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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

FACETEC, INC., *Plaintiff*, *v.* JUMIO CORPORATION, *Defendant*, and IPROOV LTD., *Defendant-Intervenor*.	Case No. 3:24-cv-3623-RFL **JUMIO CORPORATION'S PATENT L.R. 3-3 INVALIDITY CONTENTIONS**

FACETEC EXHIBIT 2012
JUMIO v. FACETEC
IPR2025-00106

Pursuant to Patent Local Rule 3-3 and the schedule set by the Court in this case (Dkt. 74), Defendant Jumio Corporation ("Jumio") hereby provides its Invalidity Contentions for claims 10–20 of U.S. Patent No. 10,776,471 (the "'471 Patent"); claims 1–9 and 19–20 of U.S. Patent No. 11,157,606 (the "'606 Patent"); claims 1–24 of U.S. Patent No. 11,693,938 (the "'938 Patent"); and claims 10–21 of U.S. Patent No. 11,874,910 (the "'910 Patent") (collectively, the "Asserted Claims" of the "Asserted Patents").[1]

1. Introduction

Jumio's discovery and investigation in connection with this case are ongoing, and these Invalidity Contentions are based on information obtained to date. Thus, these Invalidity Contentions are provided without prejudice to Jumio's right to supplement or amend based on the discovery of new information, including, but not limited to, (1) amendments to Plaintiff's Disclosure of Asserted Claims and Infringement Contentions; (2) admissions of Plaintiff regarding the prior art, the scope of the Asserted Claims, the meaning of claims terms, and the alleged priority, conception, and reduction to practice dates for any of the Asserted Claims, including statements by Plaintiff's fact and expert witnesses, statements in documents produced by Plaintiff in this case, and statements in papers filed and evidence submitted by Plaintiff in this or any other case or proceeding involving the Asserted Patents; (3) additional prior art, including prior art obtained through discovery from Plaintiff or a third party, or through further investigation by Jumio; and (4) any order issued by the Court concerning the scope of Plaintiff's infringement allegations or claim construction.

Jumio's Invalidity Contentions are based on its current understanding of the Asserted Claims and of Plaintiff's apparent interpretation of the

[1] As identified in Plaintiff's Patent Local Rule 3-1 Disclosure of Asserted Claims and Infringement Contentions, served November 12, 2024.

Asserted Claims, as set forth in Plaintiff's Infringement Contentions. Accordingly, Jumio's Invalidity Contentions, including the claim charts attached hereto, take into account alternative and potentially inconsistent positions as to claim construction and scope. Nothing in these Invalidity Contentions should be construed as an admission that any particular feature or aspect of any accused product practices any limitation of the Asserted Claims or that any of Plaintiff's apparent claim constructions are reasonable, supportable, or proper. By providing these Invalidity Contentions, Jumio does not waive the right to contest claims constructions or take positions during claim construction proceedings that may be inconsistent with positions expressed or implied herein.

Nor does Jumio waive any objections to Plaintiff's Infringement Contentions or challenges to Plaintiff's interpretation or application of the Asserted Claims in those contentions. Indeed, Plaintiff's Infringement Contentions are deficient in numerous respects and fail to describe the accused functionality and Plaintiff's interpretation of claim language in a manner that would allow Jumio to fully respond. *See* Dkt. 73. For example, Plaintiff has failed to identify "for each claim the applicable statutory subsections of 35 U.S.C. §271 asserted," as required by Patent L.R. 3-1(a). In particular, Plaintiff merely states "Statutory authority: 35 U.S.C. Sec. 271(a)/(b)" for each Asserted Patent in its Patent L.R. 3-1(a) disclosures, but later contends that "Defendant's acts of indirect infringement include inducement of infringement and contributory infringement under 35 U.S.C. §§ 271(b) and (c)." Relatedly, Plaintiff has not disclosed, "[f]or each claim which is alleged to have been indirectly infringed, an identification of any direct infringement and a description of the acts of the alleged indirect infringement that contribute to or are inducing that direct infringement," or, to the extent such "alleged direct infringement is based on joint acts of multiple

parties, the role of each such party in the direct infringement," as required by Patent L.R. 3-1(d). Plaintiff has also failed to identify, specifically and "[s]eparately for each asserted claim, each accused apparatus, product, device, process, method, act or other instrumentality," as required by Patent L.R. 3-1(b). Plaintiff has also failed to identify "specifically where and how each limitation of each asserted claim is found within each Accused Instrumentality," as required by Patent L.R. 3-1(c). In fact, Plaintiff has asserted claims for which it concedes that, as of now, it "cannot determine whether the Jumio Accused Instrumentality infringes," including claims 11, 12, 17, 18, and 20 of the '471 Patent; claims 2 and 3 of the '606 Patent; claims 2 and 9 of the '938 Patent; and claims 11, 12, 17, and 20 of the '910 Patent. Plaintiff has also failed to identify which, if any, of the Asserted Claims' preambles it contends are limiting.

Further, Plaintiff has not alleged that any Asserted Claim is "present under the doctrine of equivalents in the Accused Instrumentality" pursuant to Patent L.R. 3-1(e), and has therefore waived the right to rely on this doctrine for any limitation of any Asserted Claim. Nor has Plaintiff "identif[ied], separately for each asserted claim, each [of its own or its licensee's] apparatus[es], product[s], device[s], process[es], method[s], act[s], or other instrumentalit[ies] that incorporates or reflects that particular claim," and has therefore waived "the right to rely, for any purpose, on the assertion that [any such] instrumentality practices the claimed invention," pursuant to Patent L.R. 3-1(g).

2. Identification of Prior Art

Jumio identifies the following prior art references that anticipate and/or render obvious the Asserted Claims of each Asserted Patent, or otherwise inform the relevant knowledge of a person having ordinary skill in the relevant art at the time of the purported invention ("POSITA"). Whether a

prior art reference anticipates or renders obvious a given claim may depend upon claim construction.

In its Infringement Contentions, Plaintiff contends that each Asserted Claim is entitled to a priority date of "at least July 3, 2015," based on the disclosures of U.S. Provisional Application No. 62/188,584 (the "'584 Provisional"). These Invalidity Contentions are based on the asserted priority date of July 3, 2015. However, Plaintiff's contentions regarding the asserted priority date are insufficient at least because they only address the '584 Provisional's purported disclosure of what Plaintiff refers to as the "critical limitations" of the Asserted Claims, and "various limitations found in the dependent claims," which are not commensurate with the full scope of each Asserted Claim. Therefore, although each reference and system identified below is prior art under 35 U.S.C. §§ 102(a)(1) and/or (2) based on the asserted July 3, 2015, priority date, nothing in these Invalidity Contentions should be construed as an admission that any Asserted Claim is entitled to the asserted priority date or waiver of any argument regarding the proper priority date for each Asserted Claim. Based on the discovery of new information regarding the proper priority date of each Asserted Claim, including admissions by or on behalf of Plaintiff, further investigation by Jumio or its expert(s), and orders issued by the Court, Jumio may search for, identify, and/or rely on additional references that would not qualify as prior art based on the asserted priority date of July 3, 2015.

Further, prior art patents and publications identified below may (1) be related (such as a divisional, continuation, continuation-in-part, parent, or child) to earlier- or later-filed patents or publications, (2) have counterparts filed in other jurisdictions, and/or (3) incorporate (or be incorporated by) other patents or publications by reference. The identified patents and publications are intended to be representative of these other patents or

publications to the extent they exist. Jumio also incorporates by reference all prior art references cited on the face of the Asserted Patents and in their prosecution histories.

Responsive to the discovery of additional information, as described in Section 1 above, Jumio may identify additional prior art references that anticipate and/or render obvious the Asserted Claims of each Asserted Patent, or otherwise inform the relevant knowledge of a POSITA. Jumio also reserves the right to rely on any prior art references identified by Defendant-Intervenor iProov in its invalidity contentions in this case or in the co-pending litigation between FaceTec and iProov in the District of Nevada (Case No. 2:21-cv-02252-ART).

2.1. Prior Art Patents and Published Patent Applications

PATENT / PUBLICATION NO.	FILING DATE	ISSUE / PUBLICATION DATE	INVENTOR(S)
US 8,437,513 ("Derakhshani")	Aug. 10, 2012	May 7, 2013	Reza Derakhshani, Casey Hughlett, Jeremy Paben, Joel Teply, Toby Rush
US 2011/0299741 ("Zhang")	June 8, 2010	Dec. 8, 2011	Zhengyou Zhang, Qin Cai, Pieter R. Kasselman, Arthur H. Baker
US 8,860,795 ("Suzuki '795")	Jul. 7, 2011	Oct. 14, 2014	Tetsuaki Suzuki
US 2002/0113884 ("Tanii")	Feb. 15, 2002	Aug. 22, 2002	Junichi Tanii, Minoru Kuwana
US 9,703,939 ("Tahk")	May 22, 2013	July 11, 2007	Uisoo Tahk, Minhun Ha, Uijum Kim, Jaeyee Lee, Sanghoon Kim
US 8,280,120 ("Hoyos")	Oct. 2, 2007	Oct. 2, 2012	Hector T. Hoyos, Keith J. Hanna
US 2010/0158319 ("Jung")	Jul. 27, 2009	Jun. 24, 2010	Sun Uk Jung, Yun Su Chung, Ki Young Moon

PATENT / PUBLICATION NO.	FILING DATE	ISSUE / PUBLICATION DATE	INVENTOR(S)
US 2004/0239799 ("Suzuki '799")	May 25, 2004	Dec. 2, 2004	Naoto Suzuki, Akira Moriya
US 8,977,010 ("Frischholz")	Oct. 19, 2012	Mar. 10, 2015	Robert Frischholz, Peter Strohm
US 8,798,336 ("Nechyba")	Sep. 23, 2013	Aug. 5, 2014	Michael Christian Nechyba, Henry Will Schneiderman, Michael Andrew Sipe
US 9,230,158 ("Ramaswamy")	Dec. 18, 2012	Jan. 5, 2016	Sharadh Ramaswamy
2008/0192980 A1 ("Park")	Aug. 13, 2007	Aug. 14, 2008	Gyu-tae Park, Haitao Wang, Young-su Moon
US 9,075,975	Feb. 17, 2013	Jul. 7, 2015	Andrew Bud
US 2014/0028823	May 22, 2013	Jan. 30, 2014	Uisoo Tahk, Minhun Ha, Uijum Kim, Jaeyee Lee, Sanghoon Kim
US 2010/0014720	Oct. 2, 2007	Jan. 21, 2010	Hector T. Hoyos, Keith J. Hanna
US 9,077,891	Mar. 6, 2013	Jul. 7, 2015	Leo Benedict Baldwin
US 8,965,064	Aug. 21, 2012	Feb 4, 2015	Keith J. Hanna
US 2007/0127787	Oct. 23, 2006	Jun. 7, 2007	Kenneth R. Castleman, Qiang Wu, Samuel Cheng, Le Zou, Shalini Gupta
US 2004/0036574	Mar. 10, 2003	Feb. 26, 2004	Susan J. Bostrom
US 7,412,081	Jun. 17, 2003	Aug. 12, 2008	Miwako Doi
US 8,457,367	Jun. 26, 2012	Jun. 4, 2013	Michael Andrew Sipe, Henry Will Schneiderman, Michael Christian Nechyba
US 8,260,008	Sep. 21, 2010	Sep. 4, 2012	Keith J. Hanna, Hector T. Hoyos
JP 2009-223651	Mar. 17, 2008	Oct. 1, 2009	Rie Shirota

PATENT / PUBLICATION NO.	FILING DATE	ISSUE / PUBLICATION DATE	INVENTOR(S)
US 8,675,926	Jun. 8, 2010	ME. 18, 2014	Zhengyou Zhang, Qin Cai, Pieter R. Kasselman, Arthur H. Baker
US 9,117,109	Jun. 25, 2014	Aug. 25, 2015	Michael Christian Nechyba, Henry Will Schneiderman, Michael Andrew Sipe
WO 2013/131407	Mar. 5, 2013	Sept. 12, 2013	Ziqing Li, Zhiewie Zhang, Zhen Lei, Dong Yi
DE 102013100635	Jan. 22, 2013	Jul. 245 2014	Bauer Armin
US 8,983,207	Jan. 10, 2013	Mar. 17, 2015	Alexander S. Ran, Christopher Z. Lesner, Cynthia J. Osmon
US 2006/0136743	Dec. 31, 2003	Jun. 22, 2006	Andrew J. Polcha, Michael P. Polcha
US 2013/0212655	Mar. 15, 2013	Aug. 15, 2013	Hector T. Hoyos, Keith J. Hanna
US 2014/0056491	Aug. 23, 2013	Feb. 27, 2014	Joshua Knight
US 8,542,879	Jun 26, 2012	Sep. 24, 2013	Michael Chistian Nechyba, Henry Will Schneiderman, Michael Andrew Sipe
US 7,840,034	Apr. 27, 2007	Nov. 23, 2010	Kenta Takahashi, Masahiro Mimura
US 8,290,220	Feb. 21, 2007	Oct. 16, 2012	Kaoru Uchida
US 8,630,493	Dec. 7, 2010	Jan. 14, 2014	Salih Burak Gokturk, Dragomir Anguelov, Lorenzo Terresani, Vincent Vanhoucke, Munjal Shah, Diem Vu, Kuang-Chih Lee
US 8,705,812	Jun. 10, 2011	Apr. 22, 2014	Kenneth M. Karakotsios, Kah Kuen Fu, Volodymyr V. Ivanchenko, Mingjing Huang
US 8,856,541	Jan. 10, 2013	Oct. 7, 2014	Krishnendu Chaudhury, Avani Devarasetty

PATENT / PUBLICATION NO.	FILING DATE	ISSUE / PUBLICATION DATE	INVENTOR(S)
US 8,966,613	Sep. 30, 2011	Feb. 24, 2015	Eric Horvitz, Desney S. Tan, James Chia-Ming Liu
US 8,970,348	Aug. 28, 2012	Mar. 3, 2015	Jason M. Evans, Sean P. Loosli
US 8,984,622	Jan. 17, 2012	Mar. 17, 2015	Leo B. Baldwin, Isaac S. Noble
US 9,408,076	May 13, 2015	Aug. 2, 2016	Shaxun Chen, Amit Pande, Prasant Mohapatra
US 9,510,196	Mar. 17, 2014	Nov. 29, 2016	Saurabh Sensharma, Arvind Kulathu Ramachandran, Seyfullah Halit Oguz, Khaled Helmi El-Malch
US 9,524,421	Dec. 9, 2013	Dec. 20, 2016	Steven James Ross, Brian Patrick Williams, Henry Will Schneiderman, Michael Christian Nechyba
US 9,607,138	Dec. 18, 2013	Mar. 28, 2017	Leo Benedict Baldwin, Nicholas Ryan Gilmour
US 9,652,663	Jul. 2, 2015	May 16, 2017	James Kai Yu Lau, Ayman Kaheel, Motaz El-Saban, Mohamed Shawky, Monica Gonzalez, Ahmed El Baz, Tamer Deif, Abdel-Hakim Aly
US 9,690,998	Dec. 19, 2014	Jun. 27, 2017	Ansuya Negi, David L. Graumann, Rahuldeva Ghosh, Ranjit S. Narjala
US 9,971,920	Jul. 2, 2015	May 15, 2018	Reza R. Derakhshani, Casey Hughlett, Jeremy Paben, Joel Teply, Toby Rush
US 10,049,287	May 22, 2015	Aug. 14, 2018	Christian Holz, Miteshkumar Patel, Senaka Wimal Buthpitiya
US 10,042,993	Jun. 23, 2015	Aug. 07, 2018	Homayoon Beigi
2007/0009139 A1	Jul. 11, 2005	Jan. 11, 2007	Assaf Landschaft, Shajith Chacko Thengummootil

PATENT / PUBLICATION NO.	FILING DATE	ISSUE / PUBLICATION DATE	INVENTOR(S)
2008/0304716 A1	May 7, 2008	Dec. 11, 2008	Jyunji Hirose
2014/0310764 A1	Apr. 12, 2013	Oct. 16, 2014	Peter Tippett, Seven T. Archer, Paul V. Hubner, Paul A. Donfried, Scott N. Kern
2014/0309880 A1	Apr. 15, 2014	Oct. 16, 2014	Christopher P. Ricci
2014/0366113 A1	Aug. 1, 2014	Dec. 11,2014	Yann Lecun, Adam Perold, Yang Wang, Sagar Waghmare
US 5,886,735	Jan. 14, 1997	Mar. 23, 1999	Edward T. Bullister
US 7,436,988	Ju. 3, 2005	Oct. 14, 2008	Liyan Zhang, Anshuman Tazdan, Gerald Farin
US 8,065,528	Mar. 15. 2007	Nov. 22, 2011	Tomohiro Inoue, Masahiro Senga
US 8,204,282	Sep. 11, 2008	Jun. 19, 2012	Nobuhiro Morita, Yuji Yamanaka
US 8,423,785	Nov. 13, 2006	Apr. 16, 2013	Erina Takikawa, Takayoshi Yama-shita, Satoshi Hosoi
US 9,076,027	Nov. 17, 2009	Jul. 7, 2015	Naota Miura, Harumi Kiyomizu, Akio Nagasaka, Takafumi Miyatake, Yusuke Matsuda
US 9,239,617	May 2, 2013	Jan. 19,2016	Byung-Jun Son, Hong-Il Kim, Tae-Hwa Hong
US 9,251,427	Aug. 12, 2014	Feb. 2, 2016	Chun-Te Chu, Michael J. Conrad, Dijia Wu, Jinyu Li
US 9,262,614	Aug. 1, 2013	Feb. 16, 2016	Nobuyasu Yamaguchi
CN101923641	Sep. 9, 2010	Dec. 22, 2010	Wang Zhongli, Song Yongrui
KR20100000274	Jun, 24, 2008	Jan. 6, 2010	Joe Hee Son
2010/0194860	Feb. 3, 2010	Aug. 5, 2010	James Mentz, Samuel Caldwell

