

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AVIDBOTS CORP. and AVIDBOTS USA CORP.,

Petitioners,

v.

BRAIN CORPORATION,

Patent Owner.

Case IPR2025-01603
U.S. Patent 10,823,576

**DECLARATION OF MARILYN C. WOLF IN SUPPORT OF PATENT
OWNER'S PRELIMINARY RESPONSE**

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

I reserve the right to supplement my opinions in the future to respond to any arguments or positions Petitioners may raise, taking account of new information as it becomes available to me.

Date: 18 Feb 2026

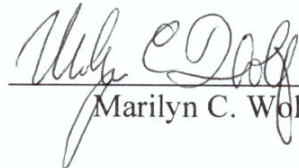

Marilyn C. Wolf, Ph.D.

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I, Marilyn Claire Wolf, declare as follows:

1. My name is Marilyn Claire Wolf. I have been retained by Knobbe, Martens, Olson & Bear, LLP, counsel for Patent Owner Brain Corporation (“Brain”) as an independent expert witness in this proceeding. I am making this declaration at the request of Brain in the matter IPR2025-01603, which concerns the claims of U.S. Patent No. 10,823,576 (“576 Patent”).

2. I am being compensated by Brain for my work in this matter at my standard rate of \$600 per hour for expert consulting services. My compensation is in no way dependent on the outcome of this proceeding.

I. QUALIFICATIONS

3. My qualifications are set forth in my curriculum vitae, a copy of which is included as Exhibit 2051. A summary of my qualifications follows.

4. I currently serve as Koch Professor of Engineering at the University of Nebraska – Lincoln (UNL).

5. I received my Bachelor’s, Master’s and Ph.D. degrees in Electrical Engineering from Stanford University in 1980, 1981, and 1984 respectively. I was elected to Phi Beta Kappa and Tau Beta Pi during my bachelor studies. My research interests include very large scale integrated systems (VLSI), embedded computing, and embedded computer vision.

6. From 1984 to the present, I served in various positions in academia, as well as in corporate settings. I was a Member of Technical Staff at AT&T Bell Laboratories from 1984 through 1989. I joined the Princeton University electrical engineering in 1989 and served there until 2007. During that time, I held various academic positions at Princeton University, including assistant professor of electrical engineering, associate professor of electrical engineering, and professor of electrical engineering. As a professor of electrical engineering at Princeton University, I taught courses on embedded computing, VLSI design, computer-aided design, computer architecture, and multimedia. In 2007, I accepted a position as a Professor, Farmer Distinguished Chair, and Georgia Research Alliance Eminent Scholar at the Georgia Institute of Technology's School of Electrical and Computer Engineering. During my time at Georgia Institute of Technology, I taught classes in embedded computing and electrical and computer engineering and I was also responsible for conducting and supervising research in these areas. I also was involved in research and wrote *The Physics of Computing*. In 2019, I accepted a position as a Professor of Engineering and Chair for the Department of Computer Science and Engineering at the University of Nebraska, where I led the formation of the School of Computing and have been responsible for researching and teaching various engineering projects and proposals.

7. I have also held a number of positions with both major corporations and start-ups. From 1984 to 1989, I was a member of the technical staff at AT&T Bell Laboratories where I conducted research in computer aided design of digital systems, and was also responsible for supervising the work of co-op and summer students. From 2001 to 2002, I held positions at MediaWorks Technology, including Chief Scientist, Principal SoC Architect and Chief Technical Officer. In these positions, I was responsible for product definition, technology development, and chip design. From 2003 to 2013, I co-founded and was employed by Verificon Corporation, which is a company that developed and licensed smart camera technology for surveillance and industrial applications.

8. I am a co-inventor on nine U.S. Patents. These patents cover various technologies, including object identification and behavior characterization using video analysis, object code compression, automated video activity analysis, video browsing, and flow detection and motion analysis. One example is U.S. Patent No. 7,200,266, titled “Method and apparatus for automated video activity analysis.” The patent describes a novel method and apparatus to detect the presence of articulated objects, such as the human body and other objects, and to identify their activities in compressed and uncompressed domains and in real-time.

9. I have authored or co-authored over 300 technical publications, including four textbooks.

10. I also have significant experience in the research and development of autonomous robots such as unmanned aerial vehicles (UAVs). A few of my publications regarding my work on UAVs include: “Achieving Resiliency and Behavior Assurance in Autonomous Navigation: An Industry Perspective,” *Proceedings of the IEEE*, 108(7), July 2020, pp. 1196-1207; "Attention-Based Activation Pruning to Reduce Data Movement in Real-Time AI: A Case-Study on Local Motion Planning in Autonomous Vehicles," *IEEE Journal on Emerging and Selected Topics in Circuits and Systems*, vol. 10, no. 3, pp. 306-319, Sept. 2020; “Closed-Loop Approach to Perception in Autonomous System,” 2021 Design, Automation & Test in Europe Conference & Exhibition; "Task-Driven RGB-Lidar Fusion for Object Tracking in Resource-Efficient Autonomous System," in *IEEE Transactions on Intelligent Vehicles*, vol. 7, no. 1, pp. 102-112, March 2022; “Autonomous UAV Landing on a Moving UAV using Machine Learning,” AIAA SCITECH 2022 Forum, 2022; "Machine Learning Components for Autonomous Navigation Systems," In *Embedded Machine Learning for Cyber-Physical, IoT, and Edge Computing: Use Cases and Emerging Challenges*, pp. 201-231; and “Adaptive Perception Control for Aerial Robots with Twin Delayed DDPG,” 2024 Design, Automation & Test in Europe Conference & Exhibition, Valencia, Spain, 2024, pp. 1-6.

11. I have received the ASEE Terman Award, IEEE Circuits and Systems Society Education Award, IEEE Computer Society Harry H. Goode Memorial Award, and IEEE Leon K. Kirchmayer Graduate Teaching Award. I am also a Fellow of the IEEE and ACM and an IEEE Computer Society Golden Core member.

12. I have supervised the dissertations of 28 Ph.D. students, including those titled *Hardware-Software Co-Synthesis of Embedded Real-Time Multiprocessors* (1998); *Design and Analysis of a Real-Time Video Human Gesture Recognition System* (2004); *Multi-Camera Systems: Tracking on Peer-to-Peer Systems, Patio-Temporal Event Detection, and Video Synchronization* (2006); *Design and Implementation of Distributed Real-Time Camera Systems* (2007); *Distributed Multi-Modal Human Activity Analysis: From Algorithms to Systems* (2007); *Detecting and Tracking Moving Objects From a Moving Platform* (2012); and *Closed Loop Perception for Resource Efficient Autonomous Systems* (2022).

13. I am active in several professional organizations, including the IEEE, ACM, SPIE, and ASEE. As noted above, I have been elected a Fellow of both the IEEE and ACM and I received the ASEE Terman Award. As part of my work with those organizations, I have helped to found several conferences and workshops, including Embedded Systems Week, MPSoC, and ICDSC. I have served on the board of the IEEE Circuits and Systems Society. I was the founding Vice President for Finance for the IEEE Council on Electronic Design Automation.

