

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. IPR2023-00632
Patent No. 9,192,861

DECLARATION OF DANIEL P. LOPRESTI, PH.D.

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I, Daniel P. Lopresti, declare:

I. INTRODUCTION

1. I have been retained by Finnegan, Henderson, Farabow, Garrett & Dunner, LLP to assess U.S. Patent No. 9,192,861 (“the ’861 Patent”). I previously submitted the same opinions presented in this Declaration in IPR2020-1611, where Google LLC filed a Petition for Inter Partes Review also challenging the ’861 Patent. I have specifically been asked to focus on claims 1, 4-5, 9, 12, 14, and 16 of that patent (the “Challenged Claims”). I am being compensated for my time at my standard rate of \$400.00 per hour, plus actual expenses. My compensation is not dependent in any way upon the outcome of the *inter partes* review of the ’861 Patent.

II. PERSONAL AND PROFESSIONAL BACKGROUND

2. My qualifications for forming the opinions set forth in this declaration are summarized below and explained in more detail in my current curriculum vitae, provided as Exhibit 1003. It also includes a list of my publications and patents.

3. I am a Full Professor in the Department of Computer Science & Engineering (“CSE”) at Lehigh University in Bethlehem, PA, and have been since July 2009. From July 2009 through June 2019, I also served as Chair of the CSE Department. In July 2015, I was named Director of the Lehigh Data X strategic initiative focused on interdisciplinary data science, a role I held until June 2020. From July 2014 through June 2015, I served as Interim Dean of the P. C. Rossin College of Engineering and Applied Science at Lehigh. From 2003 to 2009, I was an Associate Professor in the CSE Department. The courses that I have taught at Lehigh include big data analytics, artificial intelligence theory and practice, AI for social good, software product management, issues in cybersecurity, data mining, research methods, and operating system design. My research areas include computer security, biometric security, pattern and optical

character recognition, document image analysis, machine learning, and electronic voting systems.

4. From December 2002 to June 2003, I held a courtesy appointment as a Visiting Research Scientist at the Palo Alto Research Center, and from February 2003 to June 2003 I also held courtesy appointments as a Research Fellow in the Information Security Institute at Johns Hopkins University, and as a Visiting Research Associate Professor at Rensselaer Polytechnic Institute.

5. From October 1997 to December 2002, I was a Member of Technical Staff at Bell Labs/Lucent Technologies, conducting research in the areas of computer security, document image analysis, optical character recognition, and pen computing, and where I also collaborated with colleagues on the development of text-to-speech (“TTS”) technologies. I also worked on audio CAPTCHAs, speech biometrics, and handwriting biometrics.

6. From June 1991 to October 1997, I was a Principal Scientist at the Matsushita Information Technology Laboratory in Princeton, NJ, conducting research in the areas of optical character recognition, pen computing, document analysis, and document processing systems.

7. From September 1986 to May 1991, I was an Assistant Professor of Computer Science at Brown University in Providence, RI, conducting research in parallel computing and computer-aided design of VLSI. The courses that I taught at Brown included VLSI design, parallel computing, parallel computer architectures, discrete math, and computational molecular biology.

8. From 2009 through 2013, I served as Chair of Technical Committee 11 of the International Association for Pattern Recognition (“IAPR”). Technical Committee 11 is known as the “Reading Systems” committee and its goal is to understand and develop systems that can

analyze media containing character symbols and return an encoded representation of the text content and structure. From 2018 through 2021, I served as Treasurer of IAPR, and in 2021, I was elected President of IAPR. In 2022, I transitioned to the role of Past-President. I have served as a member of the IAPR Executive Committee since 2018.

9. Since 2015, I have served as an appointed member on the Council for the Computing Community Consortium (“CCC”) of the Computing Research Association (“CRA”). I assumed the role of Vice Chair of CCC effective July 2020, and the Chair of CCC effective July 2022. CRA counts among its members more than 200 North American organizations active in computing research, including nearly all of the U.S. universities that offer PhDs in computer science or related fields. The role of the CCC is to catalyze the computing research community to pursue high-impact research, conduct activities that strengthen the research community, articulate compelling research visions, and align those visions with key national and global challenges. While on the CCC Council, I have served on, and also co-chaired, the Cybersecurity and Cybercrime Task Force, and served on the Roadmap for Artificial Intelligence Research Steering Committee

10. Since 2014, I have served as an Editor-in-Chief of the International Journal of Document Analysis and Recognition which is a scholarly journal published by Springer-Nature and generally concerns all areas related to document analysis and recognition. This includes research dealing with computer recognition of characters, symbols, text, lines, graphics, images, handwriting, signatures, as well as automatic analyses of the overall physical and logical structures of documents, with the ultimate objective of a high-level understanding of their semantic content. Over a period of more than 20 years, I have served as a technical program co-chair for many of the major international conferences in the fields of document image analysis.

11. In May 2005, I co-chaired and organized the Second International Workshop on Human Interactive Proofs (“HIPs”) at Lehigh University. This workshop brought together top researchers in the area, with proceedings that were published by Springer. HIPs are a similar, overlapping concept to Completely Automatic[ed] Public Turing Tests To Tell Computers And Humans Apart, or “CAPTCHAs,” the subject matter of the Challenged Claims. Both HIPs and CAPTCHAs deal with entirely automated systems and methods to determine whether an entity interacting with a computing device is in fact human, or is instead a computer. This concept is also sometimes called a “Reverse Turing Test.” This workshop was one of the very few conferences focused specifically on HIPs, CAPTCHAs, and related concepts.

12. I received a B.A. in Mathematics and Engineering Science from Dartmouth College in 1982, an M.S.E. in Electrical Engineering and Computer Science from Princeton University in 1983, an M.A. in Electrical Engineering and Computer Science from Princeton University in 1984, and a Ph.D. in Computer Science from Princeton University in 1987.

13. My areas of expertise encompass the fields of computer security and authentication, biometric security, document image analysis techniques, optical character recognition technology, and electronic voting systems.

14. I have authored over 150 publications. I am also a named inventor on 24 United States patents, many of which are related to or in the field of document image analysis, and several of which cover audio CAPTCHA technology.

15. I have authored or co-authored several publications involving CAPTCHAs, HIPs, Reverse Turing Tests, and related concepts. These publications include “Leveraging the CAPTCHA Problem,” D. Lopresti, *Proceedings of the Second International Workshop on Human Interactive Proofs*, May 2005, Bethlehem, PA, pp.97-110; “A Reverse Turing Test Using

Speech,” G. Kochanski, D. Lopresti, and C. Shih, *Proceedings of the Seventh International Conference on Spoken Language Processing*, September 2002, Denver, CO, pp.1357-1360 (Ex. 1015); *Human Interactive Proofs*, Lecture Notes in Computer Science Vol. 3517, H. Baird and D. Lopresti (editors), Springer-Verlag, May 2005; “Human Interactive Proofs for Spoken Language Interfaces,” D. Lopresti, C. Shih and G. Kochanski, *Proceedings of the Workshop on Human Interactive Proofs*, January 2002, Palo Alto, CA, pp.30-34; and “Human/Machine Differentiation,” H. Baird and D. Lopresti, *2005 McGraw-Hill Yearbook of Science and Technology*, pp.144-147. Two of my papers are listed as a prior art publication on the ’861 patent. ’861 patent at (56) (citing Kochanski, G., Lopresti, D. and Shih, C. “A Reverse Turing Test Using Speech,” *Seventh International Conference on Spoken Language Processing*, Sep. 2002; Lopresti, Daniel, “Leveraging CAPTCHA Problem,” Presented at the Second International Workshop on Human Proofs, Bethlehem, PA, 2005).

16. I have also received a grant to do research on CAPTCHAs: “Implicit and Multi-Modal CAPTCHAs,” Co-Principal Investigator (with H. Baird), Avaya Labs Research, \$30,000, 2005-2006. I also received a grant for biometric security: “Using Generative Models to Evaluate and Strengthen Biometrically Enhanced Systems,” Co-Principal Investigator (with F. Monroe and M. Reiter), National Science Foundation, \$287,950, 2004-2008.

17. I have also taught many courses that covered the basic technical concepts underlying CAPTCHAs, HIPs, Reverse Turing Tests, and related concepts, at both the undergraduate and graduate level, over the course of the past two decades.

18. I have been a member of the Institute of Electrical and Electronics Engineers (“IEEE”) since 1982. I became an IEEE Senior Member in 2003. During my career, I have

authored or co-authored approximately 20 refereed papers or proceedings that were published in IEEE technical publications.

19. I have also been active in other IEEE activities. For example, I served as program co-chair for the Eleventh International Conference on Document Analysis and Recognition in 2011, whose proceedings were published on the IEEE Explore website. I have received two awards from IEEE organizations. I was an Associate Editor of *IEEE Transactions on Pattern Analysis and Machine Intelligence* between 2005 and 2010. I have been a member of conference program committees for several IEEE conferences, I have served as an invited reviewer for a number of different IEEE journals and several IEEE conferences, all as listed in my CV.

20. I am also a member of several other technical associations, and have conducted various activities for them, attended their conferences, and published papers and proceedings in their technical publications. These include the Association for Computing Machinery (“ACM”), the International Association for Pattern Recognition (“IAPR”), the Association for the Advancement of Artificial Intelligence (“AAAI”), and the American Association for the Advancement of Science (“AAAS”).

III. MATERIALS REVIEWED AND CONSIDERED

21. My findings, as explained below, are based on my years of education, research, experience, and background in fields related to computer security and access control, as well as my investigation and study of relevant materials for this declaration. When developing the opinions set forth in this declaration, I assumed the perspective of a person having ordinary skill in the art, as set forth in Section V below. In forming my opinions, I have studied and considered the materials identified in the list below.

Exhibit	Description
1001	U.S. Patent No. 9,192,861 (“the ’861 Patent”)
1004	File history of the ’861 Patent
1005	U.S. Provisional Application No. 61/076,495 (“HDI’s Provisional”)
1006	U.S. Patent No. 8,214,891 (“Seacat”)
1007	U.S. Patent Application Publication No. 2007/0259716 (“Mattice”)
1008	Shirali-Shahreza, <i>et al.</i> , “CAPTCHA for Children,” 2008 IEEE International Conference on System of Systems Engineering (SoSE), June 2-4, 2008 (“Shirali-Shahreza”)
1009	von Ahn, “Human Computation,” CMU-CS-05-193, Carnegie Mellon University School of Computer Science, December 7, 2005 (“vonAhn”)
1010	U.S. Patent Application Publication No. 2009/0113294 (“Sanghavi”)
1011	U.S. Patent No. 8,601,538 (“Qvarfordt”)
1012	U.S. Patent No. 8,510,795 (“Gargi”)
1013	U.S. Patent Application Publication No. 2007/0201745 (“Wang”)
1014	U.S. Patent Application Publication No. 2007/0250920 (“Lindsay”)
1015	Kochanski, Lopresti, <i>et al.</i> , “A Reverse Turing Test Using Speech,” Proceedings of the 7th International Conference on Spoken Language Processing, pp. 1357-60, September 16-20, 2002 (“Kochanski”)
1016	Institute of Electrical and Electronics Engineers, Inc., <i>CAPTCHA for Children - IEEE Conference Publication</i> , at https://ieeexplore.ieee.org/document/4724188
1017	Zhu, Huang, Lopresti, <i>et al.</i> , “Web-based Multi-observer Segmentation Evaluation Tool,” 21st IEEE International Symposium on Computer-Based Medical Systems, June 17-19, 2008
1018	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
1019	Library of Congress, <i>Public Catalog for 2008 IEEE International Conference on System of Systems Engineering (SoSE)</i> , at https://cocatalog.loc.gov/cgi-bin/Pwebrecon.cgi?Search

Exhibit	Description
	Arg=2008+IEEE+International+Conferenc e+on+System+of+Systems+Engineering&Search Code=TALL&PID= VIFL5zSeTrVcFdBaUaFwZkA 1 ayd0k&SEQ=20200904174316&CNT =25&HIST=1
1020	Excerpt from Institute of Electrical and Electronics Engineers, Inc., <i>2008 IEEE International Conference on System of Systems Engineering (SoSE)</i> , pp.343-48 (2008)
1021	Declaration of Mary K. Bolin, Ph.D., with attachments
1022	Declaration of Jessica Benner, Ph.D., with attachment
1023	Declaration of Professor Kawahara Tatsuya, with attachment
1024	Declaration of Gerard P. Grenier, with attachment
1025	<i>Human Differential Intelligence LLC v. Cigna Corporation</i> , Civil Action No. 6:20-cv-00305-ADA (W.D. Tex.), D.I. 19 (Corrected First Amended Complaint)
1040	Merriam-Webster, Inc., “Threshold,” <i>Merriam-Webster's Collegiate Dictionary</i> 1302 (11th ed. 2007)
1041	U.S. Patent Application Publication No. 2009/0319270 (“Gross”)
1042	U.S. Patent No. 8,542,251 (“Gossweiler”)
1043	U.S. Patent Application Publication No. 2009/0320123 (“Yu”)
1044	<i>Human Differential Intelligence LLC v. Cloudflare</i> , Civil Action No. 1:22-cv-01334 (W.D. Tex), D.I. 1 (Complaint)
1045	Declaration of Jessic Benner, Ph.D., with attachment (Feb. 17, 2023)
1046	Declaration of Kelley Hayes Greenfield, with attachments (Feb 22, 2023)

IV. MY UNDERSTANDING OF PATENT LAW

22. In developing my opinions, I discussed various relevant legal principles with Intuition Machine’s (“IM”) attorneys. Though I do not purport to have prior knowledge of such principles, I understood them when they were explained to me and have relied upon such legal

principles, as explained to me, in the course of forming the opinions set forth in this declaration. My understanding in this respect is as follows.

23. I understand that “*inter partes* review” (IPR) is a proceeding before the United States Patent & Trademark Office for evaluating the patentability of an issued patent’s claims based on prior-art patents and printed publications.

24. I understand that, in this proceeding, the Petitioners have the burden of proving that the Challenged Claims of the ’861 Patent are unpatentable by a preponderance of the evidence. I understand that “preponderance of the evidence” means that a fact or conclusion is more likely true than not true.

25. I understand that, in IPR proceedings, claim terms in a patent are given their ordinary and customary meaning as understood by a person of ordinary skill in the art (“POSA”) in the context of the entire patent and the prosecution history pertaining to the patent. If the specification and/or prosecution history provides a special definition for a claim term that differs from the meaning the term would otherwise possess, the special definition controls. If a claim element is expressed as a “means” for performing a specified function, I understand that it covers the corresponding structure described in the specification and equivalents of the described structure. I have applied these standards in preparing the opinions in this declaration.

26. I understand that determining whether a particular patent or printed publication constitutes prior art to a challenged patent claim can require determining the effective filing date (also known as the priority date) to which the challenged claim is entitled. I understand that for a patent claim to be entitled to the benefit of the filing date of an earlier application to which the patent claims priority, the earlier application must have described the claimed invention in sufficient detail to convey with reasonable clarity to the POSA that the inventor had possession

of the claimed invention as of the earlier application's filing date. I understand that a disclosure that merely renders the claimed invention obvious is not sufficient written description for the claim to be entitled to the benefit of the filing date of the application containing that disclosure.

27. I understand that for an invention claimed in a patent to be patentable, it must be, among other things, new (novel—i.e., not anticipated) and not obvious from the prior art. My understanding of these two legal standards is set forth below.

A. Anticipation

28. I understand that, for a patent claim to be “anticipated” by the prior art (and therefore not novel), each and every limitation of the claim must be found, expressly or inherently, in a single prior-art reference. I understand that a claim limitation is disclosed for the purpose of anticipation if a POSA would have understood the reference to disclose the limitation based on inferences that a POSA would reasonably be expected to draw from the explicit teachings in the reference when read in light of the POSA's knowledge and experience.

29. I understand that a claim limitation is inherent in a prior art reference if that limitation is necessarily present when practicing the teachings of the reference, regardless of whether a person of ordinary skill recognized the presence of that limitation in the prior art.

B. Obviousness

30. I understand that a patent claim may be unpatentable if it would have been obvious in view of a single prior-art reference or a combination of prior-art references.

31. I understand that a patent claim is obvious if the differences between the subject matter of the claim and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the relevant field at the time the invention was made. Specifically, I understand that the obviousness question involves a consideration of:

- the scope and content of the prior art;

- the differences between the prior art and the claims at issue;
- the knowledge of a person of ordinary skill in the pertinent art; and
- if present, objective factors indicative of non-obviousness, sometimes referred to as “secondary considerations.” To my knowledge, the alleged Patent Owner, Human Differential Intelligence, LLC (“HDI”) has not asserted any such secondary considerations with respect to the ’861 Patent.

