

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: IPR2024-00920
U.S. Patent No. 8,077,991

PATENT OWNER’S PRELIMINARY RESPONSE

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TABLE OF EXHIBITS

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. The same four grounds were raised in the co-pending International Trade Commission Investigation 337-TA-1380 and all but Ground 1 were dropped prior to the evidentiary hearing. All grounds fail on the merits.

As an initial matter, the parties agree that the proper construction of the term “spatial samples” in the Challenged Claims is “pixel values.”¹ While this construction is correct, Petitioner’s arguments rely on equating the term “spatial samples” with “decoded spatial information” as found in the Challenged Claims. Properly treating the terms “spatial samples” and “decoded spatial information” as distinct shows the Petition fails to properly address all limitations of the Challenged Claims.

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

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

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 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. Thus, Koga's decoder lacks an important aspect of the decoder taught by the '991 Patent. Namely, Koga's decoder must receive entire blocks of spatial information that it then combines with decoded transform information. This requires a larger bitstream, which is technically undesirable.

Koga's approach is distinct from the decoding process taught by the '991 Patent. The coded prediction error signal of the '991 Patent includes only the relevant spatial samples. The decoder then decodes these spatial samples (which address outlier values that may lead to artefacts in decoded video) into blocks of

spatial information such that the decoder can add these to decoded transform information to produce output blocks of pixels. Petitioner's equation of spatial samples and spatial information disregards this distinction, ignores an important step performed by the '991 Patent's decoder, and overlooks the corresponding efficiency gains presented by 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 22 be performed "by a processor" and the apparatus limitations present in Claim 31. Petitioner's Ground 2 thus provides no additional argument relating to the limitation of decoding spatial samples into spatial information and fails for the same reasons as Ground 1.

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 present 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 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 decoding process that receives 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.

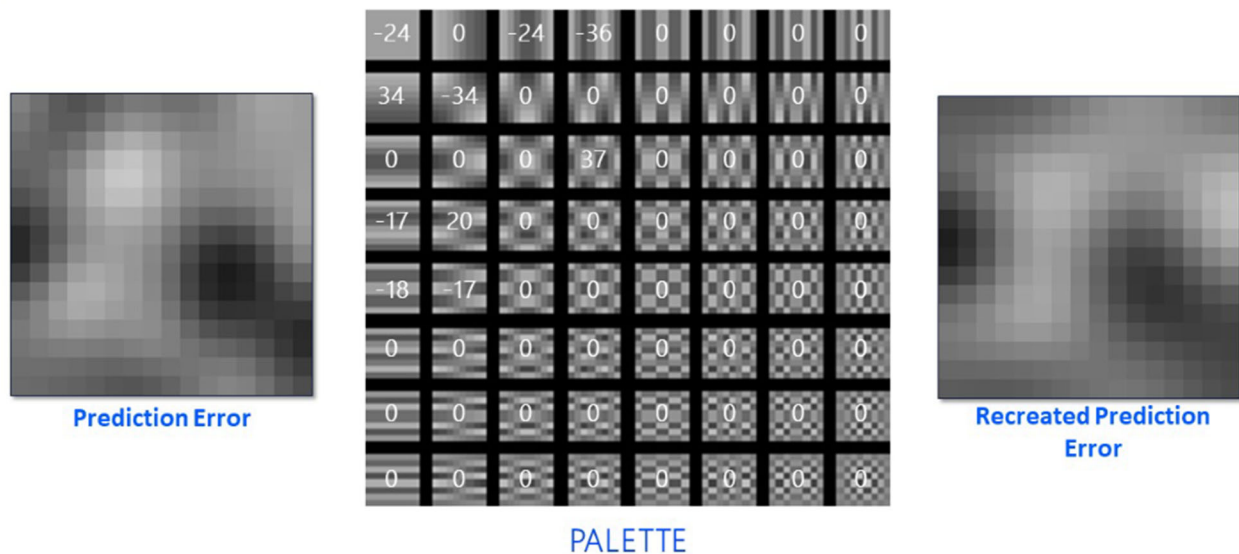
1. Transform Coding

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.

-24	0	-24	-36	0	0	0	0
34	-34	0	0	0	0	0	0
0	0	0	37	0	0	0	0
-17	20	0	0	0	0	0	0
-18	-17	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

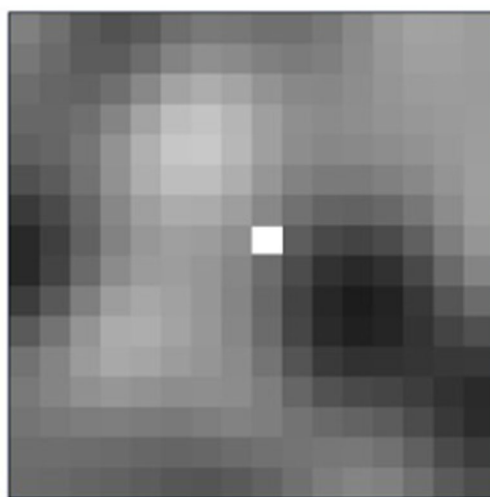
Ex-2001, ¶ 46.

