IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

BRAIN CORPORATION, Plaintiff, v. AVIDBOTS CORP. AND AVIDBOTS USA CORP., Defendant.	Case No. 1:24-cv-12569 Honorable Jeremy C. Daniel

DEFENDANT AVIDBOTS'S FINAL INVALIDITY CONTENTIONS

[redacted]

Brain Corporation EX2021
IPR2025-01600

Pursuant to L.P.R. 3.1, Defendant Avidbots Corp. and Avidbots USA Corp. (collectively "Defendant" or "Avidbots") hereby provides its Final Invalidity Contentions ("Final Invalidity Contentions") concerning the invalidity of U.S. Patent Nos. 10,001,780 ("the '780 Patent"), 10,379,539 ("the '539 Patent"), 10,274,325 ("the '325 Patent"), 10,823,576 ("the '576 Patent"), and 10,728,436 ("the '436 Patent") (collectively, the "Asserted Patents").

I. INTRODUCTION

On December 19, 2025, Brain served the following set of twenty claims under Local Patent Rule 3.1(a)(1) (collectively, the "Asserted Claims"):

Asserted Patent	Asserted Claims
'780 Patent	8, 9, 12, 13, 17, and 18
'539 Patent	1, 3, 4, and 6
'325 Patent	1, 5, and 14
'576 Patent	12, 17, 21, 22, and 23
'436 Patent	2, and 11

Avidbots contends that it does not infringe each of the Asserted Claims, and that each of the Asserted Claims is invalid under at least 35 U.S.C. §§ 101, 102, 103, and/or 112. The prior art and invalidity arguments identified in these Final Invalidity Contentions are identified with respect to the currently asserted claims only. Avidbots reserves the right to supplement these Final Invalidity Contentions and rely on additional references with respect to claims later identified by Plaintiff or based on newly discovered evidence. Avidbots further reserves the right to modify, amend, or supplement these Final Invalidity Contentions to the extent the Court permits Plaintiff to amend, supplement, or otherwise modify its Infringement Contentions, including by modifying the claims asserted, and to the full extent permitted by the Local Patent Rules.

G. Summary of Invalidity Grounds

Subject to the preceding reservations of rights to amend, and as further explained in the sections below, Defendants identify the following invalidity grounds pursuant to LPR 3.1(b).

Asserted Claims	Prior Art Grounds	Non-Prior Art Grounds
'780 Patent Claims 8, 9, 12, 13, 17, and 18	Obvious in view of Beardsley in combination with Castellanos. Obvious in view of Beardsley in combination with Castellanos and Khatib. Obvious in view of Yamamoto in combination with Khatib and Beardsley. Obvious in view of Avidbots System Art in combination with Beardsley, Khatib, and Scholz.	Lack of Enablement under 35 U.S.C. § 112. Indefiniteness under 35 U.S.C. § 112. On-Sale and/or Public Use Bar under 35 U.S.C. § 102. Unenforceability for Inequitable Conduct.
'539 Patent Claims 1, 3, 4, and 6	Obvious in view of Beardsley in combination with Castellanos. Obvious in view of Beardsley in combination with Castellanos and Khatib. Obvious in view of Yamamoto in combination with Khatib (except as to Claim 3). Obvious in view of Beardsley in combination with Castellanos and Scholz (Claim 3 only). Obvious in view of Avidbots System Art in combination	Lack of Enablement under 35 U.S.C. § 112. Indefiniteness under 35 U.S.C. § 112. On-Sale and/or Public Use Bar under 35 U.S.C. § 102. Unenforceability for Inequitable Conduct.

Asserted Claims	Prior Art Grounds	Non-Prior Art Grounds
	with Beardsley, Khatib, and Scholz.	
'325 Patent Claims 1, 5, and 14	Anticipated by Olson. Obvious in view of Olson in combination with Fong (892). Obvious in view of Stachniss in combination with Fong (892). Obvious in view of the iRobot Roomba 980 in combination with Olson.	Lack of Enablement under 35 U.S.C. § 112. Indefiniteness under 35 U.S.C. § 112. Non-statutory subject matter under 35 U.S.C. § 101. Unenforceability for Inequitable Conduct.
'576 Patent Claims 12, 17, 21, 22, and 23	Anticipated by Olson (except as to Claim 12). Obvious in view of Olson in combination with Fong (892). Obvious in view of Stachniss in combination with Prassler. Obvious in view of Stachniss in combination with Fong (892) (claim 12 only). Obvious in view of the iRobot Roomba 980 in combination with Olson and Fong (892).	Lack of Enablement under 35 U.S.C. § 112. Indefiniteness under 35 U.S.C. § 112. Non-statutory subject matter under 35 U.S.C. § 101. Unenforceability for Inequitable Conduct.
'436 Patent Claims 2 and 11	Obvious in view of Rosenstein in combination with Xu and Canny. Obvious in view of Nourbakhsh in combination with Tsutsumi. Obvious in view of the Neato Systemin combination with	Lack of Enablement under 35 U.S.C. § 112. Indefiniteness under 35 U.S.C. § 112. Non-statutory subject matter under 35 U.S.C. § 101.

Asserted Claims	Prior Art Grounds	Non-Prior Art Grounds
	Rosenstein in combination with Xu and Canny. Obvious in view of the Neato System in combination with Nourbakhsh in combination with Tsutsumi.	Unenforceability for Inequitable Conduct.

II. STATE OF THE ART PRIOR TO THE ASSERTED PATENTS[2]

The subject matter of the Asserted Claims was well understood to those of skill in the art as of the respective priority dates of the Asserted Patents. To describe the state of the art at the time of the alleged inventions, in addition to the references listed on the face of the Asserted Patents and those references listed in Section III and charted in Exhibits A1 through E13, Avidbots may rely on at least the references listed below and any admitted prior art discussed in the Asserted Patents and file histories[3] to describe the state of the art.

A. Prior Art Patents / Patent Publications

Patent / Publication No.	First Named Inventor	Date of Issue / Publication
U.S. Patent No. 5,111,401	Hobart Evertt Jr.	May 5, 1992
U.S. Patent No. 5,696,675	Kyoko Nakamura	Dec. 9, 1997
U.S. Patent No. 5,758,298	Jurgen Guldner	May 26, 1998

[2] To the extent that any prior art reference listed in §§ II.A–C was not disclosed by July 1, 2014, Avidbots is not contending herein that the reference reflected the state of the art at the time of the alleged invention of the '436 Patent.

[3] In accordance with LPR 3.1(b), the Avidbots's Prior Art Grounds of Invalidity of Brain's Asserted Claims rely only on the references listed in Section III.A, *infra*, which lists fewer than 25 references. Avidbots reserves the right to supplement these Contentions, including its grounds, in view of Avidbots's further investigation into the prior art, supplementation by or additional discovery from Brain, or orders of the Court. In addition, Avidbots reserves the right to rely on all references, including those listed in Sections II and III.A, in describing the state of the art.

Patent / Publication No.	First Named Inventor	Date of Issue / Publication
U.S. Patent No. 5,793,900	Illah Reza Nourbakhsh	Aug. 11, 1998
U.S. Patent No. 5,793,934	Rudolf Bauer	Aug. 11, 1998
U.S. Patent No. 6,667,592	Stephen Jacobs	Dec. 23, 2003
U.S. Patent No. 7,170,252	Akira Maeki	Jan. 30, 2007
U.S. Patent No. 7,502,065	Naoto Nakahara	Mar. 10, 2009
U.S. Patent No. 7,965,890	Eran Marcus	June 21, 2011
U.S. Patent No. 8,185,239	You-Wei Teng	May 22, 2012
U.S. Patent No. 8,300,890	Deepak Gaikwad	Oct. 30, 2012
U.S. Patent No. 8,542,875	Lalitha M. Eswara	Sept. 24, 2013
U.S. Patent No. 8,903,589	Boris Sofman	Dec. 2, 2014
U.S. Patent No. 8,918,241	Tien-Chen Chen	Dec. 23, 2014
U.S. Patent No. 8,948,913	Sunglok Choi	Feb. 3, 2015
U.S. Patent No. 8,954,191	Dong Hoon Yi	Feb. 10, 2015
U.S. Patent No. 9,076,214	Shohei Tsutsumi	Jul. 7, 2015 / Feb. 14, 2013
U.S. Patent No. 9,122,948	Jiajun Zhu	Sept. 1, 2015 / Oct. 5, 2011
U.S. Patent No. 9,174,672	Shuqing Zeng	Nov. 3, 2015
U.S. Patent No. 9,192,869	Toshio Moriya	Nov. 24, 2015
U.S. Patent No. 9,208,384	William Y. Conwell	Dec. 8, 2015 / Nov. 14, 2008
U.S. Patent No. 9,216,745	Paul A. Beardsley	Dec. 22, 2015
U.S. Patent No. 9,233,472	Colin Angle	Jan. 12, 2016
U.S. Patent No. 9,286,810	Ethan Eade	Mar. 15, 2016
U.S. Patent No. 9,304,001	Soon Yong Park	Apr. 5, 2016
U.S. Patent No. 9,380,922	Samuel Duffley	Jul. 5, 2016
U.S. Patent No. 9,400,501	Mark Schnittman	Jul. 26, 2016
U.S. Patent No. 9,404,756	Phillip Fong	Aug. 2, 2016
U.S. Patent No. 9,519,289	Mario Munich	Dec. 13, 2016 / May 26, 2016
U.S. Patent No. 9,534,899	Jens-Steffen Gutmann	Jan. 3, 2017 / May 30, 2013
U.S. Patent No. 9,538,892	Phillip Fong	Jan. 10, 2017 / Apr. 10, 2014
U.S. Patent No. 9,864,377	Bruce Welty	Jan. 9, 2018 / Apr. 1, 2016
U.S. Patent No. 9,910,444	Ethan Eade	Mar. 6, 2018/Jun. 2, 2016
U.S. Patent No. 9,952,053	Phillip Fong	Apr. 24, 2018 / Aug. 1, 2016
U.S. Patent No. 10,093,021	Aliakbar Aghamohammadi	Oct. 9, 2018 / Jun. 24, 2016
U.S. Patent No. 10,209,063	Peter Elving Anderson-Sprecher	Feb. 19, 2019 / Oct. 3, 2015
U.S. Patent No. 10,383,497	Seung-beom Han	Aug. 20, 2019
U.S. Patent No. 10,667,664	Faizan Sheikh	Jun. 2, 2020 / Oct. 27, 2016

Patent / Publication No.	First Named Inventor	Date of Issue / Publication
U.S. Patent No. 11,927,965	Ali Ebrahimi Afrouzi	Mar. 12, 2024 / Feb. 29, 2016
U.S. Patent Pub. 2004/0117079	Jarl Hulden	Jun. 17, 2004
U.S. Patent Pub. 2006/0188168	Vitaly S. Sheraizin	Aug. 24, 2006
U.S. Patent Pub. 2008/0059015	William Whittaker	Mar. 6, 2008
U.S. Patent Pub. 2008/0294338	Nakju Doh	Nov. 27, 2008
U.S. Patent Pub. 2012/0121161	Ethan Eade	May 17, 2012
EU Patent No. 1 240 562	Bret Wallach	Jun. 16, 2004
EU Patent No. 2 343 615	Shoji Tanaka	Oct. 31, 2018/Jul. 13, 2011
Japanese Patent Pub. No. 10206150A (also published as Japanese Patent No. 3265212)	Takashi Matsuyama	Aug. 7, 1998
Japanese Patent Pub. No. 2009216600	Shinya Oita	Sept. 24, 2009
Japanese Patent Pub. No. 2012-189874 (also published as Japanese Patent No. 5769455)	Yasuo Asakura	Oct. 4, 2012
KR Patent No. 101048098	Lee Do-heon	Jul. 11, 2011
KR Patent No. 10-2010-0027683	Le Do-heon	Mar. 11, 2010
WO 2011/146259 A2	Michael T. Rosenstein	Nov. 24, 2011
JP Patent App. No. 2009288930	Masaki Takahashi	Dec. 10, 2009
U.S. Patent Pub. No. 2015/0261223	Philip Fong	Sep. 17, 2015

B. Prior Art Publications

Citation	Publication Date
Basic Research Series: Optical Information Technology State-of-the-Art Report	1993
Bernard Feverjon et al., *A Local Based Approach for Path Planning of Manipulators with a High Number of Degrees of Freedom*, IEEE Int'l Conf. on Robotics and Automation	1987
Brett R. Fajen et al., *A Dynamical Model of Visually-Guided Steering, Obstacle Avoidance, and Route Selection*," Int'l J. of Comp. Vision, Vol. 54	2003
Christoph Rosmann et al., *Efficient Trajectory Optimization Using a Spares Model*, 2013 Eur. Conf. on Mobile Robots	Sep. 2013
Dave Ferguson et al., *Planning Long Dynamically Feasible Maneuvers for Autonomous Vehicles*, Int'l J. of Robotics Research, Vol. 28(8)	Jun. 26, 2009
David G. Lowe, *Object Recognition from Local Scale-Invariant Features*	1999

Citation	Publication Date
Dieter Fox et al., *The Dynamic Window Approach to Collision Avoidance*, IEEE Robotics and Automation Magazine, Vol. 4(1)	Apr. 1997
Francisco Amoros et al., *Global Appearance Applied to Visual Map Building and Path Estimation Using Multiscale Analysis*, Hindawi Publishing Corporation, Mathematical Problems in Engineering, Vol. 2014 Article ID 365417	Jul. 22, 2014
Garry Berkovic and Ehud Shafir, *Optical Methods for Distance and Displacement Measurements*	Sept. 11, 2012
Handbook of Optical Systems, Vol. 4: Survey of Optical Instruments	2008
Hani Safadi, *Local Path Planning Using Virtual Potential Field*, McGill University School of Computer Science	Apr. 18, 2007
J.M. Rueger, Electronic Distance Measurement, 3rd Ed.	1990
J.M. Rueger, Electronic Distance Measurement, 4th Ed.	1996
Kazushi Nakazawa et al., *Movement Control of Accompanying Robot Based on Artificial Potential Field Adapted to Dynamic Environments*, Elec. Engin. in Japan, Vol. 192	Feb. 2014
Khalid Yousif et al., *An Overview to Visual Odometry and Visual SLAM: Applications to Mobile Robotics,* Intell. Ind. Syst. Vol. 1, 289	Nov. 13, 2015
Laurent Itti, Christof Koch, and Ernst Niebur, *A Model of Saliency-Based Visual Attention for Rapid Scene Analysis*	Nov. 1998
Lina J. Karam, Nabil G. Sadaka, Rony Ferzli, and Zoran A. Ivanovski, *An Efficient Selective Perceptual-Based Super-Resolution Estimator*	Dec. 2011
Lu and Milios, *Globally Consistent Range Scan Alignment for Environment Mapping*, Autonomous robots, 4 Autonomous robots 333–49 (1997)	1997
Lu Yin et al., *A New Potential Field Method for Mobile Robot Path Planning in the Dynamic Environments*, Asian J. of Control, Vol. 11(2)	Mar. 2009
Matthias Nieuwenhuisen et al., *Predictive Potential Field-Based Collision Avoidance for Multicopters*, Remote Sensing and Spatial Information Sciences, Volume XL-1	Sep. 4, 2013
Mejdl Safran and Steven Haar, *Arduino and Android Powered Object Tracking Robot*	Nov. 27, 2012
Oscar Montiel et al., *Optimal Path Planning Generation for Mobile Robots Using Parallel Evolutionary Artificial Potential Field*, J. Intell. Robot Sys.	Sep. 20, 2014
Oussama Khatib, *Real-Time Obstacle Avoidance for Manipulators and Mobile Robots*, Int'l J. of Robotics Research, Vol. 5(1)	1986
P. Payeur, *Improving Robot Path Planning Efficiency with Probabilistic Virtual Environment Models*, IEEE Int'l Conf. on Virtual Environments	Jul. 2004
Peter Biber and Wolfgang Straßer, *nScan-Matching: Simultaneous Matching of Multiple Scans and Application to SLAM*, Proceedings 2006 IEEE International Conference on Robotics and Automation, 2006	2006
Pierre Melchior et al., *Robust Path Planning for Mobile Robot Based on Fractional Attractive Force*, 2009 American Control Conf.	Jun. 2009

Citation	Publication Date
Qian Jia & Xingsong Wang, *An Improved Potential Field Method for Path Planning*, 2010 Chinese Control and Decision Conference	2010
Qian Xu, Chaitali Chakrabarti, and Lina J. Karam, *A Distributed Canny Edge Detector and its Implementation on FGPA*	2011
Richard Szeliski, *Image Alignment and Stitching: A Tutorial*, Foundations and Trends in Computer Vol. 2	2006
Sean Quinlan & Oussama Khatib, *Elastic Bands: Connecting Path Planning and Control*, IEEE Int'l Conference on Robotics and Automation	1998
Srenivas Varadarajan and Lina J. Karam, *An Improved Perception-Based No-Reference Objective Image Sharpness Metric Using Iterative Edge Refinement*	2008
Srenivas Varadarajan, Chaitali Chakrabarti, Lina J. Karam, and Judit Martinez Bauza, *A Distributed Psycho-Visually Motivated Canny Edge Detector*	2010
Srenivas Varadarajan, Lina J. Karam, and Dinei Florencio, *Background Recovery from Video Sequences Using Motion Parameters*	2009
Stachniss et al., *Springer Handbook of Robotics, Chapter 46: Simultaneous Localization and Mapping*, Springer (2d ed.)	Jan. 1, 2016
Prassler et al., *Springer Handbook of Robotics, Chapter 65: Domestic Robots*, Springer (2d ed.)	Jan. 1, 2016
Suzuki and Abe, *Topological Structural Analysis of Digitized Binary Images by Border Following*	1983
Wang Tianmiao et al., *Mobile Robot Control Based on Dynamic Potential*, Chinese J. of Sys. Engin. & Elec. Vol. 3	Mar. 31, 1992
Ya-Chun Chang & Yoshio Yamamoto, *Path Planning of Wheeled Mobile Robot with Simultaneous Free Space Locating Capability*, Int'l Serv. Robotics	Nov. 25, 2008
Yong K. Hwang & Narenda Ahuja, *A Potential Field Approach to Path Planning*, IEEE Transactions on Robotics and Automation, Vol. 8(1)	Feb. 1992
Wolfgang Hess et al., *Real-time loop closure in 2D LIDAR SLAM*, 2016 IEEE Internation Conference on Robotics and Automation	May 16–21, 2016
Zhenyu Wu et al., *Collision Avoidance for Mobile Robots Based on Artificial Potential Field and Obstacle Envelope Modelling*, Assembly Automation, Vol 36(3)	Aug. 1, 2016
Kaiqi Huang, Liangsheng Wang, Tieniu Tan, and Steve Maybank, *A Real-Time Object Detecting and Tracking System for Outdoor Night Surveillance*	2008
Subramanian Saravankumar et al., *Multipoint potential field method for path planning of autonomous underwater vehicles in 3D space*, Intel Serv Robots 2013	Oct. 6, 2013
Javier Minguez et al., *Abstracting Vehicle Shape and Kinematic Constraints from Obstacle Avoidance Methods*, Autonomous Robots, Vol. 20(1)	Feb. 3, 2006

Citation	Publication Date
Alan Conrad Bovik, Marianna Clark, Wilson S. Geisler, *Multichannel Texture Analysis Using Localized Spatial Filters*	Jan. 1990
John Canny, *A Computational Approach to Edge Detection*, IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. PAMI-8, No.6	Nov. 1986
Edwin B. Olson, *Robust and Efficient Robotic Mapping*, Massachusetts Institute of Technology	2008
Giorgio Grisetti, et al, *Nonlinear Constraint Network Optimization for Efficient Map Learning*, 10 IEEE Transactions on Intelligent Transportation Systems 428	Sep., 2009
Edwin Olson, et al, *Fast Iterative Alignment of Pose Graphs with Poor Initial Estimates*, Proceedings of the 2006 IEE Conference on Robotics and Automation	May, 2006
John Folkesson and Henrik I. Christensen, *Closing the Loop with Graphical SLAM*, 23 IEEE Transactions on Robotics 731	Aug., 2007
Carlos Estrada, et al, *Hierarchical SLAM: Real-Time Accurate Mapping of Large Environments*, 21 IEEE Transactions on Robotics 588	Aug., 2005
Tim Bailey and Hugh Durrant-Whyte, *Simultaneous Localization and Mapping (SLAM): Part II*, IEEE Robotics & Optimization Magazine	Sep. 2006
Seongsoo Lee and Sukhan Lee, *Embedded visual SLAM: Applications for low-cost consumer robots*, 20 IEEE Robotics & Automation Magazine 83	2013
J.A. Castellanos, J. Montiel, J. Neira, J.D Tardos, *The SPmap: A probabilistic framework for simultaneous localization and map building*, 15(5) IEEE Trans. Robotics and Automation 948–952	1999
J. Scholz, S. Chitta, B. Marthi, M. Likhachev, *Cart Pushing with a Mobile Manipulation System: Towards Navigation with Moveable Objects*, IEEE International Conference on Robotics and Automation 6115-6120	2011

C. Prior Art Systems

Product / System
Neato XV-11
Neato XV Signature Pro
iRobot Roomba 880
Kärcher RoboCleaner RC3000
The Dottie
Orazio
iRobot Scooba
Kiva Systems (n/k/a Amazon Robotics)
Locus Robotics
Google Self-Driving Car Project (n/k/a Waymo)
BMW M235i

Product / System
Avidbots ARS-2[4]
Avidbots Neo[5]

[4] Avidbots contends that none of its accused products infringes Brain's Asserted Claims. *See, e.g.*, Exs. A0, B0, C0, D0, and E0 to Avidbots Initial Non-Infringement and Invalidity Contentions, dated April 14, 2025. In view of Brain's allegations of infringement, however, and as set forth in Exs. A0, B0, C0, D0, and E0 to Avidbots's Initial Non-Infringement and Invalidity Contentions, to the extent any accused Avidbots product is deemed to infringe any Asserted Claims of this patent, the Avidbots ARS-2 and/or Avidbots Neo systems predate such patent and may anticipate and/or render obvious (alone or in combination with other prior art cited herein) such claims under Brain's theory of infringement. *See, e.g.*, AVID0022656 (discussing the first sale of the ARS-2 in October 2015 in an email); AVID0022657–2675 (discussing the first sale of the ARS-2 in October 2015 in a presentation); AVID0007900–7902 (describing a public demonstration of the Neo in Rochester, NY, in October 2016); AVID0022481–23064 (disclosing functions of Avidbots's prior art systems). Additional information is set forth in the claim charts attached as exhibits to Avidbots Second Supplemental Non-Infringement and Invalidity Contentions for the Avidbots ARS-2 and Avidbots Neo, Exs. A12, B11, C8, and D8. Moreover, Avidbots produced for inspection on the source code review machine prior art / prior use source code for either or both of these systems (including versions 0.0.7, 1.0.0.rc0.160906, 1.0.rc1.161004, and 1.0.0) on May 12, 2025 (*see* Avidbots (Jalali) 5/12/25 email to Brain), and loaded additional versions 0.0.13.rc.160222, 0.0.13, and 0.0.15 onto the review machine on June 18, 2025. As Brain's infringement contentions remain deficient, including for failing to set forth a coherent infringement theory for any Asserted Claim (including by proper reference to Avidbots source code) (*id.*, § VII, Exs. A0–E0), Avidbots is unable to provide fulsome claim charts reflecting such invalidity in view of Brain's infringement theories. Indeed, Brain requested its first printouts of Avidbots source code on May 29, 2025, more than two months after Brain first inspected the Avidbots code on March 25, 2025, and no such code was yet reflected in Brain's infringement contentions by the time of Avidbots's Second Supplemental Contentions. Nonetheless, on July 23, 2025, Brain demanded that Avidbots provide invalidity claim charts for the Avidbots ARS-2 and Avidbots Neo. (*See* Brain (Loebbaka) 7/23/25 email to Avidbots.) In response, and in a good-faith effort to avoid a dispute, Avidbots promised to provide invalidity claim charts for the prior art Avidbots ARS-2 and Neo by August 27, 2025, despite Avidbots's objections, provided that those charts need not provide any greater detail as to the Avidbots prior art robots than Brain's initial infringement claim charts provided for the accused Avidbots robots. (*See* Avidbots (Jalali) 7/31/25 email to Brain.)

[5] *See supra* note 4.

III. PRIOR ART INVALIDITY GROUNDS

Avidbots contends that the Asserted Claims are invalid as anticipated by the prior art under 35 U.S.C. § 102 and/or as obvious in view of the prior art, the knowledge of a person having ordinary skill in the art, and/or secondary factors of obviousness under 35 U.S.C. § 103.

A. Asserted Prior Art

In accordance with Local Patent Rule 3.1(b), Avidbots identifies the following prior art now known to Avidbots that anticipates or render obvious each of the Asserted Claims of the Asserted Patents, as set forth in the Prior Art Grounds identified in Section I.G, *supra*, and as further explained in this Section. Each of the following patents, publications, systems, and products is prior art under at least 35 U.S.C. §§ 102(a)(1) or (2), as applicable, to the corresponding Asserted Patent. Avidbots's reliance on each prior art reference below includes the reference itself, anything incorporated by the reference, and any testimony by those with knowledge of the reference, such as named authors and inventors.

Exhibits	Reference	Type
A-14 B-13	U. S. Patent No. 9,216,745 ("Beardsley")	Patent
A-13 B-12	Chang, Ya-Chun, Yamamoto, Yoshio, On-line path planning strategy integrated with collision and dead-lock voidance schemes for wheeled mobile robot in indoor environments, Industrial Robot, An International Journal 35(5) 421-34 (2008) ("Yamamoto")	Non-Patent Literature
A-16 B-15	O. Khatib, "Real-Time Obstacle Avoidance For Manipulators and Mobile Robots," 5 Int'l J. of Robotics Research 90–98 (1986) ("Khatib")	Non-Patent Literature
A-16 B-15	J.A. Castellanos, J. Montiel, J. Neira, J.D Tardos, "The SPmap: A probabilistic framework for simultaneous localization and map building," 15(5) IEEE Trans. Robotics and Automation 948–952 (1999) ("Castellanos")	Non-Patent Literature
A-16 B-15	J. Scholz, S. Chitta, B. Marthi and M. Likhachev, "Cart pushing with a mobile manipulation system: Towards navigation with	Non-Patent Literature

Exhibits	Reference	Type
	moveable objects," IEEE International Conference on Robotics and Automation 6115-6120 (2011) ("Scholz")	
A-12 B-11	Avidbots System Art[6]	System
C-1 D-1	Stachniss et al., *Springer Handbook of Robotics, Chapter 46: Simultaneous Localization and Mapping*, Springer (2d ed.) (Jan. 1, 2016) ("Stachniss")	Non-Patent Literature
D-11	Prassler et al., *Springer Handbook of Robotics, Chapter 65: Domestic Robots,* Springer (2d ed.) (Jan. 1, 2016) ("Prassler")	Non-Patent Literature
C-3 D-10	U.S. Patent No. 9,538,892 ("Fong (892)")	Patent

[6] The Avidbots System Art includes Avidbots's system prior art that Avidbots understands to have been patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the '780 patent, see Avidbots's First Supplemental Invalidity Contentions, § III.B.1.C, and therefore qualifies as prior art under at least 35 U.S.C. §§ 102(a)(1) and (2). Specifically, the designated Exhibits address the Avidbots ARS-2 and the Avidbots Neo. The Avidbots ARS-2 refers to an autonomous commercial floor cleaner that was in public use and/or on sale by at least October 21, 2015. For example, the ARS-2 was publicly displayed at the ISSA/Interclean 2015 showcase in Las Vegas, Nevada, for three days, from October 21 to October 23, 2015, prior to the filing of the '780 patent on November 2, 2016. ISSA/Interclean Exhibitor List & Floor Plan, https://www.cleanlink.com/sm/graphics/15/09/sm0915.pdf at pg. 69, last accessed May 15, 2025. Avidbots negotiated and executed its first sale of the ARS-2 on the third day of that event, on October 23, 2015. AVID0007849–AVID0007850. The ARS-2 was also publicly demonstrated at Mohawk College of Applied Arts and Technology in Hamilton, Ontario, Canada, and deployed at the college for two weeks, from December 8 to December 21, 2015. AVID0022649–AVID0022655. Mohawk College employees witnessed and graded the performance of the ARS-2's automated coverage, cleaning quality, ease of use, and safety. AVID0022653. Avidbots also gave Mohawk College employee Keith Brewster a tutorial on mapping using the ARS-2. AVID0022649. The Avidbots Neo refers to an autonomous commercial floor cleaner that was in public use and/or on sale by at least August 24, 2016, prior to the filing of the '780 patent on November 2, 2016. For example, the Neo was publicly demonstrated at the Avidbots Headquarters in Ontario, Canada, on August 24, 2016, to employees of the Rochester Institute of Technology (RIT). AVID0517413–AVID0517414. RIT requested this demonstration through Avidbots's web portal on July 9, 2016. AVID0517411. Avidbots followed this demonstration in Ontario with another public demonstration, this time on-site at RIT, in Rochester, New York, in or around October 4, 2016. AVID0031247, at -255. It was also publicly demonstrated in Indianapolis, Indiana, from October 17 to October 20, 2016, for representatives for Simon Properties. Id.

Exhibits	Reference	Type
C-9 D-9	Edwin B. Olson, *Robust and Efficient Robotic Mapping*, Massachusetts Institute of Technology (2008) ("Olson")	Non-Patent Literature
C-10 D-12	iRobot Roomba 980 ("Roomba 980")[7]	System
E-5	U.S. Patent No. 9,076,214 ("Tsutsumi")	Patent
E-9	WO 2011/146259 A2 ("Rosenstein")	Patent
E-10	Qian Xu, *A Distributed Canny Edge Detector and its Implementation on FPGA*, Proceedings of the IEEE Digital Signal Processing Workshop (Jan. 4, 1986) ("Xu")	Non-Patent Literature
E-11	U.S. Patent No. 5,793,900 ("Nourbakhsh")	Patent
E-12	John Canny, *A Computational Approach to Edge Detection*, IEEE Transactions on Pattern Analysis and Machine Intelligence (Nov. 1986) ("Canny")	Non-Patent Literature
E-13	Neato XV-11 System Art [8]	System

[7] The iRobot Roomba 980 system was in public use, on sale, or otherwise available to the public before the effective filing date of the '325 patent. For example, iRobot announced the release of the Roomba on September 16, 2015. iRobot/Avidbots_000001, -001–004; see also PR Newswire, iRobot Enters the Smart Home with Roomba® 980 Vacuum Cleaning Robot, https://www.prnewswire.com/news-releases/irobot-enters-the-smart-home-with-roomba-980-vacuum-cleaning-robot-300144318.html (Sep. 16, 2015). iRobot published videos displaying the Roomba 980, for example demonstrating sensor maintenance and battery charging, by September 16, 2025. See, e.g., Sensor Maintenance | Roomba® 980 | iRobot®, YOUTUBE, https://www.youtube.com/watch?v=lmCWkMl54Wo (Sep. 16, 2015); Charging the Roomba Batter | Roomba® 980 | iRobot®, YOUTUBE, https://www.youtube.com/watch?v=IjImAZFGQUU (Sep. 16, 2015). Reviews of the Roomba 980 were available online by October 7, 2015. See, e.g., The New iRobot ROOMBA 980 – Unboxing and Setup, YOUTUBE, https://www.youtube.com/watch?v=JAi5VvW4hzg (Oct. 7, 2015); Roomba 980 Vacuum (iRobot): Unboxing and Setup Review, YOUTUBE, https://www.youtube.com/watch?v=n3fGEdRojsE (Nov. 14, 2025); Roomba 980 Review, YOUTUBE, https://www.youtube.com/watch?v=sgLn00zKTEU (Dec. 5, 2015).

[8] The Neato system was in public use, on sale, or otherwise available to the public before the effective filing date of the '325 patent. For example, as evidenced by the Neato Website archived www.neatorobotics.com website (https://web.archive.org/web/20100123082827/http://www.neatorobotics.com:80/buy.html) it was in public use and/or on sale at least by January 23, 2010. The Neato Manual is prior art under 35 U.S.C. § 102(a) because it was published at least by September 23, 2010 as evidenced by

(Cont'd on next page)

admission or concession that it does not apply. To the contrary, the discussion below simply provides more explanation of these specific rationales.

C. Prior Art Invalidity of U.S. Patent No. 10,001,780

Each Asserted Claim of the '780 Patent is invalid at least in view of the prior art invalidity grounds outlined in this section.

Further, Avidbots has filed Petitions for Inter Partes Review ("IPR") with the United States Patent and Trademark Office ("PTO"), seeking to invalidate all claims in each of the five Brain patents that are at issue in this lawsuit. ECF 104; Case No. IPR2025-01600 (Petition for IPR of the '780 Patent); IPR2025-01601 (Petition for IPR of the '539 Patent); Case No. IPR2025-01602 (Petition for IPR of the '325 Patent); Case No. IPR2025-01603 (Petition for IPR of the '576 Patent); IPR2025-01604 (Petition for IPR of the '436 Patent). To the extent that the grounds set forth in this are the same or similar to those laid out in Avidbots's Petitions for IPR of Brain's Asserted Patents, those Petitions and all supporting documents attached thereto, including motivations to combine, are incorporated by reference in this section as if fully set forth herein.

In light of Brain's deficient infringement contentions, Avidbots reserves the right to amend these contentions as Brain's positions in this case (and/or the known facts of the case) develop. Avidbots further reserves the right to amend these contentions in response to a ruling from the Court, including any Claim Construction. Such amendment may include, without limitation, inclusion or substitution of different references, whether now known or unknown, and identification of further disclosures within the references described below and in the exhibits to these Final Contentions wherein each element of the Asserted Claims of the '780 Patent are found.

1. Asserted Prior Art and Grounds

Avidbots identifies in the table below prior art now known to Avidbots that anticipates and/or renders obvious the Asserted Claims of the '780 Patent. Each of the following patents,

publications, systems, and products is prior art under at least 35 U.S.C. §§ 102(a)(1) or (2), as applicable. Avidbots's reliance on each prior art reference below includes the reference itself, anything incorporated by the reference, and any testimony by those with knowledge of the reference, such as named authors and inventors.

The exhibits listed in the table below are charts setting forth where in the prior art references each element of the Asserted Claims of the '780 Patent are found.

Exhibit[19]	Reference
A-14	U. S. Patent No. 9,216,745 ("Beardsley")
A-13	Chang, Ya-Chun, Yamamoto, Yoshio, On-line path planning strategy integrated with collision and dead-lock voidance schemes for wheeled mobile robot in indoor environments, Industrial Robot, An International Journal 35(5) 421-34 (2008) ("Yamamoto")
A-16	O. Khatib, "Real-Time Obstacle Avoidance For Manipulators and Mobile Robots," 5 Int'l J. of Robotics Research 90–98 (1986) ("Khatib")
A-16	J.A. Castellanos, J. Montiel, J. Neira, J.D Tardos, "The SPmap: A probabilistic framework for simultaneous localization and map building," 15(5) IEEE Trans. Robotics and Automation 948–952 (1999) ("Castellanos")
A-16	J. Scholz, S. Chitta, B. Marthi and M. Likhachev, "Cart pushing with a mobile manipulation system: Towards navigation with moveable objects," IEEE International Conference on Robotics and Automation 6115-6120 (2011) ("Scholz")
A-12	Avidbots System Art

Avidbots further identifies that these references form the following invalidity grounds for each of the Asserted Claims of the '780 Patent.

[19] These Final Invalidity Contentions include any exhibits served herewith as well as any exhibits referenced herein and previously served on Brain, such as any exhibits (including claim charts) served with Avidbots's Initial Non-Infringement and Invalidity Contentions or any supplements or amendments thereto, *e.g.*, on April 14, 2025, June 4, 2025, August 27, 2025, and January 7, 2026.

Ground No.	Type	Reference(s)	Claims
1	Obviousness	Beardsley in combination with Castellanos.	8, 9, 12, 13, 17, 18
2	Obviousness	Beardsley in combination with Castellanos and Khatib.	8, 9, 12, 13, 17, 18
3	Obviousness	Yamamoto in combination with Khatib and Beardsley.	8, 9, 12, 13, 17, 18
4	Obviousness	Avidbots System Art in combination with Beardsley, Khatib, and Scholz.	8, 9, 12, 13, 17, 18

2. Obviousness (Grounds 1–4)

a. Level of Ordinary Skill in the Art

A person of ordinary skill in the art at the time of the earliest effective filing date of the '780 Patent would have had a Bachelor's degree or higher in electrical or computer engineering (or equivalent discipline) and at least two years' experience in research, design and/or development of autonomous robotics and/or robotic mapping/navigation and/or mechanical engineering and/or a related field. Additional education could substitute for experience, and vice versa.

b. Scope and Content of the Prior Art

The background state of the art includes that which is set forth in the patent, the file history, and the prior art references disclosed herein. For example, the '780 Patent generally relates to route planning via the use of sensors to learn and detect things about the environment. In some embodiments, these routes are planned by autonomous robots. See '780 Patent, Abstract. As shown by the prior references disclosed herein and by those set forth in the '780 Patent and file history, autonomous robotic route planning, including the use of sensors to gather data on the environment and update a route, was well-known as the asserted priority date of the '780 Patent.

c. Motivations to Combine Prior Art

A person of ordinary skill in the art would have been motivated to combine the identified prior art to form the grounds listed in Section III.C.1. *See also* IPR2025-1603, Paper 1 and

Moreover, Brain's vague allegations on long-felt need, commercial success, industry recognition, and copying are untethered to the Asserted Claims. Brain establishes no nexus between the claims and any of the alleged secondary indicia of non-obviousness. Thus, Avidbots disagree that these are evidence of secondary considerations of nonobviousness tied to the Challenged Claims. To the extent Brain alleges that any secondary considerations of non-obviousness are tied to the Challenged Claims, Avidbots reserves the right to address such allegations. In any event, where, as here, there is a strong showing of obviousness, the Federal Circuit has held that even relevant secondary considerations supported by substantial evidence do not dislodge the primary conclusion of obviousness. *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1344 (Fed. Cir. 2013).

3. Prior Art Date

U.S. Application No. 15/341,612 (hereinafter, "the '612 application"), which led to the '780 Patent, was filed on November 2, 2016. To the extent that Plaintiff asserts that the '780 Patent is entitled to an earlier priority date based on any provisional application, or that certain references are not prior art due to a disclosure under 35 U.S.C. § 102(b)(1)(B), Plaintiff has the burden of proof and has not demonstrated an earlier priority date. *See* § I.A, *supra*.

D. Prior Art Invalidity of U.S. Patent No. 10,379,539

Each Asserted Claim of the '539 Patent is invalid at least in view of the prior art invalidity grounds outlined in this section.

Further, Avidbots has filed Petitions for Inter Partes Review ("IPR") with the United States Patent and Trademark Office ("PTO"), seeking to invalidate all claims in each of the five Brain patents that are at issue in this lawsuit. ECF 104; Case No. IPR2025-01600 (Petition for IPR of the '780 Patent); IPR2025-01601 (Petition for IPR of the '539 Patent); Case No. IPR2025-01602 (Petition for IPR of the '325 Patent); Case No. IPR2025-01603 (Petition for IPR of the '576

Patent); IPR2025-01604 (Petition for IPR of the '436 Patent). To the extent that the grounds set forth in this are the same or similar to those laid out in Avidbots's Petitions for IPR of Brain's Asserted Patents, those Petitions and all supporting documents attached thereto, including motivations to combine, are incorporated by reference in this section as if fully set forth herein.

In light of Brain's deficient infringement contentions, Avidbots reserves the right to amend these contentions as Brain's positions in this case (and/or the known facts of the case) develop. Avidbots further reserves the right to amend these contentions in response to a ruling from the Court, including any Claim Construction. Such amendment may include, without limitation, inclusion or substitution of different references, whether now known or unknown, and identification of further disclosures within the references described below and in the exhibits to these Final Contentions wherein each element of the Asserted Claims of the '539 Patent are found.

1. Asserted Prior Art and Grounds

Avidbots identifies in the table below prior art now known to Avidbots that anticipates and/or renders obvious the Asserted Claims of the '539 Patent. Each of the following patents, publications, systems, and products is prior art under at least 35 U.S.C. §§ 102(a)(1) or (2), as applicable. Avidbots's reliance on each prior art reference below includes the reference itself, anything incorporated by the reference, and any testimony by those with knowledge of the reference, such as named authors and inventors.

The exhibits listed in the table below are charts setting forth where in the prior art references each element of the Asserted Claims of the '539 Patent are found.

Exhibit[20]	Reference
B-13	U.S. Patent No. 9,216,745 ("Beardsley")

[20] *See supra* note 19.

Exhibit[20]	Reference
B-12	Chang, Ya-Chun, Yamamoto, Yoshio, On-line path planning strategy integrated with collision and dead-lock voidance schemes for wheeled mobile robot in indoor environments, Industrial Robot, An International Journal 35(5) 421-34 (2008) ("Yamamoto")
B-15	O. Khatib, "Real-Time Obstacle Avoidance For Manipulators and Mobile Robots," 5 Int'l J. of Robotics Research 90–98 (1986) ("Khatib")
B-15	J.A. Castellanos, J. Montiel, J. Neira, J.D Tardos, "The SPmap: A probabilistic framework for simultaneous localization and map building," 15(5) IEEE Trans. Robotics and Automation 948–952 (1999) ("Castellanos")
B-15	J. Scholz, S. Chitta, B. Marthi and M. Likhachev, "Cart pushing with a mobile manipulation system: Towards navigation with moveable objects," IEEE International Conference on Robotics and Automation 6115-6120 (2011) ("Scholz")
B-11	Avidbots System Art

Avidbots further identifies that these references form the following invalidity grounds for each of the Asserted Claims of the '539 Patent.

Ground No.	Type	Reference(s)	Claims
1	Obviousness	Obvious in view of Beardsley in combination with Castellanos.	1, 3, 4, 6
2	Obviousness	Obvious in view of Beardsley in combination with Castellanos and Khatib.	1, 3, 4, 6
3	Obviousness	Obvious in view of Yamamoto in combination with Khatib.	1, 4, 6
4	Obviousness	Obvious in view of Beardsley in combination with Castellanos and Scholz.	3
5	Obviousness	Obvious in view of Avidbots System Art in combination with Beardsley, Khatib, and Scholz.	1, 3, 4, 6

Challenged Claims. To the extent Brain alleges that any secondary considerations of non-obviousness are tied to the Challenged Claims, Avidbots reserves the right to address such allegations. In any event, where, as here, there is a strong showing of obviousness, the Federal Circuit has held that even relevant secondary considerations supported by substantial evidence do not dislodge the primary conclusion of obviousness. *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1344 (Fed. Cir. 2013).

3. Prior Art Date

U.S. Application No. 16/011,499 (hereinafter, "the '499 application"), which led to the '539 Patent, was filed on June 18, 2018. The '499 application purports to be a continuation of and claim priority to the '612 application, which was filed on November 2, 2016. Plaintiff asserts that the '539 Patent is entitled to a priority date based on the '612 application, but Plaintiff has the burden of proof. To the extent that Plaintiff asserts that the '539 Patent is entitled to an earlier priority date based on any provisional application, or that certain references are not prior art due to a disclosure under 35 U.S.C. § 102(b)(1)(B), Plaintiff has the burden of proof and has not demonstrated an earlier priority date. *See* § I.A, *supra*.

E. Prior Art Invalidity of U.S. Patent No. 10,379,325

Each Asserted Claim of the '325 Patent is invalid at least in view of the prior art invalidity grounds outlined in this section.

Further, Avidbots has filed Petitions for Inter Partes Review ("IPR") with the United States Patent and Trademark Office ("PTO"), seeking to invalidate all claims in each of the five Brain patents that are at issue in this lawsuit. ECF 104; Case No. IPR2025-01600 (Petition for IPR of the '780 Patent); IPR2025-01601 (Petition for IPR of the '539 Patent); Case No. IPR2025-01602 (Petition for IPR of the '325 Patent); Case No. IPR2025-01603 (Petition for IPR of the '576 Patent); IPR2025-01604 (Petition for IPR of the '436 Patent). To the extent that the grounds set

forth in this section are the same or similar to those laid out in Avidbots's Petitions for IPR of Brain's Asserted Patents, those Petitions and all supporting documents attached thereto, including motivations to combine, are incorporated by reference in this section as if fully set forth herein.

In light of Brain's deficient infringement contentions, Avidbots reserves the right to amend these contentions as Brain's positions in this case (and/or the known facts of the case) develop. Avidbots further reserves the right to amend these contentions in response to a ruling from the Court, including any Claim Construction. Such amendment may include, without limitation, inclusion or substitution of different references, whether now known or unknown, and identification of further disclosures within the references described below and in the exhibits to these Final Contentions wherein each element of the Asserted Claims of the '325 Patent are found.

1. Asserted Prior Art and Grounds.

Avidbots identifies in the table below prior art now known to Avidbots that anticipates and/or renders obvious the Asserted Claims of the '325 Patent. Each of the following patents, publications, systems, and products is prior art under at least 35 U.S.C. §§ 102(a)(1) or (2), as applicable. Avidbots's reliance on each prior art reference below includes the reference itself, anything incorporated by the reference, and any testimony by those with knowledge of the reference, such as named authors and inventors.

The exhibits listed in the table below are charts setting forth where in the prior art references each element of the Asserted Claims of the '325 Patent are found.

Exhibit[21]	Reference
C-1	Stachniss et al., *Springer Handbook of Robotics, Chapter 46: Simultaneous Localization and Mapping*, Springer (2d ed.) (Jan. 1, 2016) ("Stachniss")
C-3	U.S. Patent No. 9,538,892 ("Fong (892)")

[21] *See supra* note 19.

Exhibit[21]	Reference
C-9	Edwin B. Olson, *Robust and Efficient Robotic Mapping*, Massachusetts Institute of Technology (2008) ("Olson")
C-10	iRobot Roomba 980 ("Roomba 980")

Avidbots further identifies that these references form the following invalidity grounds for each of the Asserted Claims of the '325 Patent.

Ground No.	Type	Reference(s)	Claims
1	Anticipation	Olson.	1, 5, 14
2	Obviousness	Olson in combination with Fong (892).	1, 5, 14
3	Obviousness	Stachniss in combination with Fong (892).	1, 5, 14
4	Obviousness	The iRobot Roomba 980 in combination with Olson.	1, 5, 14

2. Anticipation (Ground 1)

Each of the Asserted Claims of the '325 Patent are anticipated by Olson for the reasons laid out in Exhibit C-9. To the extent that any limitation is not explicitly disclosed by Olson, that limitation is disclosed inherently and/or would have been within the common knowledge of a person of ordinary skill in the art.

3. Obviousness (Grounds 2–4)

a. Level of Ordinary Skill in the Art

A person of ordinary skill in the art at the time of the earliest effective filing date of the '325 Patent would have had a Bachelor's degree in Computer Science, Electrical Engineering Mechanical Engineering, or an equivalent discipline, and at least two years' experience in research, design and/or development of autonomous robotics and/or robotic mapping/navigation and/or mechanical engineering and/or a related field. Additional education could substitute for experience, and vice versa.

Moreover, Brain's vague allegations on long-felt need, commercial success, industry recognition, and copying are untethered to the Asserted Claims. Brain establishes no nexus between the claims and any of the alleged secondary indicia of non-obviousness. Thus, Avidbots disagree that these are evidence of secondary considerations of nonobviousness tied to the Challenged Claims. To the extent Brain alleges that any secondary considerations of non-obviousness are tied to the Challenged Claims, Avidbots reserves the right to address such allegations. In any event, where, as here, there is a strong showing of obviousness, the Federal Circuit has held that even relevant secondary considerations supported by substantial evidence do not dislodge the primary conclusion of obviousness. *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1344 (Fed. Cir. 2013).

4. Prior Art Date

U.S. Application No. 15/340,807 (hereinafter, "the '807 application"), which led to the '325 Patent, was filed on November 1, 2016. To the extent that Plaintiff asserts that the '325 Patent is entitled to an earlier priority date based on any provisional application, or that certain references are not prior art due to a disclosure under 35 U.S.C. § 102(b)(1)(B), Plaintiff has the burden of proof and has not demonstrated an earlier priority date. *See* § I.A, *supra*.

F. Prior Art Invalidity of U.S. Patent No. 10,823,576

Each Asserted Claim of the '576 Patent is invalid at least in view of the prior art invalidity grounds outlined in this section.

Further, Avidbots has filed Petitions for Inter Partes Review ("IPR") with the United States Patent and Trademark Office ("PTO"), seeking to invalidate all claims in each of the five Brain patents that are at issue in this lawsuit. ECF 104; Case No. IPR2025-01600 (Petition for IPR of the '780 Patent); IPR2025-01601 (Petition for IPR of the '539 Patent); Case No. IPR2025-01602 (Petition for IPR of the '325 Patent); Case No. IPR2025-01603 (Petition for IPR of the '576

Patent); IPR2025-01604 (Petition for IPR of the '436 Patent). To the extent that the grounds set forth in this are the same or similar to those laid out in Avidbots's Petitions for IPR of Brain's Asserted Patents, those Petitions and all supporting documents attached thereto, including motivations to combine, are incorporated by reference in this section as if fully set forth herein.

In light of Brain's deficient infringement contentions, Avidbots reserves the right to amend these contentions as Brain's positions in this case (and/or the known facts of the case) develop. Avidbots further reserves the right to amend these contentions in response to a ruling from the Court, including any Claim Construction. Such amendment may include, without limitation, inclusion or substitution of different references, whether now known or unknown, and identification of further disclosures within the references described below and in the exhibits to these Final Contentions wherein each element of the Asserted Claims of the '576 Patent are found.

1. Asserted Prior Art and Grounds

Avidbots identifies in the table below prior art now known to Avidbots that anticipates and/or renders obvious the Asserted Claims of the '576 Patent. Each of the following patents, publications, systems, and products is prior art under at least 35 U.S.C. §§ 102(a)(1) or (2), as applicable. Avidbots's reliance on each prior art reference below includes the reference itself, anything incorporated by the reference, and any testimony by those with knowledge of the reference, such as named authors and inventors.

The exhibits listed in the table below are charts setting forth where in the prior art references each element of the Asserted Claims of the '325 Patent are found.

Exhibit[22]	Reference
D-1	Stachniss et al., *Springer Handbook of Robotics, Chapter 46: Simultaneous Localization and Mapping*, Springer (2d ed.) (Jan. 1, 2016) ("Stachniss")
D-9	Edwin B. Olson, *Robust and Efficient Robotic Mapping*, Massachusetts Institute of Technology (2008) ("Olson")
D-10	U.S. Patent No. 9,538,892 ("Fong (892)")
D-11	Prassler et al., *Springer Handbook of Robotics, Chapter 65: Domestic Robots,* Springer (2d ed.) ("Prassler")
D-12	iRobot Roomba 980 ("Roomba 980")

Avidbots further identifies that these references form the following invalidity grounds for each of the Asserted Claims of the '576 Patent.

Ground No.	Type	Reference(s)	Claims
1	Anticipation	Olson.	17, 21, 22, 23
2	Obviousness	Olson in combination with Fong (892).	12, 17, 21, 22, 23
3	Obviousness	Stachniss in combination with Prassler.	12, 17, 21, 22, 23
4	Obviousness	Stachniss in combination with Fong (892).	12
5	Obviousness	Roomba in combination with Olson and Fong (892).	12, 17, 21, 22, 23

2. Anticipation (Ground 1)

Each of the Asserted Claims of the '576 Patent, excepting claim 12, are anticipated by Olson for the reasons laid out in Exhibit D-9. To the extent that any limitation is not explicitly disclosed by Olson, that limitation is disclosed inherently and/or would have been within the common knowledge of a person of ordinary skill in the art.

[22] *See supra* note 19.

Challenged Claims. To the extent Brain alleges that any secondary considerations of non-obviousness are tied to the Challenged Claims, Avidbots reserves the right to address such allegations. In any event, where, as here, there is a strong showing of obviousness, the Federal Circuit has held that even relevant secondary considerations supported by substantial evidence do not dislodge the primary conclusion of obviousness. *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1344 (Fed. Cir. 2013).

4. Prior Art Date

U.S. Application No. 16/356,160 (hereinafter, "the '160 application"), which led to the '576 Patent, was filed on March 18, 2019. The '160 application is a continuation of and purports to claim priority to the '807 application, which was filed on November 1, 2016. To the extent that Plaintiff asserts that the '576 Patent is entitled to an earlier priority date based on any provisional application, or that certain references are not prior art due to a disclosure under 35 U.S.C. § 102(b)(1)(B), Plaintiff has the burden of proof and has not demonstrated an earlier priority date. *See* § I.A, *supra*.

G. Prior Art Invalidity of U.S. Patent No. 10,728,436

Each Asserted Claim of the '436 Patent is invalid at least in view of the prior art invalidity grounds outlined in this section.

Further, Avidbots has filed Petitions for Inter Partes Review ("IPR") with the United States Patent and Trademark Office ("PTO"), seeking to invalidate all claims in each of the five Brain patents that are at issue in this lawsuit. ECF 104; Case No. IPR2025-01600 (Petition for IPR of the '780 Patent); IPR2025-01601 (Petition for IPR of the '539 Patent); Case No. IPR2025-01602 (Petition for IPR of the '325 Patent); Case No. IPR2025-01603 (Petition for IPR of the '576 Patent); IPR2025-01604 (Petition for IPR of the '436 Patent). To the extent that the grounds set forth in this are the same or similar to those laid out in Avidbots's Petitions for IPR of Brain's

Asserted Patents, those Petitions and all supporting documents attached thereto, including motivations to combine, are incorporated by reference in this section as if fully set forth herein.

In light of Brain's deficient infringement contentions, Avidbots reserves the right to amend these contentions as Brain's positions in this case (and/or the known facts of the case) develop. Avidbots further reserves the right to amend these contentions in response to a ruling from the Court, including any Claim Construction. Such amendment may include, without limitation, inclusion or substitution of different references, whether now known or unknown, and identification of further disclosures within the references described below and in the exhibits to these Final Contentions wherein each element of the Asserted Claims of the '436 Patent are found.

1. Asserted Prior Art and Grounds

Avidbots identifies in the table below prior art now known to Avidbots that anticipates and/or renders obvious the Asserted Claims of the '436 Patent. Each of the following patents, publications, systems, and products is prior art under at least 35 U.S.C. §§ 102(a)(1) or (2), as applicable. Avidbots's reliance on each prior art reference below includes the reference itself, anything incorporated by the reference, and any testimony by those with knowledge of the reference, such as named authors and inventors.

The exhibits listed in the table below are charts setting forth where in the prior art references each element of the Asserted Claims of the '325 Patent are found.

Exhibit[23]	Reference
E-5	U.S. Patent No. 9,076,214 ("Tsutsumi")
E-9	WO 2011/146259 A2 ("Rosenstein")

[23] *See supra* note 19.

Exhibit[23]	Reference
E-10	Qian Xu, *A Distributed Canny Edge Detector and its Implementation on FPGA*, Proceedings of the IEEE Digital Signal Processing Workshop (Jan. 4, 2011) ("Xu")
E-11	U.S. Patent No. 5,793,900 ("Nourbakhsh")
E-12	John Canny, *A Computational Approach to Edge Detection*, IEEE Transactions on Pattern Analysis and Machine Intelligence (Nov. 1986) ("Canny")
E-13	Neato XV-11 System Art ("Neato System Art")

Avidbots further identifies that these references form the following invalidity grounds for each of the Asserted Claims of the '576 Patent.

Ground No.	Type	Reference(s)	Claims
1	Obviousness	Rosenstein in combination with Xu and Canny.	2, 11
2	Obviousness	Nourbakhsh in combination with Tsutsumi	2, 11
3	Obviousness	Neato System Art in combination with Rosenstein, Xu, and Canny.	2, 11
4	Obviousness	Neato System Art in combination with Nourbakhsh and Tsutsumi	2, 11

2. Obviousness (Grounds 1–4)

a. Level of Ordinary Skill in the Art

A person of ordinary skill in the art at the time of the earliest effective filing date of the '436 Patent would have had a Bachelor's degree or higher in electrical or computer engineering (or equivalent discipline) and at least two years' experience in research, design and/or development of autonomous robotics and/or robotic mapping/navigation and/or mechanical engineering and/or a related field. Additional education could substitute for experience, and vice versa.

b. Scope and Content of the Prior Art

The background state of the art includes that which is set forth in the patent, the file history, and the prior art references disclosed herein. For example, the '576 Patent generally relates to route planning via the use of sensors to learn and detect things about the environment. In some

asserts that the claims are broad enough to cover the Avidbots accused functionalities. *See LizardTech Inc. v. Earth Resource Mapping*, 424 F.3d 1336, 1345 (Fed. Cir. 2005). As an example, the '436 Patent nowhere enables a POSITA to choose a threshold value that would properly detect objects in comparison to the claimed contrast parameter. The '436 Patent only explains that a threshold may be configured to account for certain variables, but never explains how it is to be chosen in the first instance, nor provides disclosure on how it could be adjusted. *See, e.g.*, '436 Patent, 14:66–15:10.

B. Invalidity for Indefiniteness Under 35 U.S.C. § 112

Avidbots alleges that each of the Asserted Claims are invalid under 35 U.S.C. § 112 as indefinite. Avidbots reserves all rights to amend their Final Invalidity Contentions under 35 U.S.C. § 112, including after the Asserted Claims are ultimately construed by the Court, in response to any interpretation of the Asserted Claims embodied in Plaintiff's infringement positions, and/or to account for any changes in the law concerning invalidity under 35 U.S.C. § 112. Avidbots also reserves the right to provide additional explanation and/or argument for their contentions under Section 112, including, for example, based on expert testimony. Avidbots's contentions that the Asserted Claims are invalid under Section 112 are not admissions regarding the construction or scope of the claims of the Asserted Patents, or that any of the claims of the Asserted Patents are not anticipated or rendered obvious by any prior art. All of the below statements are by way of example only. Any item disclosed below with respect to any patent or claim may, as appropriate, be asserted as a defense against any other patent or claim that has a similar claim limitation and patent disclosure.

1. Legal Standard for Indefiniteness

Claims are indefinite under 35 U.S.C. § 112(b) when they "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). For example, to the extent an asserted apparatus claim includes both apparatus and method limitations, that claim is invalid for indefiniteness under Section 112(b) because it fails to identify or notify the public of what constitutes direct infringement. *See IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, 430 F.3d 1377 (Fed. Cir. 2005). Similarly, a claim that uses means-plus function claiming is indefinite "[i]f the patentee fails to disclose adequate corresponding structure." *Williamson v. Citrix Online, LLC*, 792 F. 3d 1339, 1352 (Fed. Cir. 2015). A claim can also be found indefinite if it uses terms of degree. *See Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014). As the Federal Circuit has "explained, a term of degree fails to provide sufficient notice of its scope if it depends 'on the unpredictable vagaries of any one person's opinion.'" *Id.* (citation omitted). In addition, "a claim term that lacks an antecedent basis may . . . render a claim indefinite." *In re Downing*, 754 F. App'x 988, 996 (Fed. Cir. 2018).

2. Invalidity of U.S. Patent No. 10,001,780 for Indefiniteness

Avidbots contends that each of the Asserted Claims of the '780 Patent are indefinite under 35 U.S.C. Section 112(a). Avidbots provides examples of claim terms for which the '780 Patent does not provide a definite disclosure, along with the claims rendered invalid by lack of a definite disclosure for each claim term, below.

- "performing interpolation" (claims 8, 9, 12, 13, and 17). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, the Asserted Claims fail to inform whether the term "interpolation" is coextensive with mathematical interpolation methods or if it requires some other, unidentified, step.

- "route pose comprising a footprint indicative at least in part of a pose and a shape of the robot along the route" (claims 9, 12, 13, 17, and 18). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, the '780 patent fails to inform the meaning of "route pose", "pose", and "footprint" separately and relative to one another in the context of the Asserted Claims and instead provides overlapping definitions for each term. *See* 780 patent 2:35-38, 3:20-23 ("each route pose comprising a footprint indicative at least in part of a pose and a shape of the robot along the route and each route pose having a plurality of points disposed therein"); *Id.* at 13:1-4 ("By way of illustrative example, route poses 414 and 416 illustrate discretized locations along the route portion 404. This illustrative example shows route poses 414 and 416 as shaped as robot 202, with substantially similar footprints"); *Id.* at 13:24-27 ("Advantageously, having route poses 414 and 416 shaped like robot 202 (e.g., a footprint of robot 202) can allow robot 202 to determine places in which robot 202 can fit while traveling"); *Id.* at 14:21-22 ("[e]ach pose can consist of m points in a footprint. In some cases, these m points can be points on the route poses."); *Id.*, Figs. 4D and 4E. The '780 fails to specify how a "route pose" is different from a "pose" or a "footprint" but the terms are nevertheless used to define one another in the Asserted Claims.

3. Invalidity of U.S. Patent No. 10,379,539 for Indefiniteness

Avidbots contends that each of the Asserted Claims of the '539 Patent are indefinite under 35 U.S.C. Section 112(a). Avidbots provides examples of claim terms for which the '539 Patent does not provide a definite disclosure, along with the claims rendered invalid by lack of a definite disclosure for each claim term, below.

- "first point being discretized than a second point" (claims 1, 3, 4, and 6). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, this element claims a comparison between first and second points, but the nature of the comparison cannot be ascertained. In the alternative, should the Court read "than" as "then," it would be impossible for a POSITA to determine how this claimed limitation would modify "the route including a plurality of points."
- "[large]/[small]/[ ] footprint" (claim 3). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, the claims read together with the specification do not inform a POSITA as to the size of a large footprint alone or in comparison to a small footprint (and vice-versa) with reasonable certainty.
- "uniform on the respective pose" (claim 4). This claim has an inconsistent antecedent basis, and is therefore indefinite. The repulsive forces of claim 1 are computed "onto the plurality of points of the respective pose," but the repulsive forces of claim 4 are computed "on the respective pose."

4. Invalidity of U.S. Patent No. 10,274,325 for Indefiniteness

Avidbots contends that each of the Asserted Claims of the '325 Patent are indefinite under 35 U.S.C. Section 112(a). Avidbots provides examples of claim terms for which the '325 Patent does not provide a definite disclosure, along with the claims rendered invalid by lack of a definite disclosure for each claim term, below.

- "extended scan group[s]" (claims 1, 5, 14). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, the specification does not explain what an extended scan group is or how it may be formed. To date, Brain has not attempted to identify any disclosure that would render this term definite. Brain, Responses to Avidbots's First Supplemental Noninfringement and Invalidity Contentions, 26 (Jul. 23, 2025).
- "a mapping and localization unit" (claim 14). Nowhere does the specification provide a corresponding structure to accomplish the "mapping and localization" function. 35 U.S.C. § 112(f); *see Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015).
- "a navigation unit" (claim 14). Nowhere does the specification provide a corresponding structure to accomplish the "navigation" function. 35 U.S.C. § 112(f); *see Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015).

5. Invalidity of U.S. Patent No. 10,823,576 for Indefiniteness

Avidbots contends that each of the Asserted Claims of the '576 Patent are indefinite under 35 U.S.C. Section 112(a). Avidbots provides examples of claim terms for which the '576 Patent does not provide a definite disclosure, along with the claims rendered invalid by lack of a definite disclosure for each claim term, below.

- "selectively actuate one or more systems as the robot travels along the route" (claim 12). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, nowhere does the Specification disclose explain what constitutes a "system." Brain, for its part, points to such diverse features as the drive system (5:1–19), "blinkers and other signals" (6:20–32), "water flow, cleaning brushes, etc." (7:27–45), "actuators configured for actions and/or action-specific tasks" including "turning a camera and/or any sensor" (10:53–11:4, 13:11–42), navigation instructions (11:36–62), and "performance of actions and/or action-specific tasks" (22:43–61). Brain, Responses to Avidbots's 1st Supplemental Noninfringement and Invalidity Contentions, 27 (Jul. 23, 2025). These diverse disclosures do not inform a POSITA with reasonable certainty of the extent of the claimed "system."

- "detecting a home locator" (claim 17). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, nowhere does the Specification disclose what constitutes a home locator.
- "the range of each one of the plurality of nodes corresponds to a region around each one of the plurality of nodes such that each one of the plurality of nodes is located within the range" (claim 22). This self-contradicting claim is indefinite. *See Maxell, Ltd. v. Amperex Tech. Ltd.*, 94 F.4th 1369 (Fed. Cir. 2024) (holding that an internal contradiction can render a claim indefinite, even though the term at issue was not self-contradicting). In combination with claim 13, from which claim 22 depends, each node "comprises a range," and the range is both "based on [a] confidence measure at a respective node" and "corresponds to a region . . . such that ***each one of the plurality of nodes*** is located within

the range." The range of a node cannot be both based on a confidence measure, which depends only on the particular node, and the location of each of the plurality of nodes.

6. Invalidity of U.S. Patent No. 10,728,436 for Indefiniteness

Avidbots contends that each of the Asserted Claims of the '436 Patent are indefinite under 35 U.S.C. Section 112(a). Avidbots provides examples of claim terms for which the '436 Patent does not provide a definite disclosure, along with the claims rendered invalid by lack of a definite disclosure for each claim term, below.

- "contrast parameter" (claims 2 and 11). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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).
- "threshold" (claims 2 and 11). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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).
- "maximum absolute deviation of pixels" (claims 2 and 11). The Asserted Claims do not meet the definiteness requirements of 35 U.S.C. § 112 for at least the reason that they 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). For example, the specification does not describe what constitutes "maximum absolute deviation of pixels."

C. Invalidity Under 35 U.S.C. § 101

The Asserted Claims are not patent-eligible under 35 U.S.C. § 101. Avidbots reserves all rights to amend its Final Invalidity Contentions, including after the Asserted Claims are ultimately construed by the Court, in response to any interpretation of the Asserted Claims embodied in

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Respectfully submitted,

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CERTIFICATE OF SERVICE

I certify that the foregoing document was served electronically on January 14, 2026 on all counsel who have consented to electronic service.

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