32. I understand that in order for a claimed invention to be considered obvious, a POSA must have had a reason for combining teachings from multiple prior-art references (or for altering a single prior-art reference, in the case of obviousness in view of a single reference) in the fashion proposed.

33. I further understand that in determining whether a prior-art reference would have been combined with other prior art or with other information within the knowledge of a POSA, the following are examples of approaches and rationales that may be considered:

- combining prior-art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;
- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been “obvious to try,” i.e., choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior-art reference or to combine prior-art reference teachings to arrive at the claimed invention. I understand that this teaching, suggestion or motivation may come from a prior-art reference or from the knowledge or common sense of one of ordinary skill in the art.

34. I understand that for a single reference or a combination of references to render the claimed invention obvious, a POSA must have been able to arrive at the claimed invention by altering or combining the applied references.

V. PERSON OF ORDINARY SKILL IN THE ART (“POSA”)

35. For purposes of assessing whether prior-art references disclose every element of a patent claim (thus “anticipating” the claim) and/or would have rendered the claim obvious, I have been informed and understand that the patent and the prior-art references must be assessed from the perspective of a POSA to which the patent relates, based on the understanding of that person at the time of the patent claim’s priority date. I have been informed and understand that a POSA is presumed to be aware of all pertinent prior art and the conventional wisdom in the art, and is a person of ordinary creativity. I have applied this standard throughout my declaration.

36. The ’861 Patent involves technology in the field of computer security and access control, and specifically “CAPTCHA,” or “Completely Automatic Public Turing Tests To Tell Computers And Humans Apart.” Ex. 1001, Title; 1:44-46. I have been asked to provide my opinions as to the state of the art in this field by mid- 2008 through mid-2009. I use this

timeframe because the face of the '861 Patent indicates an earliest claimed priority date of June 27, 2008 based on the filing of a provisional application. Ex. 1001, (60). As discussed below in Section VIII, however, I understand that the Petitioners dispute whether any of the Challenged Claims can properly claim priority to that provisional application, and that the earliest possible priority date after that point is the filing of a non-provisional application on June 29, 2009, from which the application that resulted in the '861 Patent is a divisional. Ex. 1001, (62). The difference of that one year does not affect the level of ordinary skill, however.

37. Whenever I offer an opinion in this declaration about the knowledge of a POSA, the manner in which a POSA would have understood the claims of the '861 Patent or its description, the manner in which a POSA would have understood the prior art, or what a POSA would have been led to do based on the prior art, I am referencing the mid-2008 through mid-2009 timeframe, even if I do not say so specifically in each case.

38. I understand that the Patent Owner may attempt to prove that the alleged invention recited in the Challenged Claims was conceived at some time prior to the earliest claimed priority date on the face of the patent. At the time of this declaration, I am unaware of the Patent Owner having alleged any earlier conception date or produced any evidence to establish any earlier conception date.

39. The '861 Patent purports to describe and claim techniques to accomplish access control in computer security via CAPTCHA. *See* §VI.B below. Computer security is a field in computer science.

40. In my opinion, a person of ordinary skill in the art in the mid-2008 through mid-2009 timeframe 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. This person would have been capable of understanding and applying the teachings of the '861 Patent and the prior-art references discussed in this declaration.

41. By 2008-2009, I held two different master's degrees in Electrical Engineering and Computer Science, a Ph.D. in Computer Science, and was a professor in Computer Science and Engineering at Lehigh University in Bethlehem, Pennsylvania. I had over twenty years of work and/or research experience in computer science, working as a Principal Scientist at the Matsushita Information Technology Laboratory and a technical staff member at Bell Labs/Lucent Technologies, as well as various visiting professorships and research fellowships at other universities. I also had over fifteen years of work and/or research experience in computer security and related areas, along with experience with CAPTCHA, including the experience listed in Section II above. Therefore, I was a person of more than ordinary skill in the art during the relevant timeframe. However, I worked with many people who fit the characteristics of the POSA, and I am familiar with their level of skill. When developing the opinions set forth in this declaration, I assumed the perspective of a POSA, as set forth above.

VI. '861 PATENT OVERVIEW

A. Technology Background

42. The '861 Patent's claims concern using CAPTCHA to protect websites and other networked devices from automated access, an area in the field of access control in computer security. Ex. 1001: Title; 1:44-46. By the later 1990s, CAPTCHAs were first developed to control access to computers via the Internet and prevent automated hacking attacks from computer "bots." Ex. 1009, pp.12-14. 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 site. *Id.* The '861 Patent notes that before the filing

date it was “well-known” to use CAPTCHA challenges to control access to computers and resources on the Internet. ’861 Patent, 1:44-52.

43. Early CAPTCHA tests involved displaying a distorted text image and required the user to type the displayed word with few or no errors, as shown in the example below, from Exhibit 1010.



44. While distorted-text CAPTCHAs succeeded for a time, by the mid- 2000s computers could solve certain text-based CAPTCHAs with reasonable success, so the industry was developing CAPTCHAs based on other tasks computers could not perform well, such as non-text image recognition, audio recognition, and motion, orientation, and touch-based challenges. *E.g.*, Ex. 1009, pp.15-17.

45. By the relevant 2008-2009 time frame, various types of user inputs and interfaces were used to tell humans and computers apart. These were not limited to just visual recognition of text or numbers. Exs. 1009-10. There were also CAPTCHAs relying on visual recognition of non-text images. Exs. 1011, 1013. There were CAPTCHAs based on video clips. Ex. 1012. Some CAPTCHAs used text-to-speech interfaces. Exs. 1008, 1015. Other CAPTCHAs used touch interfaces using the motion of a user’s hands or fingers. Ex. 1006. In short, many types of CAPTCHA interfaces, inputs, and implementations were known to those of skill in the art. Ex. 1018.

B. The ’861 Patent’s Alleged Improvements and Disclosed Embodiments

46. My understanding is that the '861 Patent is one of seven patents claiming priority to HDI's Provisional. That provisional focuses primarily on an electronic PictionaryTM game, and most of the other patents claim aspects of that game. Ex.1005. The '861 Patent specification likewise focuses on the electronic PictionaryTM game, and mentions CAPTCHA in only three passages largely absent from HDI's Provisional. *Id.*, 1:44-57, 4:36-5:62, 14:1-67.

47. The '861 Patent says that CAPTCHA was “well-known for controlling access to computers and resources on the Internet.” *Id.*, 1:44-49. While mentioning “conventional (distorted) text type challenges,” the '861 Patent suggests the prior art allegedly did not appreciate the potential for image-based challenges, and states that “images can be incorporated as part of a picture[-]based game to develop appropriate challenges.” *Id.*, 1:52-57. That is incorrect. As discussed below, the prior art discloses such features.

48. The '861 specification describes two CAPTCHA embodiments. One is based on progressively revealing non-text images (Ex. 1001, 4:36-5:3) and is the focus of the claims in a different patent (the '141 Patent), which I address in a separate declaration in connection with a different IPR petition.

49. The claims of the '861 Patent focus on the other CAPTCHA embodiment, one based on physical manipulation. Ex. 1001, 5:11-50, 14:26-67. For instance, for “an iPhone [-]like” mobile device “capable of motion/orientations sensing,” the user could be asked to move or orient the device itself (e.g., “rotating it to the right, to the left, in a complete circle, picking it up and putting it down N times, shaking it in different directions,... rotating it 90 degrees,... moving it in a FIG. 8 pattern”) or to manipulate “objects within the screen...based on sensing the movement of the device.” *Id.*, 14:23-49. Alternatively, on a “touchscreen” device, a CAPTCHA challenge can involve “the user [being] required to physically touch or manipulate icons or other

objects to achieve some result,” such as the user being “asked to orient an object into its correct position by moving it with their fingers,” or “to physically touch or manipulate icons or other objects to achieve some result.” *Id.*, 14:50-59; 5:4-62.

50. Based on my review of the claims and the specification, the physical-manipulation CAPTCHA embodiments and ’861 claims require three elements. ’861 Patent, 5:11-24, 5:38-50; claims 1, 12. The first element is “automatically electing” a manipulation challenge for the user, where the challenge includes physical manipulation or touch instructions (e.g., moving or orienting the device, touching the device). *Id.* The second element is “automatically processing” sensory data associated with the user’s movements and/or manipulations. *Id.* The last element is “automatically determining” if the data meets a required threshold for satisfying the instructions to qualify the user as a human. *Id.*

C. Prosecution History of the ’861 Patent

51. The application that resulted in the ’861 Patent, filed March 24, 2014, was a divisional of U.S. App. No. 12/494,083 (now the ’141 Patent), filed June 29, 2009, which claims priority to HDI’s Provisional, filed June 27, 2008. Ex. 1001.

52. The Challenged Claims were not subject to any prior art-based rejections. Besides saying that two dependent claims lacked antecedent basis, the first office action found all pending claims allowable because the prior art allegedly did not disclose the independent claims’ steps (b) or (c): “automatically processing” data associated with user movements and/or manipulations [1B/12B]), and “automatically determining” if the data “meets a required threshold” [1C/12C]. Ex. 1004, pp.94-101. After the applicant submitted amendments correcting the two dependent claims and making other minor changes, a Notice of Allowance issued with no further discussion. *Id.*, pp.24-29, 58-65. Nothing indicates that the Examiner analyzed

whether any Challenged Claim is entitled to the filing date of HDI's Provisional. *Id.*, pp. 24-29, 58-65, 94-101.

D. The Challenged Claims

53. The '861 Patent has only two independent claims, claims 1 and 12. Those claims share a similar structure. I show them below, with the differences highlighted:

[1PRE] A method of providing a <i>motion and/or orientation based</i> Completely Automatic Public Turing Test To Tell Humans And Computers Apart (CAPTCHA) challenge on a portable computing device comprising:		[12PRE] A method of providing a <i>touch-based</i> Completely Automatic Public Turing Test To Tell Humans And Computers Apart (CAPTCHA) challenge on a portable computing device comprising:	
[1A]	a. automatically electing a manipulation challenge for a user with the portable computing device, wherein said <i>manipulation</i> challenge includes a set of physical manipulation instructions for the portable computing device for the user;	[12A]	a. automatically electing a manipulation challenge for a user with the portable computing device, wherein said manipulation challenge includes a set of physical <i>touch</i> instructions for the portable computing device for the user,
[1B]	b. automatically processing sensory data associated with user movements and/or manipulations of the portable computing device; and	[12B]	b. automatically processing <i>touch</i> sensory data associated with user movements and/or manipulations <i>of objects within a graphical interface</i> of the portable computing device; and
[1C]	c. automatically determining if said user <i>movements and/or manipulations from the user</i> meet a required threshold for satisfying said set of <i>manipulation</i> instructions to qualify said user as a human.	[12C]	c. automatically determining if said user <i>touch sensory data</i> meets a required threshold for satisfying said set of <i>physical touch</i> instructions to qualify said user as a human.

54. In general in this declaration, I add emphasis and highlighting and omit internal quotations and citations, unless I specifically state otherwise.

55. As I discuss below, the challenged dependent claims add implementation details that were known in the art to a POSA. *See* Ex. 1001, claims 4 and 14 (presenting instructions “in

audible form by a text[-]to[-]speech engine”), claim 5 (having the user move a “portable computing device so as to manipulate objects presented in an interface”), claims 9 and 16 (embodying the CAPTCHA challenge “in computer[-]readable form and implemented as a routine executing” on the device). The ’861 Patent acknowledges that this last feature was known in the art to a POSA: “Furthermore, while not explicitly shown or described herein, 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. Such code, routines, etc. may be stored in any number of forms of machine[-]readable media.” *Id.*, 25:65-26:5.

VII. CLAIM INTERPRETATION

56. I understand that determining whether a claimed invention is novel and non-obvious requires comparing the prior art to the claim. I also understand that there have been no prior determinations in civil actions or in International Trade Commission (“ITC”) proceedings interpreting any of the terms that appear in the ’861 Patent’s claims.

57. In my opinion, to resolve the validity of the Challenged Claims does not require giving any claim terms any express interpretations beyond their ordinary and customary meaning as understood by a POSA in the context of the entire ’861 Patent and its prosecution history. I do understand, however, that there is an issue regarding whether claim 1 is limited to motion/orientation of the device itself, or whether it also covers physical interactions with the device’s GUI, as HDI contends in litigation. As discussed below, my opinion is that claim 1 and its challenged dependent claims are unpatentable under either interpretation. §§IX.B, IX.C.

VIII. WHETHER HDI’S PROVISIONAL SUPPORTS ANY CHALLENGED CLAIM

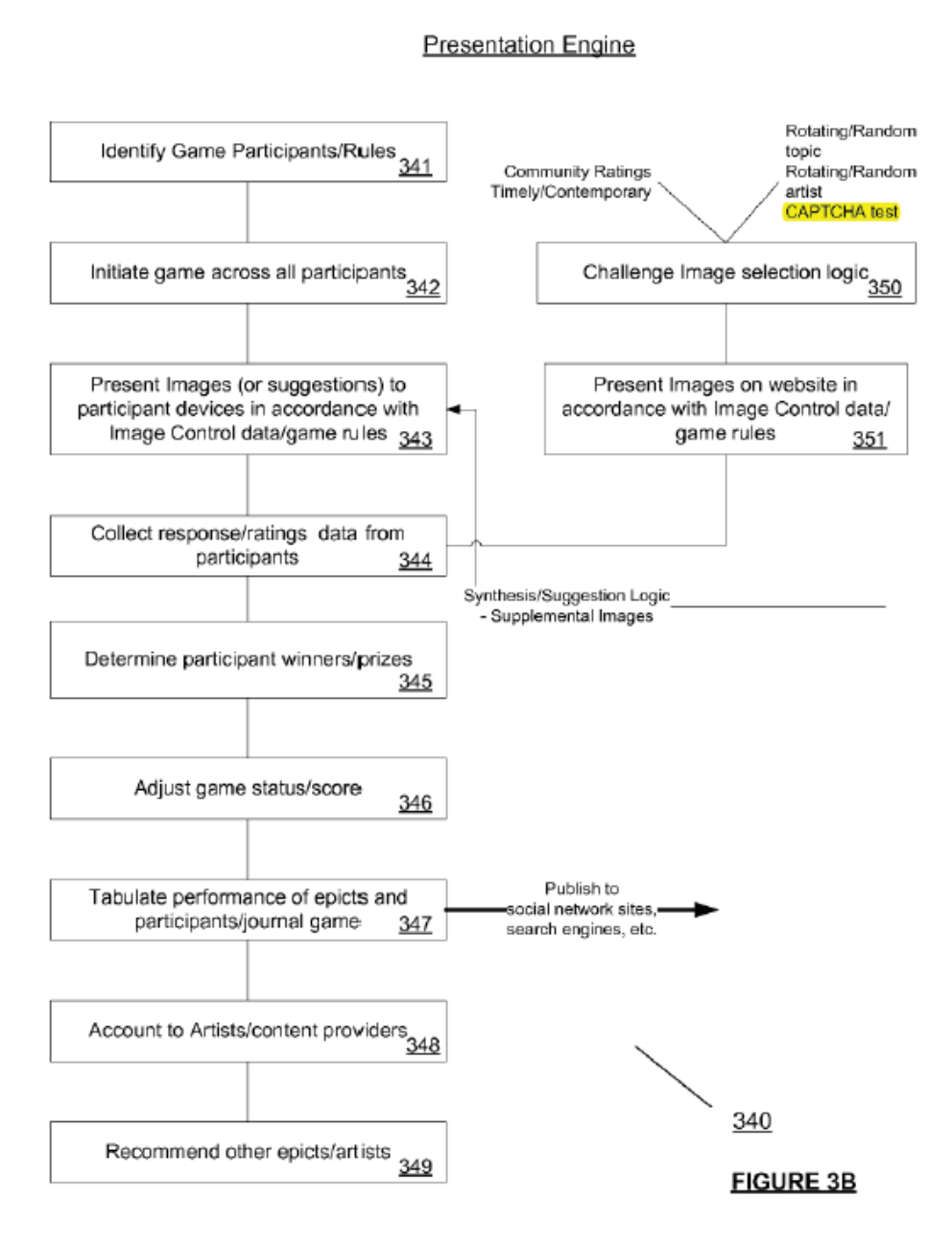
58. I understand that, as HDI is the alleged patent owner, in order to claim priority to HDI's Provisional HDI has to come forward with evidence to demonstrate that its provisional application supports any Challenged Claim. I also understand that to do so, HDI must show that its provisional contains a written description of the invention in the relevant claim, and of the manner and process of making and using it, in full, clear, concise, and exact terms that would enable any POSA to make and use the invention.

