

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTUITION MACHINES, INC. AND CLOUDFLARE, INC.,

Petitioners,

v.

HUMAN DIFFERENTIAL INTELLIGENCE, LLC,
Patent Owner.

Case No. IPR2023-00631

Patent No. 8,752,141

**PETITION FOR INTER PARTES REVIEW
UNDER 35 U.S.C. §§311-319 AND 37 C.F.R. §42.1 et seq**

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APPENDIX LISTING OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 8,752,141 (“the ’141 Patent”)
1002	Declaration of Daniel P. Lopresti, Ph.D (“Lopresti”)
1003	Curriculum vitae of Daniel P. Lopresti, Ph.D
1004	File History for U.S. Patent No. 8,752,141 (“the ’141 FH”)
1005	U.S. Provisional Application No. 61/076,495 (“HDI’s Provisional”)
1006	U.S. Patent Appl. Pub. No. 2008/0127302 A1 (“Qvarfordt”)
1007	von Ahn, <i>et al.</i> , “CAPTCHA: Using Hard AI Problems for Security” (2003). In: Biham E. (eds) Advances in Cryptology – EUROCRYPT 2003, pp. 294-311. Lecture Notes in Computer Science, vol 2656. (“vonAhn”)
1008	von Ahn, “Human Computation,” CMU-CS-05-193, Carnegie Mellon University School of Computer Science, December 7, 2005 (“vonAhn 2005”)
1009	U.S. Patent Appl. Pub. No. 2009/0113294 A1 (“Sanghavi”)
1010	U.S. Patent Appl. Pub. No. 2009/0313694 A1 (“Mates”)
1011	Greg Kochanski, Daniel Lopresti, and Chilin Shih, “A Reverse Turing Test Using Speech,” Proceedings of the 7th International Conference on Spoken Language Processing, pp. 1357-60, September 16-20, 2002 (“Kochanski”)
1012	U.S. Patent Appl. Pub. No. 2007/0201745 A1 (“Wang”)
1013	U.S. Patent Appl. Pub. No. 2007/0192849 A1 (“Golle”)
1014	U.S. Patent Appl. Pub. No. 2008/0066014 A1 (“Misra”)
1015	U.S. Patent No. 6,195,698 (“Lillibridge”)
1016	U.S. Patent Appl. Pub. No. 2009/0249477 A1 (“Punera”)
1017	Datta, <i>et al.</i> , “IMAGINATION: A Robust Image-based CAPTCHA Generation System.” In Proceedings of the 13th Annual ACM International Conference on Multimedia, pages 331–334, November 2005. (“Datta”)
1018	U.S. Patent No. 8,510,795 (“Gargi”)
1019	U.S. Patent Appl. Pub. No. 2009/0319270 A1 (“Gross”)
1020	U.S. Patent Appl. Pub. No. 2007/0250920 (“Lindsay”)
1021	U.S. Patent No. 5,578,991 (“Scholder”)
1022	U.S. Patent No. 5,835,298 (“Edgerton”)

Exhibit	Description
1023	World Intellectual Property Organization International Publication No. WO 2006/060077 A1 (“Clifford”)
1024	U.S. Patent No. 7,059,182 (“Ragner”)
1025	U.S. Patent Appl. Pub. No. 2006/0193113 A1 (“Cohen”)
1026	U.S. Patent No. 7,142,385 (“Shimotono”)
1027	U.S. Patent Appl. Pub. No. 2007/0259716 A1 (“Mattice”)
1028	U.S. Patent Appl. Pub. No. 2007/0298751 A1 (“Wulff”)
1029	U.S. Patent Appl. Pub. No. 2008/0108340 A1 (“Karstens”)
1030	European Patent Application Publication No. EP 1845468 A1 (“Karrer”)
1031	European Patent EP 2130159B1 (“Baker”)
1032	Shirali-Shahreza, <i>et al.</i> , “Bibliography of Works Done on CAPTCHA,” 2008 3rd International Conference on Intelligent System and Knowledge Engineering, November 17-19, 2008
1033	Merriam-Webster’s Collegiate Dictionary, Eleventh Edition (2007), p. 840 (definition of “noise”), p. 1302 (definition of “threshold”)
1034	Declaration of Rachel J. Watters, with attachments
1035	Declaration of Mary K. Bolin, Ph.D., with attachments
1036	Declaration of Jessica Benner, with attachment
1037	Declaration of Professor Kawahara Tatsuya, with attachment
1038	<i>Human Differential Intelligence LLC v. Cigna Corporation</i> , No. 6:20-cv-00305-ADA (W.D. Tex.), D.I. 19 (Corrected First Amended Complaint)
1039	<i>Human Differential Intelligence LLC v. The Gap, Inc.</i> , No. 6:20-cv-00307-ADA (W.D. Tex.), D.I. 14 (Corrected First Amended Complaint)
1040	<i>Human Differential Intelligence LLC v. Bed Bath & Beyond, Inc.</i> , Civil Action No. 6:20-cv-00310-ADA (W.D. Tex.), D.I. 13 (Corrected First Amended Complaint)
1041	<i>Human Differential Intelligence LLC v. CVS Health Corporation</i> , Civil Action No. 6:20-cv-00311-ADA (W.D. Tex.), D.I. 18 (First Amended Original Complaint)
1042-1052	Reserved
1053	U.S. Patent Appl. Pub. No. 2010/0077209 A1 (“Broder”)
1054	U.S. Patent Appl. Pub. No. 2009/0055910 A1 (“Lee”)
1055	U.S. Patent Appl. Pub. No. 2007/0150745 A1 (“Peirce”)
1056	Declaration of Jessica Benner, with attachment (Feb. 17, 2023)

Exhibit	Description
1057	Declaration of Rachel J. Watters, with attachments (Feb. 20, 2023)
1058	Declaration of Kelley Hayes Greenhill, with attachments (Feb. 22, 2023)
1059	<i>Human Differential Intelligence LLC v. Cloudflare</i> , No. 1:22-cv-01334 (W.D. Tex.), D.I. 13 (Order Staying Case) (Jan. 18, 2023)
1060	<i>Human Differential Intelligence LLC v. Cloudflare</i> , No. 1:22-cv-01334 (W.D. Tex.), PACER Docket (Feb. 22, 2023)
1061	<i>Human Differential Intelligence LLC v. Cloudflare</i> , No. 1:22-cv-01334 (W.D. Tex.), D.I. 1 (Complaint)

Under 35 U.S.C. §§311-19 and 37 C.F.R. §42.1, *et seq.*, Petitioners Intuition Machines, Inc. (“Intuition Machines”) and Cloudflare, Inc. (“Cloudflare”) (together “Petitioners”), request *inter partes* review of claims 1-5 and 7-14 (“Challenged Claims”) of U.S. Patent No. 8,752,141 (“’141 Patent”) (Ex1001).

I. INTRODUCTION

The ’141 Patent concerns methods for presenting and determining the efficacy of an image-based CAPTCHA in which “imagery other than words” is “progressively” presented. Ex1001, Abstract, 4:36-48. A CAPTCHA is an access control system used to protect Internet resources (e.g., websites) from computer “bot” attacks by presenting a challenge humans should pass at a high rate (e.g., 90%) but computers should pass at a low rate (e.g., 0.01%). Ex1002 (Lopresti), ¶68.

Progressive CAPTCHAs—where additional information is revealed to the user progressively over time—were known, as the ’141 Patent admits. *Id.*, 1:46-50. The ’141 Patent suggests the art failed “to appreciate the potential for image based [CAPTCHA] challenges” (*id.*, 1:51-53), but image-based CAPTCHAs were also well known. *See* Ex1006-Ex1007, Ex1009-Ex1010, Ex1012.

The Challenged Claims require measuring the effectiveness of an image-based CAPTCHA challenge by calculating an overall percentage of users who accurately guess the underlying concept associated with the image within a predetermined time. This too was known. Indeed, it would be nonsensical to

implement a CAPTCHA challenge without determining its efficacy, because one with too low a human success rate would be ineffective.

Qvarfordt (Ex1006) discloses a CAPTCHA system that progressively reveals images over time and measures the CAPTCHA's efficacy. Qvarfordt's system routinely introduces new CAPTCHA challenges to leverage user responses. The system presents two challenges to users: (1) a "vetted" CAPTCHA to which humans should respond with a high (e.g., 90% or higher) success rate (and computers should perform poorly), and which is used to provide access control; and (2) an unvetted "novel" CAPTCHA not yet used for access control, but for determining reasonable human responses.

Qvarfordt recognizes that users challenged to identify an image (e.g., a cat) may use different words to characterize the image (e.g., "cat" or "kitten"). For this novel CAPTCHA challenge, after receiving a statistically significant number of user responses so the challenge is "sufficiently vetted," Qvarfordt associates the image with a "solution" ("cat") or solution set ("cat" or "kitten") that represents answers given by a high percentage (e.g., 90%-plus) of users. Qvarfordt, [0052]; Lopreseti, 77. This determines the expected "correct" response for the CAPTCHA, which then moves to the vetted set used for access control. Qvarfordt accordingly measures the efficacy of new CAPTCHA challenges to ensure they meet or exceed a 90% human success rate before being deployed for access control.

Qvarfordt renders the Challenged Claims obvious (Ground 1). The Challenged Claims are also obvious over Qvarfordt in combination with vonAhn (Ground 2). vonAhn expressly discloses a particular technique for calculating the percentage of humans able to successfully solve a CAPTCHA within a predetermined time, and it would have been obvious to implement Qvarfordt by using vonAhn's technique for this purpose.

II. MANDATORY NOTICES

A. Real Parties-In-Interest

Petitioners are the real parties-in-interest. Petitioners agree with and adopt herein analyses previously submitted in IPR2020-01627, Google LLC's previous IPR challenging the '141 Patent, which was terminated via settlement before institution. No other entity was involved in finding and selecting prior art for this Petition, substantive discussions regarding the content of this Petition, drafting this Petition, or filing this Petition. Petitioners have complete control over all petitioner-related aspects of this proceeding and are responsible for all petitioner-related costs and expenses associated with it.

Patent Owner ("HDI") is a Texas corporation that allegedly owns the '141 Patent. Ex1061.

Petitioner Cloudflare was served with HDI's complaint alleging infringement of the '141 Patent on January 5, 2023, less than one year before this Petition.

Ex1060, Ex1061. Petitioner Intuition Machines has never been served with such a complaint, although it is referenced in HDI's complaint against Cloudflare. Ex1061 ¶¶15-16, 26-29, 41-44. This Petition raises no time-bar implications for the Board's ability to institute trial under 35 U.S.C. §315(b).

B. Related Matters

A decision in this proceeding could affect or be affected by:

1. United States Patent & Trademark Office

The application from which the '141 Patent issued claims priority to U.S. Provisional Application No. 61/076,495 ("HDI's Provisional"), filed June 27, 2008.

The following applications also claim the benefit of HDI's Provisional:

- U.S. Patent Application No. 15/268,309 (U.S. Patent No. 9,789,394), filed September 16, 2016;
- U.S. Patent Application No. 12/494,013 (U.S. Patent No. 9,266,023), filed June 29, 2009;
- U.S. Patent Application No. 12/494,065 (U.S. Patent No. 9,186,579), filed June 29, 2009;
- U.S. Patent Application No. 14/873,727 (U.S. Patent No. 9,474,978), filed October 2, 2015;
- U.S. Patent Application No. 14/223,824 (U.S. Patent No. 9,295,917), filed March 24, 2014; and

- U.S. Patent Application No. 14/233,848 (U.S. Patent No. 9,192,861 (“the ’861 Patent”)), filed March 24, 2014.¹

2. U.S. District Court for the Western District of Texas

- Human Differential Intelligence LLC v. Cloudflare, Inc., No. 1:22-cv-0134 (W.D. Tex.);
- Human Differential Intelligence LLC v. Cigna Corporation, No. 6:20-cv-00305 (W.D. Tex.) (dismissed);
- Human Differential Intelligence LLC v. The Gap, Inc., No. 6:20-cv-00307 (W.D. Tex.) (dismissed);
- Human Differential Intelligence LLC v. Bed Bath & Beyond Inc., No. 6:20-cv-00310 (W.D. Tex.) (dismissed); and
- Human Differential Intelligence LLC v. CVS Health Corporation, No. 6:20-cv-00311 (W.D. Tex.) (dismissed).

C. Counsel and Service Information – 37 C.F.R. §42.8(b)(3) and (4)

Lead Counsel: Elliot C. Cook (Reg.# 61,769; Tel. (571) 203-2738;

elliott.cook@finnegan.com); Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, 1875 Explorer Street, Suite 800, Reston, VA 20190-6023.

