UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.,
Petitioner,

v.

VEDANTI LICENSING LIMITED,
Patent Owner.

Case No. IPR2016-00212

Patent No. 7,974,339 B2

Before MICHAEL R. ZECHER, JUSTIN T. ARBES, and
JOHN A. HUDALLA, *Administrative Patent Judges*

PATENT OWNER'S NOTICE OF APPEAL

NOTICE OF APPEAL TO THE FEDERAL CIRCUIT

Notice is hereby given that under 35 U.S.C. §§ 141(c), 142 and 37 C.F.R. § 90.2(a)(1), Patent Owner Vedanti Licensing Limited[1] hereby appeals to the United States Court of Appeals for the Federal Circuit regarding the Patent Trial and Appeal Board's Final Written Decision (Paper No. 42, attached) issued in IPR2016-00212 on May 17, 2017.

Pursuant to 37 C.F.R. § 90.2(a)(3)(ii), Patent Owner submits that the appeal will address the decision holding claims 1, 6, 7, 9, 10, 12, and 13 of U.S. Patent No. 7,974,339 unpatentable, including without limitation, such issues as claim construction, due process, obviousness and substantial evidence.

A copy of this Notice of Appeal is being filed with the Patent Trial and Appeal Board. This Notice of Appeal, along with a docketing fee of $500.00, are being served electronically on the Clerk for the United States Court of Appeals for the Federal Circuit by CM/ECF.

[1] On Oct. 11, 2016 Patent Owner filed updated mandatory notices (Paper No. 18) with the PTAB indicating that Vedanti Systems Limited assigned the challenged patent to Vedanti Licensing Limited. The PTAB modified the case caption accordingly, although the PTAB's Final Written Decision (Paper No. 42) does not reflect that.

Date: June 14, 2017

Respectfully submitted,

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CERTIFICATES OF FILING AND SERVICE

I hereby certify that, in addition to being filed electronically through the Patent Trial and Appeal Board's PTAB E2E System, the original version of the foregoing PATENT OWNER'S NOTICE OF APPEAL was filed, as required by 37 C.F.R. § 104.2, by Express Mail on this 14th day of June, 2017 with the Director of the United States Patent and Trademark Office at the following address:

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
United States Patent and Trademark Office
P.O. Box. 1450
Alexandria, VA 22313-1450

The undersigned also hereby certifies that a true and correct copy of the foregoing PATENT OWNER'S NOTICE OF APPEAL and the filing fee is being filed via the electronic filing system, CM/ECF, with the Clerk's Office of the United States Court of Appeals for the Federal Circuit on June 14, 2017 and one (1) true and correct paper copy of the foregoing are being filed by Express Mail, as required by Fed. Cir. R. 15(a)(1), on this 14th day of June, 2017 with the Clerk's Office of the United States Court of Appeals for the Federal Circuit at the following address:

United States Court of Appeals for the Federal Circuit
717 Madison Place, N.W., Suite 401
Washington, DC 20439

The undersigned also hereby certifies that on June 14, 2017, copies of the foregoing PATENT OWNER'S NOTICE OF APPEAL have been served on Petitioners as provided in 37 C.F.R. § 42.6(e) via electronic mail transmission addressed to the attorneys of record for the Petitioner at the following address:

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Filed: May 17, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.,
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v.

VEDANTI SYSTEMS LIMITED,
Patent Owner.

Case IPR2016-00212[1]
Patent 7,974,339 B2

Before MICHAEL R. ZECHER, JUSTIN T. ARBES, and JOHN A. HUDALLA, *Administrative Patent Judges*.

HUDALLA, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Inter Partes Review
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

In Case IPR2016-00212 ("212 IPR"), Petitioner, Google Inc. ("Google"), filed a Petition (Paper 2[2], "212 Petition" or "212 Pet.")

[1] Case IPR2016-00215 has been consolidated with this proceeding.

[2] Unless otherwise indicated, citations to papers and exhibits are made to Case IPR2016-00212.

requesting an *inter partes* review of claims 1, 6, 7, 9, 10, 12, and 13 of U.S. Patent No. 7,974,339 B2 (Ex. 1001, "the '339 patent") pursuant to 35 U.S.C. §§ 311–319. Patent Owner, Vedanti Systems Limited ("Vedanti"), filed a Preliminary Response to the 212 Petition. Paper 6 ("212 Preliminary Response" or "212 Prelim. Resp."). Taking into account the arguments presented in Google's 212 Preliminary Response, we determined that the information presented in the 212 Petition established that there was a reasonable likelihood that Google would prevail in challenging claims 1, 6, 7, 9, 10, 12, and 13 of the '339 patent under 35 U.S.C. § 103(a). Pursuant to 35 U.S.C. § 314, we instituted this proceeding on May 20, 2016, as to these claims of the '339 patent. Paper 8 ("212 Institution Decision" or "212 Dec. on Inst.").

In related Case IPR2016-00215 ("215 IPR"), Google filed a second Petition (215 IPR, Paper 2, "215 Petition" or "215 Pet.") requesting an *inter partes* review of the same claims of the '339 patent. Vedanti filed a Preliminary Response to the 215 Petition. 215 IPR, Paper 6 ("215 Preliminary Response" or "215 Prelim. Resp."). Taking into account the arguments presented in Vedanti's 215 Preliminary Response, we also determined that the information presented in the 215 Petition established that there was a reasonable likelihood that Google would prevail in challenging claims 1, 6, 7, 9, 10, 12, and 13 of the '339 patent under 35 U.S.C. § 103(a). Pursuant to 35 U.S.C. § 314, we instituted this proceeding on May 20, 2016, as to these claims of the '339 patent. Paper 7[3] ("215 Institution Decision" or "215 Dec. on Inst."). In the 215 Institution Decision, we ordered the

[3] The 215 Institution Decision is included in the 212 IPR as Paper 7 because it includes a consolidation order.

consolidation of the 215 IPR with the 212 IPR for purposes of trial. *Id.* at 27–28.

During the course of trial, Vedanti filed a Patent Owner Response (Paper 15, "PO Resp."), and Google filed a Reply to the Patent Owner Response (Paper 22, "Pet. Reply"). Vedanti also filed a Sur-Reply (Paper 27, "PO Sur-Reply"), as was authorized by our Order of December 7, 2016 (Paper 26). Along with its Patent Owner Response, Vedanti filed a Contingent Motion to Amend (Paper 16, "Mot. to Amend"), proposing to substitute claim 14 and 15 for claims 7 and 9, respectively, if we determine claim 7 to be unpatentable; and to substitute claims 16 and 17 for claims 10 and 12, respectively, if we determine claim 10 to be unpatentable. Google filed an Opposition to the Motion to Amend (Paper 24, "Pet. Opp."), and Vedanti filed a Reply (Paper 30, "PO Reply").

An oral hearing was held on February 14, 2017, and a transcript of the hearing is included in the record. Paper 41 ("Tr.").

Google proffered Declarations of John R. Grindon, D.Sc. (Exs. 1003, 1029) with its Petitions and a Supplemental Declaration of Dr. Grindon (Ex. 1030) with its Reply. Vedanti proffered a Declaration of Omid Kia, Ph.D. (Ex. 2001) with its Response. The parties also filed transcripts of the depositions of Dr. Grindon (Exs. 2003, 2025) and Dr. Kia (Ex. 1034). Vedanti filed a Motion for Observations regarding Dr. Grindon's cross-examination (Paper 31, "Obs."), and Google filed a Response (Paper 37, "Obs. Resp.").

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of claims 1, 6, 7, 9, 10, 12, and 13 of the '339 patent. For the reasons discussed below, Google has demonstrated by a preponderance of the evidence that these claims are unpatentable under § 103(a). We also *deny* Vedanti's Contingent Motion to Amend.

I. BACKGROUND

A. Related Proceedings

Both parties identify the following proceeding related to the '339 patent (212 Pet. 3, 59; 215 Pet. 3, 59; Paper 5, 2): *Max Sound Corp. v. Google, Inc.*, No. 5:14-cv-04412 (N.D. Cal. filed Oct. 1, 2014).[4] Google was served with this complaint on November 20, 2014. *See* 212 Pet. 3 (citing Ex. 1021).

Google also identifies a second action that was dismissed without prejudice voluntarily: *Vedanti Sys. Ltd. v. Google, Inc.*, No. 1:14-cv-01029 (D. Del. filed Aug. 9, 2014). *See* 212 Pet. 3 n.1 (citing Exs. 1009, 1010), 59 (citing Ex. 1010); 215 Pet. 3 n.1, 59. We agree with Google (*see* 212 Pet.

[4] In *Max Sound*, plaintiff Max Sound Corporation ("Max Sound") sued Google and others for infringement of the '339 patent. Ex. 1011, 1–2. Although Max Sound listed Vedanti as a co-plaintiff at the outset of the case, Max Sound later alleged Vedanti was a defendant. *See id.* at 1; Order, *Max Sound Corp. v. Google, Inc.*, No. 3:14-cv-04412 (N.D. Cal. Nov. 24, 2015), ECF No. 139, 3–4. The court dismissed the action for lack of subject matter jurisdiction after determining Max Sound did "not demonstrate[e] that it had standing to enforce the '339 patent at the time it initiated th[e] action, with or without Vedanti as a party." *See id.* at 9. Subsequently, the U.S. Court of Appeals for the Federal Circuit affirmed the district court's dismissal. *Max Sound Corp. v. Google, Inc.*, No. 2016-1620, 2017 WL 192717, at *1 (Fed. Cir. Jan. 18, 2017). In its mandatory notices pursuant to 37 C.F.R. § 42.8, Vedanti states that it owns the '339 patent and that the *Max Sound* case was "filed without authorization" by Max Sound. Paper 5, 2.

3 n.1; 215 Pet. 3 n.1) that, as a result of the voluntary dismissal without prejudice, this Delaware action is not relevant to the bar date for *inter partes* review under 35 U.S.C. § 315(b). *See Oracle Corp. v. Click-to-Call Techs., LP*, Case IPR2013-00312, slip op. at 15–18 (PTAB Oct. 30, 2013) (Paper 26) (precedential in part) (holding that a dismissal without prejudice nullifies the effect of service of the complaint and leaves the parties as though the action had never been brought).

B. The ’339 patent

The ’339 patent is directed to “us[ing] data optimization instead of compression, so as to provide a mixed lossless and lossy data transmission technique.” Ex. 1001, 1:36–39. Although the embodiments in the ’339 patent are described primarily with reference to transmitting frames of video data, the Specification states that the described optimization technique is applicable to any type of data. *See* Ex. 1001, 1:50–52, 4:44–46, 4:60–62, 7:42–45, 9:54–56. Figure 1 of the ’339 patent is reproduced below.

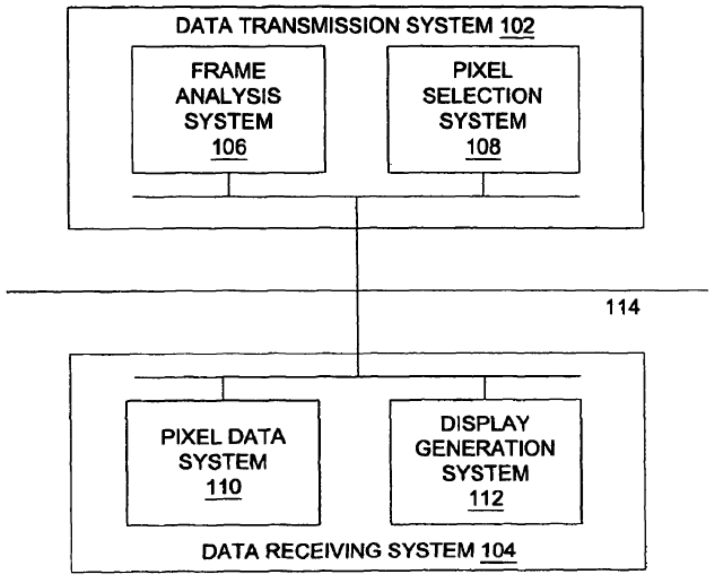

FIGURE 1

Figure 1 depicts system 100 for transmitting data having data transmission system 102 coupled to data receiving system 104. *Id.* at 2:47–49.

Data transmission system 102 includes frame analysis system 106 and pixel selection system 108. *Id.* at 2:65–67. The frame analysis system receives data grouped in frames, and then generates region data that divides frame data into regions. *Id.* at 1:42–46. Regions can be uniform or non-uniform across the frame, and regions can be sized as symmetrical matrices, non-symmetrical matrices, circles, ellipses, and amorphous shapes. *Id.* at 5:54–6:3. Figure 10 of the ’339 patent is reproduced below.

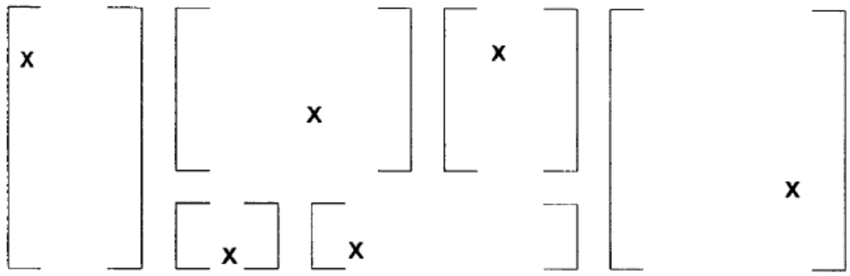

FIGURE 10

Figure 10 depicts segmentation of an array of pixel data where the regions are non-uniform matrices. *Id.* at 10:38–41. The pixel selection system receives region data and generates one set of pixel data for each region, such as by selecting a single pixel in each region. *Id.* at 1:46–49. In Figure 10 above, the "X" in each matrix represents a selected pixel. *Id.* at 10:24–29, 10:47–52. Transmission system 102 then transmits matrix data and pixel data, thereby "reduc[ing] data transmission requirements by eliminating data that is not required for the application of the data on the receiving end." *Id.* at 3:13–15, 7:63.

Data receiving system 104 further includes pixel data system 110 and display generation system 112. *Id.* at 3:35–36. Pixel data system 110 receives region data and pixel data and assembles frame data based on the region data and pixel data. *Id.* at 4:32–34. In turn, display generation system 112 receives frame data from pixel data system 110 and generates video data, audio data, graphical data, textual data, or other suitable data for use by a user. *Id.* at 4:44–46.

Google notes (*see* 212 Pet. 4, 8; 215 Pet. 4, 8) that the '339 patent claims priority to an earlier application filed on January 16, 2002. Ex. 1001, at [63]. As discussed below, Google establishes that its asserted references qualify as prior art even when assuming that January 16, 2002, is the effective filing date for the challenged claims of the ’339 patent.

C. Illustrative Claim

Claims 1, 7, and 10 are independent. Claims 6 and 13 depend from claim 1; claim 9 depends from claim 7; and claim 12 depends from claim 10. Claim 1 of the ’339 patent is illustrative of the challenged claims and recites:

> 1. A system for transmitting data transmission comprising:
>
> a analysis system receiving frame data and generating region data comprised of high detail and or low detail;
>
> a pixel selection system receiving the region data and generating one set of pixel data for each region forming a new set of data for transmission;
>
> a data receiving system receiving the region data and the pixel data for each region and generating a display;
>
> wherein the data receiving system comprises a pixel data system receiving matrix definition data and pixel data and generating pixel location data;
>
> wherein the data receiving system comprises a display generation system receiving pixel location data and generating display data that includes the pixel data placed according to the location data.

Ex. 1001, 10:62–11:9.

D. The Prior Art

Google relies on the following prior art:

> Spriggs et al., U.S. Patent No. 4,791,486, Patent Cooperation Treaty (“PCT”) filed Feb. 3, 1986, issued Dec. 13, 1988 (Ex. 1005, “Spriggs”);
>
> Golin et al., U.S. Patent No. 5,225,904, filed Dec. 4, 1991, issued July 6, 1993 (Ex. 1006, “Golin”);

Thyagarajan et al., U.S. Patent No. 6,529,634 B1, filed Nov. 8, 1999, issued Mar. 4, 2003 (Ex. 1008, "Thyagarajan"); and

Ricardo A.F. Belfor et al., *Spatially Adaptive Subsampling of Image Sequences*, 3 IEEE TRANSACTIONS ON IMAGE PROCESSING 1–14 (Sept. 1994) (Ex. 1007, "Belfor").

E. Instituted Grounds

We instituted trial based on the following grounds (212 Dec. on Inst. 23; 215 Dec. on Inst. 27):

References	Basis	Claims Challenged	Citation
Spriggs and Golin	35 U.S.C. § 103(a)	1, 6, 7, 9, 10, 12, and 13	212 Pet. 3, 24–58.
Belfor, Thyagarajan, and Golin	35 U.S.C. § 103(a)	1, 6, 7, 9, 10, 12, and 13	215 Pet. 3, 19–58.

F. Claim Interpretation

In an *inter partes* review, we construe claims by applying the broadest reasonable interpretation in light of the specification. 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard as the claim construction standard to be applied in an *inter partes* review proceeding). Under the broadest reasonable interpretation standard, and absent any special definitions, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms or phrases must be set forth "with reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

1. Claim Terms Construed in the Decisions on Institution

In the Decisions on Institution, we interpreted various claim terms of the '339 patent as follows (212 Dec. on Inst. 7–11; 215 Dec. on Inst. 7–12):

Claim Term	Interpretation
region	division of a frame
matrix	a region with square or rectangular dimensions
region data (claims 1, 10, 12, 13)	data that defines at least one region
matrix data (claims 7, 9, 12)	data that defines at least one matrix
matrix definition data (claim 1)	data that defines at least one matrix
pixel selection data/ selection pixel data	data pertaining to one or more pixels from a region selected for transmission

The parties do not dispute these interpretations in Vedanti's Patent Owner Response, Google's Reply, and Vedanti's Sur-Reply. *See* PO Resp. 17, 22–23; Pet. Reply 4–5, 9–10. We do not perceive any reason or evidence that compels any deviation from these interpretations. Accordingly, we adopt our previous analysis for purposes of this Final Written Decision, and we maintain that the interpretations set forth in the table above constitute the broadest reasonable interpretations in light of the claims and Specification of the '339 patent.

2. “analysis system”/“a analysis system receiving frame data and generating region data”

In the 215 Institution Decision, we “decline[d] to construe the ‘analysis system’ of claim 1 as requiring any particular type of analysis beyond ‘receiving frame data and generating region data,’ as is recited in claim 1 itself.” 215 Dec. on Inst. 12–13. Vedanti contends that we have ignored the term “analysis,” which renders it meaningless in the claim. PO Resp. 18–19. As such, Vedanti contends “the claim construction should be revised to require some consideration of the frame data by the system in order to generate region data.” *Id.* at 19 (citing Ex. 1001, 3:53–56). Vedanti also cites the figures and text of the ’339 patent as indicating that “the ‘analysis system’ and the ‘pixel selection system’ are separately identifiable components of the invention.” *Id.* at 19–21 (citing Ex. 1001, Figs. 1–3). Vedanti explains that “nothing in the claims suggest[s] that the analysis system and the pixel selection system can be the same process.” *Id.*

Google replies that “[t]he specification is clear that its separate depiction of an ‘analysis system’ and ‘pixel selection system’ is exemplary.” Pet. Reply 8 (citing Ex. 1001, 2:3–5, 2:41–43, 2:65–66). Google also argues that the ’339 patent “leaves open the possibility that the claims can cover a single system that functions and qualifies as both the claimed ‘analysis system’ and the ‘pixel selection system.’” *Id.* at 8–9.

We agree with Google. In fact, Vedanti’s counsel conceded at the Oral Hearing that one element (e.g., a processor executing two portions of code) serves as both the “analysis system” and the “pixel selection system” as long as it “receiv[es] frame data and generat[es] region data” and “receiv[es] the region data and generat[es] one set of pixel data.” *See*

Tr. 31:4–32:15 ("[The '339 patent] is talking about software and both of these can be implemented on software. Yes, they can both be on the same processor. But they are separately identifiable processes that go on within this processor."); *see also* PO Resp. 37 ("It is acknowledged that both systems are found in the same processor of Spriggs."). This is supported by the Specification of the '339 patent, which states that the "analysis system" and "pixel selection system" "can be implemented in hardware, *software*, or a suitable combination of hardware and software, and . . . can be *one or more software systems* operating on a general purpose processing platform." Ex. 1001, 2:65–3:3 (emphases added). Furthermore, the Specification states that software system implementations could include something as granular as "one or more lines of code." *Id.* at 3:3–3:12. Under these circumstances, we are not persuaded that the "analysis system" of claim 1 need be a separately identifiable component in the manner suggested by Vedanti.

In addition, we maintain our determination that interpreting the type of analysis performed by the "analysis system" is unnecessary, because claim 1 already recites what is required: "receiving frame data and generating region data."

3. Additional Claim Terms

In its Patent Owner Response, Vedanti proffers interpretations of "frame data," "data," "matrix size data," "selecting one of two or more sets of pixel data," and "selecting a set of pixel data from each region." PO Resp. 16–18, 23–25. Vedanti, however, does not contest Google's assertions of unpatentability based on any of its proposed interpretations. Nor does Google contend that these terms require interpretation. Pet. Reply

5–8, 10–13. In our Decisions on Institution, we did not construe these terms. Based on our review of the complete record, and because interpretation of these claims is not necessary to resolve any issue in this Final Written Decision, we determine that no explicit constructions of these terms are necessary. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (explaining that only those claim terms or phrases that are in controversy need to be construed, and only to the extent necessary to resolve the controversy).

II. ANALYSIS

A. Obviousness Ground Based on Spriggs and Golin (212 IPR)

Google contends claims 1, 6, 7, 9, 10, 12, and 13 would have been obvious over the combination of Spriggs and Golin. 212 Pet. 3, 20–58; Pet. Reply 13–22. Vedanti disputes Google's contention. PO Resp. 26–54; PO Sur-Reply 1–5.

1. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103(a)[5] 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 at the time the invention was made to a person having ordinary skill in the art to which said subject matter

[5] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 102 and 103. Because the challenged claims of the '339 patent have an effective filing date before the effective date of the applicable AIA amendments, throughout this Final Written Decision we refer to the pre-AIA versions of 35 U.S.C. §§ 102 and 103.

pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is 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. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We also recognize that prior art references must be "considered together with the knowledge of one of ordinary skill in the pertinent art." *Paulsen*, 30 F.3d at 1480 (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)). We analyze Google's obviousness grounds with the principles identified above in mind.

2. Level of Skill in the Art

In determining the level of skill in the art, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)). In addition, the prior art of record in this proceeding—namely, Spriggs, Golin, Belfor, and Thyagarajan—is indicative of the level of skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *GPAC*, 57 F.3d at 1579; *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

Google contends an ordinarily skilled artisan "would have at least a [Bachelor of Science] degree in Electrical Engineering, Computer Engineering, Computer Science, or an equivalent field, as well as at least one year of academic or industry experience in image processing or data transmission." 212 Pet. 11–12; 215 Pet. 10–11. Dr. Grindon's testimony puts forth a similar standard. Ex. 1003 ¶¶ 23–26; Ex. 1029 ¶¶ 23–26.

Citing, *inter alia*, Dr. Kia's testimony, Vedanti contends an ordinarily skilled artisan "would have at least a technical degree in Electrical Engineering, Computer Science or equivalent curriculum with coursework in image processing and at least one year of hands on experience with compression and communication techniques." PO Resp. 12 (citing Ex. 2001 ¶¶ 15–16). Alternatively, Vedanti contends such an artisan "may have earned a degree in Electrical Engineering, Computer Science or equivalent curriculum with coursework in compression and communication and at least one year of hands on experience in imaging." *Id.*

As noted by Google, one main difference between the parties' proposed definitions is that Vedanti would require an ordinarily skilled artisan "to have either coursework in compression or one year of hands-on experience with compression." Pet. Reply 2. The '339 patent, however, expressly states that the invention relates to "data transmission . . . us[ing] data optimization instead of compression." Ex. 1001, 1:32–39, 1:53–63, 2:41–46. Accordingly, we agree with Google that a specific requirement for coursework or experience in data compression need not be included in the definition of the level of skill in the art.[6]

Given the other similarities in the parties' proposed definitions, and in light of the types of problems addressed in the '339 patent and in the prior art of record, we determine an ordinarily skilled artisan at the time of the

[6] Consequently, we disagree with Vedanti's assertion that Dr. Grindon is not qualified to opine as to the abilities and understandings of a person of ordinary skill in the art because of his alleged "limited" experience in the field of video compression. *See* PO Resp. 13–15.

’339 patent would have possessed a bachelor’s degree in electrical engineering, computer engineering, computer science, or a similar discipline, and at least one year of academic or industry experience in image processing or data transmission. We, therefore, apply this level of skill in the art to our obviousness evaluation below.

3. Spriggs

Spriggs is directed to “image coding and transmission” using “a non-uniform sample structure in which non-transmitted p[ix]els are interpolated.” Ex. 1005, 1:7–8, 2:3–5. The number of points selected for transmission is greatest in detailed areas of the image. *Id.* at Abstract.

Starting with an existing block of pixels, such as a full frame, Spriggs discloses calculating a new block in which all pixels “are represented by values linearly interpolated from the corner values” of the block. *Id.* at 2:28–32, 2:43–45. Pixels in the existing block then are compared with the interpolated values to determine if there are any differences in excess of a threshold. *Id.* at 2:32–35. If the differences exceed the threshold, the existing block is divided into two subblocks, and the interpolation and comparison process is repeated on the subblocks. *Id.* at 2:48–54. This process continues until subdivision is no longer necessary (because the difference is less than the threshold) or possible. *Id.* at 2:58–60. Figure 3 of Spriggs is reproduced below.

Fig.3.

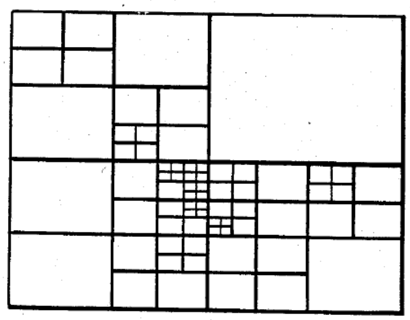

Figure 3 depicts a block that has undergone this subdivision process "where the greatest number of subdivisions wil[l] occur at edges or over fine detail." *Id.* at 2:55–57. Blocks that have finished this subdivision process can be reconstructed in the receiver as "a good approximation to the original" based on the interpolated values. *Id.* at 2:37–43.

Figure 6 of Spriggs is reproduced below.

Fig.6.

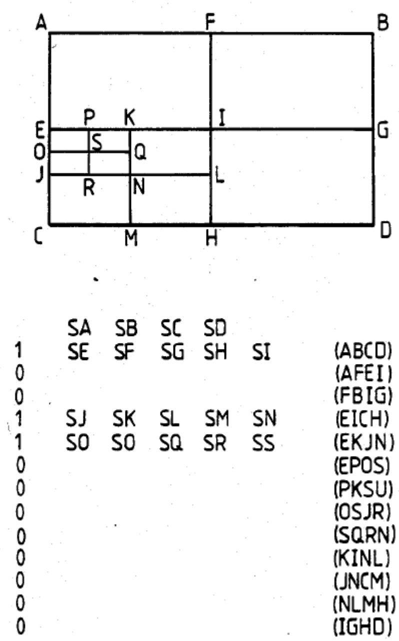

Figure 6 depicts "an image area together with the resulting coded output." *Id.* at 3:63–64. The ones and zeros on the left side of the coded output are "division codes"; "0" corresponds to a block that can be interpolated from its corner values, whereas "1" corresponds to a block that must be subdivided.

Id. at 3:2–5, 3:64. The codes such as "SA, SB etc." in the middle "indicate sample values corresponding to points A, B etc." *Id.* at 3:63–65. When subdivision of a block is completed, the addresses and values of the corner points are transmitted. *Id.* at 2:32–38. The letters in brackets on the right, which do not need to be transmitted, indicate the corresponding area to which the information on the left corresponds. *Id.* at 3:65–68.

We agree with Google (212 Pet. 4) that Spriggs qualifies as prior art under at least 35 U.S.C. § 102(b) because Spriggs's issue date of December 13, 1988, is more than one year before the earliest possible effective filing date for the challenged claims of the '339 patent, which is January 16, 2002. *See* Ex. 1001, at [63]; Ex. 1005, at [45].

4. Golin

Golin is directed to "video signal processing generally and particularly to systems for reducing the amount of digital data required to represent a digital video signal to facilitate uses, for example, such as the transmission, recording and reproduction of the digital video signal." Ex. 1006, 1:10–15. A coder splits a video frame "into a number of small groups of similar pixels" called "regions." *Id.* at 11:44–46. "For each region a code is produced for representing the values of all pixels of the region." *Id.* at 11:46–47. Figure 26 of Golin is reproduced below.

FIG. 26

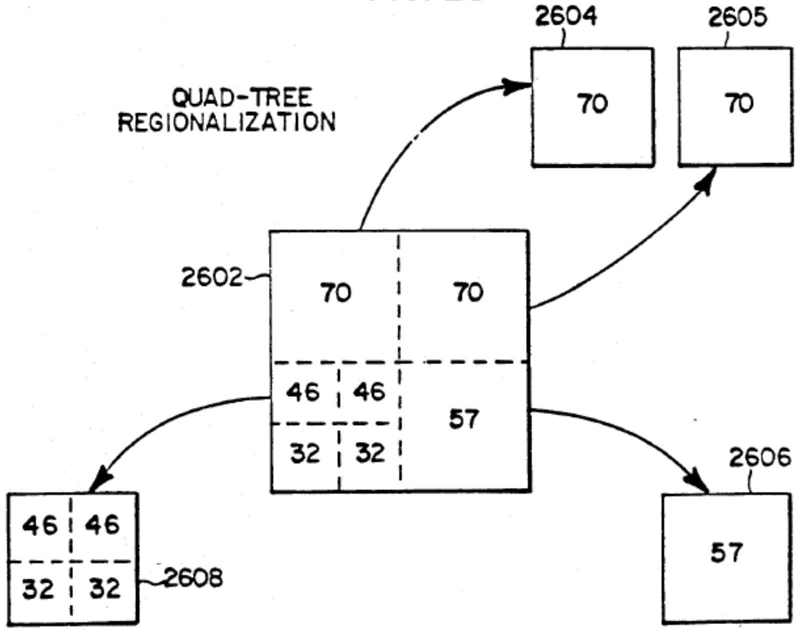

Figure 26 depicts a "quad-tree decomposition" wherein regions are split in both horizontal and vertical directions. *Id.* at 13:40–49. Golin also describes a "roughness" estimator for detecting region edges in the pixel data based on large changes in adjacent pixels, i.e., when the values of adjacent pixels differ by more than a threshold value. *Id.* at 19:34–44, Fig. 18. If edges are present in a region, the region is split horizontally or vertically. *Id.* at 20:47–63. Golin also states that "multipoint interpolation techniques" can be used as an alternative way of determining roughness. *Id.* at 20:64–66.

Golin additionally describes a regionalization process known as binary tree decomposition with reference to Figure 27, reproduced below.

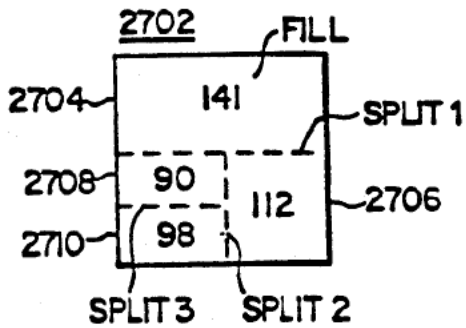

FIG. 27

Figure 27 is a diagram illustrating the binary tree regionalization of an image. *Id.* at 2:63–64, 13:3–4. "Binary tree decomposition is performed by splitting a region in half, and then possibly splitting each of the resulting sub-regions in half, until the resulting sub-regions can be efficiently encoded." *Id.* at 13:22–25. Whereas both split directions (e.g., horizontal *and* vertical) are used together in quad-tree decomposition, only a single direction (e.g., horizontal *or* vertical) is split in binary tree decomposition. *See id.* at 13:40–43.

We agree with Google (212 Pet. 4; 215 Pet. 4) that Golin qualifies as prior art under at least 35 U.S.C. § 102(b) because Golin's issue date of July 6, 1993, is more than one year before the earliest possible effective filing date for the challenged claims of the '339 patent, which is January 16, 2002. *See* Ex. 1001, at [63]; Ex. 1006, at [45].

5. Claim 1

a. Comparison of Spriggs and Golin to Claim 1

Google maps Spriggs's transmitter (also known as a "coder"), which is depicted in Figure 5 of Spriggs, to the "analysis system" and "pixel selection system" recited in claim 1. 212 Pet. 26–31. Google contends an ordinarily skilled artisan "would have recognized that certain steps in that coding process correspond to the claimed 'analysis system,' while other separate steps correspond to the claimed 'pixel selection system.'" Pet. Reply 14 (citing Ex. 1030 ¶¶ 49–55). For the "analysis system," Google cites Spriggs's teaching that the transmitter receives video frame data and performs a coding process to divide the frame into blocks. 212 Pet. 26–27 (citing Ex. 1005, 2:36–47, 2:50–54, 2:56–59, 3:53–54, Figs. 1–3). Google notes the transmitter uses an interpolation comparison to determine whether a given block "can be accurately represented by transmitting only the four corner values." *Id.* at 20–21, 27 (citing Ex. 1005, 2:26–47). If the block cannot be accurately represented based on the four corner values, then the block is subdivided into smaller blocks using the same process until subdivision is no longer necessary or possible. *Id.* at 27 (citing Ex. 1005, 2:50–54, 2:58–59). Spriggs also teaches that the transmitter transmits a division code of "1" when a block must be subdivided and "0" otherwise. *See id.* at 22, 30, 33 (citing Ex. 1003 ¶ 117; Ex. 1005, 1:43–64, 3:2–59, Figs. 1–6); Pet. Reply 14–15 & n.6 (citing Ex. 1005, 2:26–3:24, 3:51–62; Ex. 1030 ¶ 50). Google maps the corner coordinates and values[7] and division codes that are produced by Spriggs's region forming process to the recited "region data." 212 Pet. 27 (citing, *inter alia*, Ex. 1003 ¶ 107); Pet. Reply 15 (citing Ex. 1030 ¶¶ 50–51). According to Google, "high detail" corresponds to areas of the frame "where the greatest number of

[7] In the 212 Petition, Google maps "the blocks as defined by the corner coordinates *and values*" to the "region data." *See* 212 Pet. 27 (emphasis added). At the Oral Hearing, Google referenced our construction of "region data" and indicated that "[t]he values are present but you do not need to rely on the values for region data." Tr. 15:8–16:21. As explained below, we agree with Google that Spriggs's corner coordinates and division codes are "region data," and the values are "pixel data."

subdivisions will occur," whereas low detail corresponds to "larger blocks." 212 Pet. 27 (citing Ex. 1003 ¶¶ 106–110).

For the "pixel selection system," Google contends "[t]he transmitter with processor 14 in Spriggs receives region data . . . and further produces one set of pixel data for each region." 212 Pet. 30 (citing Ex. 1005, 2:36–47). Referencing Figure 6 of Spriggs, Google argues "[t]he values in the middle such as 'SA SB SC SD' indicate pixel coordinates and values corresponding to the points A, B, C, and D for example." *Id.* at 30–31 (citing Ex. 1005, 3:63–64). Google contends an ordinarily skilled artisan "would have recognized that the information indicating that new blocks have been created (*e.g.*, division code of '1') would be used to trigger the additional steps for selecting and transmitting the pixel values." Pet. Reply 16 (citing Ex. 1030 ¶ 53). Citing testimony from Dr. Grindon, Google contends an ordinarily skilled artisan:

> would have recognized that when the Spriggs transmitter, while performing its coding process, receives information that new blocks have been created (i.e., division code of '1') or that a pre-existing block does not need to be divided further (i.e., division code of '0'), obtaining that information would trigger additional steps in the coding process to select and transmit the pixel values for those blocks.

Id. at 19 (citing Ex. 1030 ¶ 60). Thus, according to Google, "[t]he corner coordinates of the newly created blocks would be used to select the values of the pixels at those locations for transmission." *Id.* at 16 (citing Ex. 1005, 3:16–17; Ex. 1030 ¶ 53).

For the "data receiving system," Google cites Spriggs's receiver as depicted in Figure 7. 212 Pet. 31. Google contends "[t]he receiver receives region data and pixel data" from the transmitter and "generates a display

‘Video Out’ output from ‘D[igital] to A[nalog converter]’ 26.” *Id.* at 32 (citing Ex. 1003 ¶ 23; Ex. 1005, Fig. 7). For the “pixel data system,” which is part of the “data receiving system,” Google contends Spriggs’s receiver in Figure 6 receives pixel data and matrix definition data “defining matrices of uniform dimensions or sizes or non-uniform dimensions or sizes.” *Id.* at 32–34. Correspondingly, Google contends “pixel location data . . . comprises the addresses of corners of the block selected for transmission.” *Id.* (citing Ex. 1005, 2:37–38). Google contends the receiver generates pixel location data insofar as “pixel values [are] laid out for a frame as illustrated in FIG. 6” of Spriggs. *Id.* at 34 (citing Ex. 1003 ¶¶ 126–127). Google cites similar teachings in Spriggs for the “display generation system,” which also is part of the “data receiving system,” because Spriggs’s receiver includes a “Video Out” output for generating “display data wi[t]h pixel data arranged according to pixel location data.” *Id.* at 34 (citing Ex. 1005, 3:24–27, 4:55–57, Fig. 7; Ex. 1003 ¶¶ 128–130).

Google only relies on Golin, in conjunction with Spriggs, with respect to one limitation of claim 1: “generating region data comprised of high detail and or low detail.” *Id.* at 26–30. Specifically, although Google cites Spriggs for teaching block subdivision using pixel interpolation, *id.* at 27 (citing Ex. 1005, 2:36–47, 2:50–54, 2:56–59), Google states that “Patent Owner may allege” that Spriggs’s comparison of pixels “is based on a *derived* interpolation value [and] not a direct comparison of an amount of variation between pixels.” *Id.* Thus, Google relies on Golin’s teachings regarding a roughness test for detection of region edges by comparing the differences of adjacent pixels with a threshold value. *Id.* at 28 (citing Ex. 1006, 19:34–38, 19:41–43, 20:52–55, 20:61–63).

Vedanti argues Spriggs "includes only an analysis system for analyzing whether to split an area using quad-tree decomposition," but not a pixel selection system. PO Resp. 33 (citing Ex. 2001 ¶ 41). Specifically, Vedanti argues "Spriggs fails to teach generating one set of pixel data for each region based on received region data/optimized matrix data." *Id.* at 36 (citing Ex. 2001 ¶ 50). Citing embodiments of the '339 patent, Vedanti contends "[t]he region needs to be known and received for the pixel selection process to take place." *Id.* at 33 (citing Ex. 1001, 4:12–14; Ex. 2001 ¶ 41). But, according to Vedanti, Spriggs's Figure 6 embodiment does not teach the generation of pixel data for each region based upon the division codes/region data. *Id.* at 36 (citing Ex. 2001 ¶ 52). Vedanti also argues no pixel selection process is triggered for a given region when a "0" is transmitted, which indicates that the region does not need to undergo further subdivision. *Id.* at 30–31, 34, 36–37 (citing Ex. 2001 ¶¶ 36–37, 46, 52); PO Sur-Reply 4; *see also* Tr. 40:8–10 ("By the time you are done and you have optimized the regions, you have already sent the pixel data."). Vedanti additionally argues Google fails to identify which "certain steps" in Spriggs's system correspond to the analysis system, and which "additional steps" in Spriggs's system correspond to the pixel selection system. PO Sur-Reply 3. In that way, Vedanti contends Google's Petition fails to "specify where each element of the claim is found in the prior art patents or printed publications relied upon" in contravention of 37 C.F.R. § 42.104(b)(4). PO Sur-Reply 3.

As an initial matter, Google establishes, with support in Spriggs and testimony from Dr. Grindon, that Spriggs's transmitter generates region data when blocks are created and a division code of "1" is transmitted.

212 Pet. 27 (citing Ex. 1005, 2:36–47, 2:50–54); Pet. Reply 14–15 & n.6 (citing Ex. 1005, 2:26–3:24, 3:51–62; Ex. 1030 ¶ 50); Tr. 64:1–70:8. As explained by Google, the region data are "the blocks as defined by the corner coordinates" plus the division code. 212 Pet. 27; Pet. Reply 15; *see also* PO Resp. 47 (Vedanti agreeing that division codes are region data). Thus, we agree with Google that these teachings correspond to the recited "analysis system" of claim 1.

Google further establishes that the values at Spriggs's corner coordinates are pixel data. 212 Pet. 31–32 (citing Ex. 1005, 3:63–64). As explained by Google, "[t]he corner coordinates of the newly created blocks would be used to select the values of the pixels at those locations for transmission." Pet. Reply 16 (citing Ex. 1005, 3:16–17; Ex. 1030 ¶ 53). This is supported in Dr. Grindon's original declaration, in which he testifies that "[i]n Spriggs' coding process[,] corner pixel values of a region division of a frame are selected for transmission." Ex. 1003 ¶ 117. Google explains that an ordinarily skilled artisan "would have recognized that the information indicating that new blocks have been created (*e.g.*, division code of '1') would be used to trigger the additional steps for selecting and transmitting the pixel values." Pet. Reply 16 (citing Ex. 1030 ¶ 53). Furthermore, we are persuaded by Google's argument that, "[g]iven that the corner coordinates are a prerequisite for selecting the pixel values at those coordinates, corner pixel values (i.e., 'pixel data') can only be obtained after receiving the corner coordinates (i.e., 'region data')." Pet. Reply 18 (citing Ex. 1030 ¶ 59). Google's analysis is consistent with Spriggs's disclosure on subdividing a block (i.e., creating corner coordinates in "Operation 3"), and then performing an interpolation analysis (i.e., "Operation 1"), before transmitting the corner coordinates and values (i.e., "Operation 2"). *See* Ex. 1005, 2:27–3:51.

We do not agree with Vedanti that Google's analysis is deficient simply because Spriggs's selection of pixel coordinates and values for transmission also happens to correspond to the corner points in the generated region data. Nothing in the claim prohibits the region data from being used to generate the pixel data. *See* Pet. Reply 16 (arguing that the division code is "used to trigger the additional steps for selecting and transmitting the pixel values, and "[t]he corner coordinates of the newly created blocks would be used to select the values of the pixels at those locations for transmission"). Indeed, claim 1 recites "receiving the region data and generating one set of pixel data for each region." In a similar fashion, we disagree with Vedanti that Google has not "identif[ied] digital information . . . corresponding to the region data and differing digital information corresponding to the pixel data." PO Resp. 45. Google has done so. Specifically, we are persuaded by Google's analysis that Spriggs's corner coordinates and division codes teach "region data" and Spriggs's pixel values teach "pixel data." *See* 212 Pet. 27, 30–31; Pet. Reply 15–16.

Vedanti also argues that "[t]he claims distinguish between region data and pixel data," such that "the claims require[] that the selected pixel data be distinct from the region or matrix data." PO Resp. 41–42. Vedanti's argument is based on the separate limitations in claim 1 for "generating region data" and "receiving the region data and generating . . . pixel data." *Id.* Nevertheless, we agree with Google that Spriggs's transmitter generates pixel data for transmission when it receives corner coordinates. Pet. Reply 18 (citing Ex. 1030 ¶ 59); *see also* 212 Pet. 30–31. As explained above, we understand Google to be mapping division codes and corner coordinates to region data and the values at those corner coordinates to pixel data. In our view, the fact that these values are associated with corner coordinates in region (or matrix) data does not undermine Google's mapping of the values to the recited "pixel data."

Finally, Vedanti focuses on the claim 1 limitation that the pixel selection system "receiv[es] region data and generat[es] . . . pixel data" and argues that Google fails to establish the recited "receiving" and "generating." PO Resp. 46–50; PO Sur-Reply 4–5. Specifically, Vedanti argues "[t]he region data are never received by a pixel selection system in Spriggs[']s] encoder that generates one set of pixel data for each region." PO Resp. 48 (citing Ex. 2001 ¶ 58). According to Vedanti, "region data is transmitted upon being generated and is not retained for use by a pixel selection system." *Id.* Yet the same logic from above differentiating Spriggs's corner coordinates from the values at those coordinates provides support for Google's mapping of the "receiving" and "generating" limitations. To wit, Spriggs's transmitter generates division codes and corner coordinates (i.e., "region data"); once these data are received, the values at those corner coordinates (i.e., "pixel data") are ascertained/ generated. *See* 212 Pet. 30–31 (citing Ex. 1003 ¶ 118; Ex. 1005, 2:36–47, 3:63–68, Fig. 6); Pet. Reply 18 (citing Ex. 1030 ¶ 59). Contrary to Vedanti's argument (*see* PO Resp. 48–50), claim 1 does not require retention of data or any additional processing by the pixel selection system other than what is claimed and what Google has established.

For these reasons, Google establishes that the combination of Spriggs and Golin teaches every limitation of claim 1.

b. Rationale for Combining Spriggs and Golin

As supported by testimony from Dr. Grindon, Google argues an ordinarily skilled artisan would have recognized Golin's direct pixel comparison to be interchangeable with Spriggs's interpolated pixel variation analysis based on, *inter alia*, Golin's explicit teaching that these two schemes are alternative types of "roughness" tests, so an ordinarily skilled artisan would have had reason to use Golin's processing in the system of Spriggs. *Id.* at 28–29 (citing Ex. 1003 ¶¶ 113–116; Ex. 1006, 20:64–66). Google also contends that there is a "trade off between level of detail desired for a human eye viewing and block size" when choosing between methods like those disclosed in Spriggs and Golin, known to an ordinarily skilled artisan, and "Golin's example threshold of ten pixels even squarely meets the '339 patent's own threshold for low detail where pixels are selected every '25 pixels or less in order to create the image to be viewed by the human eye.'" *Id.* at 29 (citing Ex. 1001, 3:23–26); *see* Ex. 1003 ¶ 113 (explaining various advantages of both methods and opining that "[t]hese kinds of tradeoffs between efficiency, quality, and appropriateness for a specific application are well-known to those in the art," and a person of ordinary skill in the art "would be familiar with balancing competing concerns such as these when designing image processing and transmission systems").

Vedanti does not contest Google's reasons for combining the teachings of Spriggs and Golin, and Google's reasons comport with the Federal Circuit's recognition of "[t]he normal desire of artisans to improve upon what is already generally known." *In re Ethicon, Inc.*, 844 F.3d 1344, 1351 (Fed. Cir. 2017). We, therefore, are persuaded by Google's rationale for the combination. Google has established that a person of ordinary skill in the art would have had reason to combine the teachings of Spriggs and Golin to achieve the system recited in claim 1.

c. Secondary Considerations of Nonobviousness

Vedanti did not put forth any evidence of secondary considerations of nonobviousness.

d. Conclusion Regarding Claim 1

Based on all of the evidence of record presented and developed during trial, we determine, by a preponderance of the evidence, that the subject matter of claim 1 would have been obvious over the combination of Spriggs and Golin under 35 U.S.C. § 103(a).

6. Claims 7 and 10

Independent claim 7 is a method claim similar in scope to claim 1, and Google's analysis is likewise similar to that of claim 1. Claim 7 recites "generating optimized matrix data from the frame data," and Google recapitulates its arguments regarding the "analysis system . . . generating region data" from claim 1. *See* 212 Pet. 38–39. Also similar to claim 1, Google cites Golin's "roughness test," which a person of ordinary skill in the art would have had reason to substitute for Spriggs's interpolation comparison. *See id.* at 41–43. Regarding the "optimized" nature of the matrix data, Google posits combining the pixel variation edge detector of Golin with Spriggs's recursive subdivision process. *See id.* at 39–43 (citing, *inter alia*, Ex. 1003 ¶¶ 151–157).

For the limitation "selecting one of two or more sets of pixel data based on the optimized matrix data," Google contends "[t]he transmitter with processor 14 in Spriggs receives sets of pixels (blocks) and further produces one set of pixel data for each matrix of a block" insofar as "corner pixel values of a matrix of a frame are selected for transmission." *Id.* at 43 (citing Ex. 1005, 2:36–47). Google analyzes the remaining limitations of claim 7 similarly to claim 1. *See id.* at 45–47. We are persuaded that Google, as supported by Dr. Grindon's testimony, and for reasons set forth above with respect to claim 1, persuasively shows the combination of Spriggs and Golin teaches the limitations in claim 7. We add the following for additional explanation.

Vedanti argues that Google improperly maps "Spriggs' coding process of Fig. 4" producing corner coordinates and corner pixel values to both the generation of "optimized matrix data" and "pixel data." PO Resp. 50. We are not persuaded Vedanti's argument for the same reasons explained above regarding the "region data" and "pixel data" recited in claim 1.

Vedanti further contends the pixels selected in Spriggs's recursive process are not yet optimized, because "optimized matrix data [corner coordinates and values] is the end result of Spriggs' coding process." *Id.* at 50–52. Thus, one question before us is whether Google's citation to region data generated as a result Spriggs's recursive subdivision process, as modified by Golin, is sufficient to teach "optimized matrix data." We determine that, for at least some regions formed in the Spriggs-Golin combination, the region data is so optimized. As stated by Dr. Grindon, "matrix data is optimized because it is based on . . . pixel variation data as taught by the edge detector of Golin." Ex. 1003 ¶ 157. Thus, regions are formed in the same way as Spriggs, but using a "roughness test" as described in Golin. *See* 212 Pet. 41 (citing Ex. 1006, 19:34–38). And at least some of Spriggs's regions are optimized at the time they are created, meaning that "sub-division is no longer necessary, or no longer possible." *Id.* at 40 (quoting Ex. 1005, 2:58–59). Thus, we do not agree with Vedanti (PO Resp. 50–52) that optimization of an entire frame is necessary to teach "optimized matrix data"; claim 7 does not include any such requirement.

Furthermore, regarding Vedanti's argument that "Spriggs and Golin lack the process of 'selecting one of two or more sets of pixel data' because no choice is made" (PO Resp. 52), we discussed a similar argument above for claim 1. For the same reasons discussed above, we are persuaded that Spriggs's selection of corner pixel values of a matrix for transmission from all the pixels in a region teaches "selecting one of two or more sets of pixel data." 212 Pet. 43–44 (citing, *inter alia*, Ex. 1005, 2:36–47). This selection is based on the optimized region/matrix data discussed above.

Independent claim 10 is a method claim similar in scope to claim 7. Google's analysis for "dividing an array of pixel data into two or more regions" also is similar to that for the "analysis system . . . generating region data" from claim 1. *See id.* at 49–50. Claim 10 additionally recites "selecting a set of pixel data for each region," about which Vedanti argues Google "has not identified any process in Spriggs for selecting a set of pixel data from any of these regions to be transmitted." PO Resp. 54. This is similar to Vedanti's argument discussed above with respect to claims 1 and 7. We are persuaded by Google's analysis of the corner pixel values for a region being transmitted in Spriggs. *See* 212 Pet. 50–52.

Google analyzes the remaining limitations in claims 7 and 10 similarly to claim 1 (*see id.* at 37–38, 45–50, 52–57), and Vedanti relies on its arguments from claim 1 for these limitations, which we have addressed above. As stated above, we are persuaded by Google's rationale for the combination of Spriggs and Golin. *See* 212 Pet. 27–29, 42–43, 55–56; Ex. 1003 ¶¶ 111–116, 149–157, 208–212. Accordingly, based on the entire record developed during trial, we conclude Google has demonstrated by a preponderance of the evidence that the subject matter of claims 7 and 10 would have been obvious over the combination of Spriggs and Golin.

7. Dependent Claims

Claims 6 depends from claim 1, and further recites "the pixel selection system comprises a pixel identification system generating pixel location data based on a location of the set of pixel data associated with each of the regions." Building upon its obviousness analysis for claim 1, Google cites Spriggs for teaching pixel location data, meaning the locations or addresses of the four corners of each block selected for transmission. 212 Pet. 36–37 (citing Ex. 1005, 2:36–47, 3:63–68, Fig. 6). Claim 13 also depends from claim 1, and it recites "the frame analysis system comprises a pixel variation system receiving two or more sets of pixel data and generating the region data based on pixel variation data from the two or more sets of pixel data." Google cites Golin's edge detection strategy for the "pixel variation system." *Id.* at 35–36 (citing Ex. 1006, 13:41, 13:61–63, 19:34–38, 20:51–55). Google contends Spriggs's system, as modified by Golin, receives "two or more sets of pixel data" insofar as it receives "the pixel values in the frame, specifically rows and columns of pixel data," prior to performing block subdivision and generating region data. *Id.* For claims 6 and 13, Vedanti relies on the same arguments it made for claim 1, which we have discussed above. *See* PO Resp. 41, 50.

Claim 9 depends from claim 7, and further recites "transmitting the pixel data and the matrix data comprises transmitting an array of pixel data and uniform matrix size data." Google cites Spriggs's Figure 2 for teaching uniform block sizes and contends that "uniform block sizes were well-known in the prior art to simplify block processing." 212 Pet. 47–48 (citing Ex. 1003 ¶ 175; Ex. 1005, Fig. 2). For claim 9, Vedanti relies on the same arguments it made for claim 7, which we have discussed above. *See* PO Resp. 53.

Claim 12 depends from claim 10, and further recites "transmitting the region data and the pixel data for each region comprises transmitting matrix data and the pixel data for each matrix." Google's analysis is similar to that of claim 10, except that Google contends the regions produced by the Spriggs-Golin combination can be matrices. *See* 212 Pet. 57–58 (citing Ex. 1003 ¶¶ 219–221; Ex. 1005, 2:36–47). For claim 12, Vedanti relies on the same arguments it made for claim 10, which we have discussed above. *See* PO Resp. 54.

Having considered Google's unpatentability contentions and supporting evidence, including the testimony of Dr. Grindon, we are persuaded that the combined teachings of Spriggs and Golin properly account for the claimed subject matter recited in claims 6, 9, 12, and 13. For the same reasons as above with respect to claims 1, 7, and 10, we also are satisfied that Google has presented sufficient reasons for the combination of Spriggs and Golin. Therefore, based on the entire record developed during trial, we conclude Google has demonstrated by a preponderance of the evidence that the subject matter of claims 6, 9, 12, and 13 would have been obvious over the combination of Spriggs and Golin.

B. Obviousness Ground Based on Belfor, Thyagarajan, and Golin (215 IPR)

Google contends claims 1, 6, 7, 9, 10, 12, and 13 would have been obvious over the combination of Belfor, Thyagarajan, and Golin. 215 Pet. 3, 19–58; Pet. Reply 23–33. Vedanti disputes Google's contention. PO Resp. 54–83.

1. Belfor

Belfor is directed to "a spatially adaptive subsampling scheme" wherein an "image is subdivided into square blocks." Ex. 1007, 1. Each block uses a specific special sampling lattice; "[i]n detailed regions, a dense sampling lattice is used, and in regions with little detail, a sampling lattice with only a few pixels is used." *Id.* Figure 4 of Belfor is reproduced below.

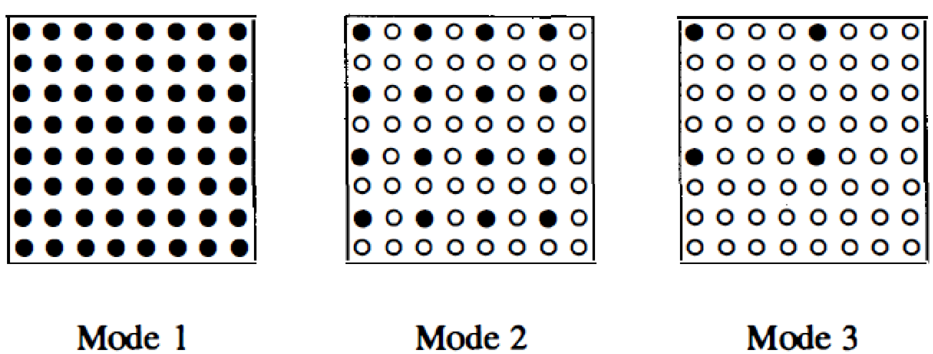

Fig. 4. Examples of different modes. The solid dots are the pixels that are transmitted.

Figure 4 depicts a set of three exemplary sampling lattices, which also are known as Modes 1, 2, and 3, where the solid dots represent the pixels that are transmitted. *Id.* at 4. In Mode 1, which can be used for highly detailed regions, all pixels are transmitted, whereas in Mode 3, which can be used for "areas with a slowly varying luminance," only 4 of the 64 pixels are transmitted. *Id.* An "interpolation module" evaluates "a criterion function that reflects the quality of the block for [each] particular mode," and a mode is assigned to each block accordingly. *Id.*

Although Belfor advocates using square blocks of the same size, Belfor acknowledges that it would be ideal

> to segment the image into regions that require the same spatial sampling frequency and sample each region according to this frequency[, though s]uch a solution would require a detailed analysis of the image, and a large amount of side information would be needed to transmit the shape of the regions.

Id.

Google contends Belfor qualifies as prior art under at least 35 U.S.C. § 102(b) because it was published in September 1994. 215 Pet. 4. Belfor bears a copyright date of 1994 and markings that indicate it was published in the September 1994 edition of IEEE TRANSACTIONS ON IMAGE PROCESSING. *See* Ex. 1007, 1. Vedanti does not dispute the prior art status of Belfor. Accordingly, we determine that Belfor qualifies as § 102(b) prior art because Belfor's 1994 publication date is more than one year before the earliest possible effective filing date for the challenged claims of the '339 patent, which is January 16, 2002. *See* Ex. 1001, at [63]; Ex. 1007, 1.

2. Thyagarajan

Thyagarajan is directed to "a compression scheme for image signals utilizing adaptively sized blocks and sub-blocks." Ex. 1008, 1:9–11. Thyagarajan describes the use of "contrast adaptive coding to achieve further bit rate reduction" by "assigning more bits to the busy areas and less bits to the less busy areas."[8] *Id.* at 4:17–24. Block sizes are assigned "us[ing] the variance of a block as a metric in the decision to subdivide a block." *Id.* at 5:54–57. "Blocks with variances larger than a threshold are subdivided, while blocks with variances smaller than a threshold are not subdivided." *Id.* at Abstract. Blocks are subdivided in quad-tree fashion and quad-tree data, known as PQR data, are generated. *Id.* at 5:41–46.

Figure 3A of Thyagarajan is reproduced below.

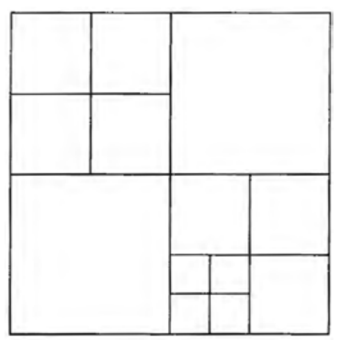

FIG. 3A

Figure 3A depicts an exemplary block size assignment after subdivision in which the blocks are of different sizes. *Id.* at 6:67–7:1. Thyagarajan contemplates both the use of blocks that are "N×N in size" and various other block sizes, such as an "N×M block size . . . where both N and M are integers with M being either greater than or less than N." *Id.* at 4:66–5:3.

Vedanti does not contest the prior art status of Thyagarajan. We agree with Google (215 Pet. 4) that Thyagarajan qualifies as prior art under at least 35 U.S.C. § 102(e) because Thyagarajan's filing date of November 8, 1999,

[8] In the 215 Institution Decision, we mistakenly stated that Thyagarajan encodes using pixel sampling. *See* 215 Dec. on Inst. 20. Instead, as pointed out by Vedanti (PO Resp. 65, 80), Thyagarajan uses discrete cosine transforms (DCT) on variably subdivided blocks. *See* Ex. 1008, Abstract.

is before the earliest possible effective filing date for the challenged claims of the ’339 patent, which is January 16, 2002. *See* Ex. 1001, at [63]; Ex. 1008, at [22].

3. Claim 1

a. Google’s Obviousness Analysis

Google cites Belfor’s teaching on subdividing an image into square blocks for the recited “analysis system” of claim 1. 215 Pet. 28 (citing Ex. 1007, 1). Google also cites Belfor’s teachings about representing each block with a specific spatial sampling lattice depending on the amount of detail in a block. *Id.* According to Google, “Belfor discloses receiving frame data (the input image) and generating region data (blocks) comprised of high detail and or low detail (some are in detailed regions and some are in regions with little detail).” *Id.* (citing Ex. 1029 ¶ 111). Google cites the same teachings for the “pixel data system” of claim 1. *Id.* at 35. Google contends Belfor teaches transmitting block size information (i.e., “matrix definition data”) and pixel data (i.e., “pixel location data”) to the receiver. *Id.* (citing Ex. 1029 ¶¶ 128–129; Ex. 1007, 4).

Google proposes combining Belfor’s teachings with Thyagarajan’s teachings on subdividing an image into blocks of various sizes based on comparing pixel variance in a block with a threshold. *Id.* at 29 (citing Ex. 1008, 4:66–5:3, 5:54–7:3, Fig. 3A). Google argues “[t]he block subdivision of Thyagarajan is a simple substitution for the block size determination of Belfor” that would have been motivated by Belfor’s purported “suggestion to find a better block subdividing method that combines the advantages of using both large blocks and small blocks." *Id.* at 30 (citing Ex. 1029 ¶ 116; Ex. 1007, 4).

Furthermore, because "Thyagarajan is based on a derived mean value [and] not a direct comparison of an amount of variation between pixels," *id.* at 31; *see also* Ex. 1008, 5:60–65 (setting forth an exemplary formula for computing variance using mean pixel values), Google further proposes adding Golin to the combination. 215 Pet. 31. Google cites Golin's teachings on a "roughness test" for detection of region edges by comparing the differences of adjacent pixels with a threshold value. *Id.* (citing Ex. 1006, 20:47–64). Google argues an ordinarily skilled artisan would have had reason to replace the "pixel variation detail determination" of Belfor in view of Thyagarajan with Golin's "pixel variation edge detector" because it is suggested by the references themselves, and it would have been a simple substitution of one known element for another to obtain predictable results. *Id.* at 32 (citing Ex. 1029 ¶ 121).

For the recited "pixel selection system," Google cites Belfor's selection of pixels based on the sampling lattices of Belfor's Figure 4. *Id.* at 32–33 (citing Ex. 1007, 1–2, 4, Fig. 4). Regarding the "data receiving system," Google cites Belfor's receiver, which performs reconstruction of the image using an interpolation filter. *Id.* at 34–35 (citing Ex. 1029 ¶¶ 124–127; Ex. 1007, 2, 4, Fig. 5). Google contends an ordinarily skilled artisan would have recognized that Belfor's reconstruction process requires "the received pixels . . . to be placed in the same location in the reconstructed image as in the original input image," such that the data receiving system would also meet the "display generation system" limitation of claim 1. *Id.* at 36 (citing Ex. 1029 ¶¶ 130–133).

b. Google's Simple Substitution Theory

Vedanti contends Google's simple substitution theory regarding Belfor and Thyagarajan "is flawed and not rational." PO Resp. 68. Vedanti's contention is based on the fact that "Belfor sets size of the blocks as a system parameter." *Id.* at 65 (citing Ex. 1007, 4). In contrast, Thyagarajan utilizes quad-tree decomposition, such that "areas with larger variances will be subdivided into smaller blocks, whereas areas with smaller variances will not be subdivided." *Id.* at 63 (quoting Ex. 1008, 3:1–3). Based on Dr. Kia's testimony, Vedanti argues "[t]here is no disclosure to suggest to one of ordinary skill in the art how to modify the encoding system of Belfor to accommodate concurrent use of different sized blocks and different sets of modes." *Id.* at 66–67 (citing Ex. 2001 ¶ 81). In addition, Vedanti argues:

> There is no disclosure to suggest to one of ordinary skill in the art how to modify the encoding system of Belfor to accommodate an indication of block size, an indication of location for each block and an identification of one of a set of lattice modes particular to the block size for each individual block.

Id. at 67 (citing Ex. 2001 ¶ 81).

In its Reply, Google attempts to reinforce its simple substitution theory. Google cites extensively to a supplemental declaration from Dr. Grindon for the proposition that "Belfor's approach for dividing an image into uniform blocks could simply be substituted with Thyagarajan's subdivision approach for generating non-uniform blocks, without affecting the rest of Belfor's process." Pet. Reply 25 (citing Ex. 1030 ¶ 74). Google argues "the only additional information Belfor's transmitter would need to transmit would relate to how an image is divided into non-uniform sized blocks." *Id.* (citing Ex. 1030 ¶ 75). Google relies on a "high level" conception of Belfor's sampling lattices such that they can be abstracted to fit any block size. *Id.* at 26–29 (citing, *inter alia*, Ex. 1030 ¶¶ 78–85). In particular, Google argues an ordinarily skilled artisan "would have readily recognized that comparisons among non-uniform blocks could easily be made 'apples to apples' by simply weighting each block to take into account the proportion of space each non-uniform block takes in an image." *Id.* at 28 (citing Ex. 1030 ¶ 81).

Google's Reply, along with Dr. Grindon's supplemental declaration, highlight the non-trivial modifications that would have been necessary to implement Thyagarajan's variable block subdivision regime in Belfor's system. The 215 Petition only provides cursory evidence of how such a combination would have been made. *See* 215 Pet. 24–25. Even if we were to credit the substantial arguments made in Google's Reply (*see* Pet. Reply 23–29), Google has not established that incorporating Thyagarajan's subdivision approach into Belfor would have been a simple substitution for one of ordinarily skill in the art, which is the basis for Google's assertion that a person of ordinary skill in the art would have had reason to combine the teachings of Belfor and Thyagarajan.

Belfor's system makes no accommodation for differently sized blocks, but rather specifically teaches that "[t]he size of the blocks is *an important system parameter*." Ex. 1007, 4 (emphasis added). Each uniformly sized block in Belfor is "sampled with a sampling lattice optimally suited for that particular block." *Id.* The data transmitted after sampling "would include the mode assignment for each block and the pixels remaining after applying the respective subsampling to each of the blocks." Ex. 2001 ¶ 66. Thus, in Google's proposed Belfor-Thyagarajan combination, Belfor's system would have to be changed substantially, insofar as it has no existing means for tracking block sizes and transmitting block size information. *See* Ex. 2001 ¶ 81.

In addition, Thyagarajan subdivides blocks using quad-tree decomposition, and it creates PQR data related to how the blocks are decomposed. Ex. 1008, 5:41–46. According to Dr. Kia, "PQR data merely provides indications 'to split' or 'not to split'" as part of Thyagarajan's quad-tree decomposition. Ex. 2001 ¶ 85 (citing Ex. 1008, 6:5–47). Vedanti is correct (PO Resp. 73) that Google "has not relied on that [PQR] data," as Google instead generically references "region data (blocks)." 215 Pet. 28; Pet. Reply 29. Even if Belfor's system were modified to accommodate variably sized blocks, we agree with Vedanti (PO Resp. 70–74) that the transformation from Thyagarajan's quad-tree split data to block size data is not only unaddressed in Google's Petition, but it also would require a further non-trivial modification of Belfor's system. *See* Ex. 2001 ¶ 85.

In addition, the sampling lattices of Belfor are applied to each of the uniformly sized blocks. *See* Ex. 1007, 4. If Belfor were modified by Thyagarajan in the way suggested by Google, Belfor would no longer have uniform blocks. As such, Belfor's conventions for applying sampling lattices, and the lattices themselves, would have to be modified. We agree with Vedanti that Google's Petition does not indicate how Belfor's encoding system would be modified "to accommodate concurrent use of different sized blocks and different sets of modes." PO Resp. 66–67 (citing Ex. 2001 ¶ 81). And, although Google contends in reply that an ordinarily skilled artisan would have known how to abstract Belfor's lattice modes to fit blocks of any size (*see* Pet. Reply 26–29), the further modifications of

Belfor's encoding system necessary to implement variable block sampling cut against the notion of simple substitution. *See* Ex. 2001 ¶ 81.

Having considered the entire record developed during trial, we determine Google fails to provide a persuasive rational underpinning to support its contention that Thyagarajan's variable block subdivision regime could be substituted simply into Belfor's fixed-block subsampling system, or that a person of ordinary skill in the art otherwise would have had reason to combine the references' teachings in the manner asserted. *See KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Thus, we conclude Google has not demonstrated, by a preponderance of the evidence, that the subject matter claim 1 would have been obvious over the combination of Belfor, Thyagarajan, and Golin.

4. Claims 6, 7, 9, 10, 12, and 13

Google's analysis for independent claims 7 and 10 (*see* 215 Pet. 41–43, 53–54) and dependent claims 6, 9, 12, and 13 (*see id.* at 36–39, 49–50, 58) relies on the same simple substitution rationale for combining the teachings of Belfor and Thyagarajan. Because Google's challenges for these claims suffer from the same deficiencies as claim 1, we further conclude Google has not demonstrated, by a preponderance of the evidence, that the subject matter of claims 6, 7, 9, 10, 12, and 13 would have been obvious over the combination of Belfor, Thyagarajan, and Golin.

C. Vedanti's Contingent Motion to Amend

In its Contingent Motion to Amend, Vedanti proposes to substitute claims 14 and 15 for claims 7 and 9, respectively, if claim 7 is found unpatentable; and to substitute claims 16 and 17 for claims 10 and 12, respectively, if claim 10 is found unpatentable. Mot. to Amend 1. Because we determine that claims 7 and 10 are unpatentable, we reach the merits of Vedanti's Contingent Motion to Amend.

As the moving party, Vedanti bears the burden of proof to establish that it is entitled to the relief requested. *See* 37 C.F.R. § 42.20(c). Entry of proposed amendments is not automatic, but occurs only upon the patent owner having met the requirements of 37 C.F.R. § 42.121 and demonstrating the patentability of the proposed substitute claims. *See MasterImage 3D, Inc. v. RealD Inc.*, Case IPR2015-00040 (PTAB July 15, 2015) (Paper 42, "*MasterImage*") (precedential)*; Idle Free Sys., Inc. v. Bergstrom, Inc.*, Case IPR2012-00027, slip op. at 7–8 (PTAB June 11, 2013) (Paper 26, "*Idle Free*") (informative). For the reasons explained below, we conclude that Vedanti has not met its burden with respect to proposed substitute claims 14–17.

1. Patentability of Substitute Claims 14 and 15

Vedanti proposes claim 14, which is reproduced below, as a substitute for claim 7.

> 14. A method for transmitting data comprising:
>
> receiving frame data;
>
> generating optimized matrix data from the frame data, <u>wherein the optimized matrix data defines at least two regions having different aspect ratios</u>;
>
> selecting one of two or more sets of pixel data based on the optimized matrix data;
>
> wherein receiving frame data comprises receiving an array of pixel data;

> wherein generating the optimized matrix data from the frame data comprises setting a matrix size based on pixel selection data:
>
> and transmitting the selection pixel data and the optimized matrix data by assembling the optimized matrix data and the selection pixel data into a generated display frame.

Mot. to Amend 26 (Claims App.) (underlining indicates language that Vedanti is seeking to add). Proposed substitute claim 15 depends from claim 14, and claim 15 is the same as existing claim 9, except for an update to claim dependency. *Id.* at 1, 26.

Vedanti bears the burden of proof to demonstrate patentability of its proposed, substitute claim over the prior art, and, thus, entitlement to the new claim. *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1307–08 (Fed. Cir. 2015) (upholding the approach established in *Idle Free* of allocating to the patent owner the burden of showing the patentability of any proposed substitute claims). In addition, Vedanti must also identify written description support for each proposed substitute claim *as a whole*. 37 C.F.R. § 42.121(b); *see Nichia Corp. v. Emcore Corp.*, Case IPR2012-00005, slip op. at 4 (PTAB June 3, 2013) (Paper 27) (representative). Vedanti's Contingent Motion to Amend fails in both of these respects.

First, Vedanti only lists written description support for its added "different aspect ratios" limitation. *See* Mot. to Amend 2–3. As such, Vedanti has not demonstrated adequate written description support for the claimed subject matter of proposed substitute claim 14 *as a whole*. *See* 37 C.F.R. § 42.121(b)(1); *Nichia*, Case IPR2012-00005, slip op. at 4.

Second, Vedanti does not demonstrate that the subject matter of proposed substitute claims 14 and 15 is patentable over the prior art combination of Spriggs and Golin, which is the same combination over which claim 7 was found to be unpatentable. *See supra* § II.A.6. Regarding the added limitation "wherein the optimized matrix data defines at least two regions having different aspect ratios," Vedanti acknowledges "subregion 2706 in Figure 27 of Golin . . . has a different aspect ratio than the other subregions." Mot. to Amend 7 (citing Ex. 1005, Fig. 27). Notwithstanding, Vedanti contends an ordinarily skilled artisan "would have had no incentive to apply the non-uniform aspect ratios disclosed by Golin . . . in Spriggs." *Id.* Vedanti also argues that Golin's "non-uniform aspect ratios require additional bits to describe the different actions—horizontal split action, vertical split action and fill action," which "would increase the necessary division code data." *Id.* (citing Ex. 1006, Fig. 30).

Google contends, *inter alia*, that proposed claims 14 and 15 are not patentable over the combination of Spriggs and Golin. Pet. Opp. 14–18. Specifically, Google cites the different aspect ratios of the regions in Golin's Figure 27. *See id.* at 14–15 (citing Ex. 1006, 13:46–48, Fig. 27). Different from its analysis for Golin and Spriggs relative to independent claims 1, 7, and 10 (*see supra* § II.A.5.a–b, II.A.6), Google posits the substitution of Golin's binary tree divisions for Spriggs's division codes. Pet. Opp. 15 (citing Ex. 1030 ¶¶ 105–109). According to Dr. Grindon, an ordinarily skilled artisan would have recognized that this substitution would "add[] a few extra bits to the division codes of Spriggs," but "would result in saving many more bits of image data that would need to be stored or transmitted to achieve a given tolerance of image distortion." Ex. 1030 ¶ 106. Google contends "[t]his would have improved transmission data size, compared to simply keeping splits having the same aspect ratio." Pet. Opp. 16. Google also cites Golin's statement that binary tree decomposition "normally result[s] in fewer regions and hence fewer bits." *Id.* at 15 (quoting Ex. 1006, 13:46–48).

We agree with Google that Vedanti has not demonstrated that the subject matter of proposed substitute claim 14 is patentable over the combination of Spriggs and Golin. Specifically, Vedanti does not dispute that the Spriggs-Golin combination discloses the "different aspect ratios" limitation in proposed claim 14 (*see* Mot. to Amend 7), and we already have found that Spriggs and Golin teach all the other limitations of this claim. *See supra* § II.A.6. The only issue we need to address is whether an ordinarily skilled artisan would have had reason to substitute Golin's binary tree decomposition for Spriggs's division codes. Google and Dr. Grindon put forth persuasive reasons for replacing Spriggs's division codes with Golin's binary tree subdivision. *See* Pet. Opp. 15–18; Ex. 1030 ¶¶ 105–109. In addition, we are not persuaded by Vedanti's argument (*see* Mot. to Amend 7) that the additional bits needed for tracking binary tree divisions would have dissuaded an ordinarily skilled artisan from making the combination, because, as pointed out by Google (Pet. Opp. 15), Golin itself extols a benefit that "fewer bits" of image data need be transmitted with binary tree decomposition. Ex. 1006, 13:46–48. As such, we disagree with Vedanti that an ordinarily skilled artisan, "at best[,] would have seen Golin's adjacent pixel variation roughness test as a substitution for Sprigg's interpolation-type roughness test, not Sprigg's division codes." PO Reply 9. We also credit the testimony of Dr. Grindon, who opines that a person of ordinary skill in the art would have appreciated that Golin's binary tree decomposition would save many more bits of transmitted image data than would be added to account for the different splitting algorithm. *See* Ex. 1030 ¶ 106.

For these reasons, we conclude that Vedanti has failed to demonstrate the patentability of proposed substitute claim 14. Vedanti does not argue separately the patentability of proposed claim 15, so we likewise conclude that Vedanti has failed to demonstrate the patentability of that claim.[9]

2. Patentability of Substitute Claims 16 and 17

Vedanti proposes claim 16, which is reproduced below, as a substitute for claim 10.

> 16. A method for transmitting data comprising:
>
> dividing an array of pixel data into two or more regions defined by region data;
>
> selecting a non-predetermined set of pixel data from each region to produce selection pixel data for each region;
>
> wherein dividing the array of pixel data comprises dividing the array of pixel data into two or more matrices having a uniform size;
>
> wherein dividing the array of pixel data comprises dividing the array of pixel data into two or more matrices having two or more different sizes;
>
> and transmitting the region data and the selection pixel data for each region by assembling the region data and the selection pixel data into a generated display frame.

Mot. to Amend 26–27 (Claims App.) (underlining indicates language that Vedanti is seeking to add). Proposed substitute claim 17 depends from

[9] Even if the burden were not on Vedanti to demonstrate patentability, we would determine that proposed substitute claims 14 and 15 are unpatentable under 35 U.S.C. § 103(a) based on the combination of Spriggs and Golin, for the reasons stated by Google and Dr. Grindon.

claim 16, and claim 17 is the same as existing claim 12, except for an update to claim dependency. *Id.* at 1, 27.

Similar to above, Vedanti fails to identify adequate written description support for proposed substitute claim 16 *as a whole* under 37 C.F.R. § 42.121(b)(1) (*see Nichia*, Case IPR2012-00005, slip op. at 4), because Vedanti only identifies written description support for the added limitations in claim 16. *See* Mot. to Amend 3–4.

Regarding patentability over the prior art, our analysis again turns on the combination of Spriggs and Golin, which we determined renders claim 10 unpatentable. *See supra* § II.A.6. Regarding the term "non-predetermined" in proposed claim 16, Vedanti acknowledges Golin discloses random pixel selection, but Vedanti argues this is part of a mean square difference calculation that cannot be combined with Spriggs's interpolation calculation. PO Reply 11 (citing Ex. 1006, 27:41–68). Accordingly, Vedanti argues "Spriggs could not determine the addresses of pixels or regions using the random pixel selection technique disclosed in Golin." *Id.*

Google highlights Golin's teachings on "select[ing] pixels for each subregion at random." Pet. Opp. 19 (citing Ex. 1006, 27:57–28:19). Google cites the following from Golin as providing motivation to use Golin's random pixel selection instead of Spriggs's predetermined selection: "'[a] strategy of picking [] pixels at random, but uniformly distributed over the region [from each subregion] has proven to be effective' in order 'to determine a representative set of pixels for [a mean square difference] calculation.'" *Id.* at 19–20 (quoting Ex. 1006, 27:57–60) (alterations by Google). Accordingly, Google contends "the Spriggs-Golin combination would have suggested to a[n ordinarily skilled artisan] random pixel selection from each region." *Id.* at 20.

We again agree with Google that Vedanti has not demonstrated that the subject matter of proposed substitute claim 16 is patentable over the combination of Spriggs and Golin. Vedanti does not contest that the random pixel selection in Golin is a type of "selecting a non-predetermined set of pixel data." *See* PO Reply 11. Rather, Vedanti's arguments for patentability rest on its contention that Golin's random pixel selection is linked to Golin's "mean square difference calculation," such that it cannot be applied to Spriggs's system. *See id.* We are not persuaded by this argument. As noted by Google (Pet. Opp. 19–20), Golin teaches random pixel selection from sub-regions and notes the effectiveness of this strategy for mean square difference calculations. *See* Ex. 1006, 27:57–28:19. This would have suggested to an ordinarily skilled artisan to use random pixel selection to sample Spriggs's subblocks. Furthermore, we are not persuaded that this modification would render Spriggs unsatisfactory for its intended purpose, as suggested by Vedanti (*see* PO Reply 11), because the modified Spriggs-Golin system could sample/select a random pixel for transmission that is separate from the pixels at the coordinates defining a subblock.

The remaining limitations added by Vedanti in proposed substitute claim 16 do not distinguish the claim over the combination of Spriggs and Golin. In particular, "defined by region data" merely makes more explicit the result of "dividing an array of pixel data into two or more regions"; in fact, "region data" already appears in the "transmitting" step. Mot. to Amend 3 ("A 'region' in original claim 10 is necessarily defined by region data. Indeed, original claim 10 later states that region data is transmitted."), 27 (Claims App.). We are persuaded that Spriggs in view of Golin teaches the limitation for the reasons stated in Google's analysis of the "analysis system . . . generating region data" from claim 1, the step of "generating optimized matrix data" in claim 7, and the step of "dividing an array of pixel data into two or more regions" in claim 10. *See* 212 Pet. 26–29, 38–43, 49–50. Specifically, Spriggs's process for dividing a frame, as modified by Golin's roughness test, creates region data in the form of corner coordinates and division codes. *See supra* § II.A.5.a. Similarly, the added limitation "to produce selection pixel data for each region" merely makes more explicit the result of "selecting a non-predetermined set of pixel data from each region," and the "transmitting" step already recites "selection pixel data." *See* Mot. to Amend 3–4 ("[W]hen 'selecting' a 'set of pixel data from each region,' the method of claim 10 necessarily will produce 'selection pixel data for each region.' Indeed, original claim 10 later states that the selection pixel data is transmitted for each region."), 27 (Claims App.); 212 Pet. 50–52.

For these reasons, we conclude that Vedanti has failed to demonstrate the patentability of proposed substitute claim 16. Vedanti does not argue separately the patentability of proposed claim 17, so we likewise conclude that Vedanti has failed to demonstrate the patentability of that claim.[10]

3 Conclusion

For the reasons set forth above, we deny Vedanti's Contingent Motion to Amend as to proposed substitute claims 14–17.

[10] Even if the burden were not on Vedanti to demonstrate patentability, we would determine that proposed substitute claims 16 and 17 are unpatentable under 35 U.S.C. § 103(a) based on the combination of Spriggs and Golin, for the reasons stated by Google.

E. Motion for Observations

We have considered Vedanti's observations and Google's responses in rendering this Final Written Decision, and accorded Dr. Grindon's testimony appropriate weight in view of Vedanti's observations and Google's responses to those observations. *See* Obs. 2–4; Obs. Resp. 2–5.

III. CONCLUSION

Google has demonstrated, by a preponderance of the evidence, that claims 1, 6, 7, 9, 10, 12, and 13 of the '339 patent are unpatentable under § 103(a) over the combination of Spriggs and Golin. Google, however, has not demonstrated, by a preponderance of the evidence, that claims 1, 6, 7, 9, 10, 12, and 13 of the '339 patent are unpatentable under § 103(a) over the combination of Belfor, Thyagarajan, and Golin.

In addition, Vedanti has not demonstrated, by a preponderance of the evidence, that proposed substitute claims 14–17 are patentable over the asserted prior art.

IV. ORDER

Accordingly, it is

ORDERED that claims 1, 6, 7, 9, 10, 12, and 13 of the '339 patent are held to be unpatentable;

FUTHER ORDERED that Vedanti's Contingent Motion to Amend is *denied*; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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