59. As discussed above (§VI.B), HDI's Provisional focuses almost entirely on the electronic PictionaryTM-style game. Ex.1005. The only disclosure relating to CAPTCHA is a single paragraph:

In some applications 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. This information can then be used to augment a library of challenge test images. For example[,] 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, thus making i[t] suitable for inclusion in a CAPTCHA system. 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. This process could be repeated iteratively—with progressively degraded versions of the image—as needed to meet the CAPTCHA system's requirements. The recognition times could also be measured for each iteration. In this manner the present invention can act as a form of testing ground for these types of challenge systems.

Id., pp.17-18.

60. Although not mentioned in the text, Figure 3B of HDI's Provisional mentions a "CAPTCHA test" in the upper right, with no further explanation:



Id., p.45.

61. The brief passage on pages 17-18 suggests only that the Pictionary™ game could augment images for a visual CAPTCHA library, though HDI’s Provisional indicates that such a CAPTCHA is “not shown.” *Id.*, pp.17-18, 45. Likewise, the mention of “CAPTCHA test” in Figure 3B refers only to the supply of such images to “challenge image selection logic 350.” *Id.*, pp.17, 45. There is **no** disclosure, mention, or suggestion of “motion and/or orientation”-based

CAPTCHA (Challenged Claim 1) or “touch”-based CAPTCHA (Challenged Claim 12). A POSA would not understand this paragraph or figure to disclose anything about those types of CAPTCHAs.

62. Although thin, the only arguable disclosure related to those CAPTCHA concepts came in the non-provisional application in June 2009, which contains passages not found in HDI’s Provisional. Ex. 1004, 139-40, 155-56. There is no written description of these ideas anywhere in HDI’s Provisional. There is no description in HDI’s Provisional that supports or in any way relates to the claim terms “motion and/or orientation,” “physical manipulation instructions,” “user movements and/or manipulations,” “sensory data,” “touch-based,” “physical touch instructions,” and “touch sensory data”—one or more of which appears in each limitation of claims 1 and 12, the only two independent claims. ’861 Patent, claims 1 and 12. I understand that those limitations are also incorporated or included in each challenged dependent claim that depends from those independent claims.

63. Therefore, a POSA would not find that HDI’s Provisional describes the claimed invention in sufficient detail to clearly conclude that the applicant invented the claimed inventions in the Challenged Claims as of June 2008, when HDI’s Provisional was filed. Needless to say, complete silence does not provide sufficient detail for a POSA to clearly conclude that the inventor invented these types of CAPTCHAs by the time of HDI’s Provisional. Instead, the earliest written description relating in any way to the CAPTCHAs of claims 1 and 12 came with the additional passages added in the non-provisional application, filed on June 29, 2009. Ex. 1004, 139-40, 155-56. In my opinion, that is the earliest possible date on which a POSA could conceivably conclude that any alleged invention in any Challenged Claims was

described in allegedly sufficient detail to clearly indicate that the applicant invented the claimed inventions. *Id.*

64. As explained below, however, I understand that all of the references relied upon in my declaration and the Petition would still be prior art to the '861 Patent even if a POSA could clearly conclude that there is sufficient description in HDI's Provisional to demonstrate that the applicant invented the claimed invention as of June 27, 2008.

IX. THE CHALLENGED CLAIMS ARE UNPATENTABLE IN LIGHT OF THE PRIOR ART IDENTIFIED IN THE PETITION.

65. I have been asked to provide my opinion concerning whether claims 1, 4-5, 9, 12, 14, and 16 of the '861 patent are anticipated or would have been obvious to a POSA in light of the prior-art references identified in the Petition. For the reasons explained below, it is my opinion that each of claims 1, 4-5, 9, 12, 14, and 16 is anticipated and/or would have been obvious to a POSA.

66. The following table summarizes my opinions as to why the Challenged Claims are anticipated and/or obvious:

Ground Number and Reference(s)		Claims	Basis
1	Seacat	12, 16	Anticipated and/or obvious
2	Seacat	1, 5, 9	Anticipated and/or obvious
3	Seacat + Mattice	1, 5, 9	Obvious
4	Seacat + Shirali-Shahreza	4, 14	Obvious
5	Seacat + Mattice + Shirali-Shahreza	4	Obvious

67. Among other things, I discuss below whether claims 1, 5, and 9 are anticipated and/or obvious to a POSA under alternative claim interpretations. My understanding is that relying on alternative claim interpretations is acceptable in declarations in support of IPR

petitions. Specifically, in relation to Ground 2 it is my opinion that claims 1, 5, and 9 are anticipated and/or would have been obvious to a POSA under both a claim interpretation consistent with HDI's infringement allegations and a narrower interpretation, while in relation to Ground 3 it is my opinion that claims 1, 5, and 9 are anticipated and/or would have been obvious to a POSA under only a narrower interpretation. Grounds 1, 4, and 5 are unaffected by this issue.

A. Ground 1: Claims 12 and 16 of the '861 Patent Are Anticipated by and/or Would Have Been Obvious Over Seacat.

68. After reviewing Seacat and claims 12 and 16 of the '861 Patent, it is my opinion that each of these claims was anticipated by, and/or would have been obvious to a POSA in view of, Seacat. Seacat discloses every limitation of these claims, and to the extent the Board believes that Seacat does not explicitly disclose every limitation, these limitations would have been met by the conventional and obvious implementation of the method Seacat discloses. The basis for my opinion and the details of my analysis are below.

1. Seacat (Ex. 1006)

69. Seacat is a U.S. patent filed March 26, 2008. I have been informed by counsel that Seacat meets the requirements to be prior art to the '861 Patent, regardless of whether the priority date to which any of the Challenged Claims is entitled is June 2008 or June 2009, and regardless of whether the Leahy-Smith America Invents Act ("AIA") applies to the '861 Patent.

70. I have been informed by IM's counsel that Seacat was not of record during the prosecution of the application that led to the '861 Patent, but its published non-provisional application (No. 2009/024947) was among over 150 references that were. '861 Patent, (56). The Examiner did not cite or comment on Seacat's published application, nor use it in any rejection. Ex. 1004.

71. Seacat, titled “Using Multi-Touch Gestures To Protect Sensitive Content Using a Completely Automated Public Turing Test To Tell Computers and Humans Apart (CAPTCHA),” teaches CAPTCHAs using a multi-touch device, like an iPhone or other portable device with a touchscreen. Seacat, Title, 1:33-34, 3:59-67. By “multi-touch,” Seacat refers to gestures that require the user to touch the device in multiple places simultaneously. Seacat, 1:10-15. A “multi-touch manager” provides a “multi-touch test” to the device, and “receives a multi-touch response” back. Seacat, 1:34-36. The manager compares the multi-touch response “with a multi-touch answer and authorizes the device based upon the comparison.” *Id.*, 1:37-39.

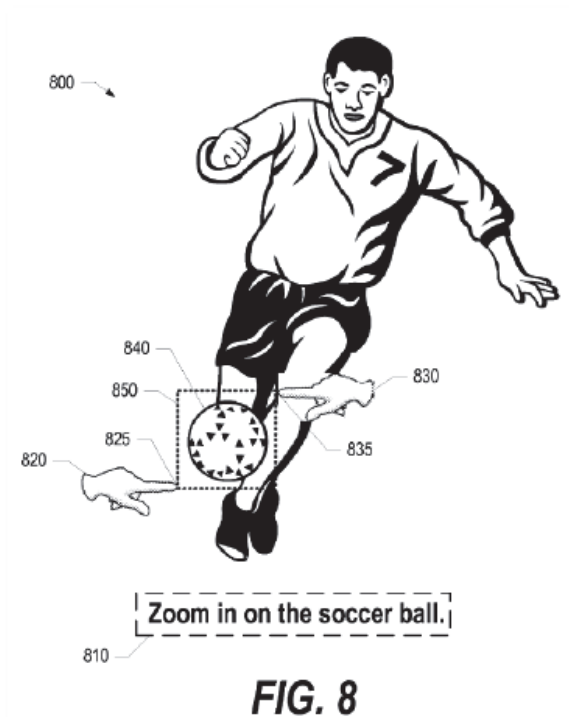
72. Seacat recognizes that “computer networks, such as the Internet,” have difficulty “determining whether a human or Spam robot is requesting information,” e.g., to access a website. *Id.*, 1:20-23. Seacat notes the need for various “security features” to deal with this problem, and that CAPTCHA acts as “this type of security feature,” for example by challenging “a user to enter a response based upon viewing an image.” *Id.*, 1:24-27. Seacat notes multi-touch devices have additional capabilities, such as “a computerized surface that uses cameras and near-infrared light to identify objects placed upon it and to allow simultaneous multiple points of touch interaction.” *Id.*, 1:16-20.

73. Seacat describes CAPTCHAs based on physical manipulation and touch. *Id.*, Abstract; 1:34-39; 7:6-13; 7:62-8:37. It discloses CAPTCHAs using a multi-touch computing device for “accessing pages of data located on a computer network such as the Internet.” *Id.*, 4:52-65. The device can be “portable,” like a “laptop,...portable telephone device,...(PDA), gaming device,...handheld computer,” or “mobile telephone.” *Id.*, Fig. 2; 3:59-67; 4:16-25. The device sends a page request to a multi-touch manager. *Id.*, 4:52-65. In response, the multi-touch

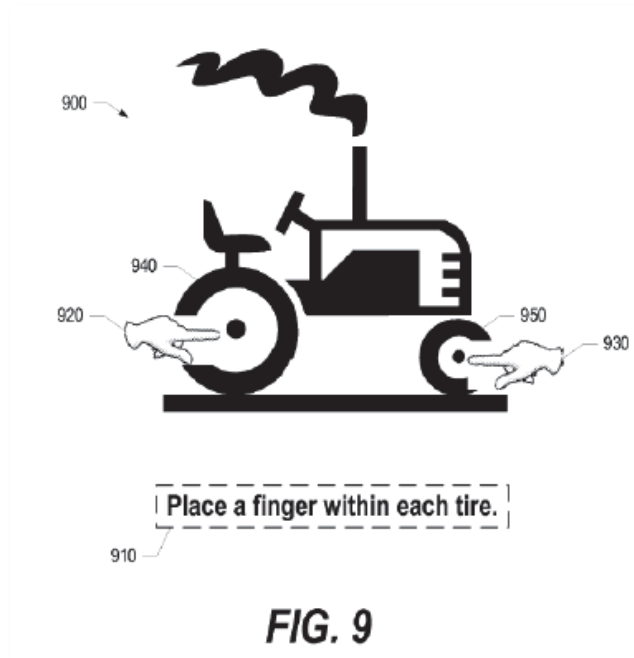
manager automatically selects a multi-touch CAPTCHA challenge or test to send to the device. *Id.*, 4:61-5:10, 5:40-51.

74. Next, the device displays the test, which will include an image and one or more instructions for the user to touch the image. *Id.*, 5:10-13. The user must manipulate or orient the image in various ways through physical touch, e.g., zooming in on part of the image, placing fingers within specific parts of the image, or rotating the image. *Id.*, Figs. 8-10; 7:6-13; 7:62-8:37. Figures 8-10 are examples of Seacat's touch-based CAPTCHA challenges requiring the user to physically manipulate and/or orient images.

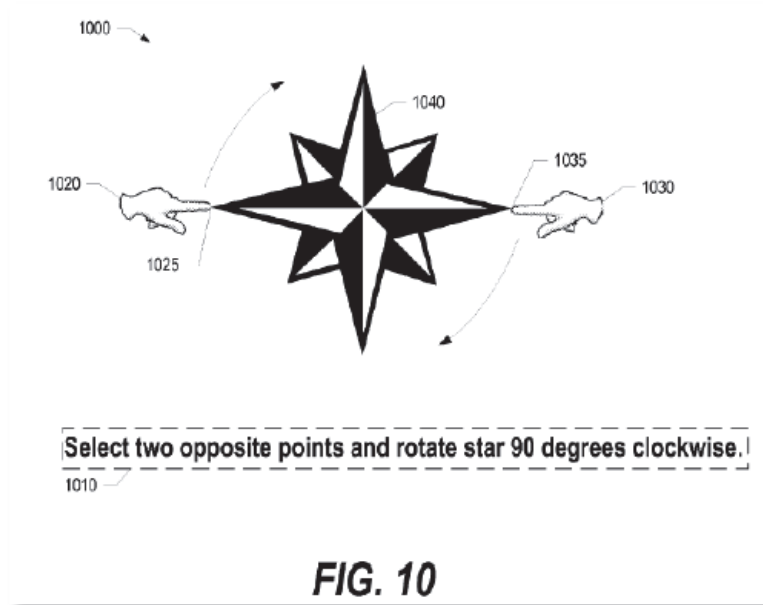
75. In Figure 8 (reproduced below), multi-touch instruction 810 tells the user to “zoom in on the soccer ball” by having her hands 820 and 830 “contact the display at two points” (825/835, respectively). *Id.*, 7:62-8:4. The user's hands then “move inward towards soccer ball 840 until the user is satisfied with the zoom area,” at which point the user clicks complete. *Id.*, 8:2-10.



76. Figure 9 (reproduced below) likewise provides a multi-touch instruction, in this case “to select two locations,” one “inside wheel 940” and another “inside wheel 950” of the tractor. *Id.*, 8:11-22.



77. Figure 10 (reproduced below) is a third example that instructs the user to contact the display on two opposite points of a compass star and “move in a clockwise direction 90 degrees, which subsequently rotates [the] star.” *Id.*, 8:24-27. The test allows “a user to rotate a picture between 85 and 95 degrees instead of exactly 90 degrees,” yet still meet the required threshold for “an acceptable range of test answers.” *Id.*, 5:24-29; 6:1-6; 7:34-42.



78. After the user completes the task, the device sends the multi-touch response to the manager. *Id.*, 5:13-22; 5:52-62; 7:14-24. The manager compares that touch response to a known answer. *Id.*, 5:24-28; 5:63-6:40; 7:34-62. If the touch response data is correct (or close enough), the manager concludes the user is human and authorizes the device; otherwise, the manager may send another test to the device. *Id.*, 5:29-34; 5:63-6:40.

2. Claims 12 and 16 of the '861 Patent Are Anticipated by Seacat.

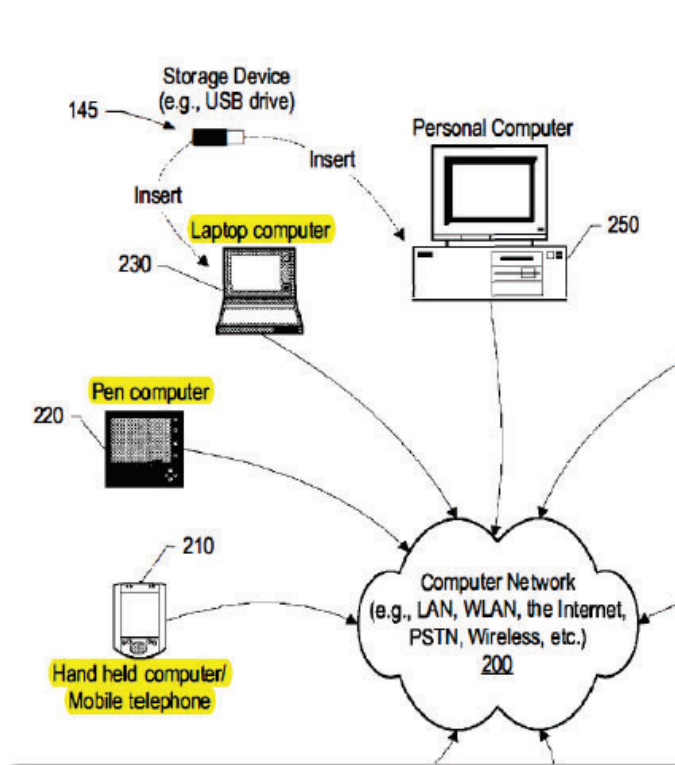
a. Claim 12

(1) [12Pre]

79. I have been informed by counsel that the preamble for a claim may or may not limit the claim, and I express no opinion on whether the preamble of claim 12 limits the claim. To the extent claim 12's preamble limits the claim, however, my opinion is that Seacat meets the preamble because Seacat discloses "[a] method of providing a touch-based Completely Automatic Public Turing Test To Tell Humans And Computers Apart (CAPTCHA) challenge on a portable computing device," as stated.