¹ Petitioners are concurrently filing a petition for IPR of several claims of the ’861 Patent.

Back-Up Counsel: Luke H. MacDonald (Reg.# 79,064; Tel. (571) 203-2742; luke.macdonald@finnegan.com); Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, 1875 Explorer Street, Suite 800, Reston, VA 20190-6023.

Back-Up Counsel: Christopher T. Bovenkamp (Reg.# 44,551; Tel. (214) 521-6400; cbovenkamp@ccrglaw.com); Charhon, Callahan, Robson, & Garza, PLLC, 333 Lee Parkway, Suite 460, Dallas, TX 75219.

Powers of attorney are submitted with the Petition.

D. Grounds for Standing

Petitioners certify that the '141 Patent is available for IPR and that Petitioners are not barred or estopped from requesting review as to the Challenged Claims. 37 C.F.R. §42.104(a).

E. Grounds for Unpatentability

Petitioners request cancellation of claims 1-5 and 7-14. The table below identifies the references, claims, and basis for unpatentability.

Ground Number and Reference(s)		Claims	Basis
1	Qvarfordt (Ex1006)	1-5 and 7-14	§103
2	Qvarfordt (Ex1006) + vonAhn (Ex1007)	1-5 and 7-14	§103

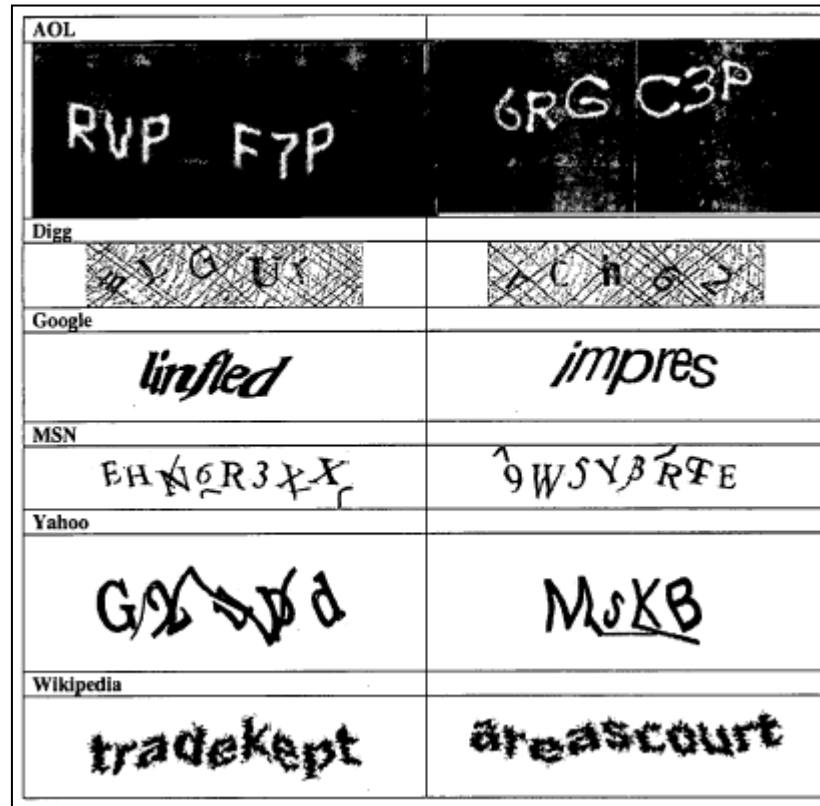
III. '141 PATENT OVERVIEW

A. Technology Background

The '141 Patent claims methods for presenting, and determining the efficacy of, image-based CAPTCHAs to protect websites and networked devices from automated access, an area in the field of access control in computer security. Ex1001, Title, 1:43-45; Lopresti, ¶41. CAPTCHAs were first developed in the late 1990s to control access to computers via the Internet and prevent automated hacking attacks from computer “bots.” Ex1008, 13-14²; Lopresti, ¶41. A CAPTCHA prevents automated attacks by requiring users to perform tasks, or pass a test, that humans can perform well, but computers generally cannot perform well, before accessing the website or computer. Ex1008, 12-13; Lopresti, ¶41.

² Petitioners cite to internal pagination of Ex1008.

Early CAPTCHA tests involved displaying a distorted text image and required the user to type the displayed word, as shown in the example below:



Ex1009, FIG. 1. While distorted-text CAPTCHAs succeeded for a time, by the mid-2000s computers could solve certain text-based challenges with reasonable success, so the industry was developing CAPTCHAs based on other tasks computers could not perform well, such as non-text image recognition and motion-based challenges. Ex1008, 15-17; Lopresti, ¶¶42-44.

B. The '141 Patent

The '141 Patent claims priority to HDI's Provisional, which focuses primarily on an electronic Pictionary™-like game. In the 38-page provisional, CAPTCHA

is mentioned in just a single paragraph. Ex1005, 17-18. The '141 Patent specification likewise focuses on that game, mentioning CAPTCHA in only three passages largely absent from HDI's Provisional. Ex1001, 1:43-56, 4:36-5:62, 14:5-15:4; Lopresti, ¶45.

The '141 Patent admits CAPTCHA was “well-known for controlling access to computers and resources on the Internet,” and that “progressive” CAPTCHA challenges were known. Ex1001, 1:43-48; Sanghavi (Ex1009), which the '141 Patent incorporates by reference, discloses that “progressive” CAPTCHAs “do not reveal the entire captcha to the user at once, but rather do so slowly and/or in multiple pieces.” Ex1009, [0026]. The '141 Patent characterizes Sanghavi's progressive CAPTCHA as using “conventional (distorted) text type challenges,” and suggests that Sanghavi “fail[ed] to appreciate the potential for image[-]based challenges.” Ex1001, 1:51-53; Lopresti, ¶46.

The '141 Patent states that, unlike text approaches, “recognition of images can be incorporated as part of a picture[-]based game to develop appropriate challenges.” Ex1001, 1:53-56. The '141 Patent accordingly discloses “a CAPTCHA challenge system that...introduce[s] visual content to be reviewed by humans to determine what appropriate tags/concepts are presented for the image in question.” *Id.*, 14:5-8; Lopresti, ¶47.

Specifically, “the challenge system could determine that an (intentionally visually distorted) image A is nonetheless identified as either X or Y by 90% of the population,” making it “suitable for inclusion in a CAPTCHA system.” *Id.*, 14:9-13. “The image could be re-presented at various times to different participants/Internet viewers—and with different levels of degradation—until it is no longer recognized by a certain percentage of the population.” *Id.*, 14:13-17. To meet the CAPTCHA system’s requirements, this process can repeat iteratively with “progressively degraded versions of the image,” and correct answers and recognition times for each iteration can be measured. *Id.*, 14:17-20. Thus, the alleged “invention can act as a form of testing ground for these types of challenge systems.” *Id.*, 14:21-22; Lopresti, ¶48.

After this “testing” of the image to determine its suitability for inclusion in a CAPTCHA system, “[a]n optimized set of image challenges” can be presented “as part of a CAPTCHA [challenge] to gain access to accounts, data, computing resources, etc.,” where “[t]he user would be asked to provide the identity of the image” through, for example, a keyboard. Ex1001, 14:23-27; Lopresti, ¶49.

The ’141 Patent accordingly discloses and claims both a method of *testing* image recognition for a CAPTCHA system, and a method of *providing* a visual

CAPTCHA challenge.³ Ex1001, 4:36-38, 4:58-60, claims 1, 5, 10. In both methods, the CAPTCHA system/challenge automatically elects an electronic image—i.e., imagery other than words—for a participant. *Id.*, 4:36-41, 4:60-63, claims 1, 5, 10; Lopresti, ¶¶50-51. The image is associated with one or more “concepts,” like “ideas, people, places, things, actions, emotions, etc.” Ex1001, 4:41-42, 4:63-64, 6:36-40, claims 1, 5, 10.

Initially, ***not all*** the image information is presented. Instead, the image is presented in a state that includes only “a subset of said set of imagery data for said electronic image.” *Id.*, claim 1; *see also* claim 5 (same), claim 10 (referring to state in which “only a first portion of the image information therein is perceptible”). The system then “progressively reveal[s] information over a first time period for the electronic image.” *Id.*, Abstract, 4:42-45, 4:64-66, claims 1, 5, 10. The methods automatically process responses to determine if the user correctly guessed the concept(s). *Id.*, 4:45-48, 4:66-5:3, claims 1, 5, 10. The methods further measure effectiveness by calculating or determining a percentage of participants able to correctly solve the CAPTCHA within a predetermined time. *Id.*, Abstract, 4:49-51, claims 1, 5, 10; Lopresti, ¶52.

³ Petitioners add emphasis, and omit quotations and citations, except as noted.

C. Prosecution History

The Examiner originally rejected application claims 1-10, “drawn to a method for presenting and progressively revealing an image and determine [*sic*] accuracy of a response” (Ex1004, 217-220), as anticipated by Mates (Ex1010). Ex1004, 226-227.

The applicant then amended the claims to recite that the “automatically elect[ed]” electronic image “comprises a set of imagery data *other than words*” and “is configured such that *a subset* of [the] set of imagery data ... can be made perceptible in a first image state,” and then progressively revealed. Ex1004, 261-264. The applicant argued that Mates did not disclose a method that “processes participant responses to the *progressively-revealed electronic image* to correlate their accuracy with the concepts (claim 1) or to detect if a guess meets a required threshold (claim 6).” *Id.*, 265. The applicant argued that Mates instead “discloses an image CAPTCHA challenge in which a single, static image or images is transmitted to the user,” such as a stereogram (akin to Magic Eye puzzles). *Id.* The applicant argued that for such images, although the viewer may not appreciate the full illusion at once, “all of the information must be viewed concurrently,” and thus, does not disclose “progressively revealing information in the electronic image over a period of time.” *Id.*, 265-266; *see id.*, 266 (“in Mates, images cannot be revealed progressively”).

The Examiner rejected the amended claims over Mates in view of Sanghavi (Ex1009). Ex1004, 285-287. The Examiner found that “Sanghavi teaches progressive CAPTCHAS including an electronic image [that] is configured such that a subset of set of imagery data for said electronic image can be made perceptible in a first image state” and “progressively reveal[ed]” over time. *Id.*, 286. The Examiner determined it would have been obvious “to employ the teachings of Sanghavi within the system of Mates” to enhance the system’s security.” *Id.*

In an interview summary, the Examiner asserted “Sanghavi teaches a progressive CAPTCHA, and ... it would have been obvious to modify the teachings of Mates to deliver a progressive pictorial CAPTCHA,” as claimed. *Id.*, 316. In a final rejection, the Examiner found “Sanghavi teaches progressive CAPTCHAS” as claimed and referred to Sanghavi’s disclosure of “portions” of an image being displayed progressively over time as teaching “a subset of imagery data” “progressively reveal[ed]” over a first time period. *Id.*, 286; Ex1009, [0038], FIG. 6. The applicant did not dispute the Examiner’s assertion that Sanghavi taught progressively revealing an image over time. *Id.*, 315-317; Lopresti, ¶¶53-57.

Rather, the applicant relied on the Examiner’s finding that neither Mates nor Sanghavi disclosed the further limitation in dependent claims 2 and 24—“calculating an overall percentage of users who accurately guess the underlying concept within a predetermined time.” Ex1004, 315-17, 322. The applicant amended the

independent claims to include that feature, and the claims were allowed. *Id.*, 311-314; Lopresti, ¶57.

D. The Challenged Claims

Independent claims 1, 5, and 10 share many limitations, with the only differences highlighted below.

Claim 1	Claim 10	Claim 5
[1PRE / 10PRE ⁴] A method of <i>testing recognition of images for</i> a Completely Automatic Public Turing Test To Tell Humans And Computers Apart (CAPTCHA) <i>system</i> comprising:		[5PRE] A method of <i>providing a visual</i> Completely Automatic Public Turing Test To Tell Humans And Computers Apart (CAPTCHA) <i>challenge</i> comprising:
[1A] a. automatically electing an electronic image for a participant with a computing system, wherein said electronic image comprises a set of imagery data other than words, and wherein said electronic image is <i>configured such that a subset of said set of imagery data for said electronic image can be made perceptible in a first image state;</i>	[10A] a. automatically electing an electronic image for a participant with a computing system, wherein said electronic image comprises a set of imagery data other than words, and wherein said electronic image is <i>presentable with differing amounts of data, including a first image state in which only a first portion of the image information therein is perceptible;</i>	[5A] a. automatically electing an electronic image for a participant with a computing system, wherein said electronic image comprises a set of imagery data other than words and wherein said electronic image is <i>configured such that a subset of said imagery data for said electronic image can be made perceptible in a first image state;</i>
[1B / 10B / 5B] b. associating said electronic image with one or more concepts;		

⁴ Claim 10's preamble is identical to claim 1's preamble except that in claim 10, "CAPTCHA" is not enclosed in parentheses.