II. MATERIALS AND INFORMATION CONSIDERED

14. I have been asked to provide technical expert opinions relating to the validity of the claims of the '576 Patent. In forming my opinions expressed in this Declaration, I have reviewed and considered the '576 Patent's claims, specification, drawings, and file history. I have also reviewed and considered Avidbot's Petition, the prior art references that Petitioner relies on, the Declaration of Lina Karam (EX1003) accompanying the petition, and all other exhibits Petitioner submitted, including Exhibits 1001 through 1025. To the extent not listed above, I have also reviewed any other materials referenced expressly or implicitly herein.

15. In forming my opinions in this Declaration, I have also relied upon my educational and professional experience.

16. Any figures appearing in this Declaration were prepared with the assistance of counsel and reflect my understanding of the '576 Patent and the materials discussed in this Declaration.

17. All *emphases* in quotes are added unless stated otherwise.

III. APPLICABLE LEGAL STANDARDS

18. I am not an attorney and I will not offer opinions of law. However, I have been informed of several principles of law concerning patent claim construction and validity, which I apply in addressing the challenged claims.

A. Claim Construction

19. I understand that, in assessing the patentability of a patent claim, the Patent Office generally construes claim terms by giving them their ordinary and customary meaning, as they would have been understood by a POSITA at the time of the invention in view of the intrinsic record (patent specification and file history). However, I understand that the inventors may, in the patent specification, expressly define a claim term to have a meaning that differs from the term's ordinary and customary meaning. I also understand that the inventors may disavow or disclaim certain claim scope, thereby departing from the ordinary and customary meaning, when the intrinsic record demonstrates that a clear and unambiguous disavowal or disclaimer has occurred. I understand that extrinsic evidence, such as relevant technical literature and dictionaries, may be useful in ascertaining how a POSITA would have understood a claim term, but the intrinsic record is the primary source for determining the meaning of claim terms. I further understand that claim terms should be construed the same way for purposes of validity and infringement. For the purposes of this review, and to the extent necessary, I have interpreted each claim term in accordance with the principles set forth in this paragraph.

B. Anticipation

20. I understand from counsel that 35 U.S.C. § 102 is the statute that governs the determination of anticipation. I understand that under § 102, a prior art

reference anticipates a claim if each and every element of a claim is found, either expressly or inherently, within the single prior art reference in the same arrangement as the claim.

21. I understand from counsel that something is “inherent” in, and therefore taught by the prior art, if it necessarily flows from the explicit disclosure of the prior art. I understand that the fact that a certain result or characteristic *may* be present in the prior art is not sufficient to establish inherency. However, if the result or characteristic is necessarily present based on the explicit disclosure in the prior art, it is inherent in the prior art and is therefore disclosed.

C. Obviousness

22. I understand from counsel that, under 35 U.S.C. § 103, a patent claim is obvious if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date to a person having ordinary skill in the art to which the claimed invention pertains.

23. I understand from counsel that the factors to be considered in an obviousness inquiry include: (1) the scope and content of the prior art, (2) the differences between the claimed subject matter and the prior art, (3) the level of ordinary skill in the pertinent art, and (4) objective considerations of nonobviousness (also referred to as secondary considerations) such as commercial success, industry

praise, teaching away, long-felt need, failure of others, skepticism, unexpected results, and copying. I understand that all of these factors must be considered in an obviousness analysis. I also understand that to establish any such evidence as objective considerations of nonobviousness, a nexus must be shown between the evidence and the claimed invention.

24. I understand from counsel that the obviousness inquiry must be made without hindsight. I also understand from counsel that the POSITA cannot use the knowledge only taught by the patented invention against the patentee. I understand from counsel that care must be taken to avoid hindsight reconstruction by using the patent as a guide to combine prior art references to achieve the result of the challenged claims.

25. I understand from counsel that a reference is available as prior art if it is analogous art. I understand that a reference is analogous art if it falls with the same field of endeavor as the claimed invention or, if not, if it is reasonably pertinent to the particular problem to which the inventor is involved.

26. I understand from counsel that that the motivation to combine or modify the prior art must be clear and particular and be supported by more than conclusory statements. I also understand from counsel that the following principles signal that a motivation to make a proposed combination is lacking:

- a. If the proposed modification would render the prior art being modified unsatisfactory or inoperable for its intended purpose;
- b. If the proposed modification or combination of the prior art would change the principle of operation of the prior art being modified; and/or
- c. If the prior art teaches away from modifying or combining certain known elements.

27. I understand from counsel that even if a skilled artisan would be motivated to combine two or more prior art references, there must be a reasonable expectation that the combination would be successful. I also understand from counsel that a “reasonable expectation of success” does not require that a skilled artisan would have been absolutely certain that the invention would work for its intended purpose.

28. I understand from counsel that when combining disclosures from multiple references, combining multiple embodiments from a single reference, or selecting from large lists of elements in a single reference, there must be a motivation to make the combination and a reasonable expectation that such a combination would be successful.

D. Perspective of a Person of Ordinary Skill in the Art at the Time of the Claimed Invention

29. I have been informed that claim construction and patent validity is generally analyzed from the perspective of a person of ordinary skill in the art (POSITA) at the time of the invention. I have assumed for purposes of my analysis

that the time of the invention, which may also be referred to as the “relevant time,” “effective filing date,” “critical date,” or “priority date,” is no later than November 1, 2016. I have based that assumption in part, on the November 1, 2016 effective filing date of the ’576 Patent.

30. I have performed my analyses and expressed my opinions from the perspective of a POSITA at the relevant time.

IV. BACKGROUND OF THE TECHNOLOGY

31. The ’576 Patent is titled “Systems and Methods for Robotic Mapping” and issued on November 3, 2020 from application No. 16/356,160. EX1001 at Cover. The ’160 Application is a continuation of an earlier application, No. 15/340,807, filed on November 1, 2016 and issued as U.S. Patent No. 10,274,325. *Id.*

32. The ’576 Patent describes systems and methods enabling a robot such as a commercial cleaning robot to learn a demonstrated route together with the task-specific actions performed along that route, such that the robot can later navigate and perform those actions autonomously. EX1001 at 6:8-32. As the specification explains, a human operator may manually drive or remotely control the robot along a desired cleaning path, during which the operator performs the associated operational tasks (e.g., activating brushes, adjusting water flow, toggling vacuum functions). *Id.* at 6:8-32, 7:27-45, 22:49-57.

33. As the robot moves through the environment, the robot's sensors collect data at discrete points along its route, represented by nodes. *Id.* at 15:63-66. Each node can be associated with an estimated pose of the robot, including measurements such as (x, y) position and orientation. *Id.* at 16:20-31. Each node also can have an associated range, which can be representative, at least in part, of areas around each node where the actual robot is located. *Id.* at 16:32-52. The patent explains that "due to compounding noise, sensor drift, and other factors," the ranges can become larger as the robot moves further on its path. *Id.* at 16:57-63. Figure 6A illustrates an example of how a robot travels along a route, wherein nodes 602A-602D have associated ranges represented by the circles or ellipses 604A-604D that get larger as the robot continues along its path.

