a POSITA in light of Koga. For these reasons, Petitioner's first ground fails. Ex-2001 ¶ 80.

4. Claims 1 and 13 are not Rendered Obvious by Koga Combined with Lin

Petitioner's arguments regarding Claims 1 and 13 being obvious in light of a combination of Koga and Lin fail for the same reason that Koga fails to render obvious Claim 1 alone. Claims 1 and 13 are substantially the same with Claim 1 being a method claim with steps performed by a processor and Claim 13 being an apparatus claim. Petitioner relies on Lin solely to provide grounds for a "computing environment" that discloses the processor and apparatus limitations of the independent claims. Even if a POSITA would have been motivated to combine Koga and Lin, Petitioner has still failed to show how the combination discloses the claim limitations regarding performing spatial coding to the difference signal. Because Koga alone does not disclose this limitation, and Petitioner offers no argument as to why Lin discloses this limitation, this ground fails as well. Ex-2001 ¶ 81.

5. Petitioner's Arguments Regarding the Dependent Claims fail

Petitioner's arguments regarding Claims 2, 3, 5, 6, 7, 10, 11, 12, 14, 15, 17, 18, and 19 fail because Petitioner failed to show that the independent claims from which these claims depend are obvious. Petitioner failed to show that Claims 1 and 13 are obvious in light of Koga or a combination of Koga and Lin, therefore, Petitioner's arguments regarding the dependent claims fail as well. *See In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988) (indicating that "[d]ependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious."). Ex-2001 ¶ 81.

6. Petitioner's Argument Regarding Claim 39 Fails

Petitioner bases its argument that a combination of Koga and Lin discloses Claim 39 on the premise that Koga and Lin disclose Claims 1 - 4. As explained above, these arguments fail and so does Petitioner's argument regarding Claim 39.

Specifically, Petitioner fails to show that a combination of Koga and Lin discloses the limitation "substituting, by a processor, outlier values in the difference signal with non-outlier values to create a modified prediction error signal." Ex-1001 Claim 39. Petitioner incorporates its argument regarding Claim 2 to satisfy this limitation. However, Petitioner fails to show that a POSITA would have been

motivated to combine Lin's median filtering with Koga's approach to prediction error coding. Ex-2001 ¶ 82.

Petitioner's first argument relies on the fact that Lin suggests combining its teachings with other video coding methods and the fact that Koga teaches a hybrid-video coding method.

First, Lin suggests combining its teachings with other video coding methods. Ex-1005, ¶0050, ¶¶0152-0153. Koga teaches a hybrid video codec that could utilize Lin's median filter.

Pet. 55.

However, this broad suggestion relied upon by Petitioner would provide a motivation to combine Lin with virtually all video codecs, as all modern codecs are hybrid codecs. A hybrid video codec is merely a codec that relies on "a hybrid of two redundancy reduction techniques – prediction and transformation." Ex-1001 at 3:39-54. The sections of Lin that Petitioner relies on to support this combination is nothing more than boilerplate language that provides no specificity into how or why a POSITA would combine these references. This argument amounts to nothing more than pointing out the fact that both references relate to video coding. Ex-2001 ¶ 83.

Petitioner's second argument fares no better.

Second, a POSITA would have looked to Lin to improve the efficiency of Koga's encoding teachings because they share a similar purpose and architecture. Both references teach similar hybrid-video coding methods.

Pet. 56

As general as this statement is, it is not true. Koga is not directed to improving the efficiency of video coding, but rather to providing a method to smoothly transition from transform to spatial coding of the prediction error. Ex-1004 at 3:59-66. Lin, on the other hand, is directed to an adaptive coding model where only "[i]n certain examples, adaptive median filtering is performed." Ex-1005 at [0031]. Koga sets out to solve a problem only present in a largely unused situation (switching between coding prediction error in either spatial or transform domain) and Lin suggests a coding model where the median filter is only applied under certain conditions. These different purposes and structures would not lead a POSITA to combine Lin and Koga. Ex-2001 ¶ 84.

Indeed, a POSITA would not have been motivated to add Lin's median filter to Koga because Koga already includes a solution for when the prediction error signal is not well correlated. Koga teaches to code the signal entirely in the spatial domain Ex-1004 4:21-34. To implement Lin's median filter would suggest modifying Koga to always code the prediction error in both spatial and transform

domains, defeating the benefit that Koga purportedly provided. Because Petitioner has failed to present any valid motivation to combine Koga and Lin, Petitioner's argument fails. Ex-2001 ¶ 85.

G. Petitioner's Grounds 3-4 Fail to Render Obvious the Challenged Claims

Petitioner's Grounds 3 and 4 challenge only dependent claims 8, 9, 20, and 21. Petitioner relies on a combination of Koga, Lin, and Narroschke, but provides no additional arguments regarding independent claims 1 and 13. For the same reasons as stated above, these grounds fail as well. Ex-2001 ¶ 86.

IV. CONCLUSION

For any or all of the above-described reasons, PO respectfully requests that the Board deny institution.

Dated: November 27, 2024

Respectfully submitted,

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CERTIFICATION OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned **PATENT OWNER'S PRELIMINARY RESPONSE** specified in 37 C.F.R. §42.24 has 6,537 words, in compliance with the 14,000 word limit set forth in 37 C.F.R. §42.24(b)(1). This word count was prepared using Microsoft Word 2010.

Dated: November 27, 2024

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CERTIFICATION OF SERVICE

The undersigned hereby certifies that a copy of this **PATENT OWNER'S PRELIMINARY RESPONSE** pursuant to 37 C.F.R. § 42.10(b) has been served on Petitioner via email on the following counsel of record for Petitioner:

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