Claim 1	Claim 10	Claim 5
[1C] c. presenting said electronic image in said first image state and progressively revealing information over a first time period within an interface for said participant using said computing system;	[10C] c. presenting said electronic image in said first image state and progressively revealing additional information in said electronic image over a first time period within an interface for said participant using said computing system;	[5C] c. progressively revealing information in said electronic image over a first time period within an interface for said participant using said computing system;
[1D / 10D] d. automatically processing responses from the participant with the computing system to correlate an accuracy of guesses from said participant for said one or more concepts associated with said electronic image; and		[5D] d. automatically processing responses from the participant with the computing system to detect if a guess from said participant for said one or more concepts associated with said electronic image meets a required threshold ; and
[1E / 10E] e. calculating a percentage of participants able to decode and accurately guess said one or more concepts within a predetermined time.		[5E] e. determining a percentage of participants with guesses meeting the required threshold within a predetermined time.

The challenged dependent claims add implementation details known in the art. See Ex1001, claims 2, 11 (“progressively revealing” “electronic image at different time intervals with differing levels of resolution, noise and/or pixelation”); 3, 13 (using image-based CAPTCHA system to grant access to resources of “a second computing system”); claims 4, 14 (using image-based CAPTCHA system to grant access to resources of “a second computing system” that is “associated with a

portable electronics device”); claim 7 (CAPTCHA challenge implemented on a “portable computing device” with “motion and/or orientation sensors”); claim 8 (“physical CAPTCHA challenge” requiring user to “manipulate the portable computing device”); claim 9 (“physical CAPTCHA challenge” requiring user to “interact” with electronic image and/or other objects in user interface); and claim 12 (“automatically processing responses” when electronic image first presented and when progressively revealed).

E. Level of Ordinary Skill in the Art

The ’141 Patent claims priority to HDI’s Provisional, filed June 27, 2008. *Id.*, (60). Petitioners do not concede the priority claim, but it does not impact the level of ordinary skill.

A person of ordinary skill in the art (“POSA”) in mid-2008 or mid-2009 would have had at least a bachelor’s degree in Computer Science or a related field, along with at least two years of work or research experience in computer security, and some experience with CAPTCHA. More education could substitute for less experience, and vice versa. Lopresti, ¶¶34-40.

IV. CLAIM INTERPRETATION

This Petition construes claim terms using the *Phillips* standard. 37 C.F.R. §42.100(b).⁵

V. GROUNDS FOR UNPATENTABILITY

A. Ground 1: Qvarfordt Renders Claims 1-5 and 7-14 Obvious

1. Qvarfordt (Ex1006)

Qvarfordt, filed August 22, 2006 and published May 29, 2008, is prior art under at least pre-AIA §§102(a) and 102(e). Qvarfordt, (22), (43).

Qvarfordt is one of over 100 references cited during the '141 Patent's prosecution. Ex1001, (56). The Examiner did not comment on Qvarfordt nor use it in a rejection. This weighs heavily against discretionary denial. *See infra* §VI.B. Qvarfordt teaches various image-based CAPTCHAs “that can be easily resolved by human sense of motion.” Qvarfordt, [0010]. Qvarfordt provides CAPTCHAs based on “obscuring images in a way ... easily perceived by humans while not by machines.” *Id.*, [0011].

Qvarfordt recognizes that for CAPTCHA systems using distorted text, there is only so much the letters “can be distorted and yet be recognizable to humans.” *Id.*, [0005]. “[T]he distorted letters can be hard to read for many people and lead to exclusion of these users.” *Id.* An oft-cited threshold is that humans' success rate

⁵ There have been no prior claim construction determinations.

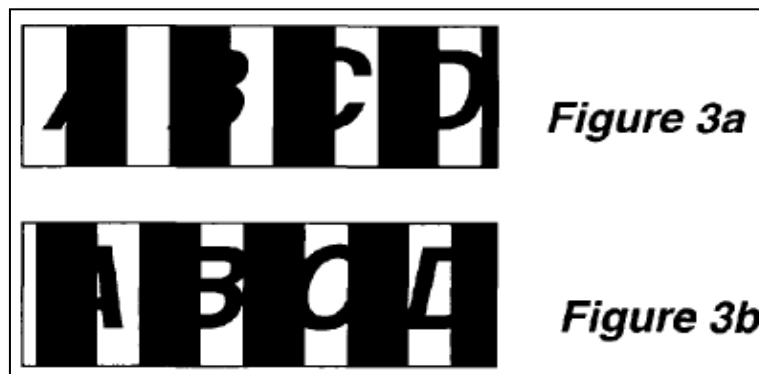
should be 90%, while computers' success rate should only be 0.01%. *Id.* But even with a 90% success rate, humans still fail one of ten trials, “which causes frustration towards the service provider.” *Id.* Accordingly, Qvarfordt provides “CAPTCHAs that are *as easy as possible* to solve by humans yet preserve or increase the difficulty for computers to solve them.” *Id.*

Qvarfordt describes animated CAPTCHAs “that can be easily resolved by human sense of motion.” *Id.*, [0010]; *see also id.*, Abstract, [0011]-[0012]. The animation includes foreground and background layers. *Id.*, Abstract, [0012]. The background layer comprises a recognizable image to decipher, and the foreground layer partially obstructs that image. *Id.*, Abstract, [0012], [0055], FIG. 10. When the CAPTCHA is a looped animation, the foreground always obstructs part of the image, but the obstructed part changes over time. *Id.*, [0031]. Thus, the user can “easily decipher” the encoded image, “as at each point in time the user will see part of the solution and will be able to easily integrate the parts to decipher the whole.” *Id.* The image becomes easily identifiable as the animation reveals more of the image over time. Lopresti, ¶¶67-69.

Based on anorthoscopic perception (a visual phenomenon), humans “excel at integrating low[-]resolution or conflicting images into apparently high[-]resolution and complete images over time.” Qvarfordt, [0030]. When driving past a fence with vertical openings between the boards, for instance, “the view of the scenery on the

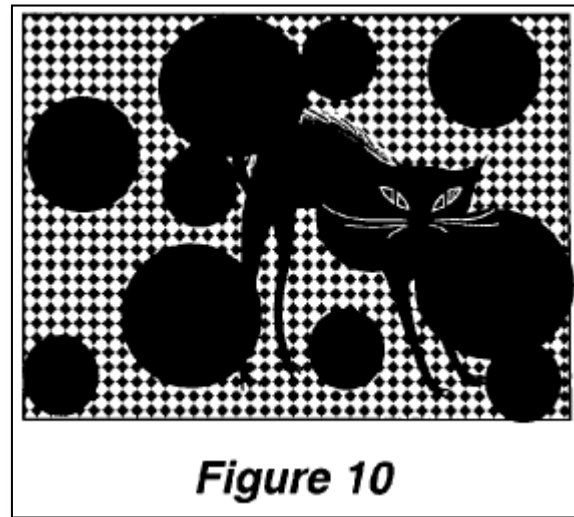
other side of the fence appears uninterrupted until the car is stopped.” *Id.* Lopresti, 70.

Qvarfordt’s Figures 3a-3b (below) show an example of a motion-based CAPTCHA, where the letters “ABCD” are stationary, but vertical black lines move right-to-left. *Id.*, [0032]. The vertical lines always cover part of each letter, so the letters are never shown “completely exposed.” *Id.* Like the scenery behind the picket fence, however, humans can easily perceive the background letters when the lines are moving. *Id.* As the animation progresses, revealing more of the letters, “at each point in time the user will see part of the solution and will be able to easily integrate the parts to decipher the whole.” *Id.*, [0031]. Lopresti, ¶71.



Qvarfordt refers to the letters to be deciphered as the “encoded solution.” *Id.*, [0032]. The “encoded solution” is not limited to letters, and may be numbers, shapes, symbols, etc. *Id.* “[T]he solution need not necessarily be a typographical character, but can be any recognizable image, which also comes under the term ‘encoded solution.’” *Id.* Lopresti, ¶72.

Figure 10 (below) shows a snapshot of an example animated CAPTCHA where “the encoded solution is an image”—here, a cat. Qvarfordt, [0055].



One layer comprises a background (diamond-pattern wallpaper), another includes the encoded solution (cat), and a top layer comprises obstruction elements (“floating disks”). *Id.*, [0053], [0055], FIG. 10. Like other embodiments, the motion may be set automatically as in an animation clip, and “when the complete animation is presented to a user in a continuous manner, the user will be able to easily decipher the [image], as at each point in time the user will see part of the solution and will be able to easily integrate the parts to decipher the whole.” *Id.*, [0031], [0055]. Once deciphered, “[t]he user is then required to enter a word corresponding to the image.” *Id.*, [0055]; Lopresti, ¶¶73-74.

Machine processing is unable to decode the animated CAPTCHA, because the “encoded solution” is never shown in a complete form, even though over time

all parts or portions of the image information may be eventually revealed. Qvarfordt, [0031]; Lopresti, ¶75.

Recognizing the difficulty of anticipating all reasonable human responses to CAPTCHAs “based on images, video, or interaction” (versus letter-based CAPTCHAs), Qvarfordt discloses an embodiment where “users are required to solve multiple CAPTCHAs consisting of two sets, one already vetted CAPTCHAs and a set of novel CAPTCHAs.” *Id.*, [0052]. For pre-vetted CAPTCHAs, the answers “determine whether the entity accessing the site is a human, and that information is used both to allow access to resources and to decide whether to use that entity’s labels for the CAPTCHAs in the second set.” *Id.* For the unvetted set of novel CAPTCHAs, the user’s response helps determine reasonable human responses to that CAPTCHA and assess its vulnerability to attack. *Id.*; Lopresti, ¶76.

Once sufficiently vetted, CAPTCHAs in the second set move to the first set, where the method associates a solution (e.g., “cat”) or solution set (e.g., “cat” or “kitten”) with them. Qvarfordt, [0052]. Such a move “can be made after a statistically significant number of solutions to the second test have been received.” *Id.* Then, “either the highest scoring solution is chosen as a correct solution, or a set of most commonly received solutions is chosen as the correct solution and a user entering any of the solution from the set, is granted access.” *Id.*; Lopresti, ¶77.

Qvarfordt thus discloses both a method of testing recognition of images for a CAPTCHA system and a method of providing an image-based CAPTCHA challenge. Lopresti, ¶78.

2. Claim 1

a. Preamble [1PRE]

To the extent limiting, Qvarfordt discloses a “method of testing recognition of images for a Completely Automatic Public Turing Test To Tell Humans And Computers Apart (CAPTCHA) system,” per claim 1’s preamble. Lopresti, ¶¶79-85.

In Qvarfordt’s two-set CAPTCHA embodiment, where users must solve two sets of image-based CAPTCHAs, user recognition of the novel image is tested. Qvarfordt, [0052]; Lopresti, ¶80. The received responses to the test are used to, *inter alia*, determine reasonable human responses to that novel CAPTCHA challenge. *Id.* In this respect, Qvarfordt observes that CAPTCHA systems that seek to, *a priori*, assign “an unambiguous label for each CAPTCHA” are disadvantageous. Qvarfordt, [0052]; Lopresti, ¶¶81-82. Qvarfordt’s system takes a different approach, testing human responses to a novel image by collecting a “statistically significant number of solutions” that users provide for that novel image, and then using those solutions to “*determine reasonable human responses* to that CAPTCHA.” Qvarfordt, [0052]; Lopresti, ¶82. Thus, Qvarfordt teaches a method of “testing recognition of images” in the novel CAPTCHA challenges. Lopresti, ¶¶82-84.

To the extent HDI contends that claim 1, like claim 5 (discussed below, §V.A.6), is directed to providing a visual CAPTCHA challenge using images with pre-associated concepts (i.e., pre-known solution or solution set), Qvarfordt also discloses such a system at least with its vetted set of image-based CAPTCHAs, as set forth in connection with claim 5. *Infra*, §V.A.6; Lopresti, ¶¶85.

b. Limitation [1A]

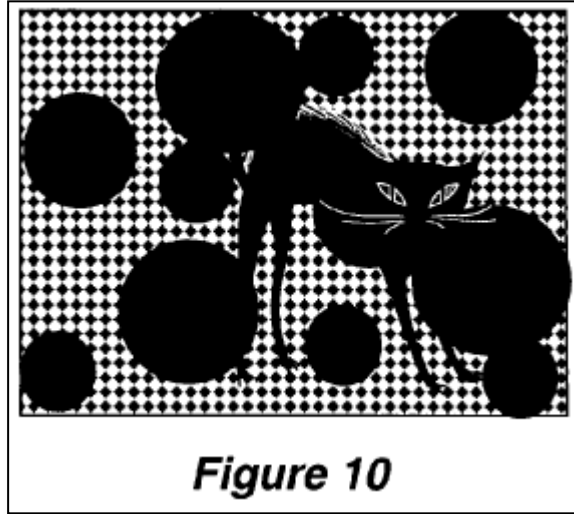
Qvarfordt discloses “automatically electing an electronic image for a participant with a computing system, wherein said electronic image comprises a set of imagery data other than words, and wherein said electronic image is configured such that a subset of said set of imagery data for said electronic image can be made perceptible in a first image state,” per limitation [1A]. Lopresti, ¶¶86-96.