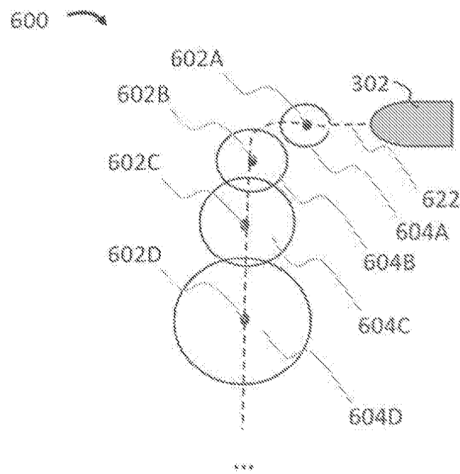


FIG. 6A

EX1001, Fig. 6A, 15:63-16:67.

34. The patent also explains that the robot may associate certain actions, such as cleaning actions like turning on/off vacuums, with the locations and positions of the robot on the route on the generated map. For example, the patent explains that after a map has been generated by the robot from scans, nodes can be represented as cells in a matrix. EX1001 at 22:12-29. More information can then be associated with each cell, “such as by associating each cell to another data structure and/or using a data structure with more dimensions.” *Id.* at 22:49-52. This information includes “the location of the route by robot 202, performance of actions and/or action-specific tasks,” and other information. *Id.* at 22:52-57.

V. LEVEL OF ORDINARY SKILL IN THE RELEVANT ART

35. I understand that validity must be assessed from the perspective of a POSITA at the time of the invention of the '576 Patent. I have been informed and understand that the level of ordinary skill in the art may be determined by various factors including: (a) the type of problems encountered in the art, (b) prior art solutions to those problems, (c) the rapidity with which innovations are made, (d) the sophistication of the technology, and (e) the educational level of active workers in the field.

36. I understand that Petitioner has provided the following proposed definition for the 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 '576 Patent would have had a Bachelor's degree or higher in electrical or mechanical engineering, or computer science (or equivalent) and at least two years' experience in research, design and/or development of autonomous robotics and/or robotic mapping/navigation and/or a related field. Additional education could substitute for experience, and vice versa.

Petition at 11.

37. I have reviewed Petitioner's proposed definition of the level of ordinary skill in the art. As detailed above, based on my education and my work experiences in autonomous vehicles, I met and exceeded the level of ordinary skill in the art.

38. For purposes of conducting my analysis at this pre-institution stage of this IPR, I have used Petitioner's definition of the level of ordinary skill in the art.

I do not necessarily agree with Petitioner's definition of the level of ordinary skill and reserve the right to offer opinions regarding the level of ordinary skill in the art in this or other proceedings, including to the extent that trial is instituted in this proceeding.

VI. GROUND 1 DOES NOT SHOW ANTICIPATION BY OLSON

39. Ground 1 of the Petition asserts that all claims of the '576 Patent is anticipated by Olson. I disagree for the reasons explained below.

A. Ground 1 Does Not Show Map Generation in “Real-Time” and Mixes Distinct Algorithms Within Olson (Limitations 1[b][2], 13[b], 25[b])

40. Each independent claim of the '576 Patent includes a limitation requiring “generate [or generating] a map of the environment and a route on the map in real-time.” Limitations 1[b][2], 13[b], 25[b]. However, the Petition does not address the “real-time” requirement. The Petition argues that “Olson discloses a multitude of sensors that are used to generate a map as a robot travels along a route in real-time, where the map includes both a representation of the environment as well as the location and position of the robot as it traveled the route.” Petition at 17-18. The Petition does not cite to any specific disclosure in Olson but instead, cross-references Sections IV.A.2.a-d of the Petition. *Id.* Those sections of the Petition, however, address Limitations 1[pre] through 1[b][1], none of which relate to the “real-time” requirement. Indeed, nothing in those sections mentions “real-time” or otherwise suggests that map generation occurs in real-time. *See* Petition at Sections IV.A.2.a-d. The Petition also does not appear to address the “real-time” requirement elsewhere in the section for Limitation 1[b][2]. *See* Petition at 17-21. The Petition’s other sections for Limitations 13[b] and 25[b] also do not address “real-time” because they simply cross-reference 1[b][2]. Petition at 36, 41. Thus, the Petition fails to show that Olson discloses the “real-time” requirement.

41. Limitation 1[b][2] also contains a separate and distinct requirement of “the map being generated concurrently with the collection of the data as the robot

travels along the route in the environment.” Limitations 13[b] and 25[b] also have that requirement. The Petition argues that “Olson explains that its robot and algorithm may be ‘used in online settings—i.e., where the optimization problem [map] is constantly changing as new sensor data continuously arrives.’” Petition at 20. Notably, “real-time” is a separate and distinct requirement from generating the map “concurrently with the collection of the data” and the two are not synonyms of each other. However, to the extent the Petition was attempting to address “real-time” by arguing the “concurrently” limitation, that argument still fails because it mixes different algorithms within Olson, which I understand is not appropriate for an anticipation argument.

42. Olson describes two distinct algorithms: a “batch” algorithm and an “online” algorithm. *See* EX1004, 3 (“Both batch and online versions of the algorithm are described.”), 106 (“This thesis describes both a batch and online version of the algorithm ...”). A POSITA would have understood that a batch SLAM algorithm is one that processes all the data at once at the end of the data collection, whereas an online algorithm processes data as new data comes in. Olson confirms this understanding. Olson explains that in a “batch applications,” the “solution is only needed at the very end” (EX1004 at 56) whereas in an “online” algorithm, “the optimization problem is constantly changing as new sensor data continuously arrives” (*Id.* at 11-12). *See also id.* at 16 (“We describe an optimization algorithm

.... A batch version of this algorithm (for off-line use) is described in Chapter 4, followed by a version suitable for on-line use in Chapter 5.”).

43. Indeed, one of Petitioner’s other references reiterates this distinction.

Stachniss explains:

The literature *distinguishes* two main forms of the SLAM problem, which are both of equal practical importance. One is known as the *full SLAM problem*: it involves estimating the posterior over the entire robot path together with the map $p(X_T, m \mid Z_T, U_T)$. Written in this way, the full SLAM problem is the problem of calculating the joint posterior probability over X_T and m from the available data. ... As we shall see, *algorithms for the full SLAM problem are often batch, that is, they process all data at the same time.*

The second, equally important SLAM problem is the *online SLAM problem*. ... Online slam seeks to recover the present robot location, instead of the entire path. *Algorithms that address the online problem are usually incremental and can process one data item at a time.*

EX1005, 1155 (***bold italics emphasis*** added, *italics* in original).

44. The Petition relies on Olson’s discussions of both the batch and online algorithms when addressing Limitation 1[b][2], apparently without realizing that it mixes these distinct embodiments. For example, the Petition relies on “maps produced by [Olson’s] algorithm, including a map of the Intel Research Center (IRC), depicted in Figure 3-17.” Petition at 19-20. However, Olson describes that map in Chapter 3—well before the online algorithm is discussed in Chapter 5. That map was

generated by a batch algorithm, which runs *after* all the data has been collected—which is neither real-time nor concurrent with the data collection. *See* EX1004 at 49 (“The Intel dataset consists of 875 poses, spanning 44.9 minutes of robot driving. ... Total processing time was 180 s.”). Olson’s explanation that the data collection comprised 44.9 minutes of robot driving followed by a total processing time of 180 seconds demonstrates that this was a batch algorithm that ran after the data was collected.