PATENT / PUBLICATION NO.	FILING DATE	ISSUE / PUBLICATION DATE	INVENTOR(S)
2012/0257797	Apr. 5, 2011	Oct. 11, 2012	Tommer Leyvand, Jinyu Li, Casey Meekhof, Tim Keosababian, Simon Stachniak, Ryan Gunn, Alan Stuart, Russ Glaser, Eddie Mays, Toan Huynh, Richard Irving, James Waletzky, Ajay Ramjee
2013/0301886	Dec. 20, 2011	Nov. 14, 2013	Yoshinori Koda
2014/0071293	Sep. 12, 2012	Mar. 13, 2014	Ramijith Unnikrishnan
2013/0051631	Aug. 21, 2012	Feb. 28, 2013	Keith J. Hanna

2.2. Prior Art Publications

TITLE	PUBLICATION DATE	AUTHOR(S) / PUBLISHER
Moving Face Spoofing Detection via 3D Projective Invariants ("Marsico")	March 2012	Maria De Marsico, Michele Nappi, Daniel Riccio, Jen-Luc Dugelay Institute of Electrical and Electronics Engineers (IEEE)
A Robust Technique for Matching Two Uncalibrated Images Through the Recovery of the Unknown Epipolar Geometry	May 1994	Zhengyou Zhang Institut National De Recherche En Informatique Et En Automatique
Optics	1974	Eugene Hecht & Alfred Zajac Addison-Wesley Publishing Co.
Introduction to Biometrics	2011	Anil K. Jain Springer
Distortion	Oct. 2009	B. Honlinger & H.H. Nasse Zeiss

TITLE	PUBLICATION DATE	AUTHOR(S) / PUBLISHER
Face distortion is not due to lens distortion (available at https://bakerdh.wordpress.com/2012/05/05/face-distortionis-not-due-to-lens-distortion/)	May 5, 2012	Daniel Baker Daniel's Visionarium, A blog about visual perception
Multiple View Geometry in Computer Vision	2011	Richard Hartley & Andrew Zisserman Cambridge Univ. Press (2nd ed.)
CSE 252B: Computer Vision II, Lecture 4: Planar Scenes and Homography	Apr. 7, 2004	Serge Belongie
Face Recognition by Elastic Bunch Graph Matching	1999	Laurenz Wiskott
Axis Communications, CCD and CMOS sensor technology: Technical White Paper	2010	
What is Depth of Field? How aperture, focal length and focus control sharpness (available at https://prism.org.gg/wp-content/uploads/2016/07/Depth-of-Field.pdf)	July 17, 2013	Jeff Meyer Digital Camera World
Understanding Camera Optics & Smartphone Camera Trends (available at https://www.anandtech.com/Show/Index/6777cPage=2&all=False&sort=0&page=2&slug=understanding-camera-optics-smartphonecamera-trends)	Feb. 22, 2013	Brian Klug Anandtech
Decentering Distortion of Lenses, Photogrammertic Engineering	1966	Duane C. Brown
Face Authentication Using Graph-Based Low-Rank Representation of Facial Local Structures for Mobile Vision Applications	Nov. 2011	Alaa E. Abdel-Hakim, Motaz El Saban 2011 IEEE Internation Conference on Computer Vision Workshops (ICCV Workshops)

TITLE	PUBLICATION DATE	AUTHOR(S) / PUBLISHER
A Matter of Perspective	May 8, 2007	John Cornicello
An Efficient Algorithm for Motion Detection Based Facial Expression Recognition Using Optical Flow	2008	Ahmad R. Naghsh-Nilchi, Mohammad Roshanzamir World Academy of Science, Engineering and Technology International Journal of Computer and Information Engineering
Impact of Focal Length on Portraits (available at www.ontakingpictures.com)	Aug. 9, 2010	Bill Waldman
Non-intrusive Liveness Detection by Face Images, Image and Vision Computing	May 22, 2007	Klaus Kollreider, Hartwig Fronthaler, Josef Bigun
Perspective in Portraits	2007	Nathan Yan Digital Photography DeCal
Evaluating Liveness by Face Images and the Structure Tensor	2005	Klaus Kollreider, Hartwig Fronthaler, Josef Bigun Institute of Electrical and Electronics Engineers (IEEE)
Securing Sensitive Data Stored on Smartphones	2012	Mark Wilson, Lei Chen Institute of Electrical and Electronics Engineers (IEEE)
Face Liveness Detection Using Variable Focusing	2013	Sooyeon Kim, Sunjin Yu, Kwangtaek Kim, Yuseok Ban, Sangyoun Lee Institute of Electrical and Electronics Engineers (IEEE)
Sensor Assisted Facial Recognition An Enhanced Biometric Authentication System for Smartphones	Jun. 2, 2014	Shaxun Chen, Amit Pande, Prasant Mohapatra

TITLE	PUBLICATION DATE	AUTHOR(S) / PUBLISHER
Real-time Mobile Facial Expression Recognition System – A Case Study	2014	Myunghoon Suk, Balakrishnan Prabhakaran 2014 IEEE Conference on Couter Vision and Pattern Recognition Workshops
SAFE: Secure Authentication with Face and Eyes	June 2013	Arman Boehm, Dongqu Chen, Mario Frank, Ling Huang, Cynthia Kuo, Tihomir Lolic, Ivan Martinovic, Dawn Song IEEE, 2013 International Conference on Privacy and Security in Mobile Systems (PRISMS)
Face Liveness Detection Using 3D Structure Recovered from a Single Camera	June 2013	Tao Wang, Jianwei Yang, Zhen Lei, Shengcai Liao, Stan Z. Li IEEE, International Conference on Biometrics
Sensor-Assisted Facial Recognition: An Enhanced Biometric Authentication System for Smartphones	June 2, 2014	Shaxun Chen, Amit Pande, Prasant Mohapatra

2.3. Prior Art Systems

SYSTEM	RELEASE DATE
EyeVerify Eyeprint ID Technology E.g., https://web.archive.org/web/20141205225010/http://eyeverify.com/product-technology/; https://web.archive.org/web/20130925224029/http://eyeverify.com/product-technology/; https://web.archive.org/web/20130926011941/http://eyeverify.com/product-technology/the-eyeprint-advantage/; https://web.archive.org/web/20130926171059/http://eyeverify.com/product-technology/products/; https://web.archive.org/web/20141205010750/http://eyeverify.com/product-technology/products/; https://web.archive.org/web/20130926011858/http://eyeverify.com/product-technology/core-technology/; https://web.archive.org/web/20120601180659/http://eyeverify.com/technology.php?DId=1; https://web.archive.org/web/20130926011923/http://eyeverify.com/product-technology/faq/#toggle-id-1; https://web.archive.org/web/20130926011923/http://eyeverify.com/product-technology/faq/#toggle-id-2; https://web.archive.org/web/20131127053853/http://eyeverify.com/category/blog/; https://web.archive.org/web/20141226004307/http://eyeverify.com/category/blog/; https://web.archive.org/web/20130915171536/http://blogs.wsj.com/venturecapital/2013/05/13/the-daily-startup-eyeverify-to-bring-eyeprint-id-to-smartphones/; https://web.archive.org/web/20120601005443/http://eyeverify.com/technology.php?DId=3; https://web.archive.org/web/20120601180703/http://eyeverify.com/technology.php?DId=2; https://web.archive.org/web/20120607050242/http://eyeverify.com/products.php; https://web.archive.org/web/20150208125628/http://www.biometrics.org/bc2002/2_bc0130_DerakhshabiBrief.pdf; https://www.globenewswire.com/en/news-release/2015/03/02/1078276/0/en/EyeVerify-Eyeprint-ID-TM-Now-Integrated-Into-AirWatch-Software-Development-Kit-and-AirWatch-Chat.html; https://www.biometricupdate.com/201304/eyeverify-lands-new-patent-for-spoof-detection; https://www.biometricupdate.com/201305/eyeverify-raises-capital-announces-availability-for-banking-financial-services-sector; https://idtechwire.com/archive/eyeverify-upgrades-eyeprint-id-will-launch-on-ios-and-android-in-january/; JUMIO-0002162 – 2191.	2012
BioID Fake Defender Technology E.g., https://web.archive.org/web/20150201025754/https:/www.bioid.com/; https://web.archive.org/web/20150201025754/https:/www.bioid.com/; https://www.airport-technology.com/contractors/data//pressreleases/press-materna-bioid-to-offer-airport-passenger-service/	Feb. 1, 2015

SYSTEM	RELEASE DATE
Hoyos Labs HoyosID Identity Assertion Platform E.g., https://web.archive.org/web/20150111135806/http:/www.hoyoslabs.com/; https://web.archive.org/web/20150106035748/http:/www.hoyoslabs.com/aboutus; https://opusresearch.net/pdfs/HoyosLabs_VBCNYC2015.pdf; https://www.globalsecuritymag.fr/fichiers/gsdays2015/FICHIERS/PRESENTATION/Presentation-HOYOS-LABS.pdf; https://www.youtube.com/watch?v=g9xeZXsz_Uc; https://www.eweek.com/small-business/hoyosid-mobile-app-uses-biometrics-to-secure-personal-info/; https://www.prnewswire.com/news-releases/hoyos-labs-introduces-free-hoyosid-mobile-app-app-leverages-biometrics-to-secure-personal-information-239034091.html; https://www.cnet.com/tech/mobile/hoyosid-uses-your-face-to-securely-sign-you-into-any-web-site-launches-in-march/.	January 2014
CASIA Anti-Spoofing System entered into "The 2nd Competition on Counter Measures to 2D Face Spoofing Attacks" by "Center for Biometrics and Security Research & National Laboratory of Pattern Recognition, Institute of Automation, Chinese Academy of Sciences," 2013 International Conference on Biometrics (ICB). *See* JUMIO-0002150 – 2155.	June 2013

3. Invalidity Under 35 U.S.C. §§ 102 & 103

In the invalidity claim charts attached hereto as Appendices 1-A – 1-L, 2-A – 2-L, 3-A – 3-L, and 4-A – 4-L ("Invalidity Claim Charts"), Jumio has attempted to identify the most relevant portions of the cited prior art references, illustrating that such references disclose, either expressly or inherently, or render obvious, either alone or in combination with other prior art references, each limitation of the Asserted Claims identified therein. However, such references may contain additional support for certain claim limitations and Jumio may rely on uncited portions of the references, other documents, and expert testimony to provide context for or to aid in understanding the disclosures of the references. Where Jumio cites to a particular figure in a reference, the citation should be understood to encompass the caption and any corresponding description of the figure.

Conversely, where Jumio cites to particular text referring to a figure, the citation should be understood to include the figure as well.

3.1. Anticipation of the Asserted Claims

Jumio contends that certain of the Asserted Claims are invalid under 35 U.S.C. § 102 as being anticipated by the following prior art patents and publications:

- U.S. Patent No. 8,437,513 ("Derakhshani");
- U.S. Patent Pub. No. 2011/0299741 ("Zhang");
- U.S. Patent No. 8,860,795 ("Suzuki '795");
- Maria De Marisco, Michele Nappi, Daniel Riccio, Jen-Luc Dugelay, *Moving Face Spoofing Detection via 3D Projective Invariants* (Institute of Electrical and Electronics Engineers, March 2012) ("Marisco");
- U.S. Patent No. 8,977,010 ("Frischholz");
- U.S. Patent No. 8,798,336 ("Nechyba");
- U.S. Patent No. 9,230,158 ("Ramaswamy"); and
- U.S. Patent Pub. No. 2008/0192980 ("Park").

In the attached Invalidity Claim Charts, Jumio specifically identifies where each of these references explicitly discloses every limitation of such claims.

Jumio further contends that all Asserted Claims are invalid under 35 U.S.C. § 102 as anticipated by the following prior art systems and technologies:

- EyeVerify Eyeprint ID Technology;
- BioID Fake Defender Technology;
- Hoyos Labs HoyosID Identity Assertion Platform; and
- CASIA Anti-Spoofing System.

In the attached Invalidity Claim Charts, Jumio specifically identifies the basis for its contention that each of these systems and technologies, as currently understood by Jumio, provided all features and functionality claimed in the Asserted Patents. Included in Jumio's Patent L.R. 3-4 document

production accompanying these Invalidity Contentions are publicly accessible documents describing such systems and technologies, as they existed prior to July 3, 2015. Also included in Jumio's production are documents Jumio obtained regarding EyeVerify's EyePrint ID technology when it acquired certain assets of EyeVerify in July 2022. Jumio believes that additional documents describing each of these systems and technologies are currently in the possession of non-parties; for example, Jumio believes additional documents describing EyeVerify's Eyeprint ID technology are currently in the possession of Ant Group (or related entities), of which EyeVerify is currently a wholly owned subsidiary. Jumio is continuing to investigate and will produce additional documents describing these and/or related prior art systems and technologies when such documentation is obtained.

3.2. Obviousness of the Asserted Claims

To the extent the prior art references and systems identified above do not anticipate an Asserted Claim, each reference and system, either alone or in combination with the knowledge of a POSITA and/or other prior art references disclosed herein, renders the claim obvious under 35 U.S.C. § 103. In the attached Invalidity Claim Charts, Jumio presents exemplary combinations of certain prior art references and specifically identifies where each reference explicitly or inherently discloses every limitation of the Asserted Claims. Jumio also provides exemplary reasons to combine such references in Section 3.4, below.

These exemplary combinations are alternatives to Jumio's anticipation and single-reference obviousness contentions and, therefore, should not be interpreted as indicating that any of the individual prior art references included in the exemplary combinations are not alone invalidating prior art under 35 U.S.C. §§ 102 and/or 103. Moreover, there are many possible combinations of the disclosed references and the inclusion of certain

exemplary combinations does not exclude other combinations. Jumio's disclosure of such exemplary combinations is without prejudice to its right to rely on additional or equivalent combinations, or to further explain any such combinations.

Further, based on the information obtained to date, Jumio is not aware of any secondary considerations that contradict the obviousness of the subject matter claimed in the Asserted Patents in view of the prior art. To the extent Plaintiff contends that any such secondary considerations exist, Jumio will respond in a manner consistent with the Federal Rules of Civil Procedure, the Court's Local Rules, and this Court's Orders.

3.3. Exemplary Invalidity Claim Charts

Exemplary citations from the following prior art references, systems, and combinations thereof are presented in the attached Invalidity Claim Charts. Responsive to the discovery of additional information, as described in Section 1 above, Jumio may further revise the Invalidity Claim Charts, or add new invalidity claim charts, to assert that any such prior art, or other newly discovered prior art, anticipates or renders obvious the claims of the Asserted Patents in a manner consistent with the Federal Rules of Civil Procedure, the Court's Local Rules, and this Court's Orders.

3.3.1. The '471 Patent

APPX.	PRIOR ART GROUND
1-A	**Derakhshani**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
1-B	**Zhang**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
1-C	**Suzuki '795**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
1-D	**EyeVerify Eyeprint ID Technology**, alone or in combination with the knowledge of a POSITA.

APPX.	PRIOR ART GROUND
1-E	**BioID Fake Defender Technology**, alone or in combination with the knowledge of a POSITA.
1-F	**Hoyos Labs HoyosID Identity Assertion Platform**, alone or in combination with the knowledge of a POSITA.
1-G	**CASIA Anti-Spoofing System**, alone or in combination with the knowledge of a POSITA.
1-H	**Marisco**, alone or in combination with the knowledge of a POSITA.
1-I	**Frischholz**, alone or in combination with the knowledge of a POSITA.
1-J	**Nechyba**, alone or in combination with the knowledge of a POSITA.
1-K	**Ramaswamy**, alone or in combination with the knowledge of a POSITA.
1-L	**Park**, alone or in combination with the knowledge of a POSITA.

3.3.2. The '606 Patent

APPX.	PRIOR ART GROUND
2-A	**Derakhshani**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
2-B	**Zhang**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
2-C	**Suzuki '795**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
2-D	**EyeVerify Eyeprint ID Technology**, alone or in combination with the knowledge of a POSITA.
2-E	**BioID Fake Defender Technology**, alone or in combination with the knowledge of a POSITA.
2-F	**Hoyos Labs HoyosID Identity Assertion Platform**, alone or in combination with the knowledge of a POSITA.
2-G	**CASIA Anti-Spoofing System**, alone or in combination with the knowledge of a POSITA.
2-H	**Marisco**, alone or in combination with the knowledge of a POSITA.
2-I	**Frischholz**, alone or in combination with the knowledge of a POSITA.
2-J	**Nechyba**, alone or in combination with the knowledge of a POSITA.
2-K	**Ramaswamy**, alone or in combination with the knowledge of a POSITA.
2-L	**Park**, alone or in combination with the knowledge of a POSITA.