First, Qvarfordt discloses “automatically electing an electronic image for a participant with a computing system.” *Id.*, ¶87. The “CA” in CAPTCHA stands for “Completely Automated.” Qvarfordt, [0004]; Lopresti, ¶87. Qvarfordt repeatedly describes its CAPTCHA test as “automated,” and teaches that it elects an image for a participant with a computing system. Qvarfordt, Abstract (“automated test to tell computers and humans apart”; “[t]he automated test may comprise displaying on a computer screen an image”), [0012] (“an automated test...which comprises: displaying on a computer screen an animation comprising...recognizable images”),

claim 1 (“An automated method...comprising: displaying on a computer screen an animation comprising...a recognizable image[.]”); Lopresti, ¶87.

Alternatively, if the Board does not consider Qvarfordt to expressly disclose that its CAPTCHA steps are automated, that would have been the conventional and obvious way to implement a CAPTCHA method of the type Qvarfordt describes. Lopresti, ¶¶88-90 (citing Exhibits 1008 and 1011 describing advantages of fully-automated CAPTCHAs); Ex1036-Ex1037 (establishing authenticity and public accessibility of Ex1008 and Ex1011); Ex1035 (Bolin), ¶¶38-50 (same); Ex1056 (same); Ex1058 (Greenhill), ¶¶24-45 (same).

Second, Qvarfordt discloses that the “electronic image comprises a set of imagery data other than words.” Lopresti, ¶91. Qvarfordt’s “automated test may comprise displaying on a computer screen *an image*.” Qvarfordt, Abstract. Qvarfordt’s “encoded solution” “can be *any recognizable image*.” *Id.*, [0032] (“*numbers, shapes, symbols*, etc.”), [0034] (“*animals or fruits and vegetables*”). Figure 10 shows an electronic image comprising a set of imagery data other than words. Lopresti, ¶¶91-92.



Qvarfordt, [0055] (“[I]n FIG. 10 the encoded solution is *an image, rather than a typographical character.*”).

Third, Qvarfordt’s “electronic image is configured such that a subset of said set of imagery data for said electronic image can be made perceptible in a first image state.” The encoded image in Qvarfordt’s CAPTCHA test, like any other electronic image, is comprised of imagery data—rows and columns of pixels, which are the smallest individual elements in an image and holding values that represent brightness and color at a specific point. Lopresti, ¶93.

In Qvarfordt’s looped animation CAPTCHA, a foreground layer continuously obstructs different parts of the encoded image. Lopresti, ¶94. When the *entire* animation is presented continuously, the user can “easily decipher” the encoded image, “as at each point in time the user will see *part* of the solution and will be able to easily integrate the parts to decipher the whole.” Qvarfordt, [0031]; *see also id.*,

[0036] (“the sum of all frames can be set as not to give a complete image of the encoded solution” because “human perception is very good at ‘completing the picture’ even when elements are missing.”). Thus, “[t]he portions of the encoded solution that are visible [are] changing over time” (*id.*, [0036]), and only a subset of the electronic image’s data is perceptible at any given time. *Id.*, [0031] (only “*part* of the solution” is visible “at each point in time”); Lopresti, ¶94. At any given time, the obstructing objects in the foreground are positioned such that only particular “part[s]” or “portions” of the encoded image are revealed. Qvarfordt, [0031], [0036]; Lopresti, ¶94. The exposed parts or portions of the encoded image at any particular time represent a “first image state” of the encoded image as claimed. Lopresti, ¶94.

Figure 10 demonstrates this limitation, as it presents the cat image in a particular state with certain portions obstructed by the disks and other portions “made perceptible” to the user as claimed. Qvarfordt, [0055]; Lopresti, ¶95. Figure 10’s snapshot of the animated CAPTCHA shows that the disks are positioned so that the cat is not completely exposed; only a subset of the cat image is perceptible in the image state shown. Lopresti, ¶95.

The prosecution history supports interpreting the “subset of said set of imagery data” made perceptible to the user in a manner that reads on Qvarfordt’s disclosure of different portions of the image at different times. Sanghavi similarly discloses revealing “portion[s]” of a CAPTCHA image at different times, the

Examiner interpreted the “subset of imagery data” onto portions of Sanghavi’s image, and the applicant never challenged that interpretation. Ex1004, 286, 315-317; Ex1009, [0038], FIG. 6; Lopresti, ¶96. *See Salazar v. Procter & Gamble Co.*, 414 F.3d 1342, 1347 (Fed. Cir. 2005) (“Statements about a claim term made by an examiner during prosecution of an application may be evidence of how one of skill in the art understood the term at the time the application was filed.”).

c. Limitation [1B]

Qvarfordt discloses “associating said electronic image with one or more concepts,” per limitation [1B]. Lopresti, ¶¶97-98.

Each image-based CAPTCHA in Qvarfordt has a solution (or solution set), which is a concept as claimed. Qvarfordt, [0052]; Lopresti, ¶98. Once sufficiently vetted, novel CAPTCHAs in the second set are moved to the first set of (vetted) CAPTCHAs. Qvarfordt, [0052]. “When the CAPTCHA is moved to the first category, a solution or solution set is *associated* with it.” *Id.* This association of one or more solutions with the newly vetted CAPTCHA challenge meets limitation [1B]. Lopresti, ¶98.

d. Limitation [1C]

Qvarfordt discloses “presenting said electronic image in said first image state and progressively revealing information over a first time period within an interface

for said participant using said computing system,” per limitation [1C]. Lopresti, ¶¶99-107.

First, Qvarfordt presents the encoded electronic image in a first image state and progressively reveals information over a first time period. *Id.*, ¶100. In Qvarfordt’s looped animation CAPTCHA, a foreground layer (e.g., Figure 10’s “floating disks”) continuously obstructs different parts of the encoded image (e.g., Figure 10’s cat). *Id.* As the animation runs, “at each point in time the user will see part of the solution and will be able to easily integrate the parts to decipher the whole.” Qvarfordt, [0031]. As “portions of the encoded solution that are visible [are] changing *over time*” (*id.*, [0036]), the animation progressively reveals more of the image over time. *Id.*, [0031]; Lopresti, ¶¶100-101. *See also, e.g.*, Qvarfordt, [0030] (“[H]uman visual systems excel at integrating low resolution or conflicting images into apparently high[-]resolution and complete images *over time*.”), [0032], [0055], FIGs. 2a-3c, 10.

Thus, the time period during which Qvarfordt’s animation completes a full cycle before repeating is a first time period as claimed, because additional information about the encoded image (e.g., Figure 10’s cat) is “progressively revealed” during that time period as claimed. Lopresti, ¶102.

Nothing in claim 1 requires that “progressively revealing information over a first time period” be interpreted narrowly to require that “revealed” portions of the

image remain visible and suffer no further obstruction once revealed. *Id.*, ¶103. Indeed, the prosecution history confirms that claim 1 is not so limited. Qvarfordt's disclosure of revealing "portions" of an image is consistent with Sanghavi's disclosure of revealing different "portion[s]" of a CAPTCHA image at different times, the Examiner found that this meets "progressively revealing information over a first time period" as claimed, and the applicant never traversed that assertion. Ex1004, 286; Ex1009, [0038], FIG. 6; *see Salazar*, 414 F.3d at 1347.

Second, Qvarfordt's electronic image is presented and progressively revealed "***within an interface***" for the participant using a computing system. Lopresti, ¶104. The '141 Patent neither defines nor discusses the claimed "interface." A POSA would have understood that in computing, a user interface enables a user to communicate with a computer, and that Qvarfordt discloses such an interface. *Id.*

Each of Qvarfordt's image-based CAPTCHAs involves displaying an image for a user to decipher, and a POSA would have understood that the image is displayed on a visual display which is a user interface. *Id.*, ¶¶104-105. Hence the electronic image is presented in a "first image state and progressively reveal[ed] over a first time period within an interface." *Id.*

Alternatively, to the extent Qvarfordt is not considered to expressly disclose that its image is presented in an interface (it does), doing so would have been the conventional and obvious way to present an electronic image and/or CAPTCHA

challenge to a user as Qvarfordt describes. *Id.*, ¶¶106-107 (citing Ex1009, Ex1012-Ex1014, disclosing CAPTCHAs displayed in an interface).

e. Limitation [1D]

Qvarfordt discloses “automatically processing responses from the participant with the computing system to correlate an accuracy of guesses from said participant for said one or more concepts associated with said electronic image,” per limitation [1D]. Lopresti, ¶¶108-115.

First, Qvarfordt discloses “automatically processing responses.” As discussed above, §V.A.2.b, the “CA” in CAPTCHA stands for “Completely Automated,” and Qvarfordt repeatedly describes its image-based CAPTCHA test as “automated.” Lopresti, ¶109. Alternatively, if the Board does not consider Qvarfordt to expressly disclose that its CAPTCHA steps are automated, that would have been the conventional and obvious way to implement a CAPTCHA method of the type Qvarfordt describes. *Id.*

Second, Qvarfordt discloses automatically processing responses from a participant to correlate an accuracy of guesses for the concept(s) associated with the electronic image. *Id.*, ¶110. Other than parroting the claim language (Ex1001, 4:45-48), the ’141 Patent does not describe “correlat[ing] an accuracy of guesses.” Other intrinsic evidence (prosecution history) suggests that a guess may be characterized in a binary fashion as either correct or incorrect for the image. Ex1004, 286, 316-

317. While the claim language and intrinsic evidence do not state what “an accuracy of guesses” should be correlated with, in litigation, HDI maintains that the “accuracy of guesses” from a participant is correlated with the “one or more concepts associated with said electronic image” to determine if the participant successfully recognized the prompted concept, and thus, solved the CAPTCHA. Ex1039, ¶26. Thus, to the extent correlating an accuracy of guesses relates to characterizing guesses as either correct or incorrect for the corresponding image, Qvarfordt does that. Lopresti, ¶¶110-111.

In Qvarfordt’s two-set CAPTCHA embodiment, “[t]he user’s response to the second [unvetted] set is used to [] determine reasonable human responses to that CAPTCHA.” Qvarfordt, [0052]. When a “statistically significant number of solutions” is received for a (second) set of novel image-based CAPTCHAs, “either the highest scoring solution is chosen as a correct solution, or a set of most commonly received solutions is chosen as the correct solution” and that correct solution is “*associated* with” the image. *Id.*; Lopresti, ¶112.

Recognizing that even the oft-cited 90% success rate for humans is lower than desired because 10% of users will fail, frustrating users and service providers, Qvarfordt teaches “CAPTCHAs that are *as easy as possible* to solve by humans.” *Id.*, [0005]. A POSA would have understood that in choosing “the highest scoring solution” or “set of most commonly received solutions...as the correct solution,”

Qvarfordt teaches choosing a “correct solution” that results in at least 90% of the “statistically significant number of solutions” received being correct. *Id.*, [0052]; *see also id.* [0005]; Lopresti, ¶113. A POSA would have further understood this involves correlating the accuracy of guesses in the “statistically significant number of solutions” to ensure that the chosen “correct solution” achieves the desired goal of having at least 90% of users succeed. Qvarfordt, [0052]; Lopresti, ¶113. For example, choosing multiple user guesses as the “correct solution” involves correlating a sufficient number of those guesses as “correct” for the image to ensure that the desired number of human users (e.g., above 90%) will correctly identify the image. *Id.*

To the extent Qvarfordt is considered to not expressly disclose correlating the accuracy of the guesses included in the “statistically significant number of solutions” when choosing “the highest scoring solution” or “set of most commonly received solutions...as the correct solution,” that would have been the conventional and obvious way to implement what Qvarfordt discloses, as this would have been the straightforward way to ensure that the chosen “correct solution” “associated with” the image results in at least 90% of human users succeeding. Qvarfordt, [0052]; Lopresti, ¶114.