45. As another example of relying on a batch algorithm, the Petition cites Olson at 63-66, for the “range” part of Limitation 1[b][2]. *See* Petition at 21 (citing EX1004 at 63-66). Those pages are from Chapter 4 of Olson, which describes the batch algorithm.

46. Thus, the Petition mixes citations relating to Olson’s batch algorithm with citations relating to Olson’s online algorithm. Accordingly, the Petition does not show that Olson anticipates Limitation 1[b][2] because it relies on separate and distinct algorithms within Olson.

B. Ground 1 Fails to Show that Olson Discloses that Each of the Nodes Comprises a Range Based on a Confidence Measure at a Respective Node (Limitations 1[b][2], 13[b], 25[b])

47. Limitations 1[b][2], 13[b], 25[b] also recites generating a map based on measurements taken by a robot’s sensor at “each one of a plurality of nodes along the route traveled by the robot,” “each one of the plurality of nodes comprising a range,

the range of each one of the plurality of nodes being based on confidence measure at a respective node.” The ’576 Patent provides an illustrative example of nodes and ranges in Figure 6A, shown below.

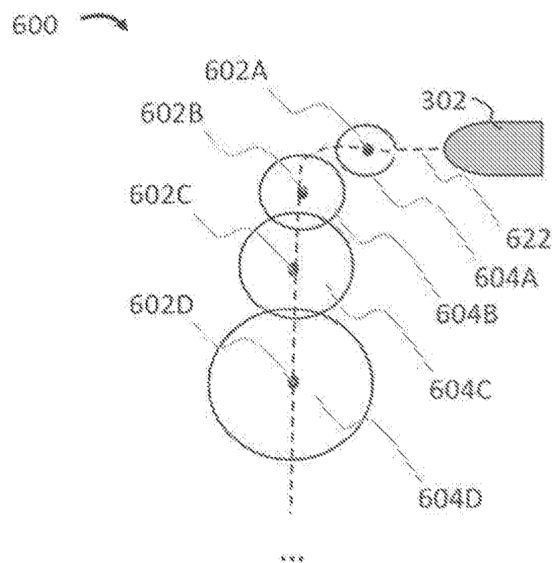


FIG. 6A

48. The ’576 Patent explains that “As robot 202 navigates along the route represented by route 622 illustrated in graph 600, it can take measurements at nodes 602A-602D.” EX1001 at 15:63-65. “Each of edges between nodes 602A-602D can have an associated probabilistic function and/or probabilistic distribution, illustrated for each of nodes 602A-602D as ranges 604A-604D, respectively.” *Id.* at 16:32-35. “In some cases, ranges 604A-604D can be representative, at least in part, of areas around each node 602A-602D, wherein the actual location of robot 202 relative to graph 600 (e.g., illustrated as robot indicator 302) can be within the areas. For

example, instead of node 602B being located as illustrated, node 602B can actually be located anywhere within range 605B, and with different poses, including positions and/or orientations, within range 605B.” *Id.* at 16:48-56. Further, the patent explains that “due to compounding noise, sensor drift, and other factors, subsequent ones of ranges 604A-604D can become larger as seen from the position of robot indicator 302 as illustrated, representing more uncertainty of the positioning of nodes 602A-602D.” *Id.* at 16:58-63. Thus, a POSITA would have understood that the claimed “range” is the range related to a node, not some other type of range or probability like the operative range of a sensor or the probability that a map is correct.

49. Ground 1 does not show that Olson discloses that each of the plurality of nodes comprises such a “range.” The Petition makes several disjointed statements relying on different sections of Olson, but none of those disclosures relate to the claimed “range.” *See* Petition at 20-21.

50. First, the Petition argues that “Olson explains that its algorithm addresses map building, and it explains that ‘[i]n general, terms, the map building problem can be described as finding the *posterior probability distribution function of a map x*.” Petition at 20-21 (citing EX1004 at 12) (*emphasis* in the Petition). This disclosure does not relate to the claimed range or nodes at all. Rather, this statement was merely a high-level description of the map building problem at the beginning of Olson’s introduction section. EX1004 at 12. The Petition used *bold italics* on

“posterior probability distribution function of a map x ” but does not explain why it emphasized those words. Those words do not disclose the claim requirement of “each one of the plurality of nodes comprising a range, the range of each one of the plurality of nodes being based on confidence measure at a respective node.”

51. Second, the Petition argues that “Olson further discloses that ‘[t]he nodes of a pose/feature graph are the same as the random variables of a graphical model.’” Petition at 21 (citing EX1004 at 20). The Petition does not provide any further explanation of why it cited that disclosure. That description does not disclose the claim requirement of “each one of the plurality of nodes comprising a range, the range of each one of the plurality of nodes being based on confidence measure at a respective node.”

52. Third, the Petition then jumps to arguing, “Olson further discloses that the probability distribution for a node may be represented as a range that ‘resemble[s] radially-oriented ellipses.’” Petition at 21 (citing EX1004 at 118). This statement is incorrect. Olson does not contain such a disclosure and Petitioner has misread Olson. Page 118 of Olson does not discuss the probability distribution for a node. Instead, Olson was describing “[t]he noise model of the laser scanner involves uncertainty in both range and bearing,” and that “[r]ange is typically more uncertain than bearing, and so the probability distributions resemble radially-oriented ellipses.” EX1004 at 117-118. This part of Olson is describing the errors associated with a sensor’s

measurements of the environment, e.g., when a laser scanner detects the distance from the robot to a wall, there is some error with the distance measurement as well as some error in the bearing or direction of the scan. A POSITA would have understood Olson's reference to "radially-oriented ellipses" here to refer to the uncertainty of laser scan points collected by a laser scanner sensor, not a range for a node. Olson confirms this. Olson explains, "[t]he probability distribution of an *observed point* is dependent upon the position of *that point relative to the scanner*." EX1004 at 118. Thus, the observed point is not the node. The Petition also follows this sentence with a "see also" cite to pages 13, 22, and 32 of Olson without any further explanation. Petition at 21. Those pages are from completely different chapters in Olson than the description of "radially-oriented ellipses" on page 118 and do not disclose the claimed requirement of "each one of the plurality of nodes comprising a range, the range of each one of the plurality of nodes being based on confidence measure at a respective node."

53. Fourth, the Petition argues, "Olson further discloses that confidence and error may be modeled as an information matrix, Σ^{-1} , and with a chi-squared error matrix, where chi-squared represents a range of uncertainty" and that "A POSITA would understand that these disclose a range associated with each node based on a confidence measure." Petition at 21 (citing EX1004 at 19-25, 32, 63-66, 118). The Petition never explains why a POSITA would so understand. Moreover, the

Petition's argument does not reflect Olson's actual disclosure. The Petition cobbles together twelve different pages spread throughout Olson and mischaracterizes them as somehow relating to confidence and error. None of these disclosures demonstrate that "each one of the plurality of nodes compris[es] a range, the range of each one of the plurality of nodes being based on confidence measure at a respective node." For example, Olson explains that chi-squared error is "the square of the Mahalanobis distance," and that such distances are "used as plausibility tests: values above three ... strongly indicate either an error in z (e.g., a measurement outlier), the confidence Σ_i , or the state." EX1004 at 25. This does not relate to the range for a node. Rather, a POSITA would have understood Olson's description of chi-squared error as a statistical tool for indicating a problem with the map. In fact, Olson expressly states that chi-squared error is not related to the nodes. Olson states, "the X^2 error tells only about the errors of the constraints, *not the positions of the nodes.*" EX1004, 25-26.

C. Ground 1 Does Not Demonstrate that Olson Associates Actions Undertaken by the Robot During Traveling Along the Route with the Location and Position of the Robot on the Route on the Map (Limitations 1[b][3], 13[c], 25[c])

54. Limitations 1[b][3], 13[c], and 25[c] recite "[associate/associating] actions undertaken by the robot during traveling along the route with the location and position of the robot on the route on the map." Ground 1 fails to show that Olson discloses these limitations for at least the following reasons.

55. **First**, the Petition fails to identify any “actions undertaken by the robot during traveling along the route.” The Petition argues, “The actions undertaken by the robot include collection of sensor data ... and storage of that data in association with the location/position of the robot on the route on the map, as well as obstacle avoidance and route planning.” Petition at 22. The Petition continues, “each of a robot’s motions through an environment are actions undertaken by a robot, and those motions are measured and associated with the robot’s location and position on the route on the map.” *Id.* Thus, the Petition argues that the “actions undertaken by the robot during traveling along the route” amount to the collection of sensor data that is used to generate the map and the movement of the robot along the route. But these are not the claimed “actions undertaken by the robot during traveling along the route.” In the context of the claims and the patent, a POSITA would understand that sensor data collection and moving along the route are not the claimed “actions” that have to be associated with a location and position of the robot on the route on the map.

56. Sensor data collection cannot be the claimed “actions” because each independent claim already separately recites “collect data by at least one sensor ... as the robot travels along the route.” If collecting sensor data could be counted as an “action[,]” that would render the entire limitation meaningless and redundant of the earlier limitation. A POSITA would not have understood the claims in a way that makes the one limitation entirely redundant of another limitation.

57. Additionally, the robot's movements along the route also cannot be the "actions undertaken by the robot" because the claimed "actions" are those that are "undertaken by the robot *during traveling along the route.*" That language shows that it is other "actions" that are undertaken during traveling, not the traveling itself. Thus, the robot's movements along a route cannot be the claimed "actions."

58. This understanding is also supported by the specification, which explains that a robot "may associate certain actions (e.g., turning, turning on/off water, spraying water, turning on/off vacuums, moving vacuum hose positions, gesticulating an arm[,], raising/lowering a lift, moving a sensor, turning on/off a sensor, etc.") with particular positions and/or trajectories." EX1001 at 7:32-39; *see also id.* at 6:22-28, 22:49-57. This is consistent with the specification's explanation that a human operator can drive a robot, such as a cleaning robot, perform "complex sets of movements and actions" and the robot will map and learn its route as well as the cleaning actions it needs to perform along that route. *See id.* at 6:8-32. The specification does not suggest that the sensor data collection and the robot's movements along the route can constitute the claimed "actions." Indeed, that would defeat the purpose of the invention because it would reduce the invention to merely a robot that maps its environment and route, rather than a robot that learns where to go and what to do from a demonstration.

59. ***Second***, even if sensor data collection and movements along the route could constitute the “actions,” the Petition fails to show that such “actions” are ever “associate[d] ... with the location and position of the robot on the route on the map.” At best, the Petition argues that a robot performs sensor data collection or moving along the route, but that does not show that a processing device “associates” the *action* of data collection or the *action* of moving with a particular location and position *on the route on the map*. For example, the ’576 Patent provides an example of how actions can be associated with a location on a route on a map: “information can be associated with each cell [in a map], such as by associating each cell to another data structure and/or using a data structure with more dimensions.” EX1001 at 22:49-52. It is not enough that actions happen along a route—those actions must be *associated* with a location and position on a route on a map.

60. Additionally, the Petition further fails to show that “*actions*” are associated. Instead, the Petition argues merely that the *data* from sensor scans and measurements of the robot’s movements are stored. *See* Petition at 22 (“each of a robot’s motions through an environment are actions undertaken by the robot, and those motions are measured and associated with the robot’s location and position on the route on the map.”). But storage of *measurement data* is not “associat[ing] *actions*.” Moreover, the Petition does not even show that measurement data is even stored with the position and location of the robot on the route on the map. The

Petition does not show, for example, that after a map is generated, that the original sensor data and measurement data can be recovered. In other words, even if sensor data and movement data is *used* in the process of generating a map, the Petition does not identify that the data is then also stored with the position and location of the robot on the route on the map. Indeed, such a practice would be unusual because the original underlying dataset could be very large and require vast amounts of storage space, whereas the map and route itself could be a relatively small in terms of storage space.

61. The Petition also argues that Olson uses sensor data “to characterize edges that connect nodes to each other.” Petition at 22. However, that merely describes the generation of a map using sensor data, which was already recited earlier in the claim, not associating an action undertaken by the robot during traveling on the route.

62. Accordingly, the Petition fails to demonstrate that Olson discloses “associate [associating] actions undertaken by the robot during traveling along the route with the location and position of the robot on the route on the map. Ground 1 therefore does not show anticipation of any claim.

VII. GROUND 2 DOES NOT SHOW ANTICIPATION BY STACHNISS

63. Ground 2 asserts that Claims 1-11, 13-23, and 25-35 are anticipated by Stachniss. For the reasons below, I disagree.

A. Ground 2 Does Not Show Anticipation Because It Mixes Different Disclosures Within Stachniss

64. I understand that in order for a reference to anticipate a claim, every limitation must be disclosed, either expressly or inherently, within the four corners of the reference and be arranged or combined in the same way as recited in the claim. This is not the case with the Petition’s Ground 2 because while it argues that Stachniss anticipates the claims, its argument draws from and mixes different disclosures within Stachniss.

65. Stachniss is a book chapter that covers a wide variety of different SLAM techniques. The introduction to Stachniss states:

This chapter provides a comprehensive introduction in to the simultaneous localization and mapping problem, better known in its abbreviated form as SLAM. ... We review the *three* major paradigms from which many published methods for SLAM are derived: (1) the extended Kalman filter (EKF); (2) particle filtering; and (3) graph optimization. We also review recent work in three-dimensional (3-D) SLAM using visual and red green blue distance-sensors (RGB-D), and close with a discussion of open research problems in robotic mapping.

EX1005 at 1153 (original italics removed, emphasis added). Stachniss also explains, “As the reader will quickly recognize, there is no single best solution to the SLAM method. The method chosen by the practitioner will depend on a number of factors, such as the desired map resolution, the update time, and the nature of the features in

the map, and so on.” *Id.* at 1154. Thus, a POSITA would have understood that Stachniss is describing multiple, separate and distinct SLAM techniques within its chapter.

66. Stachniss begins with a definition of the SLAM problem in Section 46.1. *See* EX1005 at 1154-1157. There, Stachniss provides a high-level distinction between the “two main forms of the SLAM problem,” known as the “full SLAM problem” which is performed “over the entire robot path” and “online SLAM problem” which is “incremental and can process one data item as a time.” *Id.* at 1155. Stachniss then moves to a discussion of the “Three Main SLAM Paradigms,” namely, extended Kalman filters, particle methods, and graph-based optimization techniques in Section 46.2. *Id.* at 1157-1166. And in Section 46.3, Stachniss discusses two other types of SLAM, namely Visual SLAM and RGB-D SLAM. *Id.* at 1166-69. Notably, even within these discussions of major SLAM paradigms, Stachniss also discusses numerous distinct algorithms within each, such as “the vanilla Kalman filter,” “extensions to the EKF SLAM algorithms,” “FastSLAM,” “DP-SLAM,” and 15 variants of graph-based SLAM algorithms. *See id.* at 1157-66.

67. Despite relying on anticipation, the Petition actually mixes the various discussions of different SLAM techniques within Stachniss. This leads to inaccurate statements within the Petition such as references to Stachniss’s “system” or Stachniss’s “robot” when there is no such thing as Stachniss’s “system” or “robot.”

See, e.g., Petition at 50 (“Stachniss discloses a system that enables a robot to map an environment as it traverses that environment.”); *id.* at 51 (“Stachniss further discloses that its system travels the robot”).

68. As further detailed below, the Ground 2 arguments are based on a mixture of Stachniss’s descriptions of *different* SLAM algorithms, and therefore does not demonstrate anticipation.

1. Ground 2 Relies on Different Sensors from Different Robots (Limitations 1[b][1])

69. As mentioned above, there is no such thing as Stachniss’s “system” or Stachniss’s “robot” because Stachniss is an overview of different SLAM techniques employed by different robots with different sensors. As a result, the Petition mixes these disclosures when discussing the various limitations of the claims. For example, Limitation 1[b][1] recites, “collect data by at least one sensor coupled to the robot as the robot travels along the route in an environment.” For this, Petitioner argues that “Stachniss describes a multitude of robot-mounted sensors which are used to collect data,” and “[f]or example, the robots can be coupled with sensors in the wheels or motors, a global positioning system, laser scanners, and visual sensors (*e.g.*, cameras).” Petition at 52 (citing EX1005 at Abstract, 1153, 1164, 1166-69). This argument combines several different sensors from different robots that implement different SLAM paradigms. For example, GPS was discussed in Stachniss in the context of FastSLAM, which is a particle method of SLAM. EX1005 at 1160-1161.

Laser scanner sensors were discussed in the context of graph-based SLAM. *Id.* at 1164. And cameras were discussed in the context of Visual or RGB-D SLAM. *Id.* at 1166-1169.

70. A POSITA would have understood that these sensors are used for different SLAM techniques. For example, Stachniss explains, “In comparison to laser scanners, cameras provide a fire hydrant of information, making online processing nearly impossible until recent increases in computation have become available.” *Id.* at 1166; *see also id.* at 1168 (“Visual information offers a tremendous source of information for loop closing, not present in the canonical 2-D laser SLAM systems developed in the early 2000s.”). Stachniss does not disclose a robot that has all of these different types of sensors at once, nor does it disclose a SLAM algorithm that utilizes all these different sensors at the same time.

2. The Petition Mixes Different SLAM Methods for Limitation 1[b][2]

71. Limitation 1[b][2] is lengthy and recites, “generate a map of the environment and a route on the map in real-time, the map being generated concurrently with the collection of the data as the robot travels along the route in the environment, the map corresponding to a representation of the environment, the map including information directed to location and position of the robot along the route in the environment, the map being generated based on measurements taken by the at least one sensor at each one of a plurality of nodes along the route traveled by the

robot, each one of the plurality of nodes comprising a range, the range of each one of the plurality of nodes being based on confidence measure at a respective node.” For this limitation, the Petition relies on essentially all the different SLAM techniques discussed in Stachniss.

72. When discussing “the map being generated concurrently with the collection of the data,” the Petition relies on at least two SLAM paradigms and multiple different variations of those paradigms. The Petition argues:

Stachniss explains that ‘incremental’ graph-based methods allow the robot to ‘re-use the previously computed solution’ and thereby reduce overall computation. Ex1005, 1162. Such methods “can be executed at each step of the mapping process,” enabling “on-the-fly [real-time] mapping.” Ex1005, 1164-65. Stachniss further explains that ‘recent increases in computation’ have enabled ‘online processing’ of visual data for real-time mapping based on features in the environment. Ex1005, 1166-67. Stachniss depicts an environment mapped in real-time with a 3D sensor in Figure 46.11 [].

Petition at 56. Stachniss’s discussion of “graph-based methods” comes from Section 46.2.3, titled “Graph-Based Optimization Techniques,” whereas the description of “recent increases in computation” and the “environment mapped in real-time with a 3D sensor in Figure 46.11” are from Stachniss’s discussion of Visual and RGB-D SLAM” in Section 46.3.

73. The Petition then relies on the following image in Stachniss:

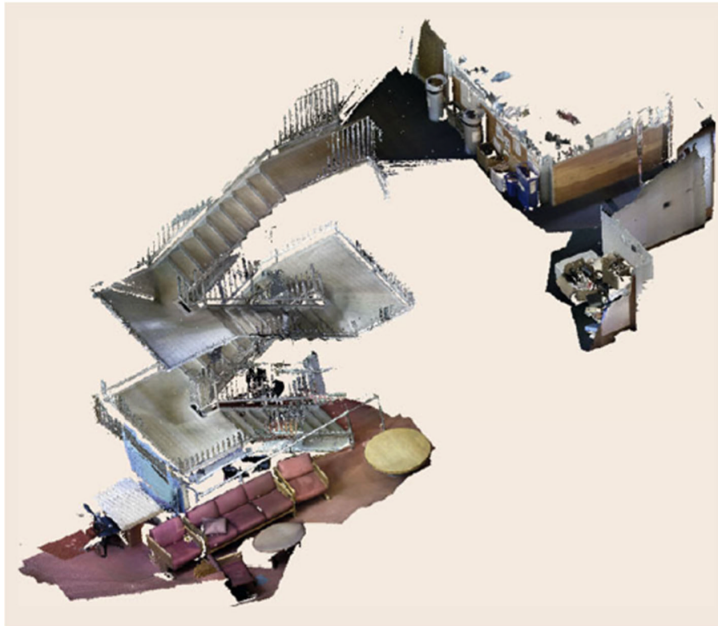


Fig. 46.11 Spatially extended KinectFusion output produced in real-time with Kintinuous (after [46.139])

But this image is from Stachniss’s discussion of Visual and RGB-D SLAM. EX1005, 1169. As a side note, Figure 46.11 was produced by “KinectFusion” which is a “modeling system that tracks the 3-D pose of a handheld Kinect while concurrently reconstructing high-quality scene 3-D models.” EX1005 at 1169. Because this involved a “handheld Kinect” sensor, this was not produced by a robot.

74. When discussing the “range ... based on confidence measure” portion of Limitation 1[b][2], the Petition also relies on different SLAM paradigms. For example, the Petition cites Equation 46.18 and argues that “Stachniss also explains that a similar expression which incorporates visual data may be derived, as shown in Equation 46.18 ... for a graph-based SLAM approach.” Petition at 58. The Petition then switches to arguing “Stachniss depicts a range associated with the uncertainty

of the position of each node for both poses and landmarks in Figure 46.2 ... in the context of an EKF mapping algorithm.” *Id.* Thus, the Petition relies on Stachniss’s discussions of both graph-based SLAM and extended Kalman filters (EKF).

75. Thus, for just a single limitation, the Petition mixes Stachniss’s disclosures regarding extended Kalman filters, graph-based SLAM, Visual SLAM, and RGB-D SLAM.

3. Petitioner Again Relies on Different Sensors from Different Robots for Limitation 1[b][3]

76. For Limitation 1[b][3], the Petition argues, “The actions undertaken by the robot include collection of sensor data using, for odometers, lasers, range sensors, cameras, and RGB-D sensors.” Petition at 60 (citing EX1005 at 1153-54, 1158-59, 1163-64, 1166-69). But as explained above, Stachniss described these sensors in the context of different SLAM paradigms used by different robots. Indeed, the Petition cites nearly every section of Stachniss to support this one sentence. *Id.* The citation to 1153-54 is from Stachniss’s introduction and overview. Pages 1158-59 describe EKF SLAM. Pages 1163-64 describe graph-based SLAM. And pages 1166-69 describe Visual and RGB-D SLAM.

4. The Petition’s Combination of Different SLAM Techniques and Different Robots Fails to Show Anticipation

77. Thus, across the various limitations, the Petition mixes and relies on every type of SLAM paradigm discussed in Stachniss. This does not show that

Stachniss anticipates Claim 1 because each of these SLAM paradigms are separate and distinct. Stachniss explains, for example, that “there is no single best solution to the SLAM method” and that “[t]he method chosen by the practitioner will depend on a number of factors, such as the desired map resolution, the update time, and the nature of the features in the map, and so on.” EX1005 at 1154.

78. A POSITA would therefore have understood that the various SLAM paradigms discussed in Stachniss are separate and distinct, and that features are not necessarily shared between different paradigms. For example, the Petition argues that Stachniss anticipated the “real-time” and “concurrently” generating a map limitations, but in fact, most of the SLAM paradigms discussed in Stachniss are offline and are performed after all of the data has been collected. Stachniss explains, for example, the full SLAM problem “involves estimating the posterior over the *entire robot path* together with the map.” EX1005 at 1155. “[A]lgorithms for the full SLAM problem are often batch, that is, they process *all data* at the same time.” *Id.* In contrast, “[o]nline SLAM seeks to recover the present robot location, instead of the entire path,” and “[a]lgorithms that address the online problem are usually incremental and can process one data item at a time.” *Id.*; *see also id.* at 1156 (“We already encountered one such distinction: full versus online.”). And when discussing the various SLAM techniques such as graph-based SLAM, Stachniss explains, “[m]ost methods in the field are offline and they optimize for the entire robot path.”

Id. at 1164; *see also id.* at 1162 (“[M]ost of the earlier techniques are offline and address the full SLAM problem.”).

79. Accordingly, the Petition fails to demonstrate anticipation because it mixes different disclosures within Stachniss.

80. Additionally, the Petition’s failure to show anticipation as to Claim 1 also extends as to every other claim in Ground 3 because the Petition’s arguments for the other independent claims, 13 and 25, are just cross-references to the Claim 1 arguments. *See* Petition at 73, 75.

B. Ground 2 Does Not Demonstrate That Stachniss Discloses “Associate Actions Undertaken by the Robot During Traveling Along the Route with the Location and Position of the Robot on the Route on the Map” (Limitations 1[b][3], 13[c], 25[c])

81. The Petition argues that Stachniss discloses Limitation 1[b][3]—but Stachniss never discusses any actions that a robot undertakes while traveling along a route. Stachniss, as explained above, is a book chapter that merely provides an overview of different SLAM paradigms. There is no description within Stachniss of a robot that performs actions along a route, such as cleaning, let alone that an actions undertaken are also associated with the location and position of the robot on the route on the map. Nevertheless, the Petition tries to argue, similar to the Olson-based arguments in Ground 1, that “[t]he actions undertaken by the robot include collection of sensor data using, for odometers, lasers, range sensors, cameras, and RGB-D

sensors, and storage of that data in association with the location/position of the robot on the route on the map.” Petition at 60. The argument fails for several reasons.

82. First, the Petition does not identify any “actions” that are “associate[d]” with the location and position of the robot on the route on the map. Rather, the Petition argues “storage of [sensor] data in association with the location/position of the robot...” Petition at 60; *see also id.* at 61 (“the ***data produced by these actions*** are associated with nodes, for example, when they are stored in a matrix representing the graph.”). The Petition fails to address the claim limitation because *sensor data* are not “actions.” The claims recite “associat[ing] actions” and not merely storing sensor data.

83. Second, as I explained above in Section IV.C.1, the claimed “actions undertaken by the robot” do not include the collection of sensor data used in map generation or the robot’s movement along its route. The Petition does not identify any “actions.”

84. Third, Petitioner argues that sensor data is “associated with nodes ... when they are stored in a matrix representing the graph.” Petition at 61. However, the Petition does not cite any disclosure in Stachniss suggesting that any sensor data is actually *stored* in a matrix. While sensor data is, of course, used in the map generation calculations, there is no disclosure of then *storing* that sensor data in the map or in a “matrix representing the graph.” There is no suggestion in Stachniss, for

example, that after a map has been generated, the original sensor data from the robot's sensors can be recovered given a particular location and position. Thus, the Petition's argument also fails for that additional reason.

C. Ground 2 Does Not Show that Stachniss Discloses that Each of the Nodes Comprises a Range Based on a Confidence Measure at a Respective Node (Limitations 1[b][2], 13[b], 25[b])

85. Limitations 1[b][2], 13[b], and 25[b] recite, in part, “each one of the plurality of nodes comprising a range, the range of each one of the plurality of nodes being based on confidence measure at a respective node.” The Petition relies on Stachniss's description of an EKF mapping algorithm and argues that it “depicts a range associated with the uncertainty of the position of each node for both poses and landmarks in Figure 46.2 (below).” Petition at 58-59. However, the Petition does not cite any disclosure in Stachniss corresponding to a “confidence measure,” let alone demonstrate that the “range” is “based on” a confidence measure. Stachniss's Figure 46.2 does not depict or describe a “measure” of confidence. EX1005, Fig. 46.2.

86. The Petition also argues that the “size of the ellipses” can change as the robot moves or senses a landmark again. Petition at 59. However, the Petition does not identify this as a “confidence measure” or explain how this is a “confidence measure.”

87. Accordingly, Ground 2 fails to demonstrate that any of the independent claims would have been obvious. For the same reasons, Ground 2 also fails to show that any of the dependent claims would have been obvious.

VIII. GROUNDS 3 AND 4 DO NOT SHOW OBVIOUSNESS OVER OLSON OR STACHNISS IN COMBINATION WITH FONG

88. I understand the Petition addresses Grounds 3 and 4 together in a single section. Specifically, Ground 3 is based on the combination of Olson and Fong, and Ground 4 is based on the combination of Stachniss and Fong. For the reasons explained below, Grounds 3 and 4 do not show that any challenged claim would have been obvious.

A. Grounds 3 and 4 Do Not Address the Deficiencies in Grounds 1 and 2

89. Under the heading, “Detailed Analysis of Grounds 3 and 4,” the Petition only addresses Limitations 1[a], 1[b], and 1[b][3] from Claim 1. Petition at 81-83. Similarly, the Petition only addresses Limitation 13[c] in Claim 13 and Limitations 25[pre] and 25[c] in Claim 25. *Id.* at 86-87. But as discussed above, Grounds 1 and 2 have many deficiencies with respect to several subparts in Limitations 1[b][2], 13[b], and 25[b].

B. Grounds 3 and 4 Do Not Provide Any Motivations to Combine the Distinct Disclosures Within Olson and Stachniss

90. As discussed above, Grounds 1 and 2 argue that the challenged claims are anticipated by Olson and Stachniss, respectively. However, Grounds 1 and 2 rely

on separate and distinct disclosures from within each of Olson and Stachniss. *See supra* Sections VI.A, VII.A.

91. In Grounds 3 and 4, the Petition argues that the claims would have been obvious based on Olson and Fong or based on Stachniss and Fong. But while the Petition argues there would have been a motivation to combine Olson with Fong and Stachniss with Fong (Petition at 80-81), the Petition never argues that there would have been a motivation to combine the different disclosures within Olson and Stachniss. Accordingly, the Petition fails to show that any claim would have been obvious in Grounds 3 and 4.

C. Grounds 3 and 4 Do Not Disclose Limitations 1[b][3], 13[c], and 25[c]

92. Grounds 3 and 4 combined Olson and Stachniss with Fong, respectively, to address the “associate/associating actions undertaken by the robot during traveling along the route with the location and position of the robot on the route on the map” limitation. Petition at 82-83. The Petition argues that Fong has a “robot can identify rooms (locations) and divide its map into zones according to those rooms,” and “its robot can receive instructions to assume a quieter mode of operation while cleaning in a particular room (associate an action with a location on the map).” Petition at 82-83. However, Fong does not disclose the claim limitation and the combination does not either for several reasons.

93. First, Fong does not associate actions “with the location and position of the robot on the route on the map.” The Petition’s argument relies on Fong at 4:59-63 and 6:36-44. Petition at 82-83. However, Fong at 4:59-63 appears completely unrelated to Petitioner’s argument. That section starts in the middle of a sentence and is generally discussing aligning a robot with a charging dock. EX1006 at 4:59-63. Fong at 6:36-44 states:

The system 100 can uniquely identify rooms (e.g. Zone A, Zone B, Zone C) by combining (1) identity information (e.g., the IPv6 identity of an “Internet of Things” 6LowPan light bulb or socket transceiver, plug unit, or the like), (2) RSSI (e.g., the signal strength/amplitude of the same nearby IPv6 RF transceiver) and (3) remote control (e.g., the ability to modulate that RF transceiver via the local network or internet).

Fong then continues after the Petition’s relied-upon portion:

For example, a robot 200 can navigate a room (e.g., Zone A, Zone B, or Zone C) until it finds a peak signal strength of an IPv6 transceiver, in which case it can be expected to be nearest this transceiver. It can then tag this transceiver with a topological or Cartesian location. Should the transceiver be associated with a room identity by an end user or automatically via any means (e.g., living room light bulb No. 3), the robot 200 can use this information in various ways. For example, the robot 200 can be commanded to clean the living room, in which case it can use its mobility and distance-dependent variation in signal strength to home on this room (even without a map).

EX1006 at 6:45-55.

94. The above portions of Fong do not disclose that any actions are associated with the location and position of the robot on the map. Rather, Fong identifies rooms based on the signal strength of an RF transceiver and instructs a robot to perform an action based on the signal strength of a transceiver.

95. The Petition also argues that in Fong, the “robot can receive instructions to assume a quieter mode of operation while cleaning in a particular room (associate an action with a location on the map). Petition at 83 (citing EX1006, 6:64-7:2). But receiving an instruction is not the same as the claim limitation, which requires “associat[ing] actions undertaken by the robot during traveling along the route with the location and position of the robot on the route on the map.” The ’576 Patent explains that actions undertaken by a robot can be associated with a location and position on the route on the map so that the robot can later navigate its route and perform those actions autonomously. *See* EX1001 at 6:8-32, 7:27-45. Fong, on the other hand, describes a robot that *receives* a new instruction to go somewhere and do something. EX1006, 6:64-7:2. For example, Fong explains the “system 100 (e.g., via instructions from the hub 110 to the robot 200) may instruct the robot 200 to return to the dock 600, move to a different, unoccupied zone, avoid the unoccupied zone, or assume a quieter mode of operation.” *Id.* But receiving a new command is not the same as associating “actions undertaken” with the location and position of the

robot on the route on the map. Fong's robot could be at any location or any position when it receives a new command. Thus, in Fong, the transmitted commands are independent of any location or position.

96. Third, the Petition never addresses the “on the route” part of the limitation. The limitation requires “associat[ing] actions undertaken by the robot during traveling along the route with the location and position of the robot **on the route** on the map.” The Petition at most argues: “Fong further explains that its robot can receive instructions to assume a quieter mode of operation while cleaning in a particular room (associate an action with a location on the map).” Petition at 83. But this does not address the “**on the route** on the map” portion of the limitation. The Petition does not explain how Olson or Stachniss when combined with Fong would disclose the “on the route” portion of the limitation.

97. Accordingly, Grounds 3 and 4 fail to demonstrate that any independent claim, and thus any dependent claim, would have been obvious.

IX. GROUND 5 DOES NOT SHOW OBVIOUSNESS OVER STACHNISS IN COMBINATION WITH PRASSLER

98. Ground 5 is based on the combination of Stachniss and Prassler and addresses only claims 12, 24, and 36, which I understand are dependent claims. Thus, Ground 5 does not resolve any of the problems identified above for Ground 2. Accordingly, Ground 5 does not show that any claim would have been obvious.

X. CONCLUSION

99. As set forth in this Declaration, it is my opinion that Avidbots has failed to demonstrate that any of the challenged claims of the '576 Patent would have been obvious to a POSITA.

XI. RESERVATION OF RIGHTS

100. In this declaration, I have offered opinions that the claims of the '576 Patent are patentable in view of the grounds presented in Avidbots's Petition for IPR. It should be noted that my silence on any particular issue or limitation is not to be construed as agreement with Petitioner's position on that issue or an admission that any prior art reference discloses a particular limitation. I reserve the right to explain how the claims are patentable for additional reasons, including to the extent this IPR proceeding is instituted, and in other proceedings, and to present additional opinions on additional issues, such as regarding claim construction, in this or other proceedings.