3.3.3. The ’938 Patent

APPX.	PRIOR ART GROUND
3-A	**Derakhshani**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, Jung, and/or Suzuki ’799.
3-B	**Zhang**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, Jung, and/or Suzuki ’799.
3-C	**Suzuki ’795**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, Jung, and/or Suzuki ’799.
3-D	**EyeVerify Eyeprint ID Technology**, alone or in combination with the knowledge of a POSITA.
3-E	**BioID Fake Defender Technology**, alone or in combination with the knowledge of a POSITA.
3-F	**Hoyos Labs HoyosID Identity Assertion Platform**, alone or in combination with the knowledge of a POSITA.
3-G	**CASIA Anti-Spoofing System**, alone or in combination with the knowledge of a POSITA.
3-H	**Marisco**, alone or in combination with the knowledge of a POSITA.
3-I	**Frischholz**, alone or in combination with the knowledge of a POSITA.
3-J	**Nechyba**, alone or in combination with the knowledge of a POSITA.
3-K	**Ramaswamy**, alone or in combination with the knowledge of a POSITA.
3-L	**Park**, alone or in combination with the knowledge of a POSITA.

3.3.4. The ’910 Patent

APPX.	PRIOR ART GROUND
4-A	**Derakhshani**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
4-B	**Zhang**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
4-C	**Suzuki ’795**, alone or in combination with the knowledge of a POSITA and/or one or more of Tanii, Tahk, Hoyos, and/or Jung.
4-D	**EyeVerify Eyeprint ID Technology**, alone or in combination with the knowledge of a POSITA.

APPX.	PRIOR ART GROUND
4-E	**BioID Fake Defender Technology**, alone or in combination with the knowledge of a POSITA.
4-F	**Hoyos Labs HoyosID Identity Assertion Platform**, alone or in combination with the knowledge of a POSITA.
4-G	**CASIA Anti-Spoofing System**, alone or in combination with the knowledge of a POSITA.
4-H	**Marisco**, alone or in combination with the knowledge of a POSITA.
4-I	**Frischholz**, alone or in combination with the knowledge of a POSITA.
4-J	**Nechyba**, alone or in combination with the knowledge of a POSITA.
4-K	**Ramaswamy**, alone or in combination with the knowledge of a POSITA.
4-L	**Park**, alone or in combination with the knowledge of a POSITA.

3.4. Motivation to Combine

It would have been obvious to a POSITA to combine certain prior art references as identified herein. In *KSR Int'l Co. v. Teleflex Inc.*, the Supreme Court clarified the standard for what types of inventions are patentable, emphasizing that inventions arising from ordinary innovation, ordinary skill, or common sense are not. *KSR Int'l Co.*, 550 U.S. at 406, 420–22. In that regard, "[t]he combination of familiar elements according to known methods is likely to be obvious," and thus not patentable, "when it does no more than yield predictable results." *Id*. at 416. As the Court explained:

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

Id. at 417; *see also id*. at 420 ("Common sense teaches … that familiar items may have obvious uses beyond their primary purposes, and in many cases a

person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.”).

3.4.1. Motivation to Combine Derakhshani with Tanii, Tahk, Hoyos, Jung, and/or Suzuki ’799

Evaluate Depth/Three-Dimensionality Using Alternative Principles. Derakhshani discloses a system that utilizes either changes in focus distance or parallax to evaluate whether an object (e.g., a user’s face) has depth/three-dimensionality. *See, e.g.*, Derakhshani at 16:44-17:11, 17:45-18:4. Numerous other camera, lens, optics, and/or mathematics-based principles were known throughout the art to evaluate the depth/three-dimensionality of objects captured by a camera based on one or more images. A POSITA would have found it obvious to modify Derakhshani to utilize one of these other known principles to evaluate the depth/three-dimensionality of an object for a variety of reasons, including but not limited to: (1) efficiency; (2) accuracy; (3) design preference; and/or (4) limitations or features of the camera and/or computing system used to capture the images.

For instance, a POSITA would have been motivated to combine Derakhshani and Tanii because Tanii recognizes that certain cameras (particularly, wide-angle cameras) produce a pronounced geometric (radial) distortion when capturing images of a face, the degree of which depends upon distance. *See, e.g.*, Tanii at [0047], Figs. 4A-B. A POSITA would have recognized that this type of geometric distortion—especially when implementing Derakhshani’s authentication process with camera systems with wide-angle lenses—would be an obvious alternative to evaluate the depth of a face. Accordingly, a POSITA would have been motivated to modify Derakhshani to capture at least two images at different actual distances and evaluate whether they exhibit different degrees of distance-induced (barrel/fish-eye) distortion, as Tanii suggests. This modification would have been nothing more than the

use of a known technique (adjusting actual distance to evaluate depth based on distance-induced distortions) to improve similar devices (devices that adjust focus distance to evaluate depth based on lens-induced blurring), or a simple substitution of elements. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Alternatively, a POSITA would have been motivated to combine Derakhshani and Jung, which teaches deriving "range" data about facial features to also confirm the three-dimensionality of the face. Jung at [0026]-[0037], Figs. 2, 3A-B.

Guided Prompts and Image Previews. Derakhshani discloses a process that involves prompting a user to take a self-portrait. *See, e.g.*, Derakhshani at 5:23-32, 6:8-16, 9:22-26, 17:64-66. Many ways of ensuring users captured images in predefined ways or to meet predetermined requirements were known in the art, however. A POSITA would have found it obvious to modify Derakhshani to utilize one of these known ways of guiding users through an image-capture process for a variety of reasons, including but not limited to: (1) ease-of-use; (2) speed; (3) accuracy; and/or (4) user preference.

For instance, a POSITA would have been motivated to combine Derakhshani and Tahk, which describes specific, user-friendly ways of ensuring that a face presented for authentication is properly framed in the camera using shapes indicating the size of the face relative to the camera, and providing users live previews of the image to be captured. *See, e.g.*, Tahk at Figs. 8A-B, 13:9–15, 14:32–38, 15:5–13, 15:35–43, 15:58–62, 15:63–16:6. A POSITA would have understood that providing a user with real-time feedback regarding how the face is framed for imminent image capture would allow the user to adjust position relative to the camera, and on-screen prompts such as

written instructions and ovals to frame the face would provide users clear instructions to ensure an image is captured that is useable for authentication.

Three-Dimensionality Through Reflection. Derakhshani discloses measuring changes in surface glare on the eye due to light—such as the illumination of the screen—to further verify "three-dimensional texture." Derakhshani at 18:8–19:8. However, other ways of measuring reflectance to confirm three-dimensionality were known throughout the art. A POSITA would have found it obvious to modify Derakhshani's reflectance evaluation to provide further evaluations—such as reflectance of specific images—to further improve the accuracy of the evaluation and undermine spoofing.

For instance, a POSITA would have been motivated to combine Derakhshani with Hoyos, which teaches displaying predetermined images on the device screen while capturing images of the user and evaluating the captured images for reflections of the displayed images to verify liveness. Hoyos at 4:8–29; 6:66–7:21. A POSITA would have been motivated to modify Derakhshani because displaying and evaluating for reflections of predetermined images would further enhance the security of the system compared to systems that look for *any* change in reflectance.

Improve Lighting through Integration. Derakhshani discloses that the camera system may be "paired with a flash or torch that can be pulsed to illuminate objects in view of the sensor." Derakhshani at 10:31–42. A POSITA would have understood, generally, that camera-image quality substantially depends on the amount of light entering the camera, and that increasing the amount of light that reaches the camera can improve image quality. For this reason, cameras are often accompanied by some sort of "flash" component to increase the amount of light captured by the camera. A POSITA would have also understood, however, that some computing devices require making design choices as to which features/components are included based on, among other

things: (1) cost; (2) size; and/or (3) usability. A POSITA would have found it obvious to modify Derakhshani's computing device to provide a number of alternative flash components.

For instance, a POSITA would have been motivated to combine Derakhshani and Suzuki, which teaches using the display of the device as an illumination source while capturing images of the user. Suzuki '799 at [0009], [0019], [0021], [0024]–[0025]. A POSITA would have appreciated that using a computing device's display—which is already provided by the device for user input and viewing—would obviate the need for a separate flash component while still increasing the amount of light reaching the camera during image capture and improving image quality.

3.4.2. Motivation to Combine Zhang with Tanii, Tahk, Hoyos, Jung, and/or Suzuki '799

Evaluate Depth/Three-Dimensionality Using Alternative Principles. Zhang discloses a system that utilizes a homography transformation and feature-point matching to evaluate whether an object (e.g., a user's face) has depth/three-dimensionality. *See, e.g.*, Zhang at [0027]-[0034]. Numerous other camera, lens, optics, and/or mathematics-based were known throughout the art to evaluate the depth/three-dimensionality of objects captured by a camera based on one or more images. A POSITA would have found it obvious to modify Zhang to utilize one of these other known principles to evaluate the depth/three-dimensionality of an object for a variety of reasons, including but not limited to: (1) efficiency; (2) accuracy; (3) design preference; and/or (4) limitations or features of the camera and/or computing system used to capture the images.

For instance, a POSITA would have been motivated to combine Zhang and Tanii because Tanii recognizes that certain cameras (particularly, wide-angle cameras) produce a pronounced geometric (radial) distortion when

capturing images of a face, the degree of which depends upon distance. *See, e.g.*, Tanii at [0047], Figs. 4A-B. A POSITA would have recognized that this type of geometric distortion—especially when implementing Zhang's authentication process with camera systems with wide-angle lenses—would be an obvious alternative to evaluate the depth of a face. Accordingly, a POSITA would have been motivated to modify Zhang to capture at least two images at different actual distances and evaluate whether they exhibit different degrees of distance-induced (barrel/fish-eye) distortion, as Tanii suggests. This modification would have been nothing more than the use of a known technique (adjusting actual distance to evaluate depth based on distance-induced distortions) to improve similar devices (devices that adjust focus distance to evaluate depth based on lens-induced blurring), or a simple substitution of elements. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Alternatively, a POSITA would have been motivated to combine Zhang and Jung, which teaches deriving "range" data about facial features to also confirm the three-dimensionality of the face. Jung at [0026]-[0037], Figs. 2, 3A-B.

Guided Prompts and Image Previews. Zhang discloses capturing at least two images of a face from two perspectives/distances. *See, e.g.*, Zhang at [0027]. Many ways of ensuring users captured images in predefined ways or to meet predetermined requirements were known in the art, however. A POSITA would have found it obvious to modify Zhang to utilize one of these known ways of guiding users through an image-capture process for a variety of reasons, including but not limited to: (1) ease-of-use; (2) speed; (3) accuracy; and/or (4) user preference.

For instance, a POSITA would have been motivated to combine Zhang and Tahk, which describes specific, user-friendly ways of ensuring that a face presented for authentication is properly framed in the camera using shapes

indicating the size of the face relative to the camera, and providing users live previews of the image to be captured. *See, e.g.*, Tahk at Figs. 8A-B, 13:9–15, 14:32–38, 15:5–13, 15:35–43, 15:58–62, 15:63–16:6. A POSITA would have understood that providing a user with real-time feedback regarding how the face is framed for imminent image capture would allow the user to adjust position relative to the camera, and on-screen prompts such as written instructions and ovals to frame the face would provide users clear instructions to ensure an image is captured that is useable for authentication.

Three-Dimensionality Through Reflection. Facial-authentication systems were known to implement more than one verification method to counter spoofing attempts. *See, e.g.*, Derakhshani at 4:53-57, 15:26-19:48 (describing plurality of metrics to determine likelihood that images depict, e.g., an image of a model or a two-dimensional picture). A POSITA would have appreciated that using "reflectance" for evaluating three-dimensionality was well known. A POSITA would have found it obvious to modify Zhang to include additional techniques, including the use of reflectance, to increase the accuracy of methods for evaluating three-dimensionality and provide further countermeasures to spoofing.

For instance, a POSITA would have been motivated to combine Zhang with Hoyos, which teaches displaying predetermined images on the device screen while capturing images of the user and evaluating the captured images for reflections of the displayed images to verify liveness. Hoyos at 4:8–29; 6:66–7:21. A POSITA would have been motivated to modify Zhang because displaying and evaluating for reflections of predetermined images would further enhance the security of Zhang's system.

Improve Lighting through Integration. A POSITA would have understood, generally, that camera-image quality substantially depends on the amount of light entering the camera, and that increasing the amount of light

that reaches the camera can improve image quality. For this reason, cameras are often accompanied by some sort of "flash" component to increase the amount of light captured by the camera. A POSITA would have also understood, however, that some computing devices require making design choices as to which features/components are included based on, among other things: (1) cost; (2) size; and/or (3) usability. A POSITA would have found it obvious to modify Zhang's computing device to provide a flash component of one of several configurations.

For instance, a POSITA would have been motivated to combine Zhang and Suzuki, which teaches using the display of the device as an illumination source while capturing images of the user. Suzuki '799 at [0009], [0019], [0021], [0024]-[0025]. A POSITA would have appreciated that using a computing device's display—which is already provided by the device for user input and viewing—would obviate the need for a separate flash component while still increasing the amount of light reaching the camera during image capture and improving image quality.

3.4.3. Motivation to Combine Suzuki '795 with Tanii, Tahk, Hoyos, Jung, and/or Suzuki '799

Evaluate Depth/Three-Dimensionality Using Alternative Principles. Suzuki '795 discloses a system and method for determining whether a user exhibits three-dimensionality based on multiple images captured at different angles or whether a masquerading attempt, i.e., use of a two-dimensional photograph, has occurred. *See, e.g.,* Suzuki '795 at 2:33-3:2; Figs. 2, 4A, 4B. Suzuki '795 uses a planar projection that transforms the second feature points onto the first image to determine whether the user's face is three-dimensional. Numerous other camera, lens, optics, and/or mathematics were known throughout the art to evaluate the depth/three-dimensionality of objects captured by a camera based on one or more images. A POSITA would have

found it obvious to modify Suzuki '795 to utilize one of these other known principles to evaluate the depth/three-dimensionality of an object for a variety of reasons, including but not limited to: (1) efficiency; (2) accuracy; (3) design preference; and/or (4) limitations or features of the camera and/or computing system used to capture the images.

For instance, a POSITA would have been motivated Suzuki '795 and Tanii because Tanii recognizes that certain cameras (particularly, wide-angle cameras) produce a pronounced geometric (radial) distortion when capturing images of a face, the degree of which depends upon distance. *See, e.g.*, Tanii at [0047], Figs. 4A-B. A POSITA would have recognized that this type of geometric distortion—especially when implementing Suzuki '795's masquerading detection process with camera systems with wide-angle lenses that capture images at different angles—would be an obvious alternative to evaluate the depth of a face. Accordingly, a POSITA would have been motivated to modify Suzuki '795 to capture at least two images at different actual distances and evaluate whether they exhibit different degrees of distance-induced (barrel/fish-eye) distortion, as Tanii suggests. This modification would have been nothing more than the use of a known technique (adjusting actual distance to evaluate depth based on distance-induced distortions) to improve similar devices (devices that adjust focus distance to evaluate depth based on lens-induced blurring), or a simple substitution of elements. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Alternatively, a POSITA would have been motivated to combine Suzuki '795 and Jung, which teaches deriving "range" data about facial features to also confirm the three-dimensionality of the face. Jung at [0026]-[0037], Figs. 2, 3A-B.

Estimating Intermediate Data and Capturing Intermediate Images. Suzuki '795 discloses capturing two images of a face from two different angles.

See, e.g., Suzuki '795 at 2:53-3:2. Capturing additional images and interpolating data was another known anti-spoofing measure because building predictive, interpolative models for biometric comparison was well known to prevent spoofers from making artificial changes between image captures. *See, e.g.*, Zhang at [0036]-[0037]; Derakhshani at 17:22-44. A POSITA would have understood that intermediate images exist *between* the first and second images and would have been motivated to generate interpolated predictions of what those intermediate images should look like and compare the intermediate images to those predictions. And a POSITA would have understood that, when predicting (i.e., interpolating) intermediate images, the biometric features from the *actual* intermediate images would be compared to the predicted features to determine if there is a match. A POSITA would have found it obvious to modify Suzuki '795 to include interpolating intermediate data and capture additional intermediate images to increase the accuracy of the masquerading system and provide further countermeasures to spoofing.

For instance, a POSITA would have been motivated to combine Suzuki '795 with Tanii to evaluate images for distance-induced distortions that increase as distance between the face and camera decreases, as Tanii discloses. *See, e.g.*, Tanii at [0048]. A POSITA would have been motivated to modify Suzuki '795 because interpolating intermediate data and capturing additional intermediate images would further enhance the accuracy and security of Suzuki '795's system.

Guided Prompts and Image Previews. Suzuki '795 discloses a process that involves prompting a user to change the angle before taking a self-portrait. *See, e.g.*, Suzuki '795 at 14:41-55. Many ways of ensuring users captured images in predefined ways or to meet predetermined requirements were known in the art, however. A POSITA would have found it obvious to modify Suzuki '795 to utilize one of these known ways of guiding users through an

image-capture process for a variety of reasons, including but not limited to: (1) ease-of-use; (2) speed; (3) accuracy; and/or (4) user preference.