Third, to the extent this limitation is read to require more than one response/guess to a CAPTCHA challenge from a single participant, Qvarfordt still

meets this limitation. Lopresti, ¶115. Qvarfordt discloses embodiments of “animation[s] comprising...*a plurality of recognizable images*.” Qvarfordt, [0012]. For those embodiments, a participant is tasked with correctly guessing the concept or solution associated with each of the “plurality of recognizable images,” and Qvarfordt’s CAPTCHA system automatically processes those responses to choose a “correct solution” for *each* of the images in the manner discussed above. Lopresti, ¶115.

f. Limitation [1E]

Qvarfordt discloses “calculating a percentage of participants able to decode and accurately guess said one or more concepts within a predetermined time,” per limitation [1E]. *Id.*, ¶¶116-130.

First, like Qvarfordt, the ’141 Patent recognizes the conventional threshold of 90% human success rate to make a challenge “suitable for inclusion in a CAPTCHA system.” Ex1001, 14:9-13; Lopresti, ¶117. Thus, a POSA would have understood that limitation [1E] is concerned with “*measuring efficacy* by determining a percentage of users who are able to solve the CAPTCHA correctly within a defined period of time.” Ex1001, Abstract; Lopresti, ¶117.

As discussed for [1D], Qvarfordt teaches (or alternatively it would have been obvious to implement Qvarfordt by) choosing a “correct solution” that results in at least 90% of the “statistically significant number of solutions” received being

correct. Qvarfordt, [0005], [0052]; Lopresti, ¶118. A POSA would have understood this involves calculating the percentage of participants that provided the “statistically significant number of solutions” whose guesses satisfy the solution or solution set adopted as the “correct solution.” Qvarfordt, [0052]; Lopresti, ¶118. To the extent Qvarfordt is considered to not expressly disclose calculating such a percentage, that would have been the conventional and obvious way to implement what Qvarfordt discloses, as this would have been the straightforward way to ensure the chosen “correct solution” will result in (at least) 90% of human users succeeding. Qvarfordt, [0052]; Lopresti, ¶119.

Indeed, Qvarfordt ensures the number of participant solutions used in determining the “correct solution” is “statistically significant.” Qvarfordt, [0052]; Lopresti, ¶120. If Qvarfordt did not calculate the percentage of those participants “able to decode and accurately guess said one or more concepts” as claimed by offering a guess that correlates with the “correct solution,” it is difficult to imagine how Qvarfordt could ensure the “correct solution” chosen for the CAPTCHA would result in 90% of human users succeeding. Lopresti, ¶120.

“[C]alculat[ing] a percentage of participants able to decode and accurately guess said one or more concepts” requires only knowing the number of participants who correctly guessed the concept(s) and the total number of participants who provided guesses. *Id.*, ¶121. Qvarfordt has that information and the calculation

itself is trivial: the number of participants who correctly guessed the concept(s) divided by the total number of participants provides “a percentage” of participants able to “decode” Qvarfordt’s “encoded” solution and accurately guess the concept(s) associated with the image. *Id.* A POSA would have had a reasonable expectation of success in implementing Qvarfordt to calculate this percentage. *Id.*

Making such a calculation was the conventional and obvious way to measure efficacy of CAPTCHAs. *Id.*, ¶122. As Qvarfordt observes and the ’141 Patent confirms, an “often cited” threshold for CAPTCHA systems characterizes them, in part, based on *percentage* success rate (90%) for humans. Qvarfordt, [0005]; Ex1001, 14:5-13; Lopresti, ¶122.

Second, a POSA would have understood that calculating a percentage of users able to solve Qvarfordt’s CAPTCHA correctly “*within a predetermined time*” would have been the conventional and obvious way to assess CAPTCHA responses. Lopresti, ¶123. While Qvarfordt does not expressly say how long it should take a human to solve its CAPTCHAs,⁶ Qvarfordt indicates the test should be “*easy for humans to solve* but hard for computers, [so] the service providers can increase the likelihood that their users are humans.” Qvarfordt, [0004]; *see also id.*, [0005], [0008]; Lopresti, ¶123.

⁶ The ’141 Patent says nothing about how long it should take a human user to solve its claimed CAPTCHAs. Lopresti, ¶123.

It was conventional to place a time limit on CAPTCHA challenges within which the user must respond before the challenge is removed, because a challenge without a time limit risks vulnerability to bot attacks by giving a computer unlimited time to “crack” the CAPTCHA. Lopresti, ¶¶124-128 (citing Ex1007, Ex1013, Ex1015-Ex1016, disclosing CAPTCHA systems with timers). The goal of using unvetted CAPTCHAs in Qvarfordt is to mimic use cases where the CAPTCHA will be deployed to grant/deny access, by collecting a statistically significant set of user responses. Qvarfordt, [0052]; Lopresti, ¶129. A POSA would have understood that to make the user responses truly significant, they should be received from users under the same conditions users will face when the CAPTCHA is deployed to control access, including a time limit. Lopresti, ¶129. Thus, a POSA would have imposed a time limit on the participants responding to Qvarfordt’s unvetted CAPTCHAs so that responses would be recognized as accurate guesses if they are provided “within a predetermined time” as claimed. *Id.* Implementing Qvarfordt to include a conventional timer would have been within a POSA’s capabilities. *Id.*, 130.

3. Claim 2

Qvarfordt discloses “[t]he method of claim 1 wherein said progressively revealing information comprises presenting said electronic image at different time

intervals with differing levels of resolution, noise and/or pixelation,” per claim 2. *Id.*, ¶¶131-136.

First, “resolution, noise and/or pixelation” covers resolution alone, noise alone, pixelation alone, or any combination; it does not require all. *Cochlear Bone Anchored Sols. AB v. Oticon Med. AB*, 958 F.3d 1348, 1359 (Fed. Cir. 2020) (for claim term written “[A] and/or [B],” the “use of the disjunctive creates three alternative subsets of claim coverage—[A] only; [B] only; and [A] together with [B]”).

Second, Qvarfordt’s “progressively revealing information” includes presenting the electronic image “at different time intervals with differing levels of ... noise[.]” The ’141 Patent states that “noise” may be **added** to an image but does not define “noise” and thus gives “noise” its ordinary meaning. Ex1001, 15:18-21. A POSA would have understood that the addition of “noise” to a CAPTCHA image means adding “irrelevant or meaningless data or output occurring along with desired information.” Lopresti, ¶¶133-134 (citing Ex1033).

A POSA would have understood that in Qvarfordt’s looped animation, the foreground layer (e.g., Figure 10’s “floating disks”) introduces noise that obstructs the encoded image (e.g., Figure 10’s cat).⁷ Lopresti, ¶135. As the animation is

⁷ Figure 10’s “wallpaper” layer with the “diamond shape pattern” is additional noise.

presented continuously, the noise levels obscuring the encoded solution differ over time because different parts (and differing amounts) of the encoded image are obstructed at different points in time. Qvarfordt, [0031], [0036] (“portions of the encoded solution that are visible [are] changing over time”); Lopresti, ¶¶134-135 (citing Ex1017, disclosing noise addition to image-based CAPTCHA); *see also* Ex1035 (discussing authenticity and public accessibility of Ex1017); Ex1058 (same); Lopresti, ¶¶238-239 (same).

Qvarfordt also explains that its invention utilizes the ability of humans to process “low resolution” images. Qvarfordt, [0030]. While the ’141 Patent does not discuss “resolution” outside of repeating the claim language (Ex1001, 2:26-28, 4:51-53), a POSA would have understood that Qvarfordt’s obscuring portions of the encoded image reduces the “resolution” of the image, and that the resolution level differs over time as different parts of the encoded image are revealed. Qvarfordt, [0031], [0036]; Lopresti, ¶136. Thus, Qvarfordt’s “progressively revealing information” also includes presenting the electronic image “at different time intervals with differing levels of resolution” as claimed. Lopresti, ¶136.

Qvarfordt, [0053], [0055]; Lopresti, ¶135.

4. Claim 3

Qvarfordt discloses “using said electronic image within a CAPTCHA system for granting access to resources of a second computing system,” per claim 3. *Id.*, ¶¶137-138.

For a novel CAPTCHA challenge image, after a “correct solution” is chosen, the CAPTCHA is “moved to the first category” and used to control access so that “*a user entering any of the solution from the set, is granted access.*” Qvarfordt, [0052] (“answers to the first set determine whether the entity *accessing the site* is a human, and that information is used [] to *allow access to resources*”); Lopresti, ¶¶138. Qvarfordt discloses that “[t]he subject invention relates to...*validation of users accessing website[s].*” Qvarfordt, [0002]; *see also id.* [0004]. A website is located within a “second computing system” as claimed. Lopresti, ¶138.

5. Claim 4

Qvarfordt discloses “[t]he method of claim 3 wherein said second computing system is associated with a portable electronics device,” per claim 4. *Id.*, ¶¶139-146.

To the extent HDI maintains (in litigation or otherwise) that when the “second computing system” is a website, and the website is “*associated* with a portable electronics device” (e.g., laptop or mobile phone) by being intended for display on such a portable electronic device (and the portable electronic device is capable of

displaying the website), then claim 2 is rendered obvious by an obvious use of Qvarfordt's system. *Id.*, ¶¶140-141.

A POSA would have understood that the claimed “portable electronics device” may be a laptop or a mobile phone. *Id.*, ¶142. Qvarfordt does not expressly mention a laptop, but it displays animated CAPTCHA “on a computer screen” and receives user actions via a keyboard or mouse input. Qvarfordt, Abstract, [0012], [0041]; Lopresti, ¶142. A POSA would have understood Qvarfordt to disclose that its system is used by laptop (and desktop) computer users. Lopresti, ¶142. To the extent Qvarfordt is not understood to disclose the use of a laptop or other portable device, it would have been obvious to use Qvarfordt's system with laptop users, as laptops were ubiquitous and conventionally used to access and display websites of the type Qvarfordt describes. *Id.*, ¶¶143-146 (citing Ex1009-Ex1010, Ex1018, disclosing portable electronic devices, including laptops, accessing websites).

6. Claim 5

a. Preamble [5PRE]

To the extent limiting, Qvarfordt meets claim 5's preamble. Lopresti, ¶¶ 147-148.

Qvarfordt discloses a method of providing a visual CAPTCHA challenge at least with its vetted image-based CAPTCHAs, the answers to which “determine whether the entity accessing the site is a human,” and “allow access to resources.”

Qvarfordt, [0052]; Lopresti, ¶148. The CAPTCHAs include both a vetted CAPTCHA to control access and an unvetted CAPTCHA, and the user does not know which CAPTCHA controls access. *Id.*

b. Limitation [5A]

The only difference between limitations [5A] and [1A] is that limitation [5A] refers to “said imagery data” whereas limitation [1A] refers to “said *set of* imagery data.” The omission of “set of” in limitation [5A] appears to be a typo because it earlier recites “set of imagery data.” Lopresti, ¶149. Qvarfordt’s presentation of the unvetted CAPTCHA as part of its test meets limitation [5A] for the same reasons it meets limitation [1A]. *Supra* §V.A.2.b; Lopresti, ¶150.

Qvarfordt’s vetted CAPTCHA presentation also meets limitation [5A] as the vetted CAPTCHA automatically elects an electronic image for which a subset of the imagery data is made perceptible in a first state in the same manner as the unvetted CAPTCHA discussed regarding limitation [1A]. *Supra* §V.A.2.b; Lopresti, ¶¶149-151.

c. Limitation [5B]

Limitation [5B] is identical to limitation [1B]. Each image-based CAPTCHA in Qvarfordt is associated with a solution (or solution set), which is a concept as claimed. *Supra* §V.A.2.c; Lopresti, ¶¶152-153. That is, “when the [previously unvetted] CAPTCHA is moved to the first category, a solution or a solution set is

associated with it.” Qvarfordt, [0052]. This association of one or more solutions with the newly vetted CAPTCHA challenge meets limitation [1B]. Lopresti, ¶152.

Claim 5 does not impose any restriction on an order in which the recited steps must occur. *Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1345 (Fed. Cir. 2008) (“[A]lthough a method claim necessarily recites the steps of the method in a particular order, as a general rule the claim is not limited to performance of the steps in the order recited, unless the claim explicitly or implicitly requires a specific order.”). Thus, for a vetted CAPTCHA presented in limitation [5A], limitation [5B] is met by the association of the solution with that CAPTCHA that occurred when the CAPTCHA was “moved to the first [vetted] category.” Qvarfordt, [0052]; Lopresti, ¶153.

d. Limitation [5C]

The only difference between limitations [5C] and [1C] is that limitation [5C] recites “progressively revealing information in said electronic image over a first time period” whereas limitation [1C] recites “presenting said electronic image in said first image state and progressively revealing information over a first time period.” During prosecution, the applicant treated these limitations as conveying the same subject matter—progressively revealing an image. Ex1004, 265-266, 315-317. Lopresti, ¶154.