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.



Prediction Error

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.

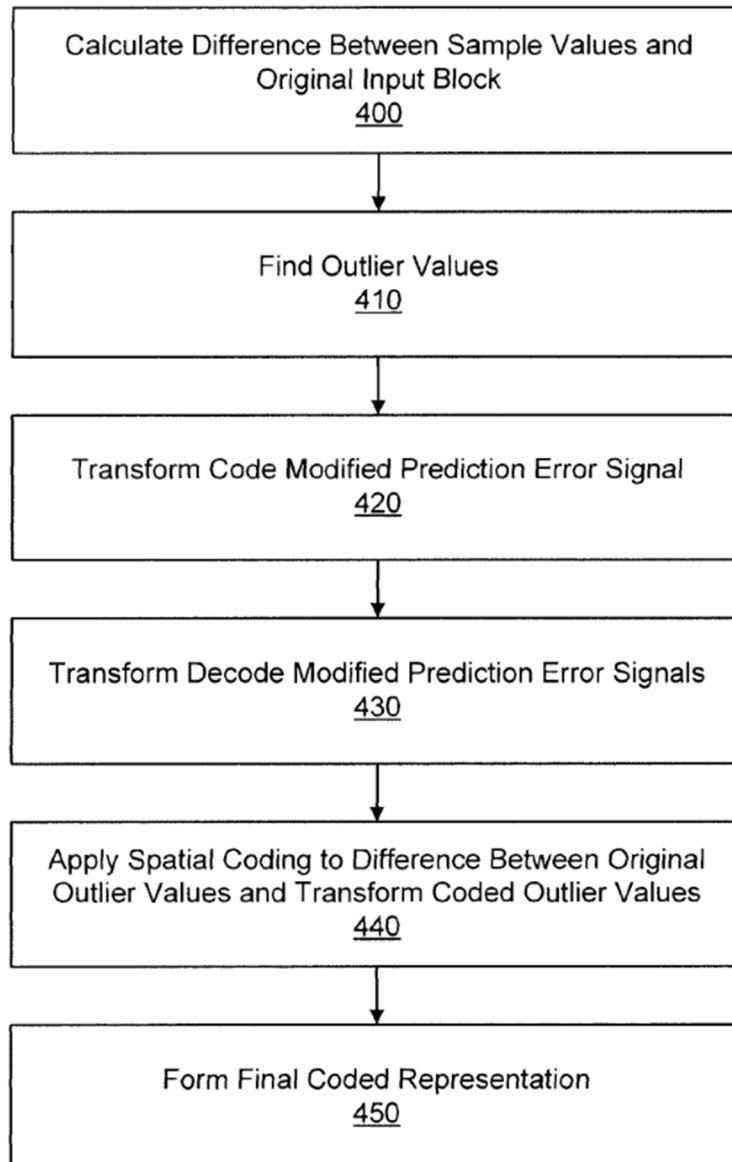


FIG. 4

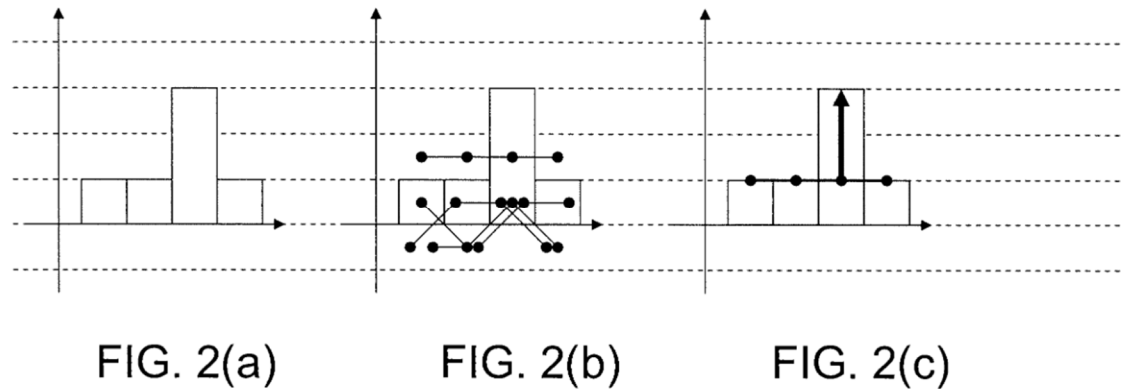
The '991 Patent provides a novel method of coding prediction error that allows for the efficiency of transform coding to be recognized, even where the

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 as well as in the Challenged Claims. Ex-2001, ¶¶ 51-53. For example, Claim 22 is reproduced below:

22: A method comprising:

receiving a coded prediction error signal, the coded prediction error signal including a plurality of transform coefficients and a plurality of spatial samples;
decoding, by a processor, the plurality of transformed coefficients into decoded transform information;
decoding, by a processor, the plurality of spatial samples into decoded spatial information; and
adding, by a processor, the decoded transform information, the decoded spatial information, and a reconstructed prediction of the block of data, thereby forming a decoded representation of the block of data.