For instance, a POSITA would have been motivated to combine Suzuki '795 and Tahk, which describes specific, user-friendly ways of ensuring that a face presented for authentication is properly framed in the camera using shapes indicating the size of the face relative to the camera, and providing users live previews of the image to be captured. *See, e.g.*, Tahk, Figs. 8A-B, 13:9–15, 14:32–38, 15:5–13, 15:35–43, 15:58–62, 15:63–16:6. A POSITA would have understood that providing a user with real-time feedback regarding how the face is framed for imminent image capture would allow the user to adjust position relative to the camera, and on-screen prompts such as written instructions and ovals to frame the face would provide users clear instructions to ensure an image is captured that is useable for authentication.

Three-Dimensionality Through Reflection. Suzuki '795 discloses that the correspondence relation between feature points that is used to determine three-dimensionality can be obtained "based on the luminance patterns surrounding the first feature points and the second feature points." *See, e.g.,* Suzuki '795 at 5:33–42. Using reflectance was a known method of verifying three-dimensionality of a user, and a POSITA would have found it obvious to modify Suzuki '795's use of corresponding luminance patterns to provide further evaluations—such as illuminating the display or reflectance of specific images—to further improve the accuracy of the evaluation and undermine spoofing.

For instance, a POSITA would have been motivated to combine Suzuki '795 and Hoyos, which teaches displaying predetermined images on the device screen while capturing images of the user and evaluating the captured images for reflections of the displayed images to verify liveness. Hoyos, 4:8–29; 6:66–7:21. A POSITA would have been motivated to modify Suzuki '795 because

displaying and evaluating for reflections of predetermined images would further enhance the security of Suzuki '795's system.

Improve Lighting through Integration. A POSITA would have understood, generally, that camera-image quality substantially depends on the amount of light entering the camera, and that increasing the amount of light that reaches the camera can improve image quality. For this reason, cameras are often accompanied by some sort of "flash" component to increase the amount of light captured by the camera. A POSITA would have also understood, however, that some computing devices require making design choices as to which features/components are included based on, among other things: (1) cost; (2) size; and/or (3) usability. A POSITA would have found it obvious to modify Suzuki '795's computing device to provide a flash component of one of several configurations.

For instance, a POSITA would have been motivated to combine Suzuki '795 and Suzuki '799, which teaches using the display of the device as an illumination source while capturing images of the user. Suzuki '799 at [0009], [0019], [0021], [0024]-[0025]. A POSITA would have appreciated that using a computing device's display—which is already provided by the device for user input and viewing—would obviate the need for a separate flash component while still increasing the amount of light reaching the camera during image capture and improving image quality.

Processes Performed Remotely From the Computing Device. A POSITA would have understood, generally, that processes able to be performed locally on a computing device could be alternatively performed remotely by a server. A POSITA would have found it obvious to modify Suzuki '795's computing device to provide the ability to perform some aspects of its processes remotely at a server for a variety of reasons, including but not

limited to: (1) efficiency; (2) storage capability; (3) design preference; and/or (4) limitations or features of the computing device.

For instance, a POSITA would have been motivated to combine Suzuki '795 and Tahk, which describes transmitting data externally. *See, e.g.*, Tahk at 5:7-15. A POSITA would have been motivated to modify Suzuki '795 because servers were well known and conventional networking infrastructure for remote processing, including biometric processing.

3.4.4. Motivation to Combine Other Prior Art References and Systems

Evaluate Depth/Three-Dimensionality Using Alternative Principles. Each of the other prior art references and systems identified in Jumio's Invalidity Claim Charts are directed to methods for detecting "spoofs" by evaluating three-dimensionality, at least under Plaintiff's interpretation of the Asserted Claims. For instance, Frischholz is directed to a "method for discriminating between a real face and a two-dimensional reproduction of the face, in a biometric process," that involves "determining the displacement of the individual image components from the first recording to the second recording" and "analyzing the displacement vector field for determining whether the recording has been made from a real face or from its reproduction." Frischholz at Abstract. Park discloses a method for "distinguishing a two-dimensional (2D) flat object from a three-dimensional (3D) non-flat object in a video image." Park at [0003]. Ramaswamy discloses a computing device for "detect[ing] one or more changes" between images and/or characteristics of images, such as "shadows produced by the flash" of the device, "to verify the presence of a three-dimensional object." *E.g.*, Ramaswamy at 3:22–4:54; *see also id*. at Abstract ("Approaches are described which enable a computing device … to detect when artificial representations of a user, such as a picture or photograph, are being used in an attempt to gain

access to the device."). Nechyba discloses a the use of "[f]acial recognition programs" to perform, e.g., "geometric and/or photometric approaches, three-dimensional (3D) modeling and recognition techniques," as part of a user authentication process. *E.g.*, Nechyba at 8:12–40. The printed publication "Moving Face Spoofing Detection via 3D Projective Variants" ("Marsico") is directed to detecting and verifying the three-dimensionality of a user's face using projective invariants to detect spoofing attacks, which is accomplished by capturing a sequence of images of a user and computing cross ratios from facial points to ascertain whether the face is genuine or a two-dimensional representation such as a photo. *See, e.g.*, Marsico at 3, 4. The EyeVerify Eyeprint ID technology could "detect a picture or video replay attack," i.e., a two-dimensional "spoof," based on changes in images of a user. *E.g.*, https://web.archive.org/web/20130926011923/http:/eyeverify.com/product-technology/faq/#toggle-id-2. The BioID Fake Defender system included a "liveness detection" feature that used several techniques, including "[c]apturing multiple face images and checking for changes" to determine whether the images depicted a "3D face" as opposed to a "2D photo." https://web.archive.org/web/20150201025754/https:/www.bioid.com/ (click "Fake defender"). The HoyosID Identity Assertion Platform also included a "liveness detection" feature that detected, e.g., "depth perception" in an image of a user. https://www.youtube.com/watch?v=g9xeZXsz_Uc. The CASIA Anti-Spoofing System detected "spoofing attacks" by extracting dense optical flows between two image frames and verifying motion of features of the user's body regions, such as the user's head. JUMIO-0002150–JUMIO-0002155 ("Chingovska") at 2–3.

Numerous other camera, lens, optics, and/or mathematics-based principles were known throughout the art to evaluate the depth/three-dimensionality of objects captured by a camera based on one or more images.

See supra Sections 3.4.1–3 For example, the Frischholz explains that it was well known in the prior art to derive geometrical features of a user's face from at least two images and the "position of predetermined typical features of the face, such as the corner of the mouth, the tip of the nose and the like, then are determined in both images and the differences of the positions are used for determining depth information." Frischholz at 1:43-56. A POSITA would naturally look to related patents, patent applications, publications, and commercial products to provide insight into how the inventors, authors, or companies framed and applied the inventions, teachings, and commercial products. And a POSITA would have found it obvious to combine and/or modify such prior art to utilize other known methods and principles to evaluate the depth/three-dimensionality of an object for a variety of reasons, including but not limited to: (1) efficiency; (2) accuracy; (3) design preference; and/or (4) limitations or features of the camera and/or computing system used to capture the images. Indeed, doing so would have required nothing more than combining known techniques and apparatuses according to their known and ordinary uses to yield predictable results. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Accordingly, a POSITA would have been motivated to combine and/or modify the prior art references and systems identified in this and the preceding sections. *See supra* Sections 3.4.1–3; *In re Inland Steel Co.*, 265 F.3d 1354, 1362 (Fed. Cir. 2001) (finding a motivation to combine where the prior art references addressed the same problem, came from the same field of art, and where the identified solutions corresponded well).

Estimating Intermediate Data and Capturing Intermediate Images. Capturing additional images and interpolating data was another known way to assess three-dimensionality and detect spoofs. *See supra* Sections 3.4.1–3. Indeed, building predictive, interpolative models for biometric comparison

was well known to prevent spoofers from making artificial changes between image captures. *See, e.g.*, Zhang at [0036]–[0037]; Derakhshani at 17:22-44. In Nechyba's "anti-spoofing programs," for example, a device may "capture three facial images of the user" and "them permute every possible pair from the three captured facial images, and compare the images within each pair." Nechyba at 15:46–68; *see also*, *e.g.*, *id*. at 20:9–27. Frischholz also discloses the use of "a third recording" and "[k]nown correlation methods" to assess three-dimensionality. *E.g.,* Frischholz at 13:50-64. The CASIA Anti-Spoofing System also extracted "dense optical flows *between* two frames, with an interval of five frames." Chingovska at 2.

Thus, because a POSITA would have understood that intermediate images exist *between* the first and second images, it would have been obvious to generate interpolated predictions of what those intermediate images should look like and to compare such predictions to *actual* intermediate images to aid in assessing three-dimensionality. Combining and/or modifying the prior art references and systems identified in this and the preceding sections to incorporate such functionality would have required nothing more than combining known techniques and apparatuses according to their known and ordinary uses to yield predictable results, providing yet another reason why a POSITA would have been motivated combine and/or modify such prior art. *KSR*, 550 U.S. at 417; *Inland Steel*, 265 F.3d at 1362.

Guided Prompts and Image Previews. A POSITA also would have understood that providing a user with instructions as to how their face should be positioned during image capture would help assure that the captured images are usable for assessing three-dimensionality, and that there are many ways to provide such instructions, such as by displaying written instructions and/or a frame in which a user places their face. *See supra* Sections 3.4.1–3. For example, Frischholz's method involves "prompt[ing] the person in front of

the camera to assume at least two different face positions so as to be able to generate a particularly significant displacement vector." Frischholz at 14:19-27. Nechyba's "anti-spoofing programs may prompt the user to submit a facial image with the user's head in a frontal orientation," and subsequently prompt the user to change the position or location of their head to capture additional images. *E.g.*, Nechyba at 14:31–45. Ramaswamy explains that, by "instruct[ing] the user to rotate and/or move the device while keeping their face within the view of the camera," it can determine whether the subject of the images is "a 2D representation of a human face" as opposed to a "3D object" based on their homography. *E.g.*, Ramaswamy at 7:13-30. The system described in Marsico also randomly prompts the user to move their face while the device takes a sequence of images. Marsico at 4.

It would have been obvious to incorporate the use of written instructions and/or visual prompts to ensure that captured images are usable for assessing three-dimensionality for a variety of reasons, including but not limited to: (1) ease-of-use; (2) speed; (3) accuracy; and/or (4) user preference. Combining and/or modifying the prior art references and systems identified in this and the preceding sections to incorporate such functionality would have required nothing more than combining known techniques and apparatuses according to their known and ordinary uses to yield predictable results, providing yet another reason why a POSITA would have been motivated combine and/or modify such prior art. *KSR*, 550 U.S. at 417; *Inland Steel*, 265 F.3d at 1362.

Three-Dimensionality Through Reflection. A POSITA also would have understood that three-dimensionality and "spoof" attacks can be detected based on reflections in captured images. *See supra* Sections 3.4.1–3. For example, Nechyba's anti-spoofing programs analyze images to "detect for a presence of any reflection of the emitted light from the eyes." *E.g.*, Nechyba at

4:54–61. Ramaswamy also discloses the ability to "detect evidence of artificial representations by utilizing a flash or other illumination device," which "create specular reflections." *E.g.*, Ramaswamy at 4:10-35. The EyeVerify Eyeprint ID "liveness detection" feature relied, in part, on detecting "changing glare, absorption, and reflection patterns." *See* https://web.archive.org/web/20130926011923/http://eyeverify.com/product-technology/faq/#toggle-id-2. And the creators of the anti-spoofing system discussed in Marsico contemplated incorporating "further techniques such as … skin reflectance." Marisco at 6.

A POSITA, thus, would have appreciated that detecting "reflectance" in images was a well-known technique for assessing three-dimensionality and found it obvious to rely on this technique for spoof detection. Combining and/or modifying the prior art references and systems identified in this and the preceding sections to incorporate such functionality would have required nothing more than combining known techniques and apparatuses according to their known and ordinary uses to yield predictable results, providing yet another reason why a POSITA would have been motivated combine and/or modify such prior art. *KSR*, 550 U.S. at 417; *Inland Steel*, 265 F.3d at 1362.

Improve Lighting through Integration. A POSITA would have understood, generally, that camera-image quality substantially depends on the amount of light entering the camera, and that increasing the amount of light that reaches the camera can improve image quality. *See supra* Sections 3.4.1–3. A POSITA would have understood the importance of image quality when assessing three-dimensionality, in particular, and that supplying additional lighting can further aid in such assessment. *See*, *e.g.*, Ramaswamy at 4:36–54 ("the computing device can detect one or more shadows produced by the flash or other illumination device to verify the presence of a three-dimensional object"); Nechyba at 31:2–6 ("while capturing the first facial, the computing

device may emit a flash"). Furthermore, a POSITA would have appreciated that using a computing device's display—which is already provided by the device for user input and viewing—would obviate the need for a separate flash component while still increasing the amount of light reaching the camera during image capture and improving image quality. *See supra* Sections 3.4.1–3.

Accordingly, a POSITA would have been motivated to combine and/or modify the prior art references and systems identified in this and the preceding sections to incorporate such functionality, which would have required nothing more than combining known techniques and apparatuses according to their known and ordinary uses to yield predictable results. *KSR*, 550 U.S. at 417; *Inland Steel*, 265 F.3d at 1362.

* * *

To the extent Plaintiff asserts that a POSITA would not have been motivated to combine any of the prior art identified herein and/or challenges a POSITA's knowledge with respect to a particular claim limitation, Jumio reserves the right to supplement these contentions and to rely on uncited portions of the prior art, other documents, admissions by or on behalf of Plaintiff, and expert testimony to establish that a POSITA would have been motivated to modify or combine such prior art so as to render the claims invalid as obvious.

4. Invalidity Under 35 U.S.C. § 101

Pursuant to 35 U.S.C. § 101, patent protection is available for "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." However, the Supreme Court has identified certain subject matter for which patent protection is not available, including abstract ideas. To determine whether a patent claims such ineligible subject matter, courts must follow a two-step framework. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 573 U.S. 208, 217 (2014). First, courts must "determine

whether the claims at issue are directed to [a] patent-ineligible concept[]," e.g., an abstract idea. *Id*. If so, the next step is to look for an "'inventive concept'—*i.e.*, an element or combination of elements that is 'sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [abstract idea] itself.'" *Id*. at 217–18. The two steps are "plainly related" and "involve overlapping scrutiny of the content of the claims." *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016). In conducting this analysis, a representative claim may be used for claims that are "substantially similar and linked to the same abstract idea." *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat'l Ass'n*, 776 F.3d 1343, 1348 (Fed. Cir. 2014); *Smart Sys. Innovations, LLC v. Chicago Transit Auth.*, 873 F.3d 1364, 1368 n.7 (Fed. Cir. 2017) (concluding that claims "should rise or fall together" when they "contain only minor differences in terminology but require performance of the same basic process") (internal quotation marks omitted).

Relevant here, the Supreme Court has held, for example, that the "mere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention." *Alice*, 573 U.S. at 223; *see also*, *e.g.*, *id*. ("Thus, if a patent's recitation of a computer amounts to a mere instruction to 'implement' an abstract idea 'on … a computer,' [] that addition cannot impart patent eligibility." (quoting *Mayo Collaborative Srvs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 84 (2012))); *Customedia Techs., LLC v. Dish Network Corp.*, 951 F.3d 1359, 1366 (Fed. Cir. 2020) ("Aside from the abstract idea of delivering targeted advertising, the claims recite only generic computer components, including a programmable receiver unit, a storage device, a remote server and a processor. … Such generic and functional hardware is insufficient to render eligible claims directed to an abstract idea."); *Bascom Global Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341, 1348 (Fed. Cir. 2016) ("An abstract idea on 'an Internet computer network' or on a generic computer is still an abstract

idea." (citing *Intellectual Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363, 1395, n.2 (Fed. Cir. 2015) (collecting cases))); *Elec. Power Grp.*, 830 F.3d at 1355 ("But in this case the claims' invocation of computers, networks, and displays does not transform the claimed subject matter into patent-eligible applications. The claims at issue do not require any nonconventional computer, network, or display components, or even a "non-conventional and non-generic arrangement of known, conventional pieces," but merely call for performance of the claimed information collection, analysis, and display functions "on a set of generic computer components" and display devices." (quoting *Bascom*, 827 F.3d at 1349–52)); *Bilski v. Kappos*, 561 U.S. 593, 610–11 (2010) ("As the [Supreme] court later explained, *Flook* stands for the proposition that the prohibition against patenting abstract ideas 'cannot be circumvented by attempting to limit the use of the [abstract idea] to a particular technological environment' or adding 'insignificant postsolution activity.'" (quoting *Diamond v. Diehr*, 450 U.S. 175, 191–92 (1981))).