Qvarfordt meets limitation [5C] for the same reasons it meets limitation [1C]. *Supra* §V.A.2.d; Lopresti, ¶¶154-155. The way Qvarfordt presents a CAPTCHA and progressively reveals the image does not change when the CAPTCHA is “moved to the first [vetted] category,” so Qvarfordt’s vetted CAPTCHAs meet [5C] for the same reason Qvarfordt’s unvetted CAPTCHAs meet [1C]. Lopresti, ¶155.

e. Limitation [5D]

Qvarfordt discloses “automatically processing responses from the participant with the computing system to detect if a guess from said participant for said one or more concepts associated with said electronic image meets a required threshold,” per limitation [5D]. Lopresti, ¶¶156-164.

First, Qvarfordt discloses “automatically processing responses” for the same reasons discussed previously. *Supra*, §V.A.2.e (Limitation [1D]); Lopresti, ¶157. Alternatively, if the Board does not consider Qvarfordt to expressly disclose that its CAPTCHA steps are automated, that would have been the conventional and obvious way to implement a CAPTCHA method of the type Qvarfordt describes. *Supra*, §V.A.2.e; Lopresti, ¶157.

Second, Qvarfordt automatically processes responses from a participant with the computing system to detect if a guess from the participant for the concept(s) associated with the electronic image meets a required threshold. Lopresti, ¶158. The ’141 Patent does not discuss “threshold” beyond repeating the claim language

(Ex1001, 4:66-5:3), but describes embodiments where the processing of the user's guess is binary (it is either correct or not) with no degrees of correctness in between (e.g., the patent states that "a CAPTCHA challenge system (not shown) could introduce visual content to be reviewed by humans to determine what appropriate tags/concepts are presented for the image in question" and "[t]he content tags represent correct responses or answers that may be associated with the [image] in question"). *Id.*, 10:41-43, 14:5-8; Lopresti, ¶158 (citing Ex1033).

The prosecution history supports interpreting the "required threshold" in a manner that reads on Qvarfordt's determination of whether a guess meets the "correct solution." Lopresti, ¶159. During prosecution, the Examiner (twice) found that Mates (Ex1010) met this limitation (and limitation [1D]) by teaching a CAPTCHA challenge where the system determines whether "recipient input" for the challenge image, "such as a description of the recognizable image [] embedded in the challenge image ... *matches* a descriptor associated with the recognizable image." Ex1004, 226, 285-286; Ex1010, [0023]. The applicant never challenged that interpretation. Thus, a POSA would have understood the "required threshold" as claimed to be an indication of the CAPTCHA's solution that the system recognizes as correct. Lopresti, ¶159-160.

Qvarfordt's vetted CAPTCHAs have been associated with a "correct solution" that is "either a highest scoring solution...or a set of most commonly received

solutions” and “a user entering any of the solution[s] from the set, is granted access.” Qvarfordt, [0052]; Lopresti, ¶161. While Qvarfordt does not use the word “threshold,” a POSA would have understood that in Qvarfordt’s CAPTCHA system, some user responses will be “correct,” and others will “fail” to differentiate a human from a computer. Lopresti, ¶161. Thus, a POSA would have understood that when Qvarfordt’s system processes a participant’s guess to determine whether it meets the “correct solution,” it detects whether the guess meets a threshold as claimed. *Id.*

Indeed, the ’141 Patent’s named inventor referred to such “thresholds” for identifying an acceptable response in a CAPTCHA system in another application filed the same week as HDI’s Provisional in June 2008. Ex1019, [0119]-[0120], [0135], [0160]; Lopresti, ¶162.

Alternatively, if the Board does not consider Qvarfordt to teach a “required threshold,” as claimed, using a threshold would have been the conventional and obvious way to implement the CAPTCHA method Qvarfordt discloses to differentiate human from computer input. Lopresti, ¶163 (citing Ex1020 (describing “threshold value[s]”)).

Third, to the extent this limitation is read to require more than one *response* to a CAPTCHA challenge, Qvarfordt still meets this limitation, because some challenges present images with multiple objects the user is challenged to identify. *Supra* §V.A.2.e; Lopresti, ¶164.

f. Limitation [5E]

As discussed for limitation [5B], claim 5 does not impose any restriction on an order in which the steps must occur. *Baldwin Graphic Sys.*, 512 F.3d at 1345. Thus, for a vetted CAPTCHA, limitation [5E] is met by the earlier processing Qvarfordt performs when that CAPTCHA was still unvetted, including determining a percentage of participants that provided the “correct solution” that was later associated with that CAPTCHA when it was “moved to the first [vetted] category.” Qvarfordt, [0052]; Lopresti, ¶165.

Thus, Qvarfordt meets or renders obvious “determining a percentage of participants with guesses meeting the required threshold within a predetermined time,” per limitation [5E] for substantially the same reasons discussed regarding limitation [1E], which is substantively similar. Lopresti, ¶¶165-172. During prosecution, the applicant treated limitations [1E] and [5E] as conveying the same subject matter with “similar language.” Ex1004, 310, 315-317.

As discussed regarding [1E] and [5D], Qvarfordt teaches (or alternatively it would have been obvious to implement Qvarfordt by) choosing a “correct solution” that results in at least 90% of the “statistically significant number of solutions” received being correct within a predetermined time. Qvarfordt, [0052]; Lopresti, ¶167. A POSA would have understood this involves calculating the percentage of participants (i.e., those that provided the “statistically significant number of

solutions”) whose guesses “meet[] the required threshold” (i.e., satisfy the solution or solution set adopted as the “correct solution”) within a predetermined time. *Id.* Accordingly, Qvarfordt meets limitation [5E]. Lopresti, ¶167.

To the extent HDI argues that claim 5’s method steps require a specific order (they do not), such that [5E] must occur later, Qvarfordt still meets or renders obvious this limitation. *Id.*, ¶168. Performing this step after a CAPTCHA’s deployment for access control would have been the conventional and obvious way to implement a CAPTCHA of the type Qvarfordt describes because this would have been the straightforward way to ensure the CAPTCHA’s continued efficacy. *Id.*, ¶¶168-172 (citing Ex1053-Ex1055, disclosing monitoring CAPTCHA/authentication systems to ensure continued efficacy).

7. Claim 7

Claim 7, which recites “[t]he method of claim 5 wherein the CAPTCHA challenge is embodied in a computer readable form and implemented as a routine executing on a portable computing device which also has motion and/or orientation sensors,” would have been obvious over Qvarfordt. Lopresti, ¶¶173-178.

The ’141 Patent admits that “the details of the various software routines, executable code, etc., required to effectuate the functionality discussed above in such modules *are not material to the present invention*, and may be implemented *in any*

number of ways known to those skilled in the art.” Ex1001, 26:5-10 (admitting that such “details” are “not explicitly shown or described”); Lopresti, ¶174.

To the extent HDI maintains (in litigation or otherwise) that claim 7 covers a portable computing device (with motion and/or orientation sensors) capable of accessing a web-based CAPTCHA challenge located within a server, then claim 7 is rendered obvious by an obvious use of Qvarfordt’s system. Lopresti, ¶¶175-176.

A POSA would have understood that the “computer” on which Qvarfordt displays its CAPTCHA encompasses portable computing devices, like laptops and mobile phones, or alternatively it would have been obvious to implement Qvarfordt’s system so that it can be accessed by such portable computers. Lopresti, ¶177. Because Qvarfordt’s animated CAPTCHA is provided on a computer, a POSA also would have understood that it is embodied in a computer readable form (e.g., HTML, JavaScript, and/or other code) and implemented as a routine executing on the portable (or other) computer. *Id.* A routine is a sequence of program instructions (e.g., code) that performs a specific task. *Id.* A POSA would have understood that when a portable computer user seeks access to restricted resources on a website as Qvarfordt discloses, code associated with Qvarfordt’s CAPTCHA routine is executed on the portable computing device. *Id.*

Further, it would have been obvious to use Qvarfordt’s system with portable computers like laptops or mobile phones that have motion and/or orientation sensors.

Lopresti, ¶178 (citing Ex1021-Ex1029, disclosing laptops and/or mobile phones with motion/orientation sensors). Claim 7 does not require that the motion and/or orientation sensors be utilized in solving the CAPTCHA (or for any purpose). Rather, the claim merely requires that the “portable computing device” *have* motion and/or orientation sensors. *Id.* Claim 7 is rendered obvious by the use of Qvarfordt’s CAPTCHA software on conventional portable computing devices (e.g., laptops or mobile phones) with motion and/or orientation sensors. *Id.*

8. Claim 8

Claim 8, which recites “[t]he method of claim 7 wherein the visual CAPTCHA challenge is combined with a physical CAPTCHA challenge requiring the user to manipulate the portable computing device in a prescribed manner,” would have been obvious over Qvarfordt. Lopresti, ¶¶179-182.

In litigation, HDI also asserts the ’861 patent, which is a divisional of the ’141 Patent and claims physical manipulation-based CAPTCHAs on a portable computing device. Lopresti, ¶180. HDI maintains that a physical CAPTCHA challenge requiring the user to manipulate the portable computing device in a prescribed manner encompasses *any* physical movement of the user interacting with the device’s graphical interface, including moving a mouse or clicking on a checkbox. Ex1039, 7-8. HDI alleges that only if “such movements and/or manipulation from the user meet a required threshold, the user is deemed human and granted access to

the protected resource or content.” *Id.*, 7. Based on HDI’s reading of the term “manipulate the portable computing device,” Qvarfordt renders obvious claim 8. Lopresti, ¶180.

Qvarfordt discloses that the user is asked to perform an “operation on the image to resolve an encoded solution” in a combination of animated and interactive CAPTCHAs. Qvarfordt, Abstract, [0012]. Qvarfordt’s “[i]nteractive CAPTCHA requires the user to perform some actions to view or construct a hidden message. The actions can either be mouse input or keyboard input (for example arrow keys).” *Id.*, [0038]. “An interactive CAPTCHA can, for example, ask the user to move the background/foreground to get a different view of the message.” *Id.* In Figure 10, “the various layers can be set in motion...in response to a user input” (*id.*, [0055]) such as dragging a layer or clicking the mouse or pressing “enter” on the keyboard (*id.*, [0039]). *See also id.*, [0035], [0055] (“[t]he user may also pick and drag any layer or one movable layer in order to properly expose the encoded solution.”); Lopresti, ¶181.

Qvarfordt also discloses that user actions, like mouse movement and click manipulation, can be tracked using conventional means, and based on this information, “the CAPTCHA can determine if the actions correspond to natural human behavior or if they could be computer generated.” Qvarfordt, [0041]; *see* Lopresti, ¶182.

9. Claim 9

Claim 9, which recites “[t]he method of claim 8 wherein said physical CAPTCHA challenge is used to interact with elements of said electronic image and/or other objects presented in said interface,” would have been obvious over Qvarfordt. Lopresti, ¶¶183-184.

Based on HDI’s reading of physical manipulation-based CAPTCHAs (above §V.A.2.8), Qvarfordt discloses that the physical CAPTCHA challenge can interact with elements of the electronic image and/or other objects presented in the interface. Lopresti, ¶184. In Figure 10, Qvarfordt says that “[t]he user may also ‘pick and drag’ *any layer or one movable layer* in order to properly expose the encoded solution.” Qvarfordt, [0055]. Qvarfordt describes that the motion may respond to user’s “dragging” of a selected layer using a mouse or other input device (e.g., dragging and moving a floating disk to expose a portion of the cat image), or a specific motion that depends on the user’s action, e.g., “foreground moves to left upon left-mouse click and to the right upon right mouse click.” *Id.*, [0035]; Lopresti, ¶184. Alternatively, “the user may also be asked to move the encoded solution [e.g., the cat image in Figure 10] itself, so that the remainder appears through the openings in the foreground.” *Id.*, [0038]; Lopresti, ¶184.

10.Claim 10

a. Preamble [10PRE]

To the extent limiting, claim 10’s preamble is identical to claim 1’s preamble, and Qvarfordt meets it for the same reasons. *Supra* §V.A.2.a; Lopresti, ¶185.

b. Limitation [10A]

Qvarfordt discloses “automatically electing an electronic image for a participant with a computing system, wherein said electronic image comprises a set of imagery data other than words, and wherein said electronic image is presentable with differing amounts of data, including a first image state in which only a first portion of the image information therein is perceptible,” per limitation [10A]. Lopresti, ¶¶186-191.

Much of limitation [10A] is identical to limitation [1A]—i.e., “automatically electing an electronic image for a participant with a computing system, wherein said electronic image comprises a set of imagery data other than words”—and met by Qvarfordt for the same reasons. *Supra* §V.A.2.b; Lopresti, ¶187.