80. Seacat's title is "Using Multi-*Touch* Gestures To Protect Sensitive Content Using a *Completely Automated Public Turing Test To Tell Computers and Humans Apart (CAPTCHA)*." Seacat repeatedly describes using touch for CAPTCHA. Seacat, Abstract ("The invention described herein uses a multi-touch manager for authorizing multi-touch devices by first providing a multi-touch test to a multi-touch device"); 1:25-29 ("(CAPTCHA) is this type of security feature"); 4:51-60 ("FIG. 3 is a diagram of a server providing a multi-touch test to a multi-touch device and authorizing the multi-touch device based upon a user's response.... (CAPTCHA) is one such security mechanism."); 5:16-22; 5:40-51 ("the multi-touch test may correspond to a. (CAPTCHA) format."); 7:6-13; Fig. 5, items 350, 500; Fig. 7, items 350, 700, 730; Figs. 8-10; 7:62-8:37; claim 2.

81. Seacat provides its touch-based CAPTCHA challenge on a portable computing device, like a portable laptop, PDA or mobile telephone. Seacat, 3:59-67 (Seacat's "information handling system may take many forms," including a "*portable*[]" laptop, notebook,... (PDA), a gaming device,.. .[or] a *portable* telephone device."). Figure 2 shows how "the methods described herein can be performed on...small *handheld* devices, such as handheld computer/*mobile* telephone 210 personal digital assistants (PDAs), personal entertainment devices, such as MP3 players, *portable* televisions, and compact disc players[, ... pen, or tablet, computer 220, laptop, or notebook, computer 230." *Id.*, 4:12-25.



Seacat, Fig. 2 excerpt.

82. A POSA would understand all these disclosures to describe “a portable computing device” as claimed, at least because Seacat describes them as being “portable,” “mobile,” and “handheld,” and because laptops, notebooks, PDAs, gaming devices, computers, mobile telephones, MP3 players, and tablets are electronic computing devices.

(2) [12A]

83. Seacat discloses “a. automatically electing a manipulation challenge for a user with the portable computing device, wherein said manipulation challenge includes a set of physical touch instructions for the portable computing device for the user,” as stated by limitation [12A].

84. First, the election of Seacat’s manipulation challenges is done “automatically.” The “CA” in CAPTCHA stands for “Completely Automated.” Seacat, 1:3-5, 23-25. A POSA would likewise understand Seacat’s disclosure of CAPTCHA method to be “Completely

Automated,” as that is the common understanding of any CAPTCHA method in this field. Seacat also repeatedly refers to its touch-based CAPTCHA test as “automated.” *Id.*, Title (“...using a completely ***automated*** public Turing test to tell computers and humans apart.”); 1:24-29 (“Completely ***Automated***.(CAPTCHA) is this type of security feature.”); 4:58–60 (“[CAPTCHA] is one such security mechanism.”); 5:43-45 (“the multi-touch test [of Seacat’s invention] may correspond to a Completely ***Automated***...format.”); claim 2 (“the multi-touch test is based upon a Completely ***Automated***... (CAPTCHA).”). By characterizing its method as CAPTCHA, a POSA would have understood Seacat to disclose that all steps in administering its CAPTCHA challenge are automated.

85. Alternatively, if the Board does not consider Seacat 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 Seacat describes. A POSA would understand that any CAPTCHA method gains significant advantages from being completely automated. For example, in “Human Computation,” Luis von Ahn describes how “CAPTCHA stands for ‘***Completely Automated*** Public Turing Test to Tell Computers and Humans Apart,’” and how such tests are automated “to prevent automated registrations” by bots on popular websites. Ex. 1009, p.13. A CAPTCHA method that was not completely automated, and instead required human intervention to function, would not protect against such automated registrations. For that reason, “[a] CAPTCHA is an *Automated* Turing Test.” *Id.* (emphasis original). “CAPTCHAs are similar to the Turing Test in that they distinguish humans from computers, but they differ in that the judge is now a computer.” *Id.* Indeed, “making the judge a computer allows CAPTCHAs to be useful for other practical applications” as well, including facilitating online polls, protecting free email services, barring search engine indexing bots, and preventing worms, spam, and

dictionary attacks. *Id.*, pp. 13-14. A CAPTCHA is therefore “an *automated* test that humans can pass but that current computer programs cannot.” *Id.*, p.12. And the ability to do so in an automated way “has important applications in practical security.” *Id.*, pp.12-14.

86. I myself discussed some of these issues in a paper titled “A Reverse Turing Test Using Speech” that I co-wrote for the Seventh International Conference on Spoken Language Processing in Denver, Colorado between September 16-20, 2002. Ex. 1015. Along with others, I drafted the paper in the months before the conference. Copies of the paper were available at the conference. In 2004, the parent organization of the conference (the International Speech Communication Association, or “ISCA”) made a PDF of the paper available for download on its website, <https://www.isca-speech.org/archive/>. At the time, the papers on that website were keyword searchable, including by title and author, were indexed by author, and any ISCA member could download papers. The abstracts were free for anyone, not just ISCA members. The copy of the paper in Exhibit 1015 is a true, accurate, and authentic copy of the paper, and accurately represents the copies of the paper available at the conference itself in 2002, which a POSA would have known about and been able to attend. There was also a true and accurate copy of the paper on my university website by at least September 1, 2004, free for public download, not just to ISCA members. See <http://www.cse.lehigh.edu/~lopresti/Publications/2002/icslp02.pdf> and <http://web.archive.Org/web/20040901075237/http://www.cse.lehigh.edu/~lopresti/Publications/2002/icslp02.pdf>. Further, in my opinion a POSA could have searched for and found this paper on ISCA’s website shortly after it was uploaded in 2004 (and either would already be an ISCA member or could easily become so to download the paper), searched for the paper via Google and found and downloaded it from my university website in 2004, and in any event could have found and downloaded the paper well before June 2008.

87. In my paper in Ex. 1015, I describe how “hackers” have “written malicious programs to exploit online services intended for human users.” Ex. 1015, p.1. These “bots” unfortunately were “already common” in 2002. *Id.* The bots “consume resources, harass users, make attempts to guess passwords, steal and repurpose copyrighted content, and invade privacy.” *Id.* “As a result, there is a need for automatic methods to tell whether the entity attempting to access a service is a human or a machine.” Only such fully “*automatic*” methods, like Reverse Turing Tests or CAPTCHAs, can “prevent automated attacks on passwords.” *Id.*, pp.1, 4.

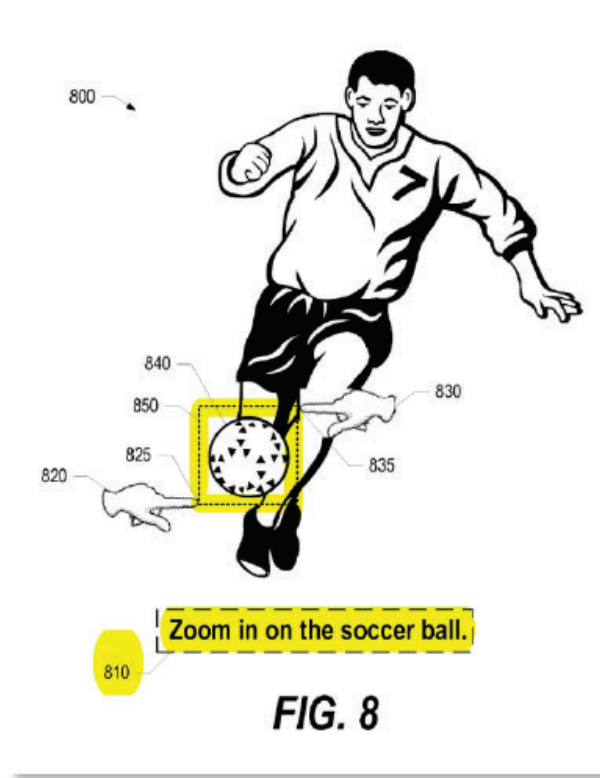
88. As described in Exhibits 1009 and 1015, the threat automated “bots” posed was real, and could only be met via fully automated responses, such as CAPTCHA—which by definition is “completely automated.” The practical security advantages of providing fully-automated CAPTCHAs were numerous, like preventing attacks on passwords, facilitating online polls, protecting free email services, barring search engine indexing bots, and preventing worms, spam, and dictionary attacks. A POSA would have known of both these problems and the advantages provided by fully automated solutions by 2008-2009. Making a CAPTCHA method fully automated in order to provide those benefits was well known to a POSA and conventional, as reflected in both my 2002 paper, the 2005 von Ahn dissertation, Seacat itself, and the many articles available at the time stressing the importance of protecting websites from attack.

89. Second, Seacat discloses “electing a manipulation challenge for a user” as claimed, when it elects its multi-touch CAPTCHA test from a collection of such tests. The multi-touch manager “pseudo-randomly selects a multi-touch test from multi-touch test store 350,” which “instructs a user to perform specific multi-touch gestures.” Seacat, 4:66-5:2; *id.*, 5:41-51 (“the server pseudo-randomly selects a multi-touch test to send to the multi-touch device,” which can be a CAPTCHA challenge); 6:48-52 (same). If the user fails the challenge, the multi-touch

manager “may provide another multi-touch test to multi-touch device 310 up to a certain number of times.” *Id.*, 5:30-34; 5:45-50; 6:10-40; 7:50-62. Seacat selects challenges from “Multi-Touch CAPTCHA Test Store 350.” *Id.*, Fig. 7; 6:48-52.

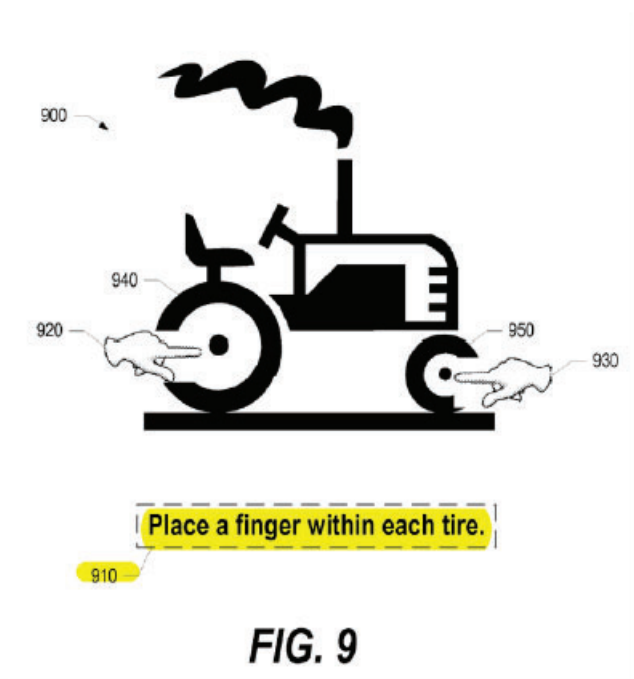
90. Third, Seacat discloses that the CAPTCHA test can be done on a “portable computing device,” like a laptop, PDA, or mobile telephone. §IX.A.2.a(1) above; 3:59-67; Fig. 2; 4:12-25.

91. Fourth, Seacat’s manipulation challenge “includes a set of physical touch instructions for the portable computing device for the user.” The point of Seacat’s CAPTCHA challenge is that it “instructs a user to perform specific multi-touch gestures, such as touching a screen at two locations and zooming in on an object or rotating an object.” *Id.*, 4:67-5:3. Seacat calls out Figures 8-10 (reproduced with highlighting added below) as detailing such instructions.



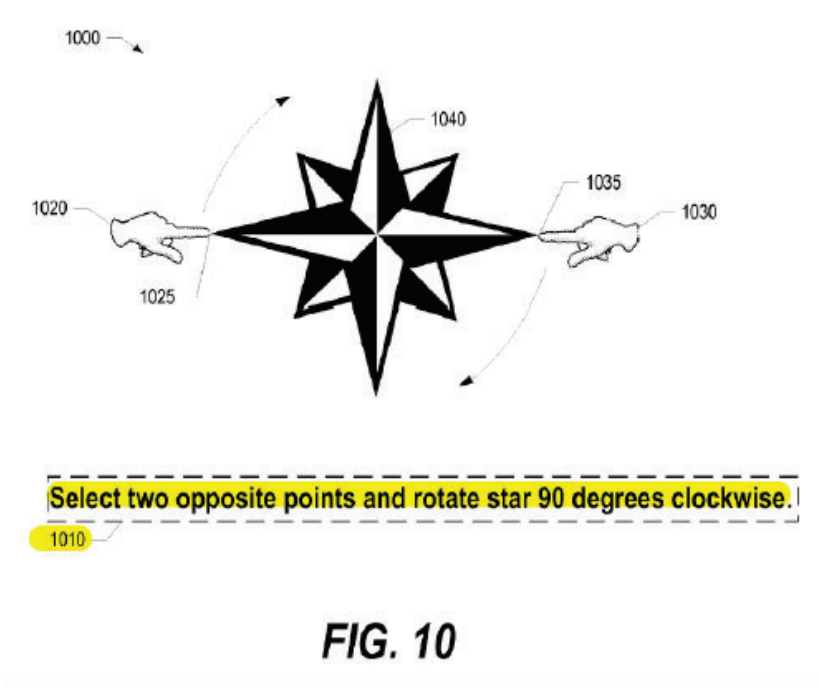
92. Figure 8 is an “example of a multi-touch test that a server provides to a multi-touch device,” and “includes an image and multi-touch instruction 810.” *Id.*, 7:62-65. It “instructs a user to zoom in on soccer ball 840,” which is a physical touch instruction. *Id.*, 7:64-65. The user follows the instruction by physically moving, orienting, and manipulating her hands and fingers 820-830 “inward towards soccer ball 840 until the user is satisfied with the zoom area.” *Id.*, 8:1-3.

93. Figure 9 provides “an image of a vehicle and **multi-touch instruction** 910” that “instructs a user to select two locations,” by placing a “finger within each tire.” *Id.*, 8:11-16. The user achieves this by physically touching each tire. *Id.*, 8:17-23.



94. Figure 10 is “another example of a multi-touch test that a server provides to a multi-touch device,” with a compass star and “**multi-touch instruction** 1010” that “instructs a user to select two opposite points of star 1040 and rotate star 1040 90 degrees in a clockwise direction.” *Id.*, 8:24-29. The user follows the instruction by “contact[ing]” the display, and then

moving and orienting her hands to manipulate and orient the object on the device to complete the task. *Id.*, 8:30-38. This is **identical** to an allegedly inventive '861 embodiment, where the user is “asked to orient an object into its correct position by moving it with [her] fingers.” '861 Patent, 14:55-59.



95. Seacat claims 1, 7, and 11 all mention “providing a multi-touch test to the multi-touch device.” Seacat, 9:20-26; 10:14-20; 11:1-7. They also all require an image and “one or more **instructions** that specify an action to perform on the image requiring a user to simultaneously **contact** a display at a plurality of locations.” *Id.*

96. In short and as detailed above, Seacat meets limitation [12A].

(3) [12B]

97. Seacat discloses “b. automatically processing touch sensory data associated with user movements and/or manipulations of objects within a graphical interface of the portable computing device,” as stated by limitation [12B].

98. First, Seacat repeatedly refers to its physical motion CAPTCHA test as “automated,” as discussed above. *Id.* at Title; 1:24-29; 4:58-60; 5:43-45; and claim 2. As discussed above (§IX.A.2.a(2)), a POSA would have understood that all Seacat’s CAPTCHA steps are completely automatic, or alternatively that would have been the conventional and obvious way to implement the CAPTCHA steps Seacat discloses. Seacat, 1:3-5, 23-25.

99. Second, as also discussed above, Seacat discloses a “portable computing device,” like a laptop, PDA, or mobile telephone. §IX.A.2.a(1) above; 3:59-67; Fig. 2; 4:12-25.

100. Third, Seacat discloses “processing touch sensory data associated with user movements or manipulations of objects within a graphical interface of the portable computing device.” As discussed above, Seacat’s CAPTCHA challenges involve the user touching and orienting the device to move, manipulate, and/or orient objects within a graphical interface, for example those in Figures 8-10. Seacat, Figs. 8-10; 7:62-8:37. Seacat’s multi-touch manager “receives a multi-touch response from the multi-touch device,” i.e., the touch sensory data associated with those touches, movements, and/or manipulations. *Id.*, 1:35-37. Then, the “multi-touch manager compares the multi-touch response with a multi-touch answer.” *Id.*, 1:37–39.

101. In this fashion, Seacat “process[es]” the “touch sensory data” it receives from the device. Seacat describes this processing several times. *E.g.*, 5:37, 63-66 (“Multi-touch device **processing** commences.... the server **compares** the multi-touch response with a multi-touch answer and provides a pass/fail/retest result back to the multi-touch device.”); 7:25-45 (“FIG. 7 is a flowchart showing steps taken in a server **analyzing** a multi-touch response.... **Processing** compares the multi-touch response with the multi-touch answer and multi-touch answer parameter sat step 730, and a determination is made as to whether the multi-touch response passed based upon the comparison.”); claims 1, 3-4, 7-9, 11-13 (“**comparing** the multi-touch

response with a multi-touch answer for the multi-touch test”). A POSA would have understood the repeated references to “comparing,” “analyzing,” and “processing” the multi-touch response as describing the processing of touch sensory data.

(4) [12C]

102. Seacat discloses claim 12’s last limitation, “automatically determining if said user touch sensory data meets a required threshold for satisfying said set of physical touch instructions to qualify said user as a human.”

103. First, as discussed above (§IX.A.2.a(2)), a POSA would have understood that all of Seacat’s CAPTCHA steps are completely automatic, or alternatively that would have been the conventional and obvious way to implement the CAPTCHA steps Seacat discloses.

104. Second, Seacat determines if the user’s touch sensory data meets a required threshold for satisfying the physical touch instructions to qualify the user as human. The “user touch sensory data” [12B] is compared to the multi-touch answer (§IX.A.2.a(3) above), and the multi-touch manager “authorizes the device based upon the comparison,” and “provides a pass/fail/retest result back to the multi-touch device” to determine if the user is human. Seacat, 1:37-39; 5:63-67.

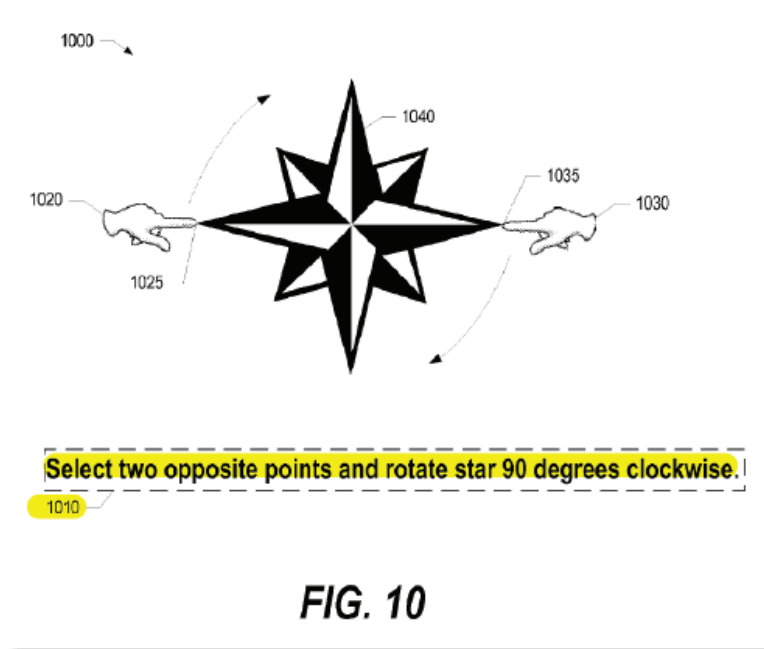
105. A “pass” result means the user has passed the threshold to meet the instructions and qualify as a human, as the purpose of Seacat’s “invention” is “to determine whether a *human* is requesting information.” *Id.*, 1:27-30; *Id.*, 1:62-67 (method includes “authorizing the multi-touch device based upon a user’s response.”); 5:62-6:23 (“A determination is made at the server as to whether the multi-touch response passed (decision 485). If the multi-touch response passed, decision 485 branches to ‘Yes’.... [I]f the multi-touch response did not pass, decision 485 branches to ‘No’”); 7:25-62 (in “determining whether to authorize the device based upon a multi-touch answer,” if the data fails to meet the threshold, “processing denies authorization to the

multi-touch device”); claims 1, 3-4, 7-9, 11-13, 9:32, 9:42-47; 10:26, 10:34-39, 11:13, 11:22-24, 12:1 (“authorizing the device based upon the comparison” between the user’s touch-based manipulations of the device and the multi-touch answer). Indeed, Seacat’s CAPTCHA method qualifies a user as a human when the user passes the test, and should fail a “bot” that it would expect to perform poorly and not pass. Of course, the “TCHA” in CAPTCHA stands for “Turing Test To Tell Computers and Humans Apart.”

106. Figures 8-10 show three manipulation challenges, where the method determines if the user’s touch sensory data meets a required threshold for satisfying the physical touch instructions to qualify the user as human. *Id.* Figs. 8-10, 7:62-8:37. The ’861 Patent does not discuss “threshold” apart from what is in the claim language, and describes numerous embodiments where the determination is binary (the response is either correct or not) with no degrees of correctness assessed. ’861 Patent, 5:3, 24, 49; 10:39-41; 14:1-4. Consistent with its ordinary and customary meaning, a threshold is simply “a level, point, or value above which something is true or will take place and below which it is not or will not.” Ex. 1040. Hence a POSA would have understood the “threshold” as claimed to just refers to a point at which the user passes as human.

107. For example, in Figure 10, the set of physical touch instructions tell the user to “[s]elect two opposite points” and “rotate the star 90 degrees.” *Id.*, 8:26-38. If the touch sensory data meets that required 90° threshold, the user qualifies as human. *Id.* Seacat’s “parameters may allow a user to rotate a picture between 85 and 95 degrees instead of exactly 90 degrees,” yet still accept the answer, which a POSA would understand establishes a threshold for satisfying the instruction. *Id.*, 5:24-29; 6:1-6; 7:34-42. The “parameters may specify an acceptable range of test answers” (*id.*, 7:36-38), so any touch data showing movement between 85°-95° meets the

threshold of being within five degrees of the required 90° answer to satisfy the physical touch instructions and qualify the user as a human.



108. While Seacat does not expressly use the word “threshold,” a POSA would have understood that in Seacat’s CAPTCHA system, some user responses will “pass” and others will “fail,” to differentiate responses from a human user from those from a computer. A POSA would have understood that differentiating some responses as passing and others as failing uses a threshold. Indeed, Seacat describes comparisons between the user’s sensory touch data and a test answer as determining whether the data qualifies the user as human. §IX.A.2.a(3) above. Seacat allows relaxed parameters to accept “close enough” data, like rotating a star between 85°-95° to meet instructions to rotate 90°. *Id.* A POSA would have understood these disclosures to show whether the user data meets a “threshold” of compliance with the instructions. Indeed, the ‘861 applicant himself referred to such “thresholds” for identifying an acceptable response in a CAPTCHA system in another patent application filed the same week of 2008. Gross, Ex. 1041, [0119-20], [0135], [0160].

109. Alternatively, to the extent the Board believes that Seacat does not teach a “threshold” of compliance with the instructions, using a threshold would have been the conventional and obvious way to implement the CAPTCHA method Seacat discloses to differentiate human from computer input. Seacat, 1:27-30; 1:37-39; 1:62-67; 5:62-6:23; 7:25-62; Lindsay (Ex. 1014), [0297]; Gross, [0119-20], [0135], [0160]. It was well-known to implement CAPTCHA systems using a threshold to differentiate human versus computer input. See Lindsay, [0297] (describing multiple “*threshold* value[s]” in the context of biometrics security, a closely-related field); Gross, [0135] (using “*thresholds*” for answers “would allow detecting machine impostors.”), [0160] (“a set of *thresholds* identifying an acceptable response” to see if “entity attempting access” is human); Gossweiler, Ex. 1042, 13:42-46 (if user’s orientation data “is within a predetermined *threshold*,” access is granted). The use of such thresholds to determine whether to “pass” a user as human, or “fail” the user as a computer, was the conventional and common way to generate results from a CAPTCHA.

b. Claim 16

110. Seacat discloses “wherein the touch[-]based CAPTCHA challenge is embodied in computer[-]readable form and implemented as a routine executing on the portable computing device,” as stated by dependent claim 16.

111. First, Seacat explains that a “preferred implementation” is a “client application, namely, a set of instructions (program code)” that can be “resident in the random[-]access memory of the computer.” Seacat, 8:38-42. The CAPTCHA “client application” presents the touch-based CAPTCHA challenge and is in a computer-readable form as claimed. *Id.*, 8:46-60 (client application can be “implemented as a computer program product for use in a computer,” and carried out in “software.”). The client application can be stored on a hard disk, optical disk, floppy disk, or other storage media. *Id.*, 88:43-46, claim 11 (reciting “A computer program

product stored in a non-transitory computer[-]readable storage medium, comprising...”), 10:62-63, 4:67-5:6, 5:22-23 (describing computer implementation details).

112. Second, as discussed above (§IX.A.2.a(1)), Seacat discloses that the “information handling system” that receives the page request from a multi-touch device and provides the touch-based CAPTCHA challenge may take the form of a “portable computing device,” like a laptop, PDA, or mobile telephone. *Id.*, 3:59-67; Fig. 2; 4:12-25; claim 11.

3. Claims 12 and 16 of the '861 Patent Are Obvious Over Seacat.

113. My analysis above supports my opinion that Seacat anticipates claims 12 and 16 of the '861 Patent. I am informed by counsel that this anticipation also renders those claims obvious, because anticipation is the epitome of obviousness. It is therefore my opinion that Seacat renders claims 12 and 16 obvious for this reason as well.

114. But if the Board believes that Seacat does not explicitly disclose that the CAPTCHA steps are “automatic” and/or does not disclose the use of a “threshold” as claim 12 states, Section IX.A.2 above shows that those limitations would have been met by the conventional and obvious implementation of Seacat’s disclosed method. So it is my opinion that claims 12 and 16 would have been obvious over Seacat for this additional, alternative reason.

B. Ground 2: Claims 1, 5, and 9 of the '861 Patent Are Anticipated by and/or Would Have Been Obvious Over Seacat Under HDI’s Proposed Interpretation, or a Narrower Interpretation.

115. After reviewing Seacat and claims 1, 5, and 9 of the '861 Patent, it is my opinion that each of these claims was anticipated by, and/or would have been obvious to a POSA in view of, Seacat. Seacat discloses every limitation of these claims, and to the extent the Board believes that Seacat does not explicitly disclose every limitation, these limitations would have been met by the conventional and obvious implementation of the method Seacat discloses. These points

are true under either HDI's proposed interpretation of the claims, or under a narrower interpretation. The basis for my opinion and the details of my analysis are below.

1. Claims 1 and 9 of the '861 Patent Are Anticipated by and/or Obvious Over Seacat Under HDI's Proposed Interpretation.

a. HDI's Proposed Interpretation

116. As I mentioned above in Section VI.D, independent claim 1 has a similar structure to the other independent claim—claim 12—but claim 1 covers a “motion and/or orientation-based” CAPTCHA using “physical manipulation instructions.” '861 Patent, claim 1.

117. I am informed by counsel that in litigation, HDI maintains that claim 1 covers not only movement or orientation of the device itself, but also manipulation or physical movement by the user via interacting with the device's touchscreen or GUI, such as touching or clicking a checkbox. Ex. 1025, pp.6-7; *see* Ex. 1044, 6 (¶18). Specifically, I understand that HDI alleges that claim 1's “motion and/or orientation-based” CAPTCHA is met when the system “automatically loads a checkbox labeled ‘I'm not a robot’” and “instructs and requires the user to check the box in order to access the protected record and processes, for example, the user's mouse movements and click manipulation.” Ex. 1025, 6-7. HDI thus alleges that a CAPTCHA method that requires the user to select the checkbox shown below by touching or clicking infringes “claim 1 of the '861 Patent[.]” *Id.*, pp. 11-16. HDI further alleges that only if “such movements and/or manipulation *from the user* [in selecting the box] meet a required threshold, the user is deemed human.” *Id.*, p.7.

118. As a result, under HDI’s interpretation, “motion and/or orientation- based” challenges, “physical manipulation instructions for the portable computing device for the user,” “user movements and/or manipulations of the portable computing device,” and “user movements and/or manipulations from the user” in claim 1 all are broad enough to read on a user’s touch-based or mouse-based interactions with a user interface of the portable computing device, and do not require that the user move or manipulate the device itself.

119. I have not been asked to express an opinion as to whether HDI’s interpretation of claim 1 is correct or incorrect. For purposes of this section only, I apply HDI’s interpretation of claim 1 to show that Seacat anticipates and/or renders obvious claims 1 and 9. As discussed below, applying HDI’s interpretation of claim 1, Seacat anticipates and/or renders obvious claims 1 and 9. Seacat’s CAPTCHA employs “user movements and/or manipulations,” as it is based on motion and/or manipulation of the user’s hands and fingers. Seacat, Figs. 8-10, 7:62-8:37.

120. Separately, Section IX.B.3 below and my discussion of Ground 3 set forth my opinion that claims 1, 5, and 9 are anticipated by and/or obvious over Seacat under an alternate construction that requires movements and/or manipulations of the portable device itself.

b. Claim 1 Is Anticipated by Seacat.

121. The analysis in this section applies Seacat's disclosure to claim 1 construed under HDI's interpretation that does not require movements and/or manipulations of the device itself, and requires only user movements in interacting with the device's touchscreen or other GUI.

(1) [1Pre]

122. I have been informed by counsel that the preamble for a claim may or may not limit the claim, and I express no opinion on whether the preamble of claim 1 limits the claim. To the extent claim 1's preamble limits the claim, however, my opinion is that Seacat meets the preamble because Seacat discloses "[a] method of providing a motion and/or orientation-based Completely Automatic Public Turing Test To Tell Humans And Computers Apart (CAPTCHA) challenge on a portable computing device," as stated.

123. First, "motion *and/or* orientation" covers motion alone, orientation alone, or motion and orientation. A POSA would have understood the phrase "and/or" to allow either or both alternatives, but not to *require* both. In other words, a POSA would have understood the phrase "A and/or B" to cover any of three scenarios: (1) A alone, (2) B alone, or (3) A together with B.

124. Second, claim 1's preamble is word-for-word identical to claim 12's, except that claim 1 says "motion and/or orientation based" CAPTCHA instead of "touch-based" CAPTCHA. §VI.D. Seacat therefore meets the aspects of claim 1's preamble identical to claim 12's preamble (e.g., a method for providing a CAPTCHA challenge on a portable computing device) for the same reasons I discuss above in connection with Ground 1. §IX.A.2.a(1) above.

Seacat's CAPTCHA is a "motion and/or orientation"-based CAPTCHA under HDI's interpretation, because Seacat's CAPTCHA is based on motion and/or orientation of the user's hands and fingers. Seacat, Figs. 8-10, 7:62-8:37.

(2) [1A]

125. Seacat discloses "a. automatically electing a manipulation challenge for a user with the portable computing device, wherein said manipulation challenge includes a set of physical manipulation instructions for the portable computing device for the user," as limitation [1A] says.

126. Limitation [1A] is the same as limitation [12A] except that [1A] recites physical "manipulation" instructions instead of physical "touch" instructions. §VI.D. Seacat meets the aspects of [12A] that are identical to [1A] (e.g., the manipulation challenge is automatically elected for a user with the portable computing device) for the same reasons I discuss above in connection with Ground 1. §IX.A.2.a(2).

127. Seacat's manipulation challenge includes a set of physical "manipulation" instructions under HDI's interpretation because its physical touch instructions tell the user to physically manipulate using her hands and/or fingers to interact with objects in the device's GUI. As discussed above, Seacat "instructs a user to perform specific multi-touch gestures, such as touching a screen at two locations and zooming in on an object or rotating an object." *Id.*, 4:67-5:3; *see also* Figs. 8-10, 7:62-8:37.

128. For example, as discussed above regarding Figure 8, Seacat "instructs a user to zoom in on soccer ball 840," which is a physical manipulation instruction. *Id.*, 7:64-65. The user follows the instruction by physically moving, orienting, and manipulating her hands 820-830 "inward towards soccer ball 840 until the user is satisfied with the zoom area." *Id.*, 8:1-3. Likewise, in Figure 10 Seacat "instructs a user to select two opposite points of star 1040 and

rotate star 1040 90 degrees in a clockwise direction,” which is a physical manipulation instruction. *Id.*, 8:26-28. The user follows the instruction by contacting the screen with her hands and moving them “in a clockwise direction 90 degrees, which subsequently rotates” the star. *Id.*, 8:30-34.

129. In sum and as detailed above, Seacat meets limitation [1A] under HDI’s interpretation. §IX.A.2.a(2).

(3) [1B]

130. Seacat discloses “b. automatically processing sensory data associated with user movements and/or manipulations of the portable computing device,” as limitation [1B] states.

131. All the language in limitation [1B] is in limitation [12B] discussed above, such that Seacat meets these limitations in limitation [1B] for the same reasons discussed in §IX.A.2.a(3). Limitation [12B] only adds additional words and requirements: (1) that the processed sensory data be “touch” sensory data, and (2) that the manipulation be “of objects within a graphical interface” of the portable computing device. *Id.* I am informed by counsel that, under HDI’s interpretation of claim 1, because Seacat discloses the narrower limitation [12B] that contains more requirements (§IX.A.2.a(3) above), it also discloses the broader limitation [1B], which contains fewer requirements. A POSA would also understand that, under HDI’s interpretation of claim 1, because Seacat discloses everything in limitation [12B], it also discloses everything in limitation [1B].

132. In addition, Seacat discloses processing “sensory data” associated with “user movements and/or manipulations” under HDI’s interpretation because “touch” sensory data is a type of sensory data, and because Seacat’s touch-based interactions instruct the user to engage in “user movement and/or manipulation.” §IX.A.2.a(3) above. The user touching and/or moving Seacat’s CAPTCHA images with her hands and fingers are movements or manipulations, and

Seacat's method processes the resulting sensory data. Seacat, Figs. 8-10; 1:35-39; 5:37, 63-66; 7:25-45; 7:62-8:37; claims 1, 3-4, 7-9, 11-13. Seacat thus meets limitation [1B] under HDI's interpretation. §IX.A.2.a(3) above.

(4) [1C]

133. Seacat discloses limitation [1C], “automatically determining if said user movements and/or manipulations from the user meet a required threshold for satisfying said set of manipulation instructions to qualify said user as a human” under HDI's interpretation.

134. Limitation [1C] has the same words as limitation [12C] except that limitation [1C] says that determining whether “movements and/or manipulations from the user” (instead of “touch sensory data”) meet the required threshold and refers back to said set of “manipulation” instructions (instead of “physical touch” instructions). Under HDI's interpretation of claim 1, Seacat meets the aspects of limitation [12C] that are identical to limitation [1C] (e.g., “automatically determining” and using a “required threshold”) for the same reasons I discuss above regarding Ground 1. §IX.A.2.a(4) above.

135. Seacat also discloses determining “movements and/or manipulations from the user” under HDI's interpretation. §IX.A.2.a(4) above. Seacat's physical touch instructions tell the user to physically move the user's hands and fingers to touch the image in two locations in each of Figs. 8-10, and to manipulate the images with her hands and fingers in Fig. 8 (to zoom in on the ball) and Fig. 10 (to rotate the star). Seacat, Figs. 8-10, 7:62-8:37; see §IX.A.2.a(4) above. For these reasons, Seacat meets limitation [1C] under HDI's interpretation. §IX.A.2.a(4) above.

c. Claim 9 Is Anticipated by Seacat.

136. For the same reasons I discuss above regarding claim 16 in Ground 1, Seacat discloses that the motion and/or orientation-based CAPTCHA challenge relied upon to meet claim 1 under HDI's interpretation is “embodied in computer readable form and implemented as

a routine executing on the portable computing device,” as dependent claim 9 recites. See §IX.A.2.b. For that reason, claim 9 is anticipated by Seacat under HDI’s interpretation.

2. Claims 1 and 9 of the ’861 Patent Are Obvious Over Seacat.

137. My analysis above supports my opinion that Seacat anticipates claims 1 and 9 of the ’861 Patent under HDI’s interpretation. I am informed by counsel that this anticipation also renders those claims obvious, because anticipation is the epitome of obviousness. It is therefore my opinion that Seacat renders claims 1 and 9 obvious under HDI’s interpretation for this reason as well.

138. But if the Board believes that Seacat does not explicitly disclose that the CAPTCHA steps are “automatic” and/or does not disclose the use of a “threshold” as claim 1 states, Section IX.A.2.a above shows that those limitations would have been met by the conventional and obvious implementation of Seacat’s disclosed method. So it is my opinion that claims 1 and 9 would have been obvious over Seacat under HDI’s interpretation for this additional, alternative reason.

3. Claims 1, 5, and 9 of the ’861 Patent Are Obvious Over Seacat Under a Narrower Interpretation Requiring Motion and/or Orientation of the Device Itself.

a. Motion and/or Orientation of the Device Itself

139. As noted above, I have not been asked to express an opinion as to whether HDI’s interpretation of claim 1 is correct or incorrect. But if the Board interprets claim 1 more narrowly than HDI contends in litigation—that is, to require “motion and/or orientation” of the device itself—then my opinion is that claim 1 is obvious over Seacat alone (Ground 2’s alternative basis) and in combination with the Mattice published patent application (Ground 3).

140. CAPTCHA challenges a user to provide input via a user interface and uses that input to tell computers and humans apart. Prior-art CAPTCHAs used various inputs and user

interfaces. Some CAPTCHAs were based on visual recognition of text or numbers (Ex. 1009; Ex. 1010) and others on visual recognition of non-text images. Ex. 1011; Ex. 1013. Some CAPTCHAs used text-to-voice interfaces. Ex. 1008; Ex. 1015. Yet other CAPTCHAs used touch interfaces using motion of the user's hands and fingers. Seacat.

141. Another well-known type of user interface for portable devices used motion and/or orientation of the portable device itself (detected by accelerometer or inclinometer sensors in the device) to allow the user to provide input to the device. Indeed, the '861 Patent acknowledges that the iPhone (launched in June 2007, a year before the earliest-claimed priority date) contains "motion sensors which can be used to determine the attitude of the device." '861 Patent, 12:45-63. Such motion sensor data could have been passed from the iPhone to an external website in June 2007, although it need not have been. The fact that the iPhone's accelerometer can measure movement does not mean a website developer could necessarily access that information. In any event, a POSA would have known the iPhone's accelerometer, which detected the attitude and/or orientation of the device, was useful in a number of different applications. '861 Patent, 12:45-63; 14:26-49. There were many other motion-sensitive portable computing devices, like "air mice" and "air styluses," that long pre-dated the '861 Patent, including ones used for CAPTCHA. For instance, the Yu published patent application (Ex. 1043) describes a portable "mobile communications device" containing "motion detection" components, with which the user can write "on the air" to create "motion passwords" for user identity verification. Yu, Title, [0008], [0020-33]. The same motion/orientation of the device itself can be used to "perform CAPTCHA," for example by displaying "letters and digits of a distorted image or an obscured sequence of letters and digits" on the screen of the mobile device and having the user "motion write" the letters and digits by moving the device to trace them. *Id.*,

[0043-45]. The method collects the resulting “motion traces,” runs “pattern recognition to extract the digit/letter sequence” from the motion, and then “compar[es] the extracted letter and digit sequence with the letter and digit sequence embedded into the image presented to the mobile user (CAPTCHA)” to determine if the user passes as human. *Id.*, [0045], Fig. 8.

142. Similarly, the Mattice published patent application (Ex. 1007) describes a handheld device with motion/orientation sensors, and a method that interprets movement and orientation of the device to provide a user interface. Mattice, Abstract; Fig. 10; [0003], [0037-39], [0046-49], [0128-152], [0228-33]. One use Mattice describes for its motion/orientation data is to increase “authentication” and “security,” which are CAPTCHA’s goals. Mattice, [0110]; [0113]; [208-10]; [0275]; [0375]; [0381].

143. The Lindsay published patent application (Ex. 1014) likewise describes security systems that use motion/orientation of a mobile device. Lindsay, Title, Abstract. Lindsay describes CAPTCHA as one such security system. Lindsay, Fig. 14; [0117-18]; [167-190]. Lindsay also describes the advantages of combining security systems on a cell phone, including motion and orientation “based on the use of sensor chips (accelerometers, inclinometers) or other sensing means that can provide information for use in accessing an account.” Lindsay, [0255]. Lindsay describes a “dual-channel security system,” where the user of a cell phone is expected to take action to confirm who she is. *Id.*, [0341]. In a phone “equipped with an accelerometer, inclinometer, or vibration-sensitive sensor, a physical motion may be used to provide input such as shaking the phone once or twice, turning the phone upside down, tilting the phone at a new angle (e.g., a 45 degree angle), etc. ” *Id.* The system transmits this motion/orientation information, along with other interactions, like “touch[ing] a contact-sensitive screen,” to provide dual-factor security. *Id.*

144. A POSA would have had numerous reasons to apply the well-known and conventional user input of motion/orientation of the device itself (as shown by the original iPhone, Yu, Mattice, and Lindsay) to Seacat's touch-based CAPTCHA method, for example to implement Seacat's Fig. 10 embodiment by rotating the device 90° to rotate the star 90°, and would have had a reasonable expectation of success in doing so.

145. First, a limited number of user inputs or interfaces were known—for example, keyboard, mouse, motion/orientation, touch, or voice—and it would have been a matter of design choice to determine which to use for a CAPTCHA method like Seacat's.

146. Second, using a motion/orientation user interface with a CAPTCHA method like Seacat's would have been nothing more than the combination of familiar elements according to known methods to yield predictable results.

147. Third, a POSA would have understood that sensor data reflecting motion/orientation of a device is difficult for a computer to mimic, and so is a good candidate for an effective CAPTCHA challenge. For example, Mattice uses such motion/orientation information for a “spatial signature,” which it uses as a form of “authentication” or security:

Another form of authentication may include a user's written signature, and at least some embodiments described herein may utilize motion input (e.g., detected at the handheld device) to receive a user's signature as a form of authentication....According to specific embodiments, a written signature (e.g., on paper) may be considered a two dimensional record of a gesture. When utilizing a handheld device with motion input, a user's signature may be represented in three dimensions and may thus comprise a “spatial signature.” Moreover, when combined with other forms of input received at the handheld device, a user's signature can take on any number of dimensions (e.g., four, five or even more dimensions). For example, a three-dimensional gesture “written” in space using the handheld device and detected at motion detector component(s) 122 may be combined with key-presses and/or other inputs to increase the number of dimensions of the signature....[These may] serve as an effective form of authentication. For example, in one embodiment, a user's spatial signature may comprise a three-dimensional form based on the user's traditional two-dimensional

written signature and/or may comprise any other suitable gesture which the user records at the handheld device as his or her signature.

Mattice, [208-10].

148. Mattice uses the motion/orientation of the device itself for these “spatial signatures” because the movement is difficult to mimic, either by computers or other humans, and thus a good method of “authentication.” For much the same reason, sensor data reflecting that movement is a good candidate for CAPTCHA challenges, and a POSA would naturally think of using such data as a method of increasing security. That thought is in line with other portable computing devices that used motion/orientation data for security, like signature authentication. Years before the ’861 Patent application was filed, there were pens that use accelerometers within the pen itself to monitor the user’s motion when signing her name. This data was used to provide signature authentication.

149. Fourth, a POSA would have found it intuitive for a user to use rotation of a mobile device with Seacat’s Figure 10 embodiment to rotate the mobile device and cause Seacat’s star to correspondingly rotate.

b. Claim 1

150. Under the narrower interpretation of claim 1 requiring motion and/or orientation of the device itself, Seacat discloses all of the claim’s limitations when combined with the well-known and conventional user interface that interprets moving/orienting of the device itself.

151. **[1Pre]:** As noted above, I have been informed by counsel that the preamble for a claim may or may not limit the claim, and I express no opinion on whether the preamble of claim 1 limits the claim. To the extent claim 1’s preamble limits the claim, however, my opinion is that Seacat meets the preamble because Seacat performs the method recited when combined with the conventional user interface that interprets the user moving/orienting the device itself.

152. Under the narrower interpretation, the combination performs Seacat’s CAPTCHA method and meets all of limitation [1Pre]’s language other than the CAPTCHA being “motion and/or orientation based” for at least the same reasons Seacat alone does. See §IX.B.1.b(1) above. As discussed above (§IX.B.3.a), a user interface that interprets the user moving/orienting the device itself was well-known and conventional, as a POSA would have known from multiple sources (e.g., Yu, Mattice, Lindsay, the original iPhone). Yu, Title, Fig. 8, [0008], [0020], [0023], [0028], [0033], [0043-45]; Mattice, Title, Abstract, Figs. 1, 10; [0003]; [0005-6]; [0037-39]; [0046-49]; [0053-65]; [0128-152]; [0228-33]; Lindsay; Title, Abstract; Fig. 14; [0117-18]; [167-190]; [0255]; [0341]; ’861 Patent, 12:45-63; 14:26-49. As mentioned above, a POSA also would have had many reasons to apply this familiar and established technology to Seacat, with a reasonable expectation of success. The combination thus performs “motion and/or orientation based” CAPTCHA under the narrower interpretation.

153. **[1A]:** Under the narrower interpretation, the combination performs Seacat’s CAPTCHA method and meets all of limitation [1A]’s language other than the instructions being “physical manipulation instructions” for at least the same reasons Seacat alone does. *See* §IX.B.1.b(2) above. The combination’s instructions require manipulation via moving/orienting the device itself when Seacat is combined with that well-known and conventional user interface (§IX.B.3.a above) and are thus “manipulation” instructions as claimed.

154. **[1B]:** Under the narrower interpretation, the combination performs Seacat’s CAPTCHA method and meets all of limitation [1B]’s language for at least the same reasons Seacat alone does. *See* §IX.B.1.b(3) above. To the extent “user movements and/or manipulations of the portable computing device” requires movement and/or manipulation of the portable computing device itself, in the combination the sensory data is associated with movement and/or

orientation of the portable computing device. *See* §IX.B.3.a above. The combination's instructions require manipulation via moving/orienting the portable computing device itself when Seacat is combined with that well-known and conventional user interface (§IX.B.3.a above) and are thus "manipulation" instructions as claimed.

155. **[1C]:** Under the narrower interpretation, the combination performs Seacat's CAPTCHA method and meets all of limitation [1C]'s language other than the determination being of user "movements and/or manipulations from the user" for at least the same reasons Seacat alone does. *See* §IX.B.1.b(4) above. To the extent "user movements and/or manipulations from the user" requires moving/orienting the device itself, the combination automatically determines such movements and/or orientations when Seacat is combined with that well-known and conventional user interface. §IX.B.3.a above.

c. Claim 5

156. Under the narrower interpretation, the combination of Seacat with a conventional user interface that interprets moving/orienting the device discloses "wherein said set of physical manipulation instructions requires the user to move the portable computing device so as to manipulate objects presented in an interface," as claim 5 states. As discussed in Section IX.B.3.a above, this combination's instructions can require the user to move (for example, rotate) the mobile device to manipulate objects (for example, by rotating the points of the star in Seacat Figure 10) in the device's user interface.

d. Claim 9

157. Under the narrower interpretation, the combination of Seacat with a conventional user interface that interprets moving/orienting the device discloses dependent claim 9's requirement of "embod[ying] the CAPTCHA challenge "in computer[-]readable form and implemented as a routine executing on the portable computing device." Seacat's method is

implemented on “computer readable media” on a portable device. §IX.B.1.c above. The addition of the well-known and conventional user interface that interprets moving/orienting the device itself does not affect that implementation, as it was conventional to implement the aspects of the user interface that interpret moving/orienting of the device via software also stored on a computer readable medium on the portable device. For instance, Mattice discloses moving/orienting the device itself, and that “computer readable media.. .may be used for storing and executing program instructions” on a portable device. Mattice, [0037-45]; [0337]. The combination’s CAPTCHA challenge therefore is embodied in a computer-readable medium form for much the same reason Seacat’s CAPTCHA challenge is. §IX.B.1.c above.

C. Ground 3: Claims 1, 5, and 9 of the ’861 Patent Would Have Been Obvious Over Seacat in View of Mattice.

158. After reviewing Seacat, Mattice, and claims 1, 5, and 9 of the ’861 Patent, it is my opinion that each of these claims would have been obvious to a POSA over Seacat in view of Mattice (“Seacat-Mattice”). The Seacat-Mattice combination discloses every limitation of these claims, and to the extent the Board believes that Seacat-Mattice does not explicitly disclose every limitation, these limitations would have been met by the conventional and obvious implementation of the method Seacat-Mattice discloses. The basis for my opinion and the details of my analysis are below.

1. Seacat (Ex. 1006)

159. I describe Seacat in Section IX.A. 1 above.

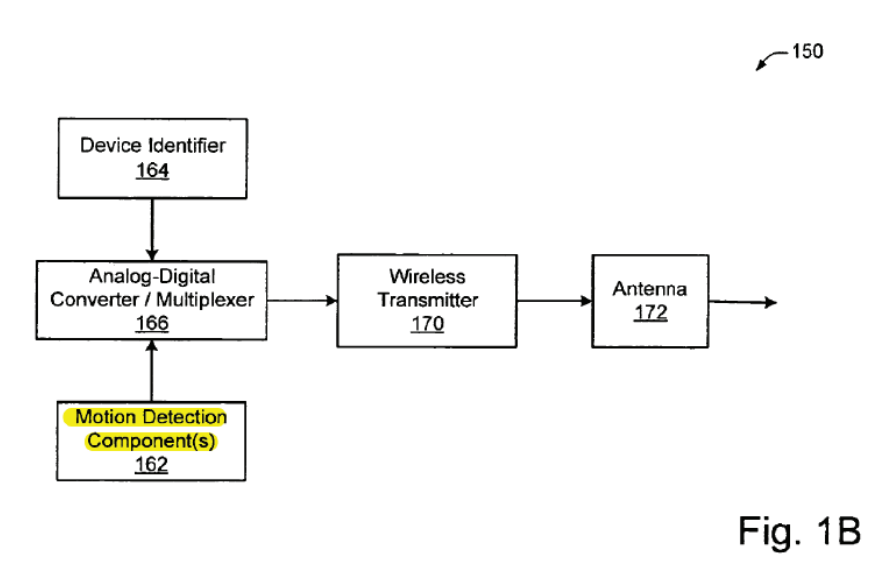
2. Mattice (Ex. 1007)

160. Mattice is a published United States patent application. Mattice claims priority to two other patent applications filed on June 18, 2004 and September 1, 2006. Mattice, (63). The Mattice patent application was itself filed on July 6, 2007, and published on November 8, 2007.

Id., (22), (43). I have been informed by counsel that Mattice meets the requirements to be prior art to the '861 Patent, regardless of whether the priority date to which any of the Challenged Claims is entitled is June 2008 or June 2009, and regardless of whether the AIA applies to the '861 Patent.

161. I have been informed by IM's counsel that Mattice was not of record during the prosecution of the application that led to the '861 Patent. '861 Patent, (56); Ex. 1004.

162. Mattice describes a gesture-based method implemented on "portable computing devices" (e.g., cellphones) having motion-detection and orientation- detection capabilities:



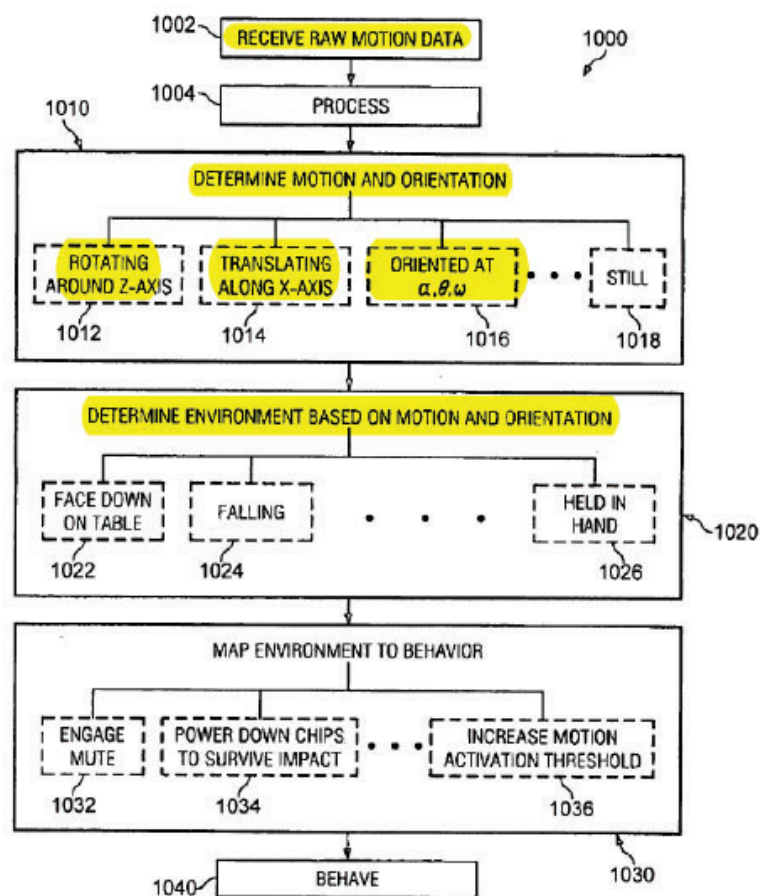


Fig. 10

Mattice, Title, Abstract, Figs. 1, 10; [0003]; [0005-6]; [0038]; [0103-04].

163. Mattice describes a method to interpret the movement and orientation of the device itself to provide input from the user. *Id.*, [0037-39], [0046-49], [0053-65], [0128-152], [0228-33]. Examples include “travel[ing] in the path of an ‘O’” ([0048]), “tilt[ing] the handheld device forward, backwards or to e[i]ther side” to scroll or navigate through menus ([0129-30]), changing volume, speed, or settings “via tilting motions and/or other gestures performed by the user” ([0131-33]), fast advancing “by the user accelerating the handheld device” ([0134]), using

a “thump” as a “button” ([0135]), applying menu overlays by tilting the device ([0136]), and playing various games in the device’s GUI by moving and orienting the device (0137-46)).

164. Mattice describes using motion/orientation data to increase “authentication” and “security.” Mattice, [0110]; [0113]; [208-11]; [0275]; [0326]; [0375]; [0381]. For instance, “a user’s signature may be represented in three dimensions and may thus comprise a ‘spatial signature’...a three-dimensional gesture ‘written’ in space using the handheld device and detected at motion detector component(s).” *Id.*, [0208-09]. This motion and orientation information is used to “authenticate” the user and increase security. *Id.*, [0208-11].

3. Implementing Seacat in View of Mattice

165. Mattice teaches that motion and orientation detection in portable computing devices was well-known. Mattice, [0005-6]; [0078]; [0103-04]; [0122]. Seacat and Mattice both describe techniques for improved access control and security. Seacat, 1:20-27; Mattice, [0110]; [0113]; [208-11]; [0275]; [0326]; [0375]; [0381].

166. A POSA would have had numerous reasons discussed below to apply Mattice’s motion/orientation user interface to Seacat’s CAPTCHA system. The resulting combination (“Seacat-Mattice”) would allow the user to move or orient the device to perform Seacat’s CAPTCHA instructions. *Id.* For example, the user could be required to rotate the device 90° to rotate the star 90° in Seacat’s Figure 10. *Id.*

167. 167. First, using a motion/orientation user interface in Seacat would have improved flexibility by not limiting Seacat’s CAPTCHA to challenges requiring use of the touch screen. This combination would have provided more options for input and expanded people who could use the device—for example, people with cerebral palsy or tremors, who might have difficulty with touch-based CAPTCHA but not tilting the device.

168. Second, using motion/orientation sensing in Seacat would increase security by allowing a user to be challenged by two forms of CAPTCHA. For instance, a user could be challenged to perform a touch-based CAPTCHA as in Figures 8 and 9 and a motion/orientation-based CAPTCHA like using rotation of the device to rotate the star in Figure 10. A POSA would have known the advantages of implementing more than one CAPTCHA method in a device. For instance, Lindsay teaches the benefits of combining multiple forms of security to protect an asset, including CAPTCHA and motion/orientation of the portable device, while Yu expressly teaches combining CAPTCHA and the device's motion/orientation, along with user identification. Lindsay, Abstract, Fig. 14; [0117-18]; [167-190]; [0255]; [0341]; Yu, [0043-45]; Fig. 8; §IX.B.3.a above. To implement both forms of security on one portable device would have been no more than a predictable variation.

169. Third, the implementation would have involved no more than using a known technique (a user interface that interprets motion/orientation of a portable computing device) to improve similar devices (other portable computing devices) in the same way (interpreting movement/orientation data) to yield a predictable result (improved CAPTCHA). In my opinion, such an improvement would have been obvious. Again, Yu explicitly teaches using a portable computing device's motion/orientation to perform CAPTCHA. Yu, [0043-45]; Fig. 8.

170. Finally, adapting Seacat to incorporate Mattice's conventional motion/orientation sensors was well within a POSA's capabilities. The adaptation would have involved (a) implementing Seacat's CAPTCHA on a mobile device (e.g., an iPhone) that has motion/orientation sensors, and (b) updating the CAPTCHA software to process the motion/orientation sensors' data. Devices with such sensors were conventional by June 2008, which a POSA would have known and which Mattice confirms. Mattice, [0005-6]; [0078];

[0103-04]; [0122]. The '861 Patent admits devices with such sensors were known. '861 Patent, 12:45-48. Updating the CAPTCHA software would have been straightforward and well within a POSA's abilities, as a POSA would have known how to program various CAPTCHA interfaces. Indeed, the use of motion/orientation sensors has been popular in computer science research. Even popular consumer items like the Nintendo Wii's motion-sensing remotes, introduced in 2006, have been used by computing researchers for a wide range of applications, including those related to security. One of the earliest and largest annual conferences in this area is the Computer-Human Interaction conference, or "CHI". Since the early 1980s, papers reflecting research on motion capture often appear in the proceedings from that conference, typically a couple such papers in each set of proceedings. A POSA would be aware of this research and would have understood its applicability to CAPTCHA.]

4. Seacat-Mattice Meets All the Limitations of Claims 1, 5, and 9 of the '861 Patent, Rendering Them Obvious.

a. Claim 1

171. Seacat-Mattice discloses all of claim 1's limitations.

172. **[1Pre]:** As noted above, I have been informed by counsel that the preamble for a claim may or may not limit the claim, and I express no opinion on whether the preamble of claim 1 limits the claim. To the extent claim 1's preamble limits the claim, however, my opinion is that Seacat-Mattice performs the method recited. Seacat-Mattice performs Seacat's CAPTCHA method and meets all of limitation [1Pre]'s language other than the CAPTCHA being "motion and/or orientation based" for at least the same reasons Seacat alone does. *See* §IX.B. 1.b(1) above. As discussed in §IX.C.3 above, Seacat-Mattice uses "motion and/or orientation" of the device itself, as taught by Mattice (Mattice, Title, Abstract, Figs. 1, 10; [0003]; [0005-6]; [0037-

39]; [0046-49]; [0053-65]; [0128-152]; [0228-33]), as the user interface and thus performs “motion and/or orientation based” CAPTCHA.

173. **[1A]:** Seacat-Mattice performs Seacat’s CAPTCHA method and meets all of limitation [1A]’s language. The instructions in Seacat-Mattice require manipulation via movement and/or orientation of the portable computing device itself as taught by Mattice (see §IX.C.3 above) and are thus “manipulation” instructions as claimed. Seacat-Mattice satisfies all the other [1A] limitations for at least the same reasons Seacat alone does. *See* §IX.B.1.b(2) above.

174. **[1B]:** Seacat-Mattice performs Seacat’s CAPTCHA method and meets all of limitation [1B]’s language for at least the same reasons Seacat alone does. *See* §IX.B.1.b(3) above. To the extent “user movements and/or manipulations of the portable computing device” requires movement and/or manipulation of the portable computing device itself, the sensory data in Seacat-Mattice is associated with movement and/or orientation of the portable computing device. *See* §IX.C.3 above. The instructions in Seacat-Mattice require manipulation via movement and/or orientation of the portable computing device itself as taught by Mattice (see §IX.C.3 above) and are thus “manipulation” instructions as claimed.

175. **[1C]:** Seacat-Mattice performs Seacat’s CAPTCHA method and meets all of limitation [1C]’s language other than the determination being of user “movements and/or manipulations from the user” for at least the same reasons Seacat alone does. *See* §IX.B.1.b(4) above. To the extent “user movements and/or manipulations from the user” requires movements and/or manipulations of the portable computing device itself, Seacat-Mattice automatically determines such movements and/or orientations. *See* §IX.C.3 above.

b. Claim 5

176. Seacat-Mattice meets claim 5 ' s limitation: "wherein said set of physical manipulation instructions requires the user to move the portable computing device so as to manipulate objects presented in an interface." As discussed in Section IX.B.3.c above, in Seacat-Mattice the instructions can require the user to move (for instance, rotate) the mobile device to manipulate objects (for instance, by rotating the points of the star in Seacat Figure 10) in the device's user interface.

c. Claim 9

177. Seacat-Mattice meets dependent claim 9's requirement of "embod[ying] the CAPTCHA challenge "in computer[-]readable form and implemented as a routine executing on the portable computing device." Like Seacat (§IX.B.1.c above), Mattice's method is implemented on "computer readable media" on a portable device. Mattice, [0037-45]; [0337]. Thus, in Seacat-Mattice, the CAPTCHA challenge is embodied in a computer readable medium form for the same reasons discussed in Ground 2 in connection with Seacat modified to employ a movement/orientation user interface. *See* §IX.B.1.c above.

D. Ground 4: Claims 4 and 14 of the '861 Patent Would Have Been Obvious Over Seacat in View of Shirali-Shahreza.

178. Dependent claims 4 and 14 further require that the manipulation instructions for the motion and/or orientation-based challenge (claim 4) and the touch-based challenge (claim 14) be in "audible form by a text to speech engine."

179. After reviewing Seacat, Shirali-Shahreza, and claims 4 and 14 of the '861 Patent, it is my opinion that each of these claims would have been obvious to a POSA over Seacat in view of Shirali-Shahreza ("Seacat-Shirali-Shahreza"). The Seacat-Shirali-Shahreza combination discloses every limitation of these claims, and to the extent the Board believes that Seacat-Shirali-Shahreza does not explicitly disclose every limitation, these limitations would have been

met by the conventional and obvious implementation of the method Seacat-Shirali-Shahreza discloses. The basis for my opinion and the details of my analysis are below.

1. Seacat (Ex. 1006)

180. describe Seacat in Section IX.A. 1 above.

2. Shirali-Shahreza (Ex. 1008)

a. Shirali-Shahreza Is a Printed Publication Accessible Before June 2009.

181. Through my membership in IEEE, my receiving regular communications from IEEE, and the fact that I have authored or co-authored approximately 20 different publications in IEEE journals, conference proceedings, and other publications, I have become personally familiar with the practices and procedures of article publication in IEEE proceedings, including the proceedings for the conference titled “2008 IEEE International Conference on System of Systems Engineering (SoSE),” which took place on June 2-4, 2008.

182. Shirali-Shahreza is a paper that appeared as part of the proceedings of that conference. Based on my review of the Shirali-Shahreza paper, including information associated with the article, the Shirali-Shahreza paper was publicly available and accessible to anyone interested in it, including a POSA, at least by the end of the conference on June 4, 2008, and in any event no later than December 2008, both of which are well before the non-provisional filing date of June 29, 2009, the earliest date at which there was any disclosure relating to the alleged invention of any Challenged Claim. See Section VIII above.

183. For its technical publications, including its conference proceedings, IEEE places PDF and HTML copies on its website, called “IEEE Xplore.” <https://ieeexplore.ieee.org/>. That website has been in existence since at least 2000, including the 2008-2009 time frame. Both today and back in 2008-2009, the IEEE website and its articles and conference proceedings were

keyword searchable, including by title, author, subject matter, abstract, and full text of the articles. There are specific pages on the website for both individual articles (including articles that appeared in IEEE conference proceedings), and for the conference itself. For Shirali-Shahreza, the webpage for the specific article is <https://ieeexplore.ieee.org/document/4724188>, and the webpage for the conference proceedings is at <https://ieeexplore.ieee.org/xpl/conhome/4695854/proceeding> (which links back to the IEEE webpage for Shirali-Shahreza itself).

184. Both today and back in 2008-2009, the public can access a copy of articles from IEEE from the webpage for that article, both in PDF and html. In some cases, individual or institutional subscriptions might include access to the article. Alternatively, one could purchase a copy of any article, including Shirali-Shahreza. Such purchases were and are not limited to IEEE members, but can be made by anyone (although members buy at a discount). I have personally downloaded a PDF copy of Shirali-Shahreza via my university's IEEE subscription from <https://ieeexplore.ieee.org/document/4724188> and confirmed that Ex. 1008 is a true and accurate copy of the document available on IEEE's website. Attached as Ex. 1008 is a true and accurate copy of the webpage from which I downloaded this PDF copy of Shirali-Shahreza.

185. IEEE's website gives a "Date of Conference" for the Shirali-Shahreza article as "2-4 June 2008." It also gives a "Date Added to IEEE Xplore" as "22 December 2008." This information indicates that the Shirali-Shahreza article was available to the public at the conference between June 2-4, 2008, and that it was available for download on IEEE's website by December 22, 2008. Further, I have reviewed the Declaration of Gerard P. Grenier of IEEE, and he states that copies of the conference proceedings—which include a true and accurate copy of the Shirali-Shahreza article, as I discuss below—were made available no later than the last day

of the conference, i.e., June 4, 2008. That statement confirms my understanding that Shirali-Shahreza was publicly accessible by June 4, 2008.

186. My personal understanding of the “Date of Conference” and “Date Added to IEEE Xplore” information for IEEE conference proceeding articles is also confirmed by IEEE’s own website, which states that “Conference proceedings have Date of Conference and Date Added to IEEE Xplore fields to denote when the conference occurred and when the conference proceeding was first published in IEEE Xplore.” See <https://ieeexplore.ieee.org/Xplorehelp/ieee-xplore-training/working-with-documents#publication-dates>.

187. The format and system the IEEE use for making conference proceedings available on its website, and used in the 2000s, is confirmed by a review of my own publications from IEEE conference proceedings. For instance, I co-authored a conference proceeding article titled “Web-Based Multi-Observer Segmentation Evaluation Tool,” which was part of the 2008 21st IEEE International Symposium on Computer-Based Medical Systems. IEEE Xplore maintains a webpage for this article at <https://ieeexplore.ieee.org/document/4561979?partnum=4561979>. That webpage gives a “Date of Conference” of “17-19 June 2008,” which lines up with when the conference occurred. It also gives a “Date Added to IEEE Xplore” of “15 July 2008,” representing when it was first available for download on IEEE’s website. I confirmed that I was able to download a true and accurate copy of my article from this IEEE website. Ex. 1017. This analogous information for one of my contemporaneous papers confirms that Shirali-Shahreza was likewise available at its conference on June 2-4, 2008, and available for download to the public from IEEE Explore in December 2008.

188. Other indicia also establish that the Shirali-Shahreza paper was published and available to POSAs before June 29, 2009.

189. Later in 2008, the same authors published another IEEE article that cites to Shirali-Shahreza. This later article is titled “Bibliography of Works Done on CAPTCHA,” as part of the proceedings of the 2008 3rd International Conference on Intelligent System and Knowledge Engineering. That bibliography article has its own IEEE Xplore webpage at <https://ieeexplore.ieee.org/document/4730926>, which gives a “Date of Conference” of “17-19 November 2008,” and a “Date Added to IEEE Xplore” of “30 December 2008.” I downloaded a copy of this bibliography article from IEEE’s website. A true and accurate copy of this article, with the citation to Shirali-Shahreza highlighted, is attached as Ex. 1018. My opinion thus is that, like Shirali-Shahreza itself and my own article discussed above, this bibliography article was publicly available as a part of the proceedings of the conference, and available for download from IEEE’s website, in 2008.

190. This bibliography article’s citation to Shirali-Shahreza is particularly relevant, because a POSA would look to it as a “one-stop shop” source of prior CAPTCHA publications. So an appearance by a prior article in this list, like Shirali- Shahreza, would make it particularly likely that a POSA would be able to locate it. A POSA would also be likely to locate Shirali-Shahreza due to the relative prominence of its authors in the CAPTCHA field. As one can see from the bibliography, they had published many articles on CAPTCHA by 2008.

191. In addition to the electronic download of Shirali-Shahreza as a separate article from IEEE’s website, it was published as part of the compiled conference proceedings from the June 2-4, 2008 IEEE International Conference on System of Systems Engineering. The publisher obtained a copyright registration in those compiled proceedings. Exhibit 1019 is a true and accurate copy of the Library of Congress copyright database (cocatalog.loc.gov) page for that registration. That database is keyword-searchable by title, name, author, full-text of the

registration, and other fields, and was searchable in the same way in 2008-2009. Exhibit 1019 shows that the proceedings in which Shirali-Shahreza appears have a “Date of Publication” of December 12, 2008, and that the record for the copyright registration was created on March 5, 2009. A POSA could have searched for and found this copyright registration no later than early March 2009.

192. A hardcopy of the compiled proceedings that was publicly available at the June 2008 conference can be purchased through a linked publisher from IEEE’s website. See <http://www.proceedings.com/04256.html>. Attached as Ex. 1020 is a true and accurate copy of an excerpt from the hardcopy proceedings, showing the front cover, title page, publication information page, table of contents, Shirali- Shahreza as it appears on pages 343-348, and the back cover. This version of Shirali- Shahreza is identical to the version downloaded from IEEE’s website, except that it is in black-and-white, and adds page numbers and a copyright information footer at the bottom of each page. The front cover and title page say that the conference took place on “2-4 June 2008,” while the publication information page says “Copyright © 2008,” and footer on every page of Shirali-Shahreza gives an ISBN number followed by “/08 \$25.00 © 2008.” The Library of Congress number given on the publication information page includes “2008” as well. All of this information further confirms that Shirali-Shahreza was publicly accessible in 2008.

193. I note that at an earlier point the IEEE website said that the 2008 IEEE International Conference on System of Systems Engineering (SoSE) took place in Singapore, while the hardcopy proceedings say the conference took place in Monterey, California. My understanding is that there was an error on the IEEE website as to the conference’s location, and that the website has been updated to reflect the correct location of Monterey, California. *See*

<https://ieeexplore.ieee.org/document/4724188>. In any event, the location of the conference does not matter to the date Shirali-Shahreza was publicly accessible at the conference, which is listed in all sources as June 2-4, 2008. The conference's location also does not affect the fact that Shirali-Shahreza was available for download on IEEE's website in December 2008.

194. For these reasons, my opinion is that Shirali-Shahreza was publicly accessible and available, and would have been found by a POSA, at least by the last day of the conference on June 4, 2008 as part of the conference proceedings, and in any event by no later than December 22, 2008, when it was available for download on IEEE's website.

b. Shirali-Shahreza's Disclosure

195. As discussed above (§VI.C), the '861 Patent claims priority to the '141 Patent's application and to HDI's Provisional. Also as discussed there, HDI's Provisional does not support claims 1 or 12 from which claims 4 and 14, respectively, depend. Ex. 1005, pp.17-18, 45. HDI's Provisional also fails to describe the text-to-speech limitation of claims 4 and 14, as it says nothing at all about text-to-speech being used for CAPTCHA. *Id.* For at least these reasons, it is my opinion that there is no written description support for either claim 4 or 14 in HDI's Provisional, and that the earliest possible support for either of these claims came in the '141 Patent's application, filed on June 29, 2009. Assuming that June 2009 is the earliest possible priority date to which either claim 4 or 14 is entitled, I have been informed by counsel that Shirali-Shahreza meets the requirements to be prior art to the '861 Patent, regardless of whether the America Invents Act applies to the '861 Patent.

196. I have been informed by IM's counsel that Shirali-Shahreza was not of record during the prosecution of the application that led to the '861 Patent. '861 Patent, (56); Ex.1004.

197. Shirali-Shahreza describes a method of making CAPTCHA more accessible to children and the elderly based on choosing an object on the screen. Shirali-Shahreza, Abstract,

p.7. Some of the objects “are chosen randomly and the pictures of these topics are downloaded from the Internet.” Shirali-Shahreza, Abstract. Effects like rotation are applied to the images, the images are shown on the screen, and the user is asked to choose a specific object. *Id.*, pp. 6-7.



Figure 6. Our Children CAPTCHA method

198. The challenge is presented “using a TTS (Text-To-Speech) system.” *Id.*, pp.4-7. Previous methods played a sound “which has been obtained by converting text to speech by certain programs,” and the user had to “recognize and type the word.” *Id.*, p.4. Shirali-Shahreza avoids reading or typing, and instead converts the challenge to audio via Text-To-Speech, by asking the user to pick the correct picture. *Id.*, p.5. It might show four images and say “rabbit” to instruct the user to click on the rabbit. *Id.* “If the user clicks on the picture of the rabbit we can conclude that a human user has done the click and the user is not a computer,” because the computer likely could neither understand the spoken word “rabbit” nor recognize the shape and location of the rabbit image. *Id.* These are hard tasks for computers, but easy for humans, including those who cannot read or have impaired vision or motor skills. *Id.*, Abstract, pp.5-6.

199. Both the Shirali-Shahreza CAPTCHA method and the earlier methods it describes use “TTS (Text-To-Speech)” to present their manipulation instructions in an audible form by a text-to-speech engine operating on the device. Shirali- Shahreza uses “FreeTTS as [the] TTS engine.” *Id.*, p.6. Shirali-Shahreza further teaches that because it avoids typing, its method is particularly suitable for portable computing devices, “such as PDA’s or mobile phones.” *Id.*, p.7.

3. Implementing Seacat in View of Shirali-Shahreza

200. Seacat and Shirali-Shahreza both disclose CAPTCHA systems to improve security and authentication. Seacat, 1:16-29; Shirali-Shahreza, p.3. Shirali- Shahreza recognizes the need for CAPTCHA more easily used by humans who have difficulty reading, like children or the elderly. Shirali-Shahreza, pp.3-5, 7. A POSA would have had numerous reasons, as discussed below, to use Shirali-Shahreza’s text-to-speech engine in Seacat’s CAPTCHA system. The proposed combination (“Seacat-Shirali-Shahreza”) uses the TTS engine to convert the instructions for Seacat’s CAPTCHAs into speech. For example, the engine would convert the text instructions shown in Figures 8-10 (items 810/910/1010) into speech, which would play in addition to or instead of displaying the text. The user has to comply with the instructions to complete the CAPTCHA, just as Seacat teaches (Seacat, 5:52-6:6; 7:63-8:37) and Shirali-Shahreza confirms. Shirali-Shahreza, pp.3-6.

201. A POSA would have had many reasons to implement Seacat’s CAPTCHA method with Shirali-Shahreza’s text-to-speech engine. First, audio instructions would have improved flexibility by allowing a broader range of users. This would have provided more options for input, expanding the people who could use the device, for example, those with impaired vision or motor skills, and preliterate children and the elderly, as expressly taught by Shirali-Shahreza. Shirali- Shahreza, pp.3-4, 7. A POSA would have known that sound- or speech-based CAPTCHA “is often done...to assist those with impaired vision.” Lindsay, [0169].

202. Second, a POSA would have appreciated that because neither method requires a keyboard, both Seacat's and Shirali-Shahreza's methods are particularly well-suited to portable computing devices. *See* §IX.A.2.a(1) above; Seacat, 3:59–67; Fig. 2; 4:12-25; Shirali-Shahreza, p.7 (“no keyboard is needed....it can be run on devices without a keyboard or devices in which it is difficult to use their keyboard, such as PDA[]s or mobile phones.”).

203. Third, the implementation would have involved no more than using a known technique (a text-to-speech engine to convert CAPTCHA instructions for use in portable computing devices) to improve similar devices (CAPTCHA used in portable computing devices) in the same way (providing instructions to perform the CAPTCHA) to yield a predictable result (CAPTCHA whose instructions are spoken, written, or both). In my opinion, such an improvement would have been obvious.

204. Adapting Seacat to incorporate the text-to-speech engine in Shirali- Shahreza was well within a POSA's capabilities. The adaptation would have involved no more than adding a TTS engine to Seacat's device if it did not already have one, and updating Seacat's software to send the CAPTCHA instruction text to the TTS engine. Shirali-Shahreza uses “FreeTTS....a small, fast, run-time speech engine” that can be easily implemented in multiple ways and devices. Shirali- Shahreza, p.6. Seacat's portable computing device already has the “[a]udio circuitry” and “internal speakers” to play the resulting audio. Seacat, Fig. 1; 3:48-52. As Shirali-Shahreza and other documents confirm, such text-to-speech engines were conventional by 2008. Shirali-Shahreza, pp. 3-4, 6-7; Ex. 1015, p.1. Updating the CAPTCHA software would have been straightforward and well within a POSA's abilities, as a POSA would know how to program various CAPTCHA interfaces. Indeed, screen readers had been known for a long time before 2008 as useful for increasing accessibility, both for computers in general and for mobile

devices. A POSA would expect to see TTS on mobile devices being discussed in papers at many conferences in the years before 2008-09.

4. Seacat-Shirali-Shahreza Meets All the Limitations of Claims 4 and 14, Rendering Them Obvious.

205. Modifying Seacat to use a TTS as taught by Shirali-Shahreza would not change any of the aspects of Seacat discussed above that anticipate and/or render obvious all limitations of independent claims 1 and 12, so Seacat-Shirali-Shahreza meets claims 1 and 12 for the same reasons Seacat does. *See* §IX.A.2.a, IX.B.1.b. Seacat-Shirali-Shahreza also meets “wherein the set of physical [manipulation/touch] instructions for the [motion and/or orientation/touch-]based CAPTCHA challenge are presented in audible form by a text[-]to[-]speech engine operating on the portable computing device,” as recited by dependent claims 4 and 14.

206. Seacat-Shirali-Shahreza has a text-to-speech engine in its “Text-To- Speech (TTS) system,” such as “FreeTTS as [the] *TTS engine*.” Shirali-Shahreza, p.6. Seacat-Shirali-Shahreza uses that engine to convert written CAPTCHA instructions into audible form. *Id.* Seacat Shirali-Shahreza’s physical manipulation/touch instructions would be those in, for instance, Seacat Figures 8–10 (items 810/910/1010), as run through Shirali-Shahreza’s TTS. Seacat-Shirali- Shahreza presents those instructions in audible form when the audio is “played” for the user. Shirali-Shahreza, p.4. Finally, the user follows the instructions by completing the CAPTCHA. Seacat, 7:63-8:37. Seacat-Shirali-Shahreza’s CAPTCHA method is implemented on portable computing devices, like mobile phones. §IX.A.2.a(1) above; Seacat, 3:59-67; Fig. 2; 4:12-25; Shirali-Shahreza, p.7.

207. In Seacat-Shirali-Shahreza, the “text[-]to[-]speech engine [is] operating on the portable computing device.” The TTS engine converts text created on the portable device and

plays audio for the user on the device itself, and is thus operating on the device. Shirali-Shahreza, p.6.

208. For example, the FreeTTS system used by Seacat-Shirali-Shahreza was implemented in various ways, including as code operable on any webpage a mobile device can load, using a client/server setup, and as a downloadable web application installable on a mobile device. *See* <http://freetts.sourceforge.net/>. This discussion of methods to use FreeTTS was the same in early 2005, the same time as Shirali-Shahreza says its authors accessed the FreeTTS website in their article. *See* Shirali-Shahreza, p.8; <http://web.archive.org/web/20050208030619/http://freetts.sourceforge.net/docs/index.php>. In my opinion, Seacat-Shirali-Shahreza discloses claims 4 and 14, rendering them obvious.

E. Ground 5: Claim 4 of the '861 Patent Would Have Been Obvious Over Seacat in View of Mattice and Shirali-Shahreza.

209. After reviewing Seacat, Mattice, Shirali-Shahreza, and claim 4 of the '861 Patent, it is my opinion that each of this claim would have been obvious to a POSA over Seacat in view of Mattice and Shirali-Shahreza ("Seacat-Mattice-Shirali-Shahreza"). The Seacat-Mattice-Shirali-Shahreza combination discloses every limitation of this claim, and to the extent the Board believes that Seacat-Mattice-Shirali-Shahreza does not explicitly disclose every limitation, these limitations would have been met by the conventional and obvious implementation of the method Seacat-Shirali-Shahreza discloses. The basis for my opinion and the details of my analysis are below.

1. Seacat (Ex. 1006)

210. I describe Seacat in Section IX.A.1 above.

2. Mattice (Ex. 1007)

211. I describe Mattice in Section IX.C.2 above.

3. Shirali-Shahreza (Ex. 1008)

212. I describe Shirali-Shahreza in Section IX.D.2 above.

4. Seacat-Mattice-Shirali-Shahreza Meets All the Limitations of Claim 4, Rendering It Obvious.

213. All the above-discussed reasons a POSA would have had to add a TTS engine (as taught by Shirali-Shahreza) to Seacat apply equally to Seacat-Mattice, and a POSA would have had the same expectation of success in using a TTS engine to audibly present Seacat-Mattice's CAPTCHA instructions. *See* §IX.D.3. The resulting Seacat-Mattice-Shirali-Shahreza combination renders claim 4 obvious. §IX.D.4.

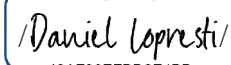
214. Modifying Seacat-Mattice to use a TTS would not change any of the aspects of Seacat-Mattice that I discuss above that make claim 1 obvious, so Seacat-Mattice-Shirali-Shahreza meets claim 1 for the same reasons Seacat-Mattice does. *See* §IX.C.4.a. Dependent claim 4's additional text-to-speech limitations are met by Seacat-Mattice-Shirali-Shahreza for the same reasons they are met by Seacat-Shirali-Shahreza. §IX.D.4.

X. CONCLUSION

215. I declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

I declare under penalty of perjury that the foregoing is true and correct.

Date: 2/23/2023

DocuSigned by:

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Daniel P. Lopresti, Ph.D.