Notably, Claim 22 requires decoding a plurality of spatial samples (representing the individualized outlier values) into decoded spatial information. The decoder need only receive a small amount of spatial samples representing outliers to aid in the reconstruction of the block. However, sole spatial samples with no location information are not capable of being added to the reconstructed prediction of the block of data and the decoded transform information. Therefore, the decoder must perform a step of decoding the spatial samples into spatial information which is suitable for addition. This can be achieved, for example, by decoding the spatial samples into a block array where the spatial samples are placed in the appropriate locations. This crucial component of coding outlier values spatially is at the heart of the '991 Patent and is lacking from all prior art relied on by Petitioner. Ex-2001, ¶ 54.

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. Accordingly, 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.	¥
Overview of the H.264/AVC video coding standard IEEE Transactions on Circuits and Systems for Video	Wigand T. et al.	¥

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

Reference	Inventors / Authors	'991 FH
Technology, IEEE Service Center, vol. 13, no.7, July 1, 2003, pages 560-576.		

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. Koga alone fails to render obvious the independent Challenged Claims. Additionally, Petitioner's proposed combinations do not address the shortcomings of Koga alone as they pertain to the dependent claims (Claims 22 and 31). As such, Petitioner's Grounds also 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 submitted a proposal to the first standard, H.261, that coded the entire prediction error signal spatially. 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. Ex-2001, ¶ 44, 55-60.

When performing spatial and transform coding, Koga describes an entire “block signal wherein the prediction error signal (from the quantizer 17) is encoded.” Ex. 1004 at 6:50-58. This means that Koga's decoder receives an entire block of spatial values. This has two effects, (1) drastically increases the bitstream associated with the coded prediction error signal, and (2) precludes any need for the decoder to decode the spatial samples into spatial information suitable for addition. In Koga, there is no difference between the spatially coded values that are received by the decoder and the values that are added to form the final decoded image. Ex-2001, ¶ 53.

2. Lin (Ex-1005)

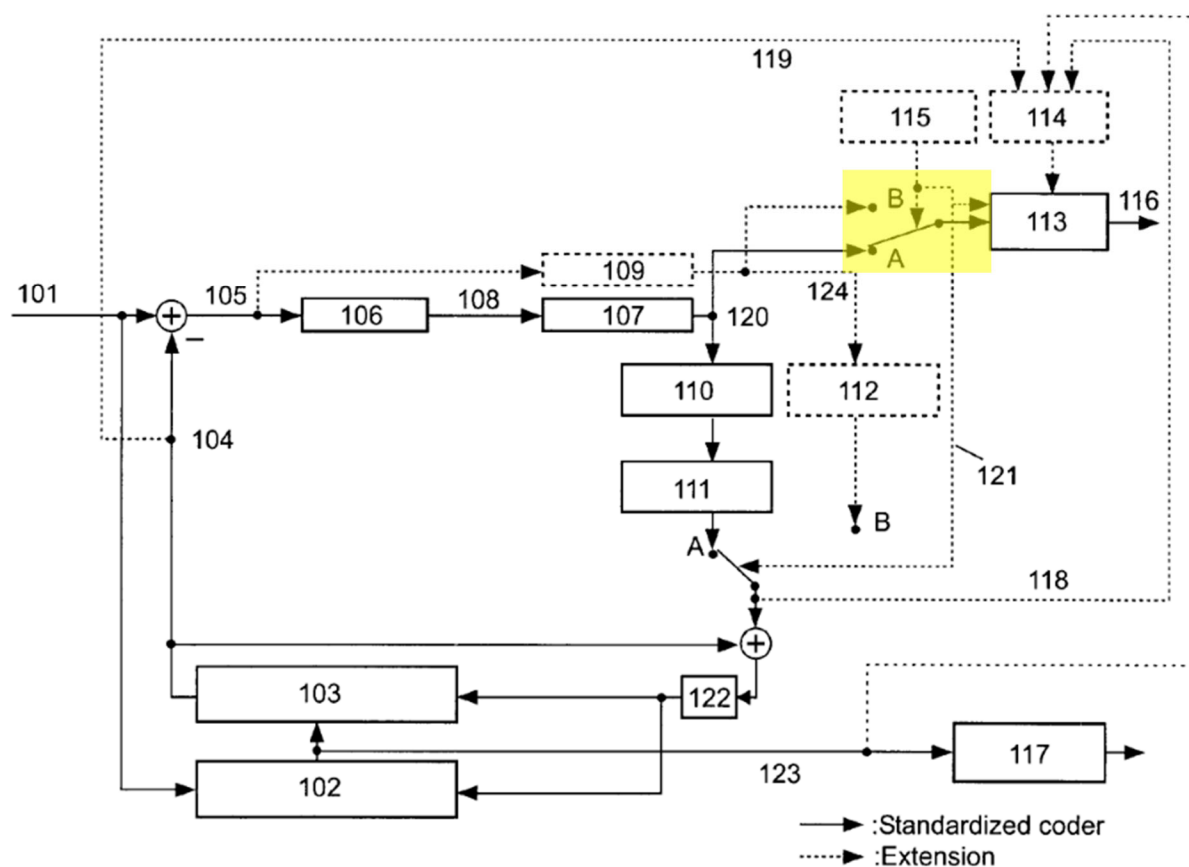
U.S. Patent Publication No. 2006/0268990 (“Lin”) was published on Nov. 30, 2006 and names Chih-Lung Lin, Minghui Xia, Pohsiang Hsu, and Shou-Jen Wu as inventors. Lin is directed to “technology relate[d] to video compression, and more specifically, to adaptive video encoding using a perceptual model.” 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 this 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. Patent Owner reserves the right to argue in favor of different level of skill should trial be instituted.

E. Claim Construction

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. 26-27.

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 Claims 22 and 31 are obvious over Koga and therefore failed to show that all claims depending from Claim 22 (Claims 23, 24, 26, and 30) and Claim 31 (Claims 32, 33, 35, and 38) are obvious. Petitioner's reliance on Lin only addresses the hardware limitations found within Claims 22 and 31 and falls to the same distinction as present in Claim 22.

1. Claim 22 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 fatally flawed because Petitioner incorrectly relies on entropy coding to satisfy the decoding limitation and incorrectly treats the claimed "spatial samples" and "spatial information" interchangeably. Petitioner's argument is premised on misrepresentations of Koga and a misapplication of entropy decoding. Ex-2001, ¶ 66.

- a) Entropy coding cannot satisfy the limitation of "decoding, by a processor, the plurality of spatial samples into decoded spatial information" because entropy decoding does not change the contents of a signal.**

Entropy coding cannot satisfy the decoding limitation, because it is merely decoding a string of bits into the original signal. The bits are a binary representation of the coded signal and the output is identical to the pre-entropy coded signal. Petitioner states that "[a] POSITA would have understood that decoding the residual in this manner results in a decoded version of the spatial information that was encoded at the encoder, therefore producing the decoded spatial information." Pet. 44. However, Petitioner does not identify any spatial information that is encoded at the encoder. Petitioner only points out spatial samples that are encoded. Ex-2001, ¶ 67.

Koga also teaches **the coded prediction error signal including ... a plurality of spatial samples**. For example,

Figure 3 discloses spatial samples produced at subtracter 19 are quantized at quantizer 17, and then entropy coded and multiplexed by the code converter into signal 3000, without ever being transform coded.

Pet. 35 (emphasis in original).

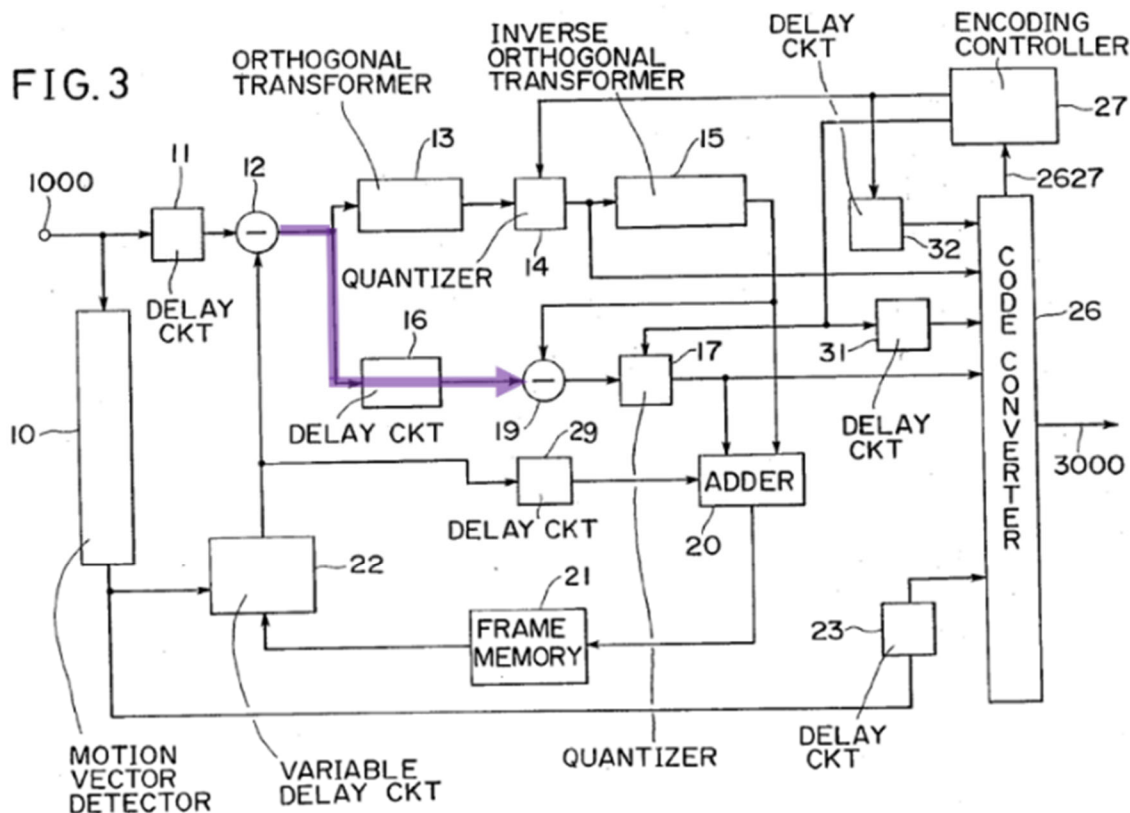
Because entropy coding allows for a perfect recreation on the decoding side, the output of the entropy decoder, under Petitioner's own labels, is the plurality of spatial samples. Petitioner attempts to sidestep this fact of entropy coding by re-labeling the spatial values on the encoder side to fit the narrative of decoding "spatial information." Ex-2001, ¶ 68.