Qvarfordt’s “electronic image is presentable with differing amounts of data, including a first image state in which only a first portion of the image information therein is perceptible.” Lopresti, ¶188. The electronic image in Qvarfordt’s CAPTCHA, like any other electronic image, is comprised of imagery data (i.e., rows and columns of pixels). *Id.*

In Qvarfordt’s looped animation CAPTCHA, a foreground layer continuously obstructs different parts of the encoded image. Lopresti, ¶189. “[A]t each point in time the user will see *part* of the solution.” Qvarfordt, [0031]. “The *portions* of the encoded solution that are visible [are] changing over time” and “the sum of all frames can be set as not to give a complete image of the encoded solution.” *Id.*, [0036]; Lopresti, ¶189. At any given time, the obstructing objects in the foreground are positioned such that only particular “part[s]” or “portions” of the encoded image are revealed. Qvarfordt, [0031], [0036]; Lopresti, ¶189. The exposed parts or portions of the encoded image at any particular time represent a “first image state” of the encoded image as claimed wherein “only a first portion of the image information therein is perceptible.” Lopresti, ¶189.

Figure 10 demonstrates this, as it presents the cat image in a particular state with certain portions obstructed by the disks, so that the cat image is not completely exposed and only a portion of the cat image is perceptible. Qvarfordt, [0055]; Lopresti, ¶190.

Limitation [10A] does not require actually presenting the image with “differing amounts of data,” but just that it be “presentable” with “differing amounts of data.” In Qvarfordt, “[t]he *portions* of the encoded solution that are visible [are] changing over time.” Qvarfordt, [0036]. Thus, a POSA would have understood that the encoded image is “presentable with differing amounts of data” as claimed

because some configurations of the disks can reveal a greater amount of the solution in the encoded image (e.g., cat) than other configurations. Lopresti, ¶191.

c. Limitation [10B]

Limitations [10B] and [1B] are identical, and Qvarfordt meets limitation [10B] for the same reasons it meets limitation [1B]. *Supra* §V.A.2.c; Lopresti, ¶192.

d. Limitation [10C]

Limitation [10C] recites “progressively revealing *additional* information *in said electronic image* over a first time period,” whereas limitation [1C] recites “progressively revealing information over a first time period.” The specification does not attribute any substantive difference between these limitations, and the applicant treated them as substantively identical during prosecution. Ex1004, 315-316; Lopresti, ¶¶193-194.

Qvarfordt meets limitation [10C] for the same reasons it meets limitation [1C]. *Supra* §V.A.2.d; Lopresti, ¶195. Specifically, the “information” identified as being progressively revealed in §V.A.2.d above for [1C] is “additional information in said electronic image.” That is, as the foreground objects in Qvarfordt’s animation move while the animation completes a full iteration, the objects reveal different and “additional” portions of the encoded image and thus reveal “additional information in said electronic image.” *Supra* §V.A.2.d; Lopresti, ¶195.

e. Limitation [10D]

Limitations [10D] and [1D] are identical, and Qvarfordt meets limitation [10D] for the same reasons it meets limitation [1D]. *Supra* §V.A.2.e; Lopresti, ¶196.

f. Limitation [10E]

Limitations [10E] and [1E] are identical, and Qvarfordt meets limitation [10E] for the same reasons it meets limitation [1E]. *Supra* §V.A.2.f; Lopresti, ¶197.

11.Claim 11

Qvarfordt meets claim 11 for the same reasons it meets claim 2. *Supra* §V.A.3; Lopresti, ¶198.

12.Claim 12

Qvarfordt discloses “[t]he method of claim 10 wherein said automatically processing responses occurs during said presenting said electronic image and said progressively revealing additional information,” per claim 12. Lopresti, ¶¶199-201.

Qvarfordt discloses presenting the unvetted CAPTCHA to the user along with a vetted CAPTCHA used to control access. Qvarfordt, [0052]. A POSA would have understood that CAPTCHA systems process user responses while the CAPTCHA is presented for a limited time and processes the user response in real time to grant or deny the user access. *Id.*, [0052], [0055]; Lopresti, ¶200. Thus, a POSA would have understood that Qvarfordt processes the user responses to the vetted and unvetted

CAPTCHAs while the electronic images are presented and additional information for them is progressively revealed as the animation runs. Lopresti, ¶200. Alternatively, to the extent Qvarfordt is not considered to expressly disclose processing user responses while the CAPTCHA challenge images are presented and its animations run, that would have been the conventional and obvious way to implement a CAPTCHA challenge of the type Qvarfordt discloses. Lopresti, ¶201.

13.Claims 13-14

Qvarfordt meets claims 13-14 for the same reasons it meets claims 3-4, respectively. *Supra* §V.A.4-5; Lopresti, ¶¶202-203.

B. Ground 2: Qvarfordt and vonAhn Render Claims 1-5 and 7-14 Obvious

vonAhn expressly discloses a particular technique for calculating the rate or percentage of humans able to successfully solve a CAPTCHA within a predetermined time. It would have been obvious to implement Qvarfordt by using vonAhn's technique for this purpose, which renders obvious the Challenged Claims. Lopresti, ¶¶204-234.

1. vonAhn (Ex1007)

vonAhn, a printed publication dated 2003, is prior art under pre-AIA §102(b). vonAhn was not disclosed during prosecution. Lopresti, ¶205.

vonAhn, which appears in the publication *Advances in Cryptology – EUROCRYPT 2003*, was publicly accessible by August 2003, and a POSA could

have retrieved it. Ex1034 (Watters, Aug. 5, 2020), 1-2 (testifying that vonAhn is a printed publication accessible before June 2007), ExA (authenticated copy of vonAhn), ExB (cataloging system record); Ex1057 (Watters, Feb. 20, 2023); see Bolin, ¶¶5, 23-37 (providing additional evidence of authenticity; pre-June 2008 public accessibility); Ex1013, Ex1030-1031 (pre-June 2008 patent filings and/or publications citing vonAhn); Ex. 1058, ¶¶7, 24-33; Lopresti, ¶¶206-208.

vonAhn, which provides several new CAPTCHAs, explains the importance of establishing that a CAPTCHA can be passed by a certain portion of users:

Intuitively, a CAPTCHA is a test V over which most humans have success close to 1, and for which *it is hard to write a computer program that has high success over V* . We will say that it is hard to write a computer program that has high success over V *if any program that has high success over V can be used to solve a hard AI problem*.

vonAhn, 297-98⁸ (defining “ V ” as “the *verifier* or *tester*”); *see id.*, 294. vonAhn explains “[a] test V is said to be (α, β) -human executable if ***at least an α portion of the human population has success greater than β over V*** ,” and that “a statement of the form ‘ V is (α, β) -human executable’ ***can only be proven empirically***.” *Id.* (unbolded emphasis original). Lopresti, ¶¶209-210.

Although vonAhn does not say precisely “how long it should take a human to solve a CAPTCHA, ***it is preferable for humans to be able to solve CAPTCHAs in***

⁸ Petitioners cite internal pagination of vonAhn.

a very short time” because CAPTCHAs that take too long for humans to solve “are probably useless for all practical purposes.” vonAhn, 298. vonAhn observes that most CAPTCHA applications “*require the tests to be answered within a short time after they are presented.*” *Id.*, 299; *see id.*, 303; Lopresti, ¶211.

vonAhn discloses “PIX,” a CAPTCHA where “pictures of simple concrete objects” are mapped to the object contained in the image. *Id.*, 305. According to the “PIX” CAPTCHA, a distorted image (e.g., a distorted picture of a monkey) is presented to a user along with a set of different labels (e.g., monkey, horse, cow, etc.); if the user responds with the correct label within a predetermined amount of time (i.e., before a timer has expired), the user is deemed human; otherwise, access is denied. *Id.* Lopresti, ¶212.

2. Implementing Qvarfordt in View of vonAhn

Recognizing that “users will fail one out of ten trials” with the conventional 90% success rate for humans, Qvarfordt discloses image-based CAPTCHAs that are “*as easy as possible*” for humans to solve yet very difficult for computers. Qvarfordt, [0005]. vonAhn likewise recognizes the importance of establishing a CAPTCHA with a high success rate for humans (“close to 1”) and a low success rate for computers, and provides a specific calculation to determine a CAPTCHA’s efficacy: “A test V is said to be (α, β) -human executable if at least an α portion of the human population has success greater than β over V .” vonAhn, 297. vonAhn teaches that

the “statement of the form ‘ V is (α, β) -human executable’ can only be proven empirically.” vonAhn, 298. Such empirical data includes, *inter alia*, a percentage of users who accurately solve the CAPTCHA. Lopresti, ¶¶213-214.

Also recognizing that it is preferable for humans to be able to solve CAPTCHAs in “a very short time” for CAPTCHAs to be “practical,” vonAhn provides image-based CAPTCHAs that “can be quickly answered by humans” within a predetermined time. vonAhn, 298, 303; Lopresti, ¶215.

A POSA would have had numerous reasons to implement Qvarfordt’s image-based CAPTCHA system, in view of vonAhn (“Qvarfordt-vonAhn”), to determine or calculate the percentage of humans able to successfully solve Qvarfordt’s CAPTCHAs within a predetermined time. Lopresti, ¶216.

First, Qvarfordt’s desire to provide an effective CAPTCHA—one that at least meets a known threshold for human success (90%)—would motivate a POSA to calculate an overall percentage of participants able to correctly solve its image-based CAPTCHAs. *Id.*, ¶217. vonAhn reinforces the desirability of determining the rate at which humans solve a CAPTCHA and provides a specific calculation for measuring such efficacy—namely, Qvarfordt’s image-based CAPTCHA would “be **(α, β) -human executable** if at least an α portion of the human population has success greater than β over V .” vonAhn, 297; Lopresti, ¶217.

Second, Qvarfordt desires “CAPTCHAs that are *as easy as possible to solve by humans*,” and, thus, quickly solvable. Qvarfordt, [0005]; Lopresti, ¶218. vonAhn likewise indicates CAPTCHAs should be solved “in a very short time.” vonAhn, 298-299; Lopresti, ¶218.

A POSA would have been motivated to implement Qvarfordt’s CAPTCHA system with vonAhn’s timer, where humans must provide a response to the CAPTCHA within a predetermined time. vonAhn, 305; Lopresti, ¶219. Doing so would provide Qvarfordt’s system with additional security, which Qvarfordt identifies as an important goal. Qvarfordt, [0005], [0008]-[0009], [0033]-[0037], [0041]; Lopresti, ¶219. Because Qvarfordt seeks to provide “CAPTCHAs that...preserve or increase the difficulty for computers to solve them” (Qvarfordt, [0005]), a timer provides further protection against attacks by restricting the available time for bots to solve the CAPTCHA. Lopresti, ¶219.

Third, the implementation would have involved no more than using known techniques (calculating a total percentage of users able to accurately associate the image with the concept(s) within a predetermined time) to improve similar devices (computers implementing CAPTCHAs) in the same way (ensuring efficacy and increased security) to yield a predictable result (an improved CAPTCHA system). Lopresti, ¶200. Such an improvement would have been obvious. *KSR Int’l. Co. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007) (“predictable variation[s]” are obvious).

Finally, implementing Qvarfordt to calculate an overall percentage of users able to accurately guess the underlying concept within a predetermined time would have been within a POSA’s capabilities. Lopresti, ¶221. Implementing Qvarfordt in this manner would have involved nothing more than performing a simple calculation on certain datasets already discussed in Qvarfordt (i.e., dividing the number of participants who correctly guessed the concept(s) by the total number of participants) and using a timer. *Id.* As vonAhn confirms, such timers were known. vonAhn, 305; Lopresti, ¶221.

Qvarfordt-vonAhn is thus Qvarfordt’s system implemented to calculate an overall percentage of users able to accurately guess the underlying concept of an unvetted CAPTCHA within a predetermined time as part of associating a “correct solution” with an unvetted CAPTCHA and moving it “to the first [vetted] category.” Qvarfordt, [0052]; Lopresti, ¶222.

3. Claim 1

a. Preamble [1PRE] and Limitations [1A]-[1D]

Qvarfordt-vonAhn meets claim 1’s preamble and limitations [1A]-[1D] for the same reasons discussed in Ground 1 regarding Qvarfordt alone, because Qvarfordt-vonAhn does not change any aspect of Qvarfordt relied on to meet claim 1’s preamble and limitations [1A]-[1D]. Lopresti, ¶223.

b. Limitation [1E]

As explained above, §V.B.2, a method performed by Qvarfordt-vonAhn includes “calculating a percentage of participants able to decode and accurately guess said one or more concepts within a predetermined time” and thus meets limitation [1E]. Lopresti, ¶224.