Moreover, although claims that "improve the functioning of the computer itself" may be eligible for patent protection, it is "not enough [] to merely improve a fundamental practice or abstract process by invoking a computer merely as a tool." *Customedia*, 951 F.3d at 1362–64. For example, "improving a user's experience while using a computer application is not, without more, sufficient to render the claims directed to an improvement in computer functionality." *Id*. at 1365; *see also*, *e.g.*, *In re TLI Commc'ns LLC Patent Litig.*, 823 F.3d 607, 612–13 (Fed. Cir. 2016) ("The specification does not describe a new telephone, a new server, or a new physical combination of the two. The specification fails to provide any technical details for the tangible components, but instead predominately describes the system and methods in purely functional terms. … In other words, the focus of the patentee and of the claims was not on an improved telephone unit or an improved server.").

4.1. The ’471 Patent

Claim 10 of the ’471 Patent—the only asserted independent claim—recites the following:

> A method for authenticating three-dimensionality of a user via a user's camera equipped computing device, the method, during an authentication session comprising:
>
> > capturing at least one first image of the user taken with the camera of the computing device at a first location which is a first distance from the user;
> >
> > processing the at least one first image or a portion to create first data;
> >
> > moving the camera from the first location to a second location, the second location being a second distance from the user, or the user moving from the first location to the second location to change the distance between the user and the camera from the first distance to a second distance;
> >
> > capturing at least one second image of the user taken with the camera of the computing device at the second distance from the user, the second distance being different than the first distance;
> >
> > processing the at least one second image or a portion thereof to create second data;
> >
> > comparing the first data to the second data to determine whether expected distortion exist between the first data and the second data which indicated three-dimensionality of the user;
> >
> > authenticating the user when the differences between the first data and the second data have expected distortion resulting from movement of the camera from the first location to the second location or movement of the user from the first location to the second location, which causes the change in distance between the user and the camera.

The method of claim 10 essentially performs three functions: (1) capturing two images of a user from different distances, (2) comparing data derived from the two images, and (3) determining that the user is three-dimensional when “expected distortion” exists between the two images.

The first two steps are just the abstract ideas of capturing two images and comparing them. Regarding the last step, the term "expected distortion" lacks adequate written description and/or is indefinite, as explained below in Sections 5.1.1 and 5.2.1, respectively. To the extent "expected distortion" is found to not be indefinite and to be supported by sufficient written description, it should be limited to what is described in the specification of the '471 Patent: what the specification refers to as "the fish-eye effect of the lens." '471 Patent, 3:55. This "fish-eye effect" is a well-known optical effect that can be calculated using a formula, given information about the lens, including its focal length and a constant defined by details of the lens design, and the distance of the subject to the lens. In particular, the equation recognizes a relationship between magnification and the distance to the subject. As light rays pass through a lens, they form similar triangles between the object and the image, because the angles of incidence and refraction are the same for corresponding rays, and the magnification becomes larger as the distance to the object becomes smaller. In other words, for a particular lens that exhibits what is known as "negative distortion," there is "barrel" distortion or "fish-eye" distortion as the subject moves closer to the lens, which makes the center of an image scene appear as if it is bulging towards the camera relative to the periphery.

Given this background, determining whether a subject is a flat object (such as a photograph or video display) or a convex object (such as a face) is based solely on natural phenomena. Some distortion will be observed when a camera captures an image of a flat surface, due to the object being extended laterally from the optic axis. However, an image of a convex three-dimensional object will show more distortion with the same camera than an image of a flat surface. This is because the parts of the three-dimensional object closer to the lens experience more magnification than those further away. If central features

in the object are closer to the camera, this change in magnification with distance amplifies any barrel distortion effect. An example where this combination of effects occurs is a close-up image of a face where the nose is near the center of the image, and is the closest feature to the camera. In summary, image magnification is larger (a) for features in the object that are near the optic axis of a camera lens with barrel distortion, or (b) for features at shorter distances from the camera, regardless of lens shortcomings. Both effects may occur simultaneously in an imaging system.

If "expected distortion" is found to mean something other than barrel or fish-eye distortion, then the claim is even more abstract. It would claim simply looking at the two images for some "expected distortion" between them to determine the subject is three-dimensional. That know-it-when-you-see-it approach is the epitome of an abstract idea, not a specific implementation or any improvement. Further, it is entirely functional claiming: find any distortion that shows the subject is three-dimensional. As such, it would improperly preempt the field. *See Yu v. Apple Inc.*, 1 F.4th 1040, 1045 (Fed. Cir. 2021) (finding claim that used two lenses and two image sensors to produce an enhanced image abstract).

Nor does claim 10 add any inventive concept to the natural phenomenon. Instead, all that claim 10 adds is that the camera is part of a "camera equipped computing device." The specification makes clear that such a device is a generic mobile device. *See* '471 Patent, 5:54–56 ("The mobile device 112 may comprise any type of mobile device capable of capturing an image, either still or video, and performing processing of the image or communication over a network."), 8:16–22 ("The mobile device 200 may comprise any type of mobile communication device capable of performing as described below. The mobile device may comprise a PDA, cellular telephone, smart phone, tablet PC, wireless electronic pad, an IoT device, a 'wearable'

electronic device or any other computing device."), 8:31–33 ("The processor 208 [of the mobile device] may comprise a general purpose processor, ASIC, ARM, DSP, controller, or any other type processing device."), 8:45–47 ("The memory 210 [of the mobile device] may comprise RAM, ROM, flash memory, optical memory, or micro-drive memory."), 8:57–58 ("The display [of the mobile device] comprises any type display screen configured to display visual information to the user. "). As the specification makes clear, the entire point of the purported invention is that the natural phenomenon of "fish-eye" distortion can be determined with any device capable of taking images from different distances.

Nor do the dependent claims add any inventive concept. Claim 11 simply adds the processing of a third image at a distance between the first and second distances. Claim 12 adds the additional natural phenomenon that as the user moves closer to the camera, at some point their ears will no longer be seen in the image. Claims 13 and 14 add the abstract idea of prompting the user to take images from different distances. Claim 15 only narrows the independent claim by requiring the user to hold the device capturing images at two different distances (i.e., moving the camera as opposed to moving the subject). Claims 16 and 17 only put additional limitations on the form of the data processed from the images. Claim 18 adds the natural phenomenon of reflection. Claim 19, like claim 15, requires the user to remain still while the camera moves between distances. Claim 20 only adds the requirement that the image data be maintained on the computing device.

4.2. The '606 Patent

Claim 1 of the '606 Patent is representative of the asserted independent claims and recites the following:

> A method for verifying three-dimensionality of a user's face using images of the user's face captured using a

camera equipped computing device, the method comprising:

capturing at least one first image of the user taken with the camera of the computing device at a first distance from the user;

processing the at least one first image to obtain first biometric data from the at least one first image;

capturing at least one second image of the user taken with the camera of the computing device at a second distance from the user, the second distance being different than the first distance;

processing the at least one second image to obtain second biometric data based on the at least one second image;

comparing the first biometric data with the second biometric data to determine whether the first biometric data matches the second biometric data;

comparing the first biometric data to second biometric data to determine whether differences between the at least one first image and the at least one second image match expected differences resulting from movement of the camera or the user which changed the distance between the user and camera from the first distance to the second distance;

determining that the user's face is three-dimensional when:

the first biometric data does not match the second biometric data; and

the second biometric data has the expected differences as compared to the first biometric data resulting from the change in distance between the user and the camera when capturing the at least one first image and the at least one second image.

As with the ’471 Patent, the method of claim 1 essentially performs three functions: (1) capturing two images of a user from different distances, (2) comparing data derived from the two images, and (3) determining that the user is three-dimensional when “expected differences” exists between the two images.

The first two steps are just the abstract ideas of capturing two images and comparing them. Regarding the last step, the term "expected differences" lacks adequate written description and/or is indefinite, as explained below in Sections 5.1.2 and 5.2.2, respectively. To the extent "expected differences" is found to not be indefinite and to be supported by sufficient written description, it should be limited to what is described in the specification of the '606 Patent: what the specification refers to as "fish-eye type distortion" also known as "perspective distortion." '606 Patent, 29:17–19. Perspective or fish-eye distortion, also called barrel distortion, is a well-known optical effect that can be calculated using a formula, given information about the lens, including its focal length and a constant defined by details of the lens design, and the distance of the subject to the lens. In particular, the equation recognizes a relationship between magnification and the distance to the subject. As light rays pass through a lens, they form similar triangles between the object and the image, because the angles of incidence and refraction are the same for corresponding rays, and the magnification becomes larger as the distance to the object becomes smaller. In other words, for a particular lens that exhibits a particular type of perspective distortion known as "negative distortion," there is "barrel" distortion or "fish-eye" distortion as the subject moves closer to the lens, which makes the center of an image scene appear as if it is bulging towards the camera relative to the periphery.

Given this background, determining whether a subject is a flat object (such as a photograph or video display) or a convex object (such as a face) is based solely on natural phenomena. Some distortion will be observed when a camera captures an image of a flat surface, due to the object being extended laterally from the optic axis. However, an image of a convex three-dimensional object will show more distortion with the same camera than an image of a flat surface. This is because the parts of the three-dimensional object closer to the

lens experience more magnification than those further away. If central features in the object are closer to the camera, this change in magnification with distance amplifies any barrel distortion effect. An example where this combination of effects occurs is a close-up image of a face where the nose is near the center of the image, and is the closest feature to the camera. In summary, image magnification is larger (a) for features in the object that are near the optic axis of a camera lens with barrel distortion, or (b) for features at shorter distances from the camera, regardless of lens shortcomings. Both effects may occur simultaneously in an imaging system.

If "expected differences" is found to mean something other than barrel or fish-eye distortion, then the claim is even more abstract. It would claim simply looking at the two images for some "expected differences" between them to determine the subject is three-dimensional. That know-it-when-you-see-it approach is the epitome of an abstract idea, not a specific implementation or any improvement. Further, it is entirely functional claiming: find any differences that shows the subject is three-dimensional. As such, it would improperly preempt the field. *See Yu*, 1 F.4th at 1045.

Nor does claim 1 add any inventive concept to the natural phenomenon. Instead, all that claim 1 adds is that the camera is part of a "camera equipped computing device." The specification makes clear that such a device is a generic mobile device. *See* '606 Patent, 6:4–7 ("The mobile device 112 may comprise any type of mobile device capable of capturing an image, either still or video, and performing processing of the image or communication over a network."), 8:16–22 ("The mobile device 200 may comprise any type of mobile communication device capable of performing as described below. The mobile device may comprise a PDA, cellular telephone, smart phone, tablet PC, wireless electronic pad, an IoT device, a 'wearable' electronic device or any other computing device."), 8:47–49 ("The processor 208 [of the mobile device]

may comprise a general purpose processor, ASIC, ARM, DSP, controller, or any other type processing device."), 8:61–63 ("The memory 210 [of the mobile device] may comprise RAM, ROM, flash memory, optical memory, or micro-drive memory."), 9:6–7 ("The display [of the mobile device] comprises any type display screen configured to display visual information to the user. "). As the specification makes clear, the entire point of the purported invention is that the natural phenomenon of "perspective" or "fish-eye" distortion can be determined with any device capable of taking images from different distances.

Claim 1 is representative of the other asserted independent claim, claim 19. Claim 19 recites the same method, but from the perspective of receiving images taken by the camera, as opposed to capturing the images by the camera.

Nor do the dependent claims add any inventive concept. Claim 2 simply adds the processing of a third image at a distance between the first and second distances. Claim 3 adds the additional natural phenomenon that as the user moves closer to the camera, at some point their ears will no longer be seen in the image. Claims 4 and 5 add the abstract idea of prompting the user to take images from different distances. Claim 6 only narrows the independent claim by requiring the user to hold the device capturing images at two different distances (i.e., moving the camera as opposed to moving the subject). Claim 7 is the inverse of claim 6, requiring the computing device (and camera) to be still, and the user to move between the first distance and the second distance. to the Claims 16 and 17 only put additional limitations on the form of the data processed from the images. Claim 8 only adds that an image (apparently any image) is displayed on the device while capturing one of the images. Claims 9 and 20 add that the data is transmitted to a server, but does not add any limitation about anything that is done on the server with the data.

4.3. The ’938 Patent

Claim 1 of the ’938 Patent is representative of the asserted independent claims and recites the following:

> A non-transient computer readable medium containing non-transitory machine executable code configured to determine if the three-dimensional shape is consistent with that of a human face, the non-transitory machine executable code configured to:
>
> > receive or derive first biometric data from at least one first image of a user taken with a computing device camera located at a first distance from the user;
> >
> > receive or derive second biometric data from at least one second image of the user taken with the computing device camera located at a second distance from the user, the second distance being different than the first distance;
> >
> > compare the first biometric data with second biometric data for expected differences that result from characteristics of a human face and the at least one first image and the at least one second image being captured at different distances from the user;
> >
> > determine that the three-dimensional shape is not exhibited when the second biometric data does not have expected differences compared to the first biometric data, the expected differences comprising at least differences due to the change in the relative distance between the user's facial features and the camera when the at least one first image was captured at the first distance and the at least one second image was captured at the second distance, wherein the expected differences result from fish-eye type distortion in at least one of the at least one first image and the at least one second image and due to the three-dimensional nature of the human face and the change in distance between the camera and the user.

Claim 1 recites executable code that, when executed, performs a method, similar to the claims of the other asserted patents, with three functions: (1) taking two images of a user from different distances, (2) comparing data derived from the two images, and (3) determining that the user is three-dimensional when “expected differences” exists between the two images.

The first two steps are just the abstract ideas of capturing two images and comparing them. Regarding the last step, the term "expected differences" lacks adequate written description and/or is indefinite, as explained below in Sections 5.1.3 and 5.2.3, respectively. To the extent "expected differences" is found to not be indefinite and to be supported by sufficient written description, it should be limited to what is described in the specification of the '938 Patent: what the specification refers to as "the fish-eye effect of the lens." '938 Patent, 3:58. This "fish-eye effect" is a well-known optical effect that can be calculated using a formula, given information about the lens, including its focal length and a constant defined by details of the lens design, and the distance of the subject to the lens. In particular, the equation recognizes a relationship between magnification and the distance to the subject. As light rays pass through a lens, they form similar triangles between the object and the image, because the angles of incidence and refraction are the same for corresponding rays, and the magnification becomes larger as the distance to the object becomes smaller. In other words, for a particular lens that exhibits what is known as "negative distortion," there is "barrel" distortion or "fish-eye" distortion as the subject moves closer to the lens, which makes the center of an image scene appear as if it is bulging towards the camera relative to the periphery.

Given this background, determining whether a subject is a flat object (such as a photograph or video display) or a convex object (such as a face) is based solely on natural phenomena. Some distortion will be observed when a camera captures an image of a flat surface, due to the object being extended laterally from the optic axis. However, an image of a convex three-dimensional object will show more distortion with the same camera than an image of a flat surface. This is because the parts of the three-dimensional object closer to the lens experience more magnification than those further away. If central features

in the object are closer to the camera, this change in magnification with distance amplifies any barrel distortion effect. An example where this combination of effects occurs is a close-up image of a face where the nose is near the center of the image, and is the closest feature to the camera. In summary, image magnification is larger (a) for features in the object that are near the optic axis of a camera lens with barrel distortion, or (b) for features at shorter distances from the camera, regardless of lens shortcomings. Both effects may occur simultaneously in an imaging system.

If "expected differences" is found to mean something other than barrel or fish-eye distortion, then the claim is even more abstract. It would claim simply looking at the two images for some "expected differences" between them to determine the subject is three-dimensional. That know-it-when-you-see-it approach is the epitome of an abstract idea, not a specific implementation or any improvement. Further, it is entirely functional claiming: find any differences that shows the subject is three-dimensional. As such, it would improperly preempt the field. *See Yu*, 1 F.4th at 1045.

Nor does claim 1 add any inventive concept to the natural phenomenon. Instead, all that claim 1 adds is that code capable of executing the method is stored on non-transient computer readable medium and that the images are taken with a "computing device camera." The specification makes clear that such a device is a generic mobile device. *See* '938 Patent, 5:57–60 ("The mobile device 112 may comprise any type of mobile device capable of capturing an image, either still or video, and performing processing of the image or communication over a network."), 8:18–24 ("The mobile device 200 may comprise any type of mobile communication device capable of performing as described below. The mobile device may comprise a PDA, cellular telephone, smart phone, tablet PC, wireless electronic pad, an IoT device, a 'wearable' electronic device or any other computing device."), 8:33–35 ("The processor

208 [of the mobile device] may comprise a general purpose processor, ASIC, ARM, DSP, controller, or any other type processing device."), 8:47–49 ("The memory 210 [of the mobile device] may comprise RAM, ROM, flash memory, optical memory, or micro-drive memory."), 8:59–60 ("The display [of the mobile device] comprises any type display screen configured to display visual information to the user. "). As the specification makes clear, the entire point of the purported invention is that the natural phenomenon of "fish-eye" distortion can be determined with any device capable of taking images from different distances.

Claim 1 is representative of the other asserted independent claims. Claim 8 recites the same method as stored within the executable code of claim 1. Claim 8 also refers to "differences between the first data and the second data indicate an expected type of distorting change." This is the same as the "expected differences" of claim 1. Claim 17 recites the same method as applied to images of a user's head. Claim 20 recites the same method, but refers to "characteristics" that include "distortion." These characteristics are the same as "expected differences" (or "expected distortion" recited in other asserted patents).

Nor do the dependent claims add any inventive concept. Claim 2 requires only the natural phenomenon of barrel distortion, that the expected differences will appear as changes in relative size and shape of facial features. Claims 3 and 5 only add that the method is done in the context of authentication. Claims 4, 10, 11, and 21 add the abstract idea of guiding the user to take images from different distances. Claims 6, 12, 16, and 22 only narrow the respective independent claims by requiring the user to hold the device capturing images at two different distances (i.e., moving the camera as opposed to moving the subject). Claims 7, 13, 23, and 24 only put additional limitations on the data processed from the images. Claim 9 only recites simply

adds the processing of additional images at a distance between the first and second distances. Claim 14 only adds the abstract idea of moving the camera linearly toward or away from the user. Claim 15 adds the natural phenomenon of using light to illuminate the user's face. Claim 18 only specifies where the processing occurs. Claim 19 only recites that authentication is authentication of three-dimensionality.

4.4. The '910 Patent

Claim 10 of the '910 Patent—the only asserted independent claim—recites the following:

> A method for evaluating three-dimensionality of a user, the method comprising:
>
> > capturing at least one first image of the user taken with a camera at a first location which is a first distance from the user;
> >
> > processing the at least one first image or a portion thereof to create first data;
> >
> > moving the camera from the first location to a second location, the second location being a second distance from the user, or the user moving to change the distance between the user and the camera from the first distance to the second distance;
> >
> > capturing at least one second image of the user taken with the camera when the camera is the second distance from the user, the second distance being different than the first distance;
> >
> > processing the at least one second image or a portion thereof to create second data;
> >
> > comparing the first data to the second data to determine whether expected differences exist between the first data and the second data which indicate three-dimensionality of the user;
> >
> > verifying the images of the user exhibit three-dimensional traits when the first data and the second data have expected differences resulting from the at least one first image being captured with the camera at a different distance from the user than when the at least one second image is captured.

As with the other asserted patents, the method of claim 10 essentially performs three functions: (1) capturing two images of a user from different distances, (2) comparing data derived from the two images, and (3) determining that the user is three-dimensional when "expected differences" exists between the two images.

The first two steps are just the abstract ideas of capturing two images and comparing them. Regarding the last step, the term "expected differences" lacks adequate written description and/or is indefinite, as explained below in Sections 5.1.4 and 5.2.4, respectively. To the extent "expected differences" is found to not be indefinite and to be supported by sufficient written description, it should be limited to what is described in the specification of the '910 Patent: what the specification refers to as "fish-eye type distortion" also known as "perspective distortion." '910 Patent, 28:60–62. Perspective or fish-eye distortion, also called barrel distortion, is a well-known optical effect that can be calculated using a formula, given information about the lens, including its focal length and a constant defined by details of the lens design, and the distance of the subject to the lens. In particular, the equation recognizes a relationship between magnification and the distance to the subject. As light rays pass through a lens, they form similar triangles between the object and the image, because the angles of incidence and refraction are the same for corresponding rays, and the magnification becomes larger as the distance to the object becomes smaller. In other words, for a particular lens that exhibits a particular type of perspective distortion known as "negative distortion," there is "barrel" distortion or "fish-eye" distortion as the subject moves closer to the lens, which makes the center of an image scene appear as if it is bulging towards the camera relative to the periphery.

Given this background, determining whether a subject is a flat object (such as a photograph or video display) or a convex object (such as a face) is

based solely on natural phenomena. Some distortion will be observed when a camera captures an image of a flat surface, due to the object being extended laterally from the optic axis. However, an image of a convex three-dimensional object will show more distortion with the same camera than an image of a flat surface. This is because the parts of the three-dimensional object closer to the lens experience more magnification than those further away. If central features in the object are closer to the camera, this change in magnification with distance amplifies any barrel distortion effect. An example where this combination of effects occurs is a close-up image of a face where the nose is near the center of the image, and is the closest feature to the camera. In summary, image magnification is larger (a) for features in the object that are near the optic axis of a camera lens with barrel distortion, or (b) for features at shorter distances from the camera, regardless of lens shortcomings. Both effects may occur simultaneously in an imaging system.

If "expected differences" is found to mean something other than barrel or fish-eye distortion, then the claim is even more abstract. It would claim simply looking at the two images for some "expected differences" between them to determine the subject is three-dimensional. That know-it-when-you-see-it approach is the epitome of an abstract idea, not a specific implementation or any improvement. Further, it is entirely functional claiming: find any differences that shows the subject is three-dimensional. As such, it would improperly preempt the field. *See Yu*, 1 F.4th at 1045.

Nor does claim 10 add any inventive concept to the natural phenomenon. Claim 10 recites "processing," but does not recite any particular device that does said processing. The specification makes clear that such a device is a generic mobile device. *See* '910 Patent, 4:47–50 ("The mobile device 112 may comprise any type of mobile device capable of capturing an image, either still or video, and performing processing of the image or communication

over a network."), 8:9–15 ("The mobile device 200 may comprise any type of mobile communication device capable of performing as described below. The mobile device may comprise a PDA, cellular telephone, smart phone, tablet PC, wireless electronic pad, an IoT device, a 'wearable' electronic device or any other computing device."), 8:22–24 ("The processor 208 [of the mobile device] may comprise a general purpose processor, ASIC, ARM, DSP, controller, or any other type processing device."), 8:38–40 ("The memory 210 [of the mobile device] may comprise RAM, ROM, flash memory, optical memory, or micro-drive memory."), 8:50–51 ("The display [of the mobile device] comprises any type display screen configured to display visual information to the user. "). As the specification makes clear, the entire point of the purported invention is that the natural phenomenon of "perspective" or "fish-eye" distortion can be determined with any device capable of taking images from different distances.

Nor do the dependent claims add any inventive concept. Claim 2 simply adds the processing of a third image at a distance between the first and second distances. Claim 3 adds the additional natural phenomenon that as the user moves closer to the camera, at some point their ears will no longer be seen in the image. Claims 4 and 5 add the abstract idea of prompting the user to take images from different distances. Claim 6 only narrows the independent claim by requiring the user to hold the device capturing images at two different distances (i.e., moving the camera as opposed to moving the subject). Claim 7 is the inverse of claim 6, requiring the computing device (and camera) to be still, and the user to move between the first distance and the second distance. to the Claims 16 and 17 only put additional limitations on the form of the data processed from the images. Claim 8 only adds that an image (apparently any image) is displayed on the device while capturing one of the images. Claims 9 and 20 add that the data is transmitted to a server, but does not add any limitation about anything that is done on the server with the data.

5. Invalidity Under 35 U.S.C. § 112

As explained below, Jumio contends that certain limitations of the Asserted Claims fail to satisfy the requirements of 35 U.S.C. § 112 for lack of written description, lack of enablement, and/or indefiniteness, but has nonetheless identified prior art disclosures that anticipate and/or render obvious each and every limitation of the Asserted Claims in the accompanying Invalidity Claim Charts based on an assumption that Plaintiff will contend that such claims are supported by an adequate written description, adequately enabled, and definite. Jumio's identification of prior art disclosures that anticipate and/or render obvious a particular claim limitation in the accompanying Invalidity Claim Charts is not an admission that the claim limitation satisfies the requirements of § 112, nor does it represent any agreement or view as to the meaning of the limitation.

Where a claim term or limitation in one claim is identified as failing one or more requirements under § 112, Jumio contends that the same claim term or limitation fails the same requirement(s) in every instance the term or limitation is recited throughout the Asserted Claims. Where a phrase is identified as failing one or more requirements under § 112, Jumio contends that the subparts of the phrase also fail such requirement(s) within the context recited in the claim.

5.1. Lack of Written Description and/or Enablement

Pursuant to 35 U.S.C. § 112(a), a patent "specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same." Specifically, the specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention (the

"written description requirement"). *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). Additionally, the "enablement requirement" requires that "one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation." *Sitrick v. Dreamworks, LLC*, 516 F.3d 993, 999 (Fed. Cir. 2008) (*quoting AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1244 (Fed. Cir. 2003)). "It is the specification, not the knowledge of one skilled in the art, that must supply the novel aspects of an invention in order to constitute adequate enablement." *Genentech, Inc. v. Novo Nordisk A/S*, 108 F.3d 1361, 1366 (Fed. Cir. 1997). Enablement is judged as of the filing date of the patent application. *Elan Pharms., Inc. v. Mayo Found. for Med. Educ. & Rsch.*, 346 F.3d 1051, 1056-57 (Fed. Cir. 2003).

5.1.1. The '471 Patent

Asserted claims 10–20 are invalid under § 112(a) because there is nothing in the '471 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, "comparing the first data to the second data to determine whether ***expected distortion*** exist between the first data and the second data" or "authenticating the user when the differences between the first data and the second data have ***expected distortion***," as recited in claim 10. The specification does not explain, e.g., what is meant by "expected distortion," how the claimed "data" relates to such distortion, or how determinations regarding such distortion (or lack thereof) could be made based on the claimed "data." Indeed, the term "expected distortion" is only mentioned in the specification twice and only to explain that "authentication may be device dependent":

> In FIGS. 13A and 13B, the system may predict the expected fish-eye distortion of the images based on the mobile device used for enrollment and authentication, and based on known and trusted enrollment data. In addition or as an alternative, the known specifications of

> a mobile phone camera for a given model may be utilized to predict the ***expected distortion*** of the person's facial features at different distances from the lens. Thus, the authentication may be device dependent. Further, enrollment information from the user is not required at every possible distance from the camera.
>
> For example, as described above, enrollment images and biometrics may be obtained for a user at two distances from the user. During authentication, multiple images are captured in addition to images corresponding the close and far distances of the enrollment images and biometrics. Based on the ***expected distortion*** of these intermediary images according to the distanced traveled by the device, the system may validate that the change in distortion of the images is happening at the correct rate, even though only two enrollment profiles are obtained.

'471 Patent at 29:65–30:18. Accordingly, the '471 Patent specification does not sufficiently describe or enable "comparing the first data to the second data to determine whether ***expected distortion*** exist between the first data and the second data" or "authenticating the user when the differences between the first data and the second data have ***expected distortion***," as recited in claim 10, rendering this claim (as well as all claims that depend therefrom) invalid under § 112(a).

Asserted claim 11 is also invalid under § 112(a) because there is nothing in the '471 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, "interpolating the first data and the second data to obtain estimated intermediate data" or "comparing the estimated intermediate data with the third data to determine whether the third data matches the estimated intermediate data." The specification does not once use the term "interpolating" (or any variation thereof) or otherwise describe any process by which "intermediate data" is obtained from a first data and a second data. Similarly, the specification does not once refer to "intermediate data," much less explain what is meant by "estimated intermediate data." Nor does the specification describe "comparing the estimated intermediate data with the

third data" (or any other data) or explain what is meant by "the third data matches the estimated intermediate data." Accordingly, the '471 Patent specification does not sufficiently describe or enable "interpolating the first data and the second data to obtain estimated intermediate data" or "comparing the estimated intermediate data with the third data to determine whether the third data matches the estimated intermediate data," as recited in claim 11, rendering this claim invalid under § 112(a).

Asserted claim 12 is also invalid under § 112(a) because there is nothing in the '471 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, "verifying the presence of the user's ears in the at least one first image, and verifying the absence or reduced visibility of the user's ears in the at least one second image." Indeed, the specification does not once mention a "user's ears," much less describe "verifying" the presence, absence, or reduced visibility thereof. Accordingly, the '471 Patent specification does not sufficiently describe or enable "verifying the presence of the user's ears in the at least one first image, and verifying the absence or reduced visibility of the user's ears in the at least one second image," as recited in claim 12, rendering this claim invalid under § 112(a).

5.1.2. The '606 Patent

Asserted claims 1–9 and 19–20 are invalid under § 112(a) because there is nothing in the '606 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, "comparing the first biometric data [to / with] the second biometric data to determine whether differences between the at least one first image and the at least one second image match ***expected differences***" or "determining that the user's face is three-dimensional when: … the second biometric data has the ***expected differences*** as compared to the first biometric

data," as recited in claims 10 and 19. The specification does not explain, e.g., what is meant by "expected differences," how to determine such differences, how the claimed "biometric data" relates to such differences, how determinations regarding such differences (or lack thereof) could be made based on the claimed "biometric data," or what is required for such differences and differences between the images to "match." Indeed, the term "expected differences" is only mentioned in the specification once and only to note that "expected differences ***in the rate to [sic] change***" are one example of "expected values" that may be based on testing:

> The expected values or expected rate of change of an item in an image, defined by pixel location or values, may be based on testing over time such as expected location, expected displacement, expected rate of change of the item, or even ***expected differences*** in the rate to change which would indicate three-dimensionality (as opposed to a 2D photograph or video screen of a person).

'606 Patent at 36:15–22. Accordingly, the '606 Patent specification does not sufficiently describe or enable "comparing the first biometric data [to / with] the second biometric data to determine whether differences between the at least one first image and the at least one second image match ***expected differences***" or "determining that the user's face is three-dimensional when: … the second biometric data has the ***expected differences*** as compared to the first biometric data," as recited in claims 10 and 19, rendering these claims (as well as all claims that depend therefrom) invalid under § 112(a).

Asserted claim 2 is also invalid under § 112(a) because there is nothing in the '606 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, "interpolating the first biometric data and the second biometric data to obtain estimated intermediate biometric data" or "comparing the estimated intermediate biometric data with the third biometric data to determine whether the third biometric data matches the estimated

intermediate biometric data." The specification does not once use the term "interpolating" (or any variation thereof) or otherwise describe any process by which "intermediate biometric data" is obtained from a first data and a second data. Similarly, the specification does not once refer to "intermediate biometric data," much less explain what is meant by "estimated intermediate biometric data." Nor does the specification describe "comparing the estimated intermediate biometric data with the third biometric data" (or any other data) or explain what is meant by "the third biometric data matches the estimated intermediate biometric data." Accordingly, the '606 Patent specification does not sufficiently describe or enable "interpolating the first biometric data and the second biometric data to obtain estimated intermediate biometric data" or "comparing the estimated intermediate biometric data with the third biometric data to determine whether the third biometric data matches the estimated intermediate biometric data," as recited in claim 2, rendering this claim invalid under § 112(a).

5.1.3. The '938 Patent

Asserted claims 1–19 are invalid under § 112(a) because there is nothing in the '938 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, determining whether "expected differences" exist between data derived from images of a person's face, as recited in claims 1, 2, 8, 9, and 17. At most, the claims indicate that such differences are indicative of three-dimensionality and relate to distortion in one or more images. *E.g.*, '938 Patent at Claim 1 ("determine that the ***three-dimensional shape is not exhibited*** when the second biometric ***data does not have expected differences*** compared to the first biometric data"; "wherein the ***expected differences result from fish-eye type distortion*** in at least one of the at least one first image and the at least one second image"), Claim 8 ("determining the user's

face is ***not three-dimensional*** when the first data and the second data do ***not have expected differences*** indicating the user exhibits three-dimensionality"), Claim 17 ("wherein the ***expected differences: would be present*** when the first image and second images of the head of the person being captured at different distances ***has three-dimensional characteristics***"). However, the specification does not, e.g., specify the type or magnitude of "differences" that are "expected," or explain how determinations regarding such differences (or lack thereof) could be made based on the claimed data. Indeed, the specification does not once use the term "expected differences," and merely notes that it is possible for "a difference between the two images, or a difference in biometrics obtained from the two images," to "indicate[] that a real person is being imaged." '938 Patent at 31:32–35; *see also id*. at 3:67–4:6 ("The incremental frames during an authentication may then be matched to frames captured at similar locations during enrollment along the motion path and compared to ensure that the expected similarities and difference are found. This results in a motion path and captured image and biometric data that can prove a three-dimensional person is presently being imaged."). Accordingly, the '938 Patent specification does not sufficiently describe or enable determining whether "expected differences" exist between data derived from images of a person's face, as recited in claims 1, 2, 8, 9, and 17, rendering these claims (as well as all claims that depend therefrom) invalid under § 112(a).

Asserted claims 8–16 are also invalid under § 112(a) because there is nothing in the '938 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, "examining the first data and the second data to determine whether differences between the first data and the second data indicate an ***expected type of distorting change*** in at least one image," as recited in claim

8. At most, the claims indicate that such change is "consistent with a real person being imaged" and "indicative of three-dimensionality." '938 Patent at Claim 8. However, the specification does not once refer to any "type of distorting change," much less what is required for such change to be "expected" or how such change (or lack thereof) could be determined based on the claimed data. Accordingly, the '938 Patent specification does not sufficiently describe or enable "examining the first data and the second data to determine whether differences between the first data and the second data indicate an ***expected type of distorting change*** in at least one image," as recited in claim 8, rendering this claim (as well as all claims that depend therefrom) invalid under § 112(a).

Asserted claims 20–24 are also invalid under § 112(a) because there is nothing in the '938 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, determining that "the [first / second] data exhibits [first / second] ***characteristics*** that indicate the [first / second] data was derived from an image of the user captured at the [first / second] distance," that "the first characteristics or the second ***characteristics include at least distortion*** within the at least one first image or the at least one second image," or that "the user does not exhibit the expected degree of three-dimensionality" based on such characteristics, as recited in claim 20. Indeed, the specification only once uses the term "characteristic" and only to note that, "by using algorithms to process the ***characteristics*** of the face and light striking the face between the different images, the authentication server 120 can determine that the face in the authentication images is three-dimensional." '938 Patent at 14:58–62. But, again, the specification fails to explain *how* this determination is made and what information it is based on, including what it means for "characteristics" to indicate the distance at which an image was captured or include "distortion."

Accordingly, the '938 Patent specification does not sufficiently describe or enable determining that "the [first / second] data exhibits [first / second] ***characteristics*** that indicate the [first / second] data was derived from an image of the user captured at the [first / second] distance," that "the first characteristics or the second characteristics include at least distortion within the at least one first image or the at least one second image," or that "the user does not exhibit the expected degree of three-dimensionality" based on such characteristics, as recited in claim 20, rendering this claim (as well as all claims that depend therefrom) invalid under § 112(a).

5.1.4. The '910 Patent

Asserted claims 10–21 are invalid under § 112(a) because there is nothing in the '910 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, "comparing the first data to the second data to determine whether ***expected differences*** exist between the first data and the second data" or "verifying the images of the user exhibit three-dimensional traits when the first data and the second data have ***expected differences***," as recited in claim 10. The specification does not explain, e.g., what is meant by "expected differences," how to determine such differences, how the claimed data relates to such differences, or how determinations regarding such differences (or lack thereof) could be made based on the claimed data. Indeed, the term "expected differences" is only mentioned in the specification once and only to note that "expected differences ***in the rate to [sic] change***" are one example of "expected values" that may be based on testing:

> The expected values or expected rate of change of an item in an image, defined by pixel location or values, may be based on testing over time such as expected location, expected displacement, expected rate of change of the item, or even ***expected differences*** in the rate to change which would indicate three-dimensionality (as opposed to a 2D photograph or video screen of a person).

’910 Patent at 35:59–66. Accordingly, the ’910 Patent specification does not sufficiently describe or enable “comparing the first data to the second data to determine whether ***expected differences*** exist between the first data and the second data” or “verifying the images of the user exhibit three-dimensional traits when the first data and the second data have ***expected differences***,” as recited in claim 10, rendering this claim (as well as all claims that depend therefrom) invalid under § 112(a).

Asserted claim 11 is also invalid under § 112(a) because there is nothing in the ’910 Patent specification from which a POSITA could reasonably conclude that the inventors had possession of, or would instruct a POSITA how to practice, “interpolating the first data and the second data to obtain estimated intermediate data” or “comparing the estimated intermediate data with the third data to determine whether the third data matches the estimated intermediate data.” The specification does not once use the term “interpolating” (or any variation thereof) or otherwise describe any process by which “intermediate data” is obtained from a first data and a second data. Similarly, the specification does not once refer to “intermediate data,” much less explain what is meant by “estimated intermediate data.” Nor does the specification describe “comparing the estimated intermediate data with the third data” (or any other data) or explain what is meant by “the third data matches the estimated intermediate data.” Accordingly, the ’910 Patent specification does not sufficiently describe or enable “interpolating the first data and the second data to obtain estimated intermediate data” or “comparing the estimated intermediate data with the third data to determine whether the third data matches the estimated intermediate data,” as recited in claim 11, rendering this claim invalid under § 112(a).

5.2. Indefiniteness

Pursuant to 35 U.S.C. § 112(b), a patent "specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention." According to the Supreme Court, this statutory requirement "is met only when [the claims] clearly distinguish what is claimed from what went before in the art and clearly circumscribe what is foreclosed from future enterprise." *United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228, 236 (1942). Thus, "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). Claim terms that are "insolubly ambiguous" also fail the definiteness requirement of § 112 because such terms do not permit those skilled in the art to understand with precision what is inside and outside the scope of the claim. *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1347 (Fed. Cir. 2005).

5.2.1. The '471 Patent

"*first data*," "*second data*" (claims 10, 11, 16, 17, and 20) and "*third data*" (claim 11) — The '471 Patent fails to specify with reasonable certainty what constitutes "first data," "second data," and "third data" that is created or obtained by "processing" a "first image," "second image," and "third image," respectively. The specification merely discusses processing images for "facial biometric information," generally, but does not explain what is involved in such processing or describe the nature of the resulting data. *See*, *e.g.*, '471 Patent at 2:34–36. At most, the patent requires the "first data" and the "second data" to include information that can be used to assess "three-dimensionality of the user," *id*. at Cl. 10, and identifies two examples of such data—"biometric data" and "a mapping of facial features," *id*. at Cls. 16 and 17—neither of which

provide meaningful guidance as to the scope of the claimed "first data" and "second data." As for the claimed "third data," the patent, at most, requires the ability to compare such data with "estimated intermediate data" obtained from the "first data" and the "second data," *id*. at Cl. 11, which is similarly insufficient.

"*estimated intermediate data*" (claim 11) — The '471 Patent fails to specify with reasonable certainty what constitutes "interpolating the first data and the second data to obtain *estimated intermediate data*," as recited in claim 11. In particular, because it is unclear what exactly constitutes "first data" and "second data," it is also unclear what would constitute "estimated intermediate data" obtained therefrom. Further, the specification does not once mention, much less explain what is meant by, "interpolating" the claimed first and second data or the resulting "estimated intermediate data."

"*the third data matches the estimated intermediate data*" (claim 11) — The '471 Patent fails to specify with reasonable certainty what is required for "the third data [to] match[] the estimated intermediate data," as recited in claim 11. In particular, because it is unclear what exactly constitutes "third data" and "estimated intermediate data," it is also unclear what is required for such data to "match[]."

"*biometric data*" (claim 16) — The '471 Patent fails to specify with reasonable certainty what constitutes "biometric data," as recited in claim 16. At most, the specification identifies non-limiting and non-specific examples of "biometric data," which do not provide meaningful guidance as to the scope of this term. *See*, *e.g.*, '471 Patent at 6:37–45 ("The term biometric data may include among other information biometric information concerning facial features and path parameters. Examples of path parameters may include an acceleration and speed of the mobile device, angle of the mobile device during image capture, distance of the mobile device to the user, path direction in

relation to the user's face position in relation to the user, or any other type of parameter associated with movement of the mobile device or the user face in relation to a camera."), 6:66–67 ("…biometric information, such as facial data"), 7:31–34 ("…biometric data, such as numeric data").

"*the second distance being different than the first distance*" (claim 10) and "*the first distance is larger than the second distance*" (claim 12) — The '471 Patent fails to specify with reasonable certainty what constitutes a first distance that is "different" or "larger" than a second distance, as recited in claims 10 and 12, respectively. In particular, the specification does not provide any guidance as to the extent to which such distances must differ in accordance with the purported invention; it merely refers to images being captured at "close and far distances," generally. *E.g.*, '471 Patent at 29:7–11, 30:11–13.

"*[the user moving / movement of the user] from the first location to the second location*" (claim 10) — Claim 10 is indefinite insofar as it contemplates "the user moving" or "movement of the user"—as opposed to "moving the camera" or "movement of the camera"—"from the first location to the second location" because each such location is defined by its "distance *from* the user."

"*comparing the first data to the second data to determine whether expected distortion exist between the first data and the second data which indicated three-dimensionality of the user*" and "*authenticating the user when the differences between the first data and the second data have expected distortion resulting from … the change in distance between the user and the camera*" (claim 10) — The '471 Patent fails to specify with reasonable certainty the scope of the "comparing" and "authenticating" steps recited in claim 10—in particular, with respect to their use of the term "expected distortion." As an initial matter, the specification does not discuss

"distortion" as an attribute of "data" or "differences between" data, as claimed, but rather as an attribute of images or facial features depicted in images. '471 Patent at 30:1–5 ("the known specifications of a mobile phone camera for a given model may be utilized to predict the expected *distortion of the person's facial features* at different distances"), 30:13–18 ("Based on the expected *distortion of these intermediary images* … the system may validate that the change in *distortion of the images* is happening at the correct rate…"). And as explained above, the terms "first data" and "second data" are themselves indefinite. The "comparing" and "authenticating" steps of claim 10 are, thus, indefinite insofar as they contemplate the existence of any distortion "between the first data and the second data." Furthermore, the term "expected distortion" implies the existence of a predetermined expectation of distortion (e.g., a threshold) to which distortion identified from a plurality of images is compared, but the plain language of claim 10 contemplates the "expected distortion" itself—as opposed to any identified distortion—being the based on of how such images were obtained and/or the subject of the images. In any event, the patent does not describe or place meaningful limits on, e.g., the type or magnitude of distortion that is "expected," or otherwise explain how to determine whether any potential distortion is what was "expected."

"*the second distances*" (claim 11) — This term lacks antecedent basis, as neither claim 11 nor claim 10 (from which claim 11 depends) introduces "second distance**s**."

5.2.2. The '606 Patent

"*first biometric data*," "*second biometric data*" (claims 1, 2, 9, 19, and 20) and "*third biometric data*" (claim 2) — The '606 Patent fails to specify with reasonable certainty what constitutes "first biometric data," "second biometric data," and "third biometric data" that is obtained by "processing" (or is "generated from") a "first image," "second image," and "third

image," respectively. The specification merely discusses processing images for "facial biometric information," generally, but does not explain what is involved in such processing or prescribe any meaningful limits with respect to the nature of the resulting data. *See*, *e.g.*, '606 Patent at 2:44–45. At most, the patent requires (1) that the "first biometric data" and the "second biometric data" include information that can be used to assess "three-dimensionality of the user," *id*. at Cls. 1 & 19, (2) the ability to compare the "third biometric data" with "estimated intermediate biometric data" obtained from the "first biometric data" and the "second biometric data," *id*. at Cl. 2, and (3) that the term "biometric data" encompasses numerous non-limiting and non-specific examples of such data, *see, e.g.*, *id*. at 6:54–63 ("The term biometric data may include among other information biometric information concerning facial features (distorted and undistorted) and path parameters. Examples of path parameters may include an acceleration and speed of the mobile device, angle of the mobile device during image capture, distance of the mobile device to the user, path direction in relation to the user's face position in relation to the user, or any other type parameter associated with movement of the mobile device or the user face in relation to the camera."), 7:16–17 ("…biometric information, such as facial data"), 7:49–50 ("…biometric data, such as numeric data"), 38:35–38 ("the map of the two-dimensional vectors of pixel movement…can be used itself as biometric data"), 45:40–42 ("…using other biometric data such as a fingerprint or retina scan, path-based motion and imaging…")—none of which provide meaningful guidance as to the scope of the claimed "biometric data."

"*the first biometric data [matches / does not match / is not identical to] the second biometric data*" (claims 1 and 19) — The '606 Patent fails to specify with reasonable certainty what is required for "first biometric data" to "match," "not match," or be "not identical to" "second biometric data." In

particular, because it is unclear what exactly constitutes "first biometric data" and "second biometric data," it is also unclear how to determine whether such data matches or is identical. Further, although the requirement that such data "does not match" (as recited in claim 1) must, under the doctrine of claim differentiation, have a different meaning and scope than the requirement that such data "is not identical" (as recited in claim 19), there is nothing in the patent that distinguishes the two. To the contrary, the plain language of claims 1 and 19 suggest that they are interchangeable and that either is sufficient as the threshold requirement for "determining that the user's face is three-dimensional." And the specification does not once describe first and second biometric data as "identical" or "not identical," or as "match[ing]" or "not match[ing]," or otherwise provide meaningful guidance as to what is required to satisfy these limitations.

"*estimated intermediate biometric data*" (claim 2) — The '606 Patent fails to specify with reasonable clarity what constitutes "interpolating the first biometric data and the second biometric data to obtain *estimated intermediate biometric data*," as recited in claim 2. In particular, because it is unclear what exactly constitutes "first biometric data" and "second biometric data," it is also unclear what would constitute "estimated intermediate biometric data" obtained therefrom. Further, the specification does not once mention, much less explain what is meant by "interpolating" the claimed first and second biometric data or the resulting "estimated intermediate biometric data."

"*the third biometric data matches the estimated intermediate biometric data*" (claim 2) — The '606 Patent fails to specify with reasonable certainty what is required for the "third biometric data [to] match[] the estimated intermediate biometric data," as recited in claim 2. In particular, because it is unclear what exactly constitutes "third biometric data" and

"estimated intermediate biometric data," it is also unclear what is required for such data to "match[]."

"*the second distance being different than the first distance*" (claims 1 and 19) and "*the first distance is larger than the second distance*" (claim 3) — The '606 Patent fails to specify with reasonable certainty what constitutes a first distance that is "different" or "larger" than a second distance, as recited in claims 1, 3, and 19. In particular, the specification does not provide any guidance as to the extent to which such distances must differ in accordance with the purported invention; it merely refers to images being captured at "close and far distances," generally. *E.g.*, '606 Patent at 30:12–15, 31:16–18.

"*comparing the first biometric data [to] [with] second biometric data to determine whether differences between the at least one first image and the at least one second image match expected differences resulting from movement of the camera or the user which change[d][s] the distance between the user and camera*" and "*determining that the user's face is three-dimensional when: ... the second biometric data has [the] expected differences as compared to the first biometric data[, the expected differences] resulting from the change in distance between the user and the camera*" (claims 1 and 19) — The '606 Patent fails to specify with reasonable certainty the scope of the "comparing" and "determining" steps recited in claims 1 and 19—in particular, with respect to their use of the term "expected differences." As an initial matter, it is unclear what and how "differences between the at least one first *image* and the at least one second *image*" can be determined by "comparing the first biometric *data* [to] [with] second biometric *data*." Indeed, as explained above, the terms "first biometric data" and "second biometric data" are, themselves, indefinite. It is similarly unclear whether the claimed "expected differences" relate to differences between images (as recited in the "comparing" steps), differences between

data (as recited in the "determining" steps), or both. Further, the term "expected differences" implies the existence of a predetermined expectation of differences (e.g., a threshold) to which differences identified from images and/or data are compared, but the plain language of claims 1 and 19 contemplates the "expected differences" themselves—as opposed to any identified differences—being the based on of how such images and/or data were obtained. In any event, the patent does not describe or place meaningful limits on, e.g., the type or magnitude of differences between images or data that are "expected" or otherwise explain how to determine whether any identified differences are what were "expected." At most, the patent suggests that such differences can somehow be used to assess three-dimensionality.

5.2.3. The '938 Patent

"*first biometric data*" and "*second biometric data*" (claims 1, 7, and 17) — The '938 Patent fails to specify with reasonable certainty what constitutes "first biometric data" and "second biometric data" that is received or derived from a "first image" and "second image," respectively. The specification merely discusses processing images for "facial biometric information," generally, but does not explain what is involved in such processing or prescribe any meaningful limits with respect to the nature of the resulting data. *See*, *e.g.*, '938 Patent at 2:37–39. At most, the patent requires that the "first biometric data" and the "second biometric data" include information regarding "facial features" (claims 1 and 7) or "aspects of the head" (claim 17), and identifies non-limiting and non-specific examples of such data, none of which provides meaningful guidance as to the scope of this term. *See, e.g.*, *id*. at 6:40–48 ("The term biometric data may include among other information biometric information concerning facial features and path parameters. Examples of path parameters may include an acceleration and speed of the mobile device, angle of the mobile device during image capture,

distance of the mobile device to the user, path direction in relation to the user's face position in relation to the user, or any other type parameter associated with movement of the mobile device or the user face in relation to a camera."), 7:2–3 ("…biometric information, such as facial data"), 7:36 ("…biometric data, such as numeric data").

"*enrollment data*" (claim 5) — The '938 Patent fails to specify with reasonable certainty what constitutes "*enrollment data* derived from an enrollment image," as recited in claim 5. The specification merely discusses processing images for "facial biometric information," generally, but does not explain what is involved in such processing or prescribe any meaningful limits with respect to the nature of the resulting data. *See*, *e.g.*, '938 Patent at 2:37–39. Indeed, although claim 5 recites "compar[ing]" the "enrollment data" to other data, it only requires determining that such data "do not sufficiently correspond," which does not provide meaningful guidance as to the scope of this term. At most, the specification identifies non-limiting and non-specific examples of "enrollment *information*," which is similarly insufficient. *See, e.g.*, '938 Patent at 2:30–33 ("The enrollment information (the enrollment biometrics, movement, and other information) …"), 24:41–42 ("The enrollment information may further include distance information.").

"*the first data, second data, or both*" (claim 5) — This term lacks antecedent basis, as neither claim 5 nor claim 1 (from which claim 5 depends) introduces "first data" or "second data."

"*first data*," "*second data*" (claims 8, 9, 13, 20, 23, and 24), and "*additional data*" (claim 9) — The '938 Patent fails to specify with reasonable certainty what constitutes "first data," "second data," and "additional data" that is created or generated from a "first image," a "second image," and "additional images," respectively. The specification merely discusses processing images for "facial biometric information," generally, but does not explain what is involved

in such processing or describe the nature of the resulting data. *See, e.g.*, '938 Patent at 2:37–39. At most, the patent requires the claimed "data" to include information that can be used to assess "three-dimensionality," *id*. at Cls. 8, 9, 17, and identifies two examples of such data—"biometric data" and "image data of facial features," *id*. at Cls. 13, 23, 24—neither of which provide meaningful guidance as to the scope of the claimed "first data," "second data," or "additional data."

"*biometric data*" (claims 13 and 23) — The '938 Patent fails to specify with reasonable certainty what constitutes "biometric data," as recited in claims 13 and 23. At most, the specification identifies non-limiting and non-specific examples of "biometric data," which do not provide meaningful guidance as to the scope of this term. *See, e.g.*, '938 Patent at 6:40–48 ("The term biometric data may include among other information biometric information concerning facial features and path parameters. Examples of path parameters may include an acceleration and speed of the mobile device, angle of the mobile device during image capture, distance of the mobile device to the user, path direction in relation to the user's face position in relation to the user, or any other type parameter associated with movement of the mobile device or the user face in relation to a camera."), 7:2–3 ("…biometric information, such as facial data"), 7:36 ("…biometric data, such as numeric data").

"*image data of facial features*" (claims 7 and 24) — The '938 Patent fails to specify with reasonable certainty what constitutes "image data of facial features," as recited in claims 7 and 24. In particular, claim 7 requires "image data of facial features" to be *part of* the "biometric data," *see also, e.g.*, '938 Patent at 11:9–11 ("The facial recognition module 366 may process the image data to generate facial data (biometric information)"), 16:65–66 ("image data (authentication images/biometrics)"), whereas claims 23 and 24 together indicate that "image data of facial features" is *different* than "biometric data."

Further, the specification, at most, provides that "image data" can be used "to perform image recognition" for a wide array of purposes, including "facial detection, item detection, facial recognition, item recognition, or bar/box code reading," *id*. at 10:4–7, which does not provide meaningful guidance as to the scope of this term.

"*the second distance [being / is] different [than / from] the first distance*" (claims 1, 8, and 20) and "*a second distance, which is different from the first distance*" (claim 17) — The '938 Patent fails to specify with reasonable certainty what is required for the "first distance" and the "second distance" to be "different," as recited in claims 1, 8, 17, and 20. In particular, the specification does not provide any guidance as to the extent to which such distances must differ in accordance with the purported invention; it merely refers to images being captured at "close and far distances," generally. *E.g.*, '938 Patent at 29:10–14, 30:14–16.

"*compare the first biometric data with second biometric data for expected differences that result from characteristics of a human face and the at least one first image and the at least one second image being captured at different distances from the user*" and "*wherein the expected differences result from fish-eye type distortion in at least one of the at least one first image and the at least one second image and due to the three-dimensional nature of the human face and the change in distance between the camera and the user*" (claim 1) — The '938 Patent fails to specify with reasonable certainty the scope of the "compare" step and the "wherein" clause recited in claim 1—in particular, with respect to the use of the terms "expected differences" and "characteristics of a human face." For example, it is unclear what and how "differences that result from" (1) "*characteristics of a human face* and the at least one first *image*," (2) "the at least one second *image* being captured at different distances," and/or (3) "fish-eye type distortion in at least

one of the at least one first image and the at least one second image" can be determined by "compar[ing] the first *biometric data* with second *biometric data*." Indeed, as explained above, the terms "first biometric data" and "second biometric data" are, themselves, indefinite. It is also unclear whether the claim is referring to "the expected differences," "fish-eye type distortion," or both as "due to the three-dimensional nature of the human face and the change in distance between the camera and the user." Further, the term "expected differences" implies the existence of a predetermined expectation of differences (e.g., a threshold) to which differences identified from data are compared, but the plain language of claim 1 contemplates the "expected differences" themselves—as opposed to any identified differences—being the based on of how such data were obtained and/or what the data represents. For example, claim 1 states that "*the* expected differences *result from* fish-eye type distortion in at least one of" the images from which three-dimensionality is being determined. Claim 1 also states that such "expected differences [] *result from* characteristics of a human face" in the images from which three-dimensionality is being determined. For both to be true, the claimed "characteristics" cannot be unique to "a human face" (as the plain language of the claim suggests) because fish-eye distortion is not a phenomenon unique to human faces (or any human-specific characteristics). In any event, the patent does not describe or place meaningful limits on, e.g., the type or magnitude of differences between "the first biometric data" and "the second biometric data" that are "expected" or otherwise explain how to determine whether any identified differences are what were "expected." At most, the patent suggests that such differences involve some information regarding fish-eye distortion and can somehow be used to assess three-dimensionality.

"determine that the three-dimensional shape is not exhibited when the second biometric data does not have expected differences compared to

***the first biometric data, the expected differences comprising at least differences due to the change in the relative distance between the user's facial features and the camera when the at least one first image was captured at the first distance and the at least one second image was captured at the second distance*" (claim 1) —** The '938 Patent fails to specify with reasonable certainty the scope of the "determine" step recited in claim 1 for at least the same reasons explained above with respect to the "compare" step and the "wherein" clause of claim 1. This limitation is indefinite for the additional reason that it recites an impossibility, i.e., it can never be satisfied, in view of the rest of the claim. In particular, the preamble of claim 1 recites a "non-transient computer readable medium … configured to determine if *the three-dimensional shape* is consistent with that of a human face" such that the entire claim is premised on the existence of "the three-dimensional shape," yet this limitation requires a "determin[ation] that the three-dimensional shape *is not exhibited*." The limitation further contradicts itself by requiring "*the* expected differences [to] compris[e] at least differences…" after determining that "the second biometric data *does not have* expected differences."

***"The non-transient computer readable medium of claim 1 wherein the expected differences appear as changes in the relative size and shape of facial features of the user*" (claim 2) —** Claim 2 is indefinite at least because claim 1 (from which claim 2 depends) requires a determination that "the expected differences" do not exist and therefore cannot "appear as changes in the relative size and shape of facial features of the user" (or otherwise), and because the patent fails to specify with reasonable certainty what constitutes the claimed "changes."

***"The non-transient computer readable medium of claim 1 wherein determining that three-dimensionality is not exhibited happens during an authentication session*" (claim 3) —** Claim 3 is indefinite at least because the

preamble of claim 1 (from which claim 3 depends) requires that three-dimensionality *is* exhibited.

"examining the first data and the second data to determine whether differences between the first data and the second data indicate an expected type of distorting change in at least one image that is consistent with a real person being imaged and which is indicative of three-dimensionality" **(claim 8) —** The '938 Patent fails to specify with reasonable certainty the scope of the "examining" step recited in claim 8—in particular, with respect to its use of the term "expected type of distorting change." For example, it is unclear what and how a "distorting change in at least one *image*" can be determined based on "differences between the first *data* and the second *data*." Indeed, as explained above, the terms "first data" and "second data" are, themselves, indefinite. Is it similarly unclear what "type of distorting change" would fall within the scope of this claim because distortion is not indicative of "realness."

"determining the user's face is not three-dimensional when the first data and the second data do not have expected differences indicating the user exhibits three-dimensionality" **(claim 8) and "*examining the additional data, the first data, and the second data, or portions thereof, to determine whether expected differences therebetween indicate the user's face exhibits three-dimensionality*" (claim 9) —** The '938 Patent fails to specify with reasonable certainty the scope of the "determining" step recited in claim 8 or the "examining" step recited in claim 9—in particular, with respect to their use of the term "expected differences." For example, because it is unclear what exactly constitutes "first data," "second data," and "additional data," it is also unclear what and how "differences" between such data (or "portions thereof") can be determined or indicate three-dimensionality. Further, the term "expected differences" implies the existence of a

predetermined expectation of differences (e.g., a threshold) to which differences identified from data are compared, but the plain language of claims 8 and 9 contemplates the "expected differences" themselves—as opposed to any identified differences—being the based on what the data represents. In any event, the patent does not describe or place meaningful limits on, e.g., the type or magnitude of differences between the claimed data that are "expected" or otherwise explain how to determine whether any identified differences are what were "expected." At most, the patent suggests that such differences can somehow be used to assess three-dimensionality.

"*comparing one or more aspects of the head from the first image or first biometric data derived from the first image to one or more aspects of the head from the second image or second biometric data derived from the second image to determine whether expected differences are not present*" and "*wherein the expected differences: would be present when the first image and second images of the head of the person being captured at different distances has three-dimensional characteristics but not if the head did not have three-dimensional characteristics; and the expected differences result from differences in relative dimensions of a person's face appearing different when capturing images is done close to the person's face and far from the persons fac*e" (claim 17) — The '938 Patent fails to specify with reasonable certainty the scope of the "comparing" step and the "wherein" clause recited in claim 17—in particular, with respect to the use of the term "expected differences." For example, it is unclear what and how "differences in relative dimensions of a person's face" can be determined by "comparing one or more aspects of the head from the first image or first biometric data derived from the first image to one or more aspects of the head from the second image or second biometric data derived from the second image." Indeed, as explained above, the terms "first biometric data" and

"second biometric data" are, themselves, indefinite. It is similarly unclear what and how "aspects of the head" in the images can be used "to determine whether expected differences are not present," or what "three-dimensional characteristics" fall within the scope of claim 17. It is also unclear whether the claimed "expected differences" relate to differences between images, differences between data, or both. Further, the term "expected differences" implies the existence of a predetermined expectation of differences (e.g., a threshold) to which differences identified from data and/or images are compared, but the plain language of claim 17 contemplates the "expected differences" themselves—as opposed to any identified differences—being the based on how the data and/or images were obtained and what they include. In any event, the patent does not describe or place meaningful limits on, e.g., the type or magnitude of differences between the claimed data and/or images that are "expected" or otherwise explain how to determine whether any identified differences are what were "expected." At most, the patent suggests that such differences can somehow be used to assess three-dimensionality.

"*if the expected differences are not present, denying authentication of the person … wherein the authentication is authentication of liveness, three-dimensionality, or both*" (claim 17) — The '938 Patent fails to specify with reasonable certainty the scope of the "denying" step recited in claim 17. In particular, this limitation is indefinite based on its use of the term "expected differences" for at least the same reasons discussed above. It is also indefinite to the extent it requires the claimed "expected differences"—which relate only to three-dimensionality—to be indicative of "liveness."

"analyzing the [first] [second] data to determine at least if the [first] [second] data exhibits [first] [second] characteristics that indicate the [first] [second] data was derived from an image of the user captured at the [first] [second] distance, wherein the first characteristics or the second

***characteristics include at least distortion within the at least one first image or the at least one second image*" (claim 20) —** The '938 Patent fails to specify with reasonable certainty the scope of the "analyzing" step recited in claim 20—in particular, with respect to its use of the terms "characteristics" and "distortion." For example, because it is unclear what exactly constitutes "first data" and "second data," it is also unclear how such data could be used to determine "distortion within" an image. It is similarly unclear how "characteristics" exhibited by such data can "indicate" the distance at which an image was captured. At most, the specification discusses using "algorithms to process the *characteristic* of the face and light striking the face between the different images," *see, e.g.*, '938 Patent at 14:58–63, but fails to provide meaningful guidance as to the scope of the claimed "characteristics."

"***determining the user does not exhibit the expected degree of three-dimensionality when either or both of the following occur: the step of analyzing the first data determines the first data does not exhibit first characteristics that indicate the first data was derived from an image of the user captured at the first distance; or the step of analyzing the second data determines the second data does not exhibit second characteristics that indicate the second data was derived from an image of the user captured at the second distance*" (claim 20) —** The'938 Patent fails to specify with reasonable certainty the scope of the "determining" step recited in claim 20 for at least the same reasons explained above with respect to the "analyzing" step. This limitation is indefinite for the additional reason that it recites an impossibility, i.e., it can never be satisfied, in view of the rest of the claim. In particular, this limitation requires a determination that the first image was *not* captured at the first distance or that the second image was *not* captured at the second distance, but other limitations explicitly require "capturing at least one first image … [at] a first distance" *and* "capturing at

least one second image … [at] a second distance." The patent also fails to provide meaningful guidance as to what "*degree* of three-dimensionality" is expected when such images are captured at the required distances.

5.2.4. The '910 Patent

"*first data*," "*second data*" (claims 10, 11, 16, 17, and 20) and "*third data*" (claim 11) — The '910 Patent fails to specify with reasonable certainty what constitutes "first data," "second data," and "third data" that is created or obtained by "processing" a "first image," "second image," and "third image," respectively. The specification merely discusses processing images for "facial biometric authentication," generally, but does not explain what is involved in such processing or describe the nature of the resulting data. *See, e.g.*, '910 Patent at 2:21–22. At most, the patent requires the "first data" and the "second data" to include information that can be used to assess "three-dimensionality of the user," *id*. at Cl. 10, and identifies three examples of such data—"biometric data" and "a map of facial features," *id*. at Cls. 16, 17—neither of which provides meaningful guidance as to the scope of the claimed "first data" and "second data." As for the claimed "third data," the patent, at most, requires the ability to compare such data with "estimated intermediate data" obtained from the "first data" and the "second data," *id*. at Cl. 11, which is similarly insufficient.

"*estimated intermediate data*" (claim 11) — The '910 Patent fails to specify with reasonable certainty what constitutes "interpolating the first data and the second data to obtain *estimated intermediate data*," as recited in claim 11. In particular, because it is unclear what exactly constitutes "first data" and "second data," it is also unclear what would constitute "estimated intermediate data" obtained therefrom. Further, the specification does not once mention, much less explain what is meant by, "interpolating" the claimed data or the resulting "estimated intermediate data."

"*the third data matches the estimated intermediate data*" (claim 11) — The '910 Patent fails to specify with reasonable certainty what is required for the "third data [to] match[] the estimated intermediate data," as recited in claim 11. In particular, because it is unclear what exactly constitutes "third data" and "estimated intermediate data," it is also unclear what is required for such data to "match[]."

"*biometric data*" (claim 16) — The '910 Patent fails to specify with reasonable certainty what constitutes "biometric data," as recited in claim 16. At most, the specification identifies non-limiting and non-specific examples of "biometric data," which do not provide meaningful guidance as to the scope of this term. *See, e.g.*, '910 Patent at 6:31–40 ("The term biometric data may include among other information biometric information concerning facial features (distorted or undistorted) and path parameters. Examples of path parameters may include an acceleration and speed of the mobile device, angle of the mobile device during image capture, distance of the mobile device to the user, path direction in relation to the user's face position in relation to the user, or any other type parameter associated with movement of the mobile device or the user face in relation to a camera."), 6:60–61 ("…biometric information, such as facial data"), 7:26–27 ("…biometric data, such as numeric data."), 38:12–15 ("the map of two-dimensional vectors of pixel movement…can be used itself as biometric data"), 45:18–20 ("…using other biometric data such as a fingerprint or retina scan, path-based motion and imaging…").

"*the second distance being different than the first distance*" (claim 10) and "*the first distance is larger than the second distance*" (claim 12) — The '910 Patent fails to specify with reasonable certainty what constitutes a first distance that is "different" or "larger" than a second distance, as recited in claims 10 and 12, respectively. In particular, the specification does not provide any guidance as to the extent to which such distances must differ in

accordance with the purported invention; it merely refers to images being captured at "close" and "farther away" distances, generally. *E.g.*, '910 Patent at 29:37–40, 29:46–47, 29:55–57, 30:60–62.

"*comparing the first data to the second data to determine whether expected differences exist between the first data and the second data which indicate three-dimensionality of the user*" and "*verifying the images of the user exhibit three-dimensional traits when the first data and the second data have expected differences resulting from the at least one first image being captured with the camera at a different distance from the user than when the at least one second image is captured*" (claim 10) — The '910 Patent fails to specify with reasonable certainty the scope of the "comparing" and "verifying" steps recited in claim 10—in particular, with respect to their use of the term "expected differences." For example, the term "expected differences" implies the existence of a predetermined expectation of differences (e.g., a threshold) to which differences identified from data are compared, but the plain language of claim 10 contemplates the "expected differences" themselves—as opposed to any identified differences—being the based on of how such data were obtained and/or what the data represents. In any event, the patent does not describe or place meaningful limits on, e.g., the type or magnitude of differences between "the first data and the second data" that are "expected" or otherwise explain how to determine whether any identified differences are what were "expected." At most, the patent suggests that such differences can somehow be used to assess three-dimensionality.

"*the second distances*" (claim 11) — This term lacks antecedent basis, as neither claim 11 nor claim 10 (from which claim 11 depends) introduces "second distance**s**."

6. PLR 3-4 Document Production

Pursuant to PLR 3-4(b), these Invalidity Contentions are accompanied by copies of each prior art reference identified in Sections 2.1 and 2.2, above, as well as documents Jumio has obtained to date describing each prior art system identified in Section 2.3, above.

However, as explained in Jumio's Motion to Strike Plaintiff's Infringement Contentions (Dkt. 73), Plaintiff has not properly accused any Jumio product or technology of infringement and, therefore, Jumio does not possess any documents responsive to the other categories identified in PLR 3-4. Jumio will not produce any documents regarding its technology, or Plaintiff's damages claims based on such technology, unless and until its motion to strike is resolved in Plaintiff's favor or Jumio is otherwise ordered to do so by the Court.

Dated: January 17, 2025 PERKINS COIE, LLP

By: */s/ Grant Kinsel*

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CERTIFICATE OF SERVICE

I hereby certify that on January 17, 2025, I caused the foregoing document and all accompanying documents referenced therein to be served on all counsel of record for Plaintiff FaceTec, Inc. and Defendant-Intervenor iProov Ltd. via email as follows:

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