b) Petitioner's reliance on entropy coding is legally flawed.

Petitioner's argument disregards the distinct meanings of "spatial samples" and "spatial information." This is improper as "different claim terms are presumed to have different meanings." *MicroStrategy Inc. v. Bus. Objects Ams.*, 238 F. App'x 605, 609 (Fed. Cir. 2007) (citing *CAE Screenplates Inc. v. Heinrich Fiedler GmbH & Co. KG*, 224 F3d 1308, 1317 (Fed. Cir. 2000) ("In the absence of any evidence to the contrary, we must presume that the use of these different terms in the claims connotes different meanings."); *Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1333 n.3 (Fed. Cir. 2006) ("[T]he use of two terms in a claim requires that they connote different meanings...")). Claim 22[c] claims "decoding, by a processor, the plurality of spatial samples into decoded spatial information; and."

Ex-1001 Claim 22. The inventor of the '991 Patent specifically chose to use distinct terms for these two limitations. As such, they should be afforded different meanings. Petitioner has presented no evidence indicating that the two terms should be given the same meaning. Petitioner attempts to blur the lines between these two terms, and in doing so, ignores the heart of the '991 Patent – the identification of outlier values that are spatially coded.

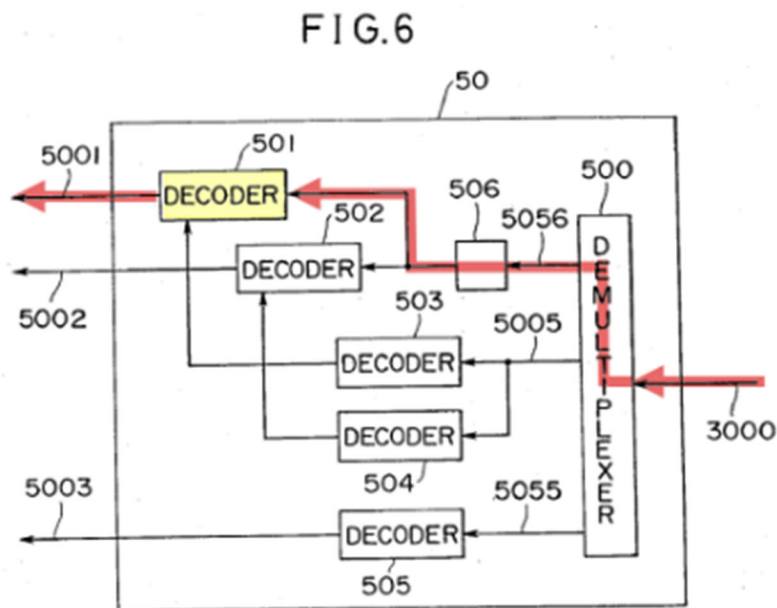
Petitioner's equating of the two terms is described in detail below. To begin, Petitioner points to Figure 3 of Koga to show that Koga discloses "the coded prediction error signal including ... a plurality of spatial samples." Pet. 35-36. Petitioner states that "Figure 3 discloses spatial samples produced at subtracter 19 are quantized at quantizer 17, and then entropy coded and multiplexed by the code converter into signal 3000, without ever being transform coded," and provides the following annotated figure. Pet. 35; Ex-2001, ¶ 69-70.



Pet. 36 (citing Ex-1004, Fig. 3 (annotated)).

Petitioner clearly points to the signal prior to entropy coding as the “spatial samples” disclosed in Koga on the encoding side. However, this treatment changes on the decoding side in Petitioner’s analysis.

When addressing the claim limitation “decoding, by a processor, the plurality of spatial samples into decoded spatial information,” Petitioner points to the entropy coded signal 3000 as including the spatial samples. Ex-2001, ¶ 71.



Pet. 43 (citing Ex-1004, Fig. 6 (annotated)).

Petitioner points to decoder 501 to perform the decoding of spatial samples into spatial information. However, the decoders shown in Figure 6 (the expanded view of the inverse code converter in the decoder) are analogous to the entropy encoders in Figure 4. Ex-1004 6:34-49 (“[t]he decoder 505 corresponds to the encoder 265”). Petitioner acknowledges this in its description relating to the decoding of transformed coefficients, stating “the transform coefficients are split out from signal 3000 and decoded (e.g., returned to their pre-entropy coded state).” Pet. 39. Entropy coding cannot perform the step of decoding spatial samples into decoded spatial information because Petitioner has already shown that the pre-entropy signal consists of spatial samples. There is no change from spatial samples to spatial

information and Petitioner offers no explanation of how entropy decoding would perform any change of this kind. Ex-2001, ¶ 72.

c) Petitioner's reliance on entropy coding is factually incorrect

As explained above, entropy coding cannot satisfy the limitation of “decoding, by a processor, the plurality of spatial samples into spatial information” because entropy coding does not change the contents of a signal. Additionally, Petitioner's reliance on entropy coding further exemplifies Petitioner's jumbling of terms in Koga to fit the Claims of the '991 Patent. Under Petitioner's own explanation of Koga's encoding, the output of the entropy decoder are spatial samples. Petitioner attempts to hide this by mixing the labels between encoding and decoding as shown in the Figures below. Ex-2001, ¶ 73.

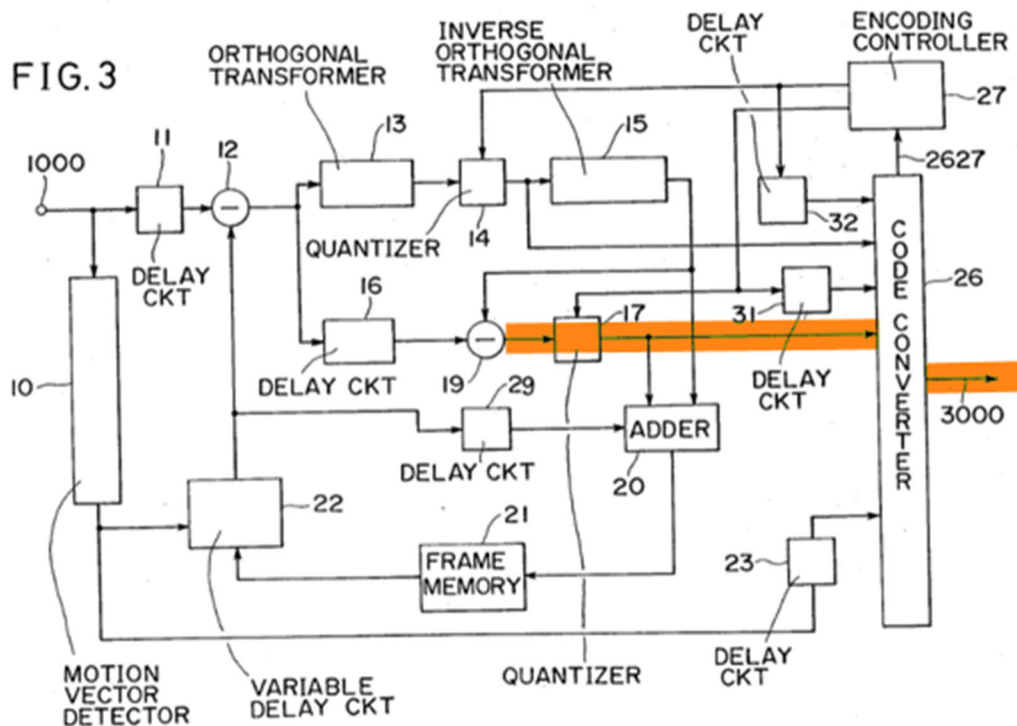
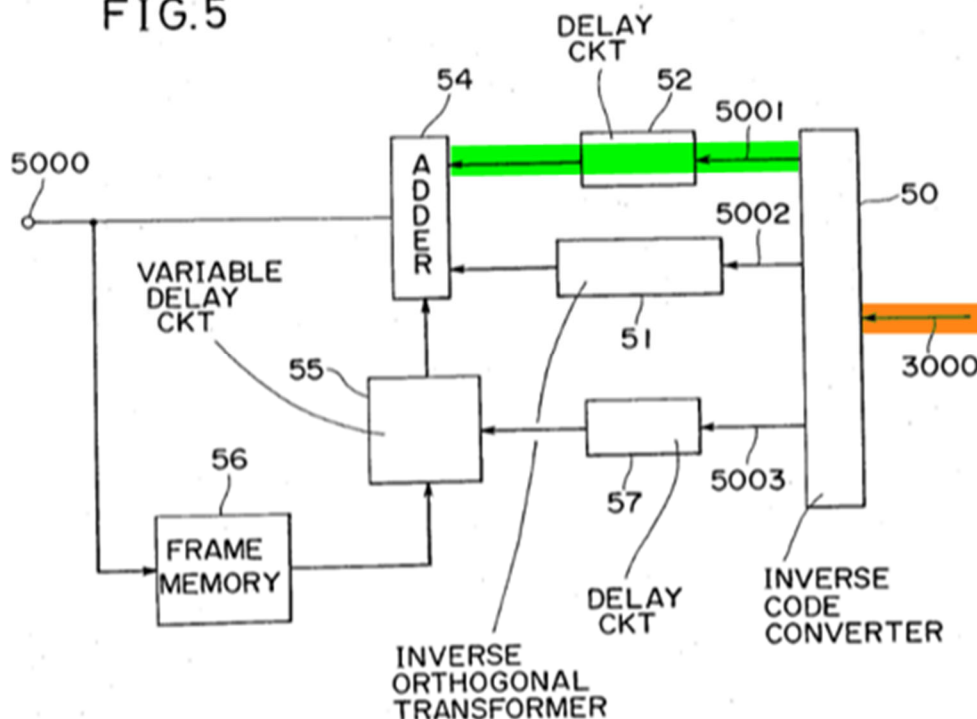


FIG. 5

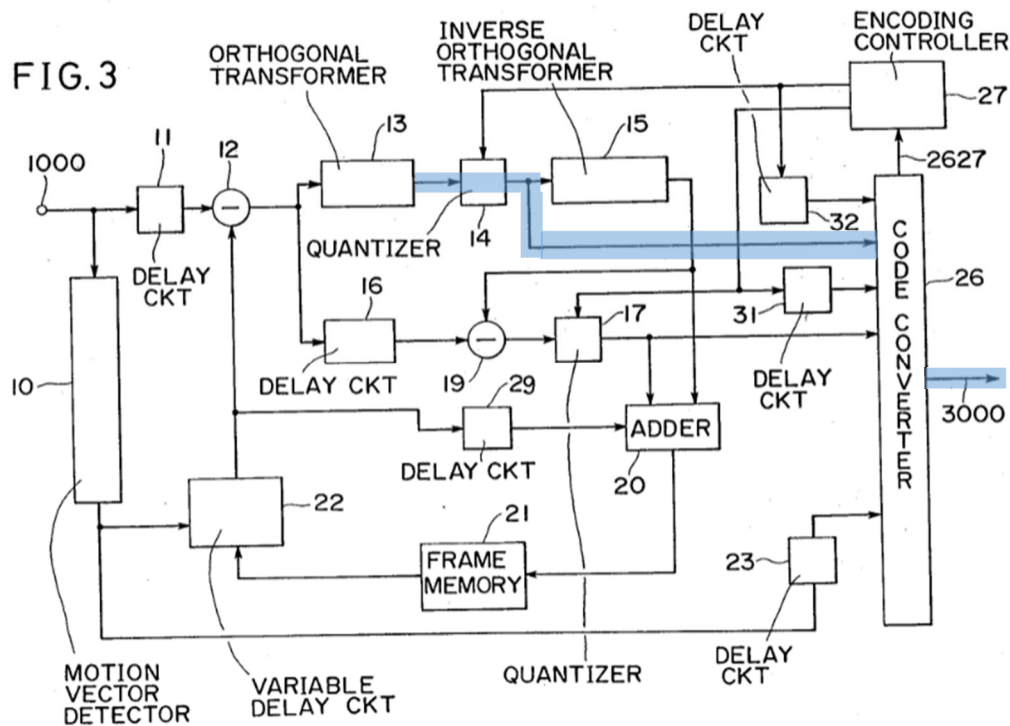


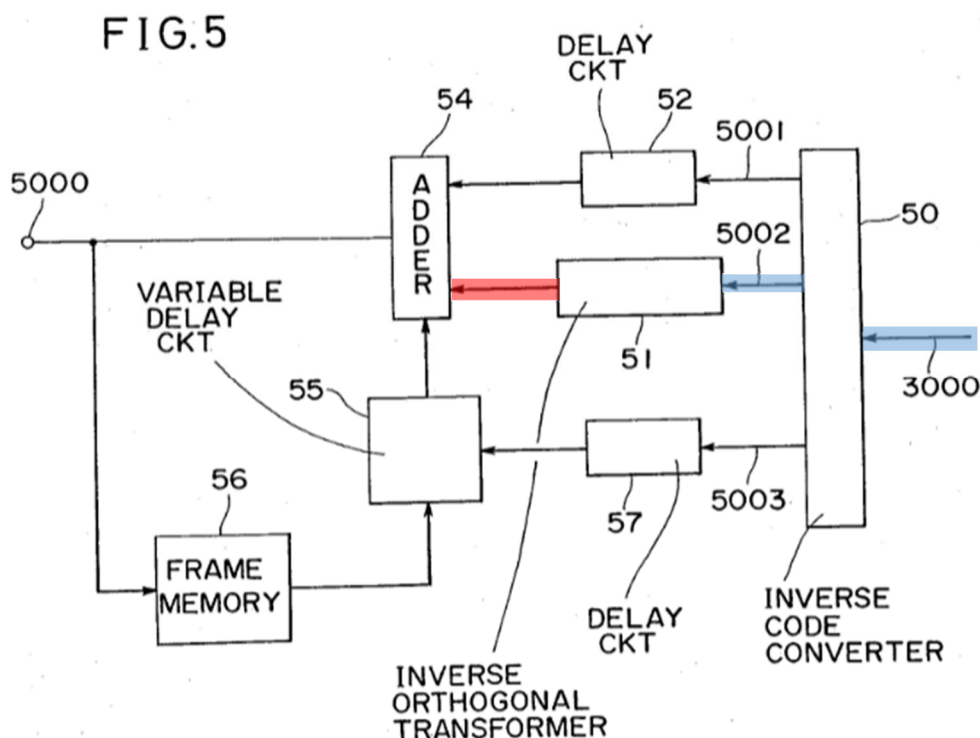
Ex-1004, Figs. 3, 5 (annotated).

In the annotated Figures above, the orange highlighting shows what Petitioner equates to the spatial samples and the green highlighting show Petitioner's spatial information. Pet. 35-36, 42-44. However, as entropy coding is a lossless process, the orange signal in Figure 3 between blocks 19 and 26 is identical to the green signal in Figure 5 between blocks 50 and 54. Ex-2001, ¶ 74.

Indeed, Petitioner seems to realize this shortcoming as it relates to the transform coefficients. Petitioner does not point to the entropy decoding of the transform coefficients to satisfy the limitation of “decoding the transformed coefficients into decoded transform information,” but rather to the inverse orthogonal transform in the decoder. Pet. 40 (“[a]s explained above for the

corresponding inverse orthogonal transformer in the encoder, a POSITA would have understood that applying the inverse operation transforms the quantized transform coefficients back to the spatial domain ... [t]hus the encoding is undone”). In contrast to the figures above, Petitioner’s annotations regarding transform coefficients are reproduced below. Ex-2001, ¶ 75.





Ex-1004, Figs. 3, 5 (annotated).

In the Figures above, the blue highlighting represents what Petitioner points to as transform coefficients and the red highlighting represents Petitioner’s decoded transform information. Pet. 33-34, 39-40. Notably, the transform coefficients are not “decoded” at the inverse code converter 50, but rather at the inverse orthogonal transform 51. Ex-2001, ¶ 76.

Under Petitioner’s explanation of Koga, the coded prediction error signal only includes spatial samples, and the only decoding that Petitioner points to decodes the entropy coded signal to produce spatial samples. Petitioner’s attempt to invalidate the ’991 Patent in light of Koga ignores the critical element of the ’991 Patent that leads to efficiency gains – the ability to code only outlier spatial samples and decode

them into spatial information suitable for adding to the reconstructed prediction of the block of data and the decoded transform information to create a decoded representation of the block of data.

2. Claims 22 and 31 are not Rendered Obvious by Koga Combined with Lin

Petitioner's arguments regarding Claims 22 and 31 being obvious in light of a combination of Koga and Lin fail for the same reason that Koga fails to render obvious Claim 22 alone. Claims 22 and 31 are substantially the same with Claim 22 being a method claim with steps performed by a processor and Claim 31 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 decoding the plurality of spatial samples into spatial information. Because Koga alone does not disclose this limitation, and Petitioner offers no argument that Lin discloses this limitation, this ground fails as well. Ex-2001, ¶ 78.

3. Petitioner's Arguments Regarding the Dependent Claims fail

Petitioner's arguments regarding Claims 26, 29, 30, 35, and 38 fail because Petitioner failed to show that the independent claims from which these claims depend are obvious. Petitioner failed to show that Claims 22 and 31 are obvious in

light of Koga or a combination of Koga and Lin, therefore, Petitioner's arguments regarding the independent 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, ¶ 79.

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

Petitioner's Grounds 3 and 4 challenge only dependent claims 23, 24, 29, 32, 33, and 38. Petitioner relies on a combination of Koga, Lin, and Narroschke, but provides no additional arguments regarding independent claims 22 and 31. For the same reasons as stated above, these grounds fail as well. Ex-2001, ¶ 80.

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 5,476 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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