4. Claims 2-4

Qvarfordt-vonAhn meets claims 2-4 for the same reasons discussed in Ground 1 regarding Qvarfordt alone, because the combination does not change any aspect of Qvarfordt relied on to meet claims 2-4. Lopresti, ¶225.

5. Claim 5

a. Preamble [5PRE] and Limitations [5A]-[5D]

Qvarfordt-vonAhn meets claim 5’s preamble and limitations [5A]-[5D] for the same reasons discussed in Ground 1 regarding Qvarfordt alone because the combination does not change any aspect of Qvarfordt relied upon to meet claim 5’s preamble and limitations [5A]-[5D]. Lopresti, ¶226.

b. Limitation [5E]

As discussed above, §V.A.6.c, claim 5 does not impose any restriction on an order in which the recited steps must occur. Thus, for a vetted CAPTCHA presented in limitations [5A], [5C] and [5D] (*supra* §§V.A.6.b,d-e), limitation [5E] is met by the earlier processing Qvarfordt-vonAhn performs when that CAPTCHA was still

unvetted, including determining a percentage of participants that provided the “correct solution” that was later associated with that CAPTCHA when it was “moved to the first [vetted] category.” Qvarfordt, [0052]; Lopresti, ¶227. To the extent HDI argues that claim 5’s method steps require a specific order, such that limitation [5E] must occur later, Qvarfordt still meets or renders obvious this limitation for the same reasons discussed above. *Supra*, §V.A.6.f.

A POSA also would have understood that Qvarordt’s system processes a participant’s guess to determine whether it meets the “correct solution” so detects whether the guess meets a threshold as claimed. Lopresti, ¶229. The threshold (i.e., the solution or solution set adopted as the “correct solution”) does not change in Qvarfordt-vonAhn, so is met in the same way. *Id.*

Thus, Qvarfordt-vonAhn meets “determining a percentage of participants with guesses meeting the required threshold within a predetermined time,” per limitation [5E]. Lopresti, ¶230.

6. Claims 7-9

Qvarfordt-vonAhn meets claims 7-9 for the same reasons discussed in Ground 1 regarding Qvarfordt alone, because the combination does not change any aspect of Qvarfordt relied on to meet claims 7-9. Lopresti, ¶231.

7. Claim 10

a. Preamble [10PRE] and Limitations [10A]-[10D]

Qvarfordt-vonAhn meets claim 10's preamble and limitations [10A]-[10D] for the same reasons discussed in Ground 1 regarding Qvarfordt alone, because the combination does not change any aspect of Qvarfordt relied on to meet claim 10's preamble and limitations [10A]-[10D]. Lopresti, ¶232.

b. Limitation [10E]

Qvarfordt-vonAhn meets limitation [10E] for the same reasons it meets limitation [1E]. *Supra* §V.A.2.f; Lopresti, ¶233.

8. Claims 11-14

Qvarfordt-vonAhn meets claims 11-14 for the same reasons discussed in Ground 1 regarding Qvarfordt alone, because the combination does not change any aspect of Qvarfordt relied on to meet claims 11-14. Lopresti, ¶234.

VI. NO BASIS FOR DISCRETIONARY DENIAL

A. Section 314(a): Parallel Litigation Does Not Weigh Against Institution

The related district court litigation, *Human Differential Intelligence LLC v. Cloudflare, Inc.*, No. 1:22-cv-0134 (W.D. Tex.) (*see* §II.B.2), does not warrant discretionary denial under §314(a). *See Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11, 7-8 (P.T.A.B. Mar. 20, 2020).

The first *Fintiv* factor favors institution. Petitioner Intuition Machines is not a party to the litigation. Moreover, Petitioner Cloudflare, which is a defendant in that case, may move to stay if institution here is granted, although whether the district court will grant such a motion is unknown. Without “specific evidence” of how the court would rule, this factor would be neutral. *Sand Revolution II, LLC v. Continental Intermodal Group-Trucking LLC*, IPR2019-01393, Paper 24, 7 (P.T.A.B. June 16, 2020) (informative, designated July 13, 2020); *Google LLC v. Jawbone Innovations, LLC*, IPR2022-00649, Paper 13, 7 (P.T.A.B. Oct. 31, 2022) (Board will not predict likelihood of stay absent “specific evidence.”). Nevertheless, the earlier in a litigation an IPR is filed, the higher the chances of a stay being granted. *Comm’n Techs., Inc. v. Samsung Elecs. Am., Inc.*, 2023 WL 1478447, at *3 (E.D. Tex. Feb. 2, 2023) (considering “whether the defendant acted with reasonable dispatch” in filing IPRs). Given the exceptional earliness of this Petition—within two months of Cloudflare being served on January 5, 2023—this factor should favor institution.

The second *Fintiv* factor also favors institution. The related litigation is currently stayed pending further order of the court. Ex1059. Defendant Cloudflare’s response to the complaint was served the same day as the filing of this Petition, a trial date has not been set, no discovery requests have been served, and no claim construction activities have begun. Ex1060. If this Petition is instituted, a final

written decision is likely due before September 2024. Given the current stay, lack of any substantive litigation activity, and possible delays during litigation, it is unlikely a trial would occur before a final written decision here. *Beckman Coulter v. Sirigen II Limited*, IPR2022-01205, Paper 12, 19-20 (P.T.A.B. Jan. 6, 2023) (noting the Board “will consider the speed with which the district court case may come to trial and be resolved.”).

The third *Fintiv* factor favors institution because the parties expended almost no resources in the related litigation, where no contentions have been exchanged, no discovery has occurred, and no claim construction proceedings have even been scheduled. *See Cisco Sys. v. WSOU Investments, LLC*, IPR2021-01117, Paper 10, 16-17 (P.T.A.B. Jan. 10, 2022) (finding third factor weighs against denial even after claim construction ruling).

The fourth *Fintiv* factor favors institution. A final written decision would streamline the related litigation as Petitioners would not be able to raise the same grounds in any district court proceeding. *LinkedIn Corp. v. EBuddy Techs. B.V.*, IPR2022-00177, Paper 13, 11-12 (P.T.A.B. May 17, 2022); 35 U.S.C. §315(e)(2).

The fifth *Fintiv* factor favors institution because a final written decision here is nearly certain to issue before any trial in district court, where the case is currently stayed and trial has not been scheduled. *Kinaxis Inc. v. Blue Yonder Grp., Inc.*, IPR2021-01302, Paper 15, 30-31 (P.T.A.B. Feb. 9, 2021) (fifth *Fintiv* factor weighs

against discretionary denial where final written decision precedes trial date); *Google LLC v. Parus Holdings, Inc.*, IPR2020-00846, Paper 9, 20-21 (P.T.A.B. Oct. 21, 2020) (where petitioner is defendant in parallel litigation, the fifth factor “depend[s] on which tribunal [is] likely to address the challenged patent first.”).

The sixth *Fintiv* factor favors institution because the merits are exceptionally strong for the reasons explained above.

B. Section 325(d) Provides No Basis To Deny Institution

Denial is also improper under the Board’s two-part test for assessing §325(d). *Advanced Bionics v. Med-El Elektromedizinsche Geräte*, IPR2019-01469, Paper 6, 8 (P.T.A.B. Feb. 13, 2020) (precedential).

Petitioners’ grounds rely on references (Qvarfordt and vonAhn) that were not used in any rejection, including one (vonAhn) that was not of record during prosecution. *Supra* §§V.A.1, V.B.1. Even though Qvarfordt was of record, the Board has “***consistently held*** that a reference [like Qvarfordt] that was neither applied against the claims nor discussed by the Examiner does not weigh in favor of exercising[] discretion under § 325(d).” *Bowtech, Inc. v. MCP IP, LLC*, IPR2019-00382, Paper 12, 12 (P.T.A.B. Aug. 6, 2019). *See, e.g., Amgen Inc. v. Alexion Pharms., Inc.*, IPR2019-00739, Paper 15, 62-63 (P.T.A.B. Aug. 30, 2019) (collecting cases); *Amber.io, Inc. v. 72Lux, Inc.*, IPR2020-00015, Paper 8, 19-20 (P.T.A.B. Apr. 1, 2020) (post-*Advanced Bionics* and instituting where art only cited in an IDS);

Microsoft Corp. v. Parallel Networks Licensing LLC, IPR2015-00486, Paper 10, 15 (P.T.A.B. July 15, 2015) (granting institution on grounds asserting references merely listed in an IDS where “there [was] no evidence that the Examiner considered the particular disclosures cited.”).

The Examiner never applied Qvarfordt in rejecting any claim. Ex1004. There is no overlap between the arguments made during examination and the instant grounds. Because the Examiner did not reject the challenged claims over Qvarfordt alone (Ground 1) or in combination with another reference (Ground 2), the way Petitioners rely on the prior art does not overlap with arguments made during prosecution. Indeed, Petitioners rely on an obviousness argument based on art and expert declaration not before the Examiner.

The Board often holds reliance on cited, but unapplied, art ***affirmatively “weighs strongly against”*** discretionary denial. *SolarEdge Techs. v. SMA Solar Tech.*, IPR2020-00021, Paper 8, 11 (P.T.A.B. Apr. 10, 2020); *Adobe Inc. v. RAH Color Techs.*, IPR2019-00629, Paper 44, 19 (P.T.A.B. Sept. 4, 2019) (“weighs strongly against”); *Intel Corp. v. Qualcomm Inc.*, IPR2019-00047, Paper 8, 10-15 (P.T.A.B. July 9, 2019) (same despite art and a search report describing its relevance being cited); *Apple Inc. v. Qualcomm Inc.*, IPR2018-01316, Paper 7, 24-25 (P.T.A.B. Jan. 18, 2019).

The grounds raise materially different arguments than previously presented to the Office. *Axioma Metering UAB v. Kamstrup A/S*, IPR2019-01640, Paper 10, 10-11 (P.T.A.B. Apr. 8, 2020). The Examiner determined that application claim 2, which included the step of “calculating a percentage of participants able to decode and accurately guess said one or more concepts within a predetermined time,” was “likely to be allowable.” Ex1004, 226, 286, 322. The applicant argued (and the Examiner ultimately agreed) that the prior art disclosed only “checking to see whether an individual user’s guess is correct.” *Id.*, 316-17. Conversely, Qvarfordt, alone or in combination with vonAhn, discloses calculating an overall percentage of users who accurately guess the underlying concept within a predetermined time. The record reflects no indication that the Examiner considered such an argument.

Finally, even if the first prong of the Board’s two-part test is satisfied, the second prong strongly supports institution because the Examiner failed to appreciate Qvarfordt’s teachings. Again, the Examiner neither discussed nor rejected any claims over Qvarfordt. The Examiner necessarily failed to appreciate the full scope of Qvarfordt’s teachings, including that Qvarfordt discloses or suggests the alleged point of novelty recited in step (e) of the independent claims.

VII. CONCLUSION

Petitioners respectfully request cancellation of claims 1-5 and 7-14.

Respectfully submitted,

February 27, 2023

/Elliot C. Cook/

Elliot C. Cook, Reg.# 61,769

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP

CERTIFICATION OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24, the undersigned certifies that the foregoing Petition for *Inter Partes* Review contains 13,657 words excluding a table of contents, a table of authorities, Mandatory Notices under §42.8, a certificate of service or word count, and appendix of exhibits or claim listing. Petitioner has relied on the word count feature of the word processing system used to create this paper in making this certification.

Date: February 27, 2023

/William Esper/
William Esper
Case Manager and PTAB Coordinator
FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP

CERTIFICATE OF SERVICE UNDER 37 C.F.R. §42.6 (e)(4)

The undersigned certifies that, in accordance with 37 C.F.R. §42.6(e) and 37 C.F.R. §42.105, a copy of the foregoing **Petition for *Inter Partes* Review**; the associated **Powers of Attorney**; and **Exhibits 1001-1041, 1053-1061** are being served via Priority Mail Express on the 27 day of February 2023, the same day as the filing of the above-identified documents in the United States Patent and Trademark Office/Patent Trial and Appeal Board, upon the Patent Owner by serving the correspondence address of record with the USPTO as follows:

John Nicholas Gross
Law Office of J. Nicholas Gross, Prof. Corp.
PO BOX 9489
Berkeley, CA 94709

And upon the following counsel of record for the Patent Owner in litigation pending before the Western District of Texas Case No. 1:22-cv-01334 via FedEx Priority Overnight:

Andrew G. DiNovo
DiNovo Price LLP
7000 N. MoPac Expressway, Suite 350
Austin, TX 78731

Date: February 27, 2023

/William Esper/

William Esper
Case Manager and PTAB Coordinator
FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP