| Citation | Publication Date |
|---|---|
| Seongsoo Lee and Sukhan Lee, *Embedded visual SLAM: Applications for low-cost consumer robots*, 20 IEEE Robotics & Automation Magazine 83 | 2013 |

**c. Prior Art Products and 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 |
| Avidbots ARS-2[21] |
| Avidbots Neo[22] |

**2. Anticipation**

Avidbots has identified the following prior art known to Avidbots as anticipating the Asserted Claims of the '325 Patent. Each of the references cited below anticipates the Asserted Claims, either expressly or inherently as understood by a person of ordinary skill in the art, depending on the Court's interpretation of the claims. In some instances, Avidbots has treated certain prior art as anticipatory, where certain elements are present based on at least Plaintiff's apparent claim construction in its Infringement Contentions. Exhibits C1–C8 are charts setting forth where in the prior art references each element of the Asserted Claims of the '325 Patent are

[21] *See supra* note 15.

[22] *See supra* note 15.

found. Where Avidbots charts a prior art product or system based on patents and/or printed publications related to that product/system, Avidbots reserves the right to rely on such patents and/or printed publications alone as anticipatory references to the Asserted Claims of the '325 Patent. Avidbots has diligently pursued anticipatory prior art, and has charted the art that appears at this time to be anticipatory. In light of Brain's deficient infringement contentions and the compressed early case schedule pursued at Brain's insistence, and because these contentions are initial and not final, Avidbots reserves the right to add additional anticipatory references be them patent, published, or system art, as its diligence locates that art and/or as Brain's positions in this case (and/or the known facts of the case) develop such that additional anticipatory art exists.

| Exhibit | Reference |
|---|---|
| C1 | Stachness et al., *Springer Handbook of Robotics, Chapter 46: Simultaneous Localization and Mapping*, Springer (2d ed.) ("SLAM Handbook") |
| C2 | U.S. Patent No. 9,952,053 ("Fong (053)") |
| C3 | U.S. Patent No. 9,538,892 ("Fong (892)") |
| C4 | 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 ("Biber") |
| C5 | Lu and Milios, *Globally Consistent Range Scan Alignment for Environment Mapping*, 4 Autonomous robots 333–49 (1997) ("Lu") |
| C6 | U.S. Patent No. 10,667,664 ("Sheikh") |
| C7 | Product and System Art Identified in Table III.D.1.c |
| C8 | Avidbots System Art Identified in Table III.D.1.c |

**3. Obviousness**

To the extent that Plaintiff argues that any of the above references do not anticipate the Asserted Claims of the '325 Patent, the claims are invalid as obvious under 35 U.S.C. § 103 in view of these references alone, in combination with the knowledge of a POSITA, and in combination with other references as described below. Exhibits C1–C8 and Section III.D.1 further identify specific examples of art that alone or in combination render obvious the limitations of the

Asserted Claims of the '325 Patent. Additional evidence of obviousness can be found in the references identified in the section identifying prior art patents, publications, and systems.

While some of the above identified prior art may anticipate the asserted claims, this presents no obstacle to also relying on this reference as a basis for invalidity based on obviousness. It is established law that "a rejection for obviousness under § 103 can be based on a reference which happens to anticipate the claimed subject matter." *In re Meyer*, 599 F.2d 1026, 1031 (C.C.P.A. 1979). And to the extent any prior art item cited herein may not fully disclose a limitation of an asserted claim or is alleged by Plaintiff to lack disclosure of the limitation, such limitation is present and identified in another prior art item as shown in the attached claim charts. It would have been obvious to combine the disclosed claim elements based on the teachings of other art in existence at that time, the general knowledge of a person of ordinary skill in the art, and the recognition of similarities between the art and the claimed features. On such basis, on an element-by-element basis, subject to the limitations on combinations set forth below, Avidbots expressly intends to combine one or more prior art items identified herein with each other to address any further contentions from Plaintiff that a particular prior art item supposedly lacks one or more elements of an asserted claim. In other words, Avidbots contends that each charted prior art item can be combined with other charted prior art items if a particular prior art item lacks or does not explicitly disclose an element or feature of an asserted claim. To the extent Avidbots contends that any one or more prior art references in a combination disclose an element of an Asserted Claim as set forth in Avidbots's respective claim charts attached hereto, Avidbots reserves the right to rely on any one or more of such references, whether alone or in combination, as disclosing or rendering obvious that particular claim limitation.

Specifically, Avidbots asserts that any one of the below combinations would render the Asserted Claims of the '325 patent obvious under Section 103:

- any two charted patent prior art references;
- any two charted non-patent literature prior art references;
- any two charted system prior art references; or
- any combination of one or two charted patent prior art references, any one or two charted non-patent literature prior art references, and/or any one or two charted system prior art references to a maximum of five references per combination.

**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.

**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 '325 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* '325 Patent, Abstract. As shown by the prior references disclosed herein and by those set forth in the '325 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 '325 Patent.

**c. Motivations to Combine Prior Art**

A person of ordinary skill in the art would have been motivated to combine the above identified prior art items according to the combinations listed in Section III.D.3. A person of skill in the art would have been motivated to combine these references according to these categories because the references teach and/or suggest that a person of skill do so. For example, SLAM Handbook, Biber, and Lu are each non-patent literature references that provide background on Simultaneous Localization and Mapping (SLAM), including on alternative approaches such as the use of different operational strategies and sensors. Fong (053), Fong (892), and Sheikh are each patents directed to innovative modes of autonomous mapping and navigation, and both Fong (053) and Fong (892) reference SLAM as a suitable base technology for further innovation. *See, e.g.*, Fong (053), 4:11–32; Fong (892), 8:24–40. The identified patents thus direct a person of skill to general, non-patent, references on autonomous mapping and navigation technology including those pertaining to SLAM—such as SLAM Handbook, Biber, and Lu—to understand the full scope of the patent disclosures and to consider alternative approaches for accomplishing the same task. Indeed, the '325 Patent itself acknowledges this teaching and similarly directs persons of skill in the art to SLAM generally as a prior art backdrop to understand its invention. *See* '325 Patent, 16:26–61 ("A person having ordinary skill in the art would appreciate that ranges 604A-604D can also be computed using other statistical methods, such as . . . any other statistical methods used in, for example, Simultaneous Localization and Mapping ('SLAM').") Further, any elements claimed in the Asserted Claims would have been obvious to a person of ordinary skill in the art and predictable solutions resulting from routine optimization. Certain of these rationales are discussed more specifically below. The fact that others are not discussed more specifically should not be interpreted as an admission or concession that it does not apply. To the contrary, the discussion below simply provides more explanation of these specific rationales.

As set forth below, it would have been obvious to a person of ordinary skill in the art to combine the teachings of similar prior art references to render the Asserted Claims obvious. The references identified in the exemplary combinations set forth below are analogous prior art and for at least the reasons set forth below, a person of ordinary skill in the art would have had reasons for combining them. The various teachings, suggestions, and/or reasons to modify any of the references and/or to combine any two or more references come from various sources, including the prior art (specific and as a whole), common knowledge, common sense, predictability, expectations, industry trends, design incentives or need, market demand or pressure, market forces, the nature of the problem faced, and/or the knowledge possessed by one of ordinary skill in the art.

Furthermore, to the extent that Plaintiff argues any modification of a base reference is required to meet the claim elements, such modification was routine and predictable, within the skill of a person of ordinary skill in the art, and a person of ordinary skill in the art would have had a reasonable expectation of success in making such a combination.

The following are exemplary motivations to combine:

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose "generating a graph comprising a plurality of nodes," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have

attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose "performing scan matching on extended scan groups," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose "constraining the graph between a start location and an end location, the end location being at a substantially similar location in the environment," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose "start and end locations in view of home locator," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to

research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose "start and end locations in view of a home locator," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose a "root node as a reference location," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose "finding overlap in measurements of distinct features," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have

attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose grouping nodes into "extended scan groups based at least in-part on overlapping distinct features," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose "a navigation unit configured to navigate the robot autonomously," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '325 patent, to the extent the references charted in any of Exhibits C1–C8 do not disclose a "cost function," it would have been obvious to combine the charted references according to the combinations listed in Section III.D.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '325 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what

would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.D.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

**d. Secondary Considerations of Non-Obviousness**

A patentee bears the burden of production with respect to evidence of secondary considerations of non-obviousness. *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1373 (Fed. Cir. 2018). As of the date of these Initial Non-Infringement and Invalidity Contentions, Plaintiff has not identified any evidence of secondary considerations. Avidbots reserves the right to present additional evidence and argument regarding secondary considerations of non-obviousness to the extent Plaintiff purports to identify any such evidence. In any event, as shown in these Initial Non-Infringement and Invalidity Contentions, other companies and individuals described, built, and/or patented the exact same concepts in the '325 Patent before Plaintiff ever did—often many years before. Even where others' invention(s) occurred around the same time as the '325 Patent, such simultaneous invention demonstrates the obviousness of the '325 Patent.

**4. Priority 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 documentation, Plaintiff has the burden of proof and has not demonstrated an earlier priority date.

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

### 1. Identification of Prior Art[23]

Avidbots identifies the following prior art now known to Avidbots that anticipate or render obvious one or more of the Asserted Claims of the '576 Patent. Each of the following patents, publications, systems, and products is prior art under at least one or more of 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.

#### a. Patents and Patent Publications

| Patent / Publication No. | First Named Inventor | Date of Issue / Publication |
|---|---|---|
| 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. 8,903,589 | Boris Sofman | Dec. 2, 2014 |
| U.S. Patent No. 8,954,191 | Dong Hoon Yi | Feb. 10, 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. 9,400,501 | 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 (filed) |
| U.S. Patent No. 9,952,053 | Phillip Fong | Apr. 24, 2018 / Aug. 1, 2016 (filed) |
| U.S. Patent No. 10,093,021 | Aliakbar Aghamohammadi | Oct. 9, 2018 / Jun. 24, 2016 (filed) |

[23] *See supra* note 3.

| Patent / Publication No. | First Named Inventor | Date of Issue / Publication |
|---|---|---|
| U.S. Patent No. 10,209,063 | Peter Elving Anderson-Sprecher | Feb. 19, 2019 / Oct. 3, 2015 (filed) |
| 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 (filed) |
| U.S. Patent No. 11,927,965 | Ali Ebrahimi Afrouzi | Mar. 12, 2024 / Feb. 29, 2016 (provisional) |
| U.S. Patent Pub. 2008/0294338 | Nakju Doh | Nov. 27, 2008 |
| U.S. Patent Pub. 2012/0121161 | Ethan Eade | May 17, 2012 |

**b. Printed Publications**

| Citation | Publication Date |
|---|---|
| Stachness et al., *Springer Handbook of Robotics, Chapter 46: Simultaneous Localization and Mapping*, Springer (2d ed.) | Jun. 26, 2016 |
| 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 |
| Lu and Milios, *Globally Consistent Range Scan Alignment for Environment Mapping*, 4 Autonomous robots 333–49 (1997) | 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 |
| 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 |
| Richard Szeliski, *Image Alignment and Stitching: A Tutorial*, Foundations and Trends in Computer Vol. 2 | 2006 |
| Wolfgang Hess et al., *Real-time loop closure in 2D LIDAR SLAM*, 2016 IEEE Internation Conference on Robotics and Automation | May 16–21, 2016 |
| Giorgio Grisetti, et al, *A Tutorial on Graph-Based SLAM*, 2 IEEE Intelligent Transportation Systems Magazine 31 | Feb. 4, 2011 |
| 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 |

| Citation | Publication Date |
|---|---|
| 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 |

**c. Prior Art Products and 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 |
| Avidbots ARS-2[24] |
| Avidbots Neo[25] |

**2. Anticipation**

Avidbots has identified the following prior art known to Avidbots as anticipating the Asserted Claims of the '576 Patent. Each of the references cited below anticipates the Asserted Claims, either expressly or inherently as understood by a person of ordinary skill in the art, depending on the Court's interpretation of the claims. In some instances, Avidbots has treated certain prior art as anticipatory, where certain elements are present based on at least Plaintiff's

[24] *See supra* note 15.

[25] *See supra* note 15.

apparent claim construction in its Infringement Contentions. Exhibits D1–D8 are charts setting forth where in the prior art references each element of the Asserted Claims of the '576 Patent are found. Where Avidbots charts a prior art product or system based on patents and/or printed publications related to that product/system, Avidbots reserves the right to rely on such patents and/or printed publications alone as anticipatory references to the Asserted Claims of the '576 Patent. Avidbots has diligently pursued anticipatory prior art, and has charted the art that appears at this time to be anticipatory. In light of Brain's deficient infringement contentions and the compressed early case schedule pursued at Brain's insistence, and because these contentions are initial and not final, Avidbots reserves the right to add additional anticipatory references be them patent, published, or system art, as its diligence locates that art and/or as Brain's positions in this case (and/or the known facts of the case) develop such that additional anticipatory art exists.

| Exhibit | Reference |
|---|---|
| D1 | Stachness et al., *Springer Handbook of Robotics, Chapter 46: Simultaneous Localization and Mapping*, Springer (2d ed.) ("SLAM Handbook") |
| D2 | U.S. Patent No. 9,952,053 ("Fong (053)") |
| D3 | 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 ("Biber") |
| D4 | Lu and Milios, *Globally Consistent Range Scan Alignment for Environment Mapping*, 4 Autonomous robots 333–49 (1997) ("Lu") |
| D5 | U.S. Patent No. 9,233,472 ("Angle") |
| D6 | U.S. Patent No. 10,667,664 ("Sheikh") |
| D7 | Product and System Art Identified in Table III.E.1.c |
| D8 | Avidbots System Art Identified in Table III.E.1.c |

**3. Obviousness**

To the extent that Plaintiff argues that any of the above references do not anticipate the Asserted Claims of the '576 Patent, the claims are invalid as obvious under 35 U.S.C. § 103 in view of these references alone, in combination with the knowledge of a POSITA, and in

combination with other references as described below. Exhibits D1–D8 and Section III.E.1 further identify specific examples of art that alone or in combination render obvious the limitations of the Asserted Claims of the '576 Patent. Additional evidence of obviousness can be found in the references identified in the section identifying prior art patents, publications, and systems.

While some of the above identified prior art may anticipate the asserted claims, this presents no obstacle to also relying on this reference as a basis for invalidity based on obviousness. It is established law that "a rejection for obviousness under § 103 can be based on a reference which happens to anticipate the claimed subject matter." *In re Meyer*, 599 F.2d 1026, 1031 (C.C.P.A. 1979). And to the extent any prior art item cited herein may not fully disclose a limitation of an asserted claim or is alleged by Plaintiff to lack disclosure of the limitation, such limitation is present and identified in another prior art item as shown in the attached claim charts. It would have been obvious to combine the disclosed claim elements based on the teachings of other art in existence at that time, the general knowledge of a person of ordinary skill in the art, and the recognition of similarities between the art and the claimed features. On such basis, on an element-by-element basis, subject to the limitations on combinations set forth below, Avidbots expressly intends to combine one or more prior art items identified herein with each other to address any further contentions from Plaintiff that a particular prior art item supposedly lacks one or more elements of an asserted claim. In other words, Avidbots contends that each charted prior art item can be combined with other charted prior art items if a particular prior art item lacks or does not explicitly disclose an element or feature of an asserted claim. To the extent Avidbots contends that any one or more prior art references in a combination disclose an element of an Asserted Claim as set forth in Avidbots's respective claim charts attached hereto, Avidbots

reserves the right to rely on any one or more of such references, whether alone or in combination, as disclosing or rendering obvious that particular claim limitation.

Specifically, Avidbots asserts that any one of the below combinations would render the Asserted Claims of the '576 patent obvious under Section 103:

- any two charted patent prior art references;
- any two charted non-patent literature prior art references;
- any two charted system prior art references; or
- any combination of one or two charted patent prior art references, any one or two charted non-patent literature prior art references, and/or any one or two charted system prior art references, to a maximum of five references per combination.

**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 '576 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 robots, including experience with automation. 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 embodiments, these routes are planned by autonomous robots. See '576 patent, Abstract. As shown by the prior references disclosed herein and by those set forth in the '576 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 '576 Patent.

**c. Motivations to Combine Prior Art**

A person of ordinary skill in the art would have been motivated to combine the above identified prior art items according to the combinations listed in Sections III.E.3. A person of skill in the art would have been motivated to combine these references according to these categories because the references teach and/or suggest that a person of skill do so. For example, SLAM Handbook, Biber, and Lu are each non-patent literature references that provide background on Simultaneous Localization and Mapping (SLAM), including on alternative approaches such as the use of different operational strategies and sensors. Fong (053), Angle, and Sheikh are each patents directed to innovative modes of autonomous mapping and navigation, and each references SLAM as a suitable base technology for further innovation. *See, e.g.*, Fong (053), 4:11–32; Angle, 31:56–32:3. The identified patents thus direct a person of skill to general, non-patent, references on autonomous mapping and navigation technology including those pertaining to SLAM—such as SLAM Handbook, Biber, and Lu—to understand the full scope of the patent disclosures and to consider alternative approaches for accomplishing the same task. Indeed, the '576 Patent itself acknowledges this teaching and similarly directs persons of skill in the art to SLAM generally as a prior art backdrop to understand its invention. *See* '576 Patent, 16:26–61 ("A person having ordinary skill in the art would appreciate that ranges 604A-604D can also be computed using other statistical methods, such as . . . any other statistical methods used in, for example, Simultaneous Localization and Mapping ('SLAM').") Further, any elements claimed in the Asserted Claims would have been obvious to a person of ordinary skill in the art and predictable solutions resulting from routine optimization. Certain of these rationales are discussed more specifically below. The fact that others are not discussed more specifically should not be interpreted as an admission or concession that it does not apply. To the contrary, the discussion below simply provides more explanation of these specific rationales.

As set forth below, it would have been obvious to a person of ordinary skill in the art to combine the teachings of similar prior art references to render the Asserted Claims obvious. The references identified in the exemplary combinations set forth below are analogous prior art and for at least the reasons set forth below, a person of ordinary skill in the art would have had reasons for combining them. The various teachings, suggestions, and/or reasons to modify any of the references and/or to combine any two or more references come from various sources, including the prior art (specific and as a whole), common knowledge, common sense, predictability, expectations, industry trends, design incentives or need, market demand or pressure, market forces, the nature of the problem faced, and/or the knowledge possessed by one of ordinary skill in the art.

Furthermore, to the extent that Plaintiff argues any modification of a base reference is required to meet the claim elements, such modification was routine and predictable, within the skill of a person of ordinary skill in the art, and a person of ordinary skill in the art would have had a reasonable expectation of success in making such a combination.

The following are exemplary motivations to combine:

- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose "generating map of the environment and a route on the map in real-time," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have

attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose a "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," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose "each one of the plurality of nodes comprising a range . .

. based on confidence measure at a respective node," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose "actuating one or more systems selectively as the robot travels along the route, the one or more systems comprises a cleaning system, the cleaning system comprises one or mor of water flow, brush and vacuum cleaner," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results,

including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose a "determining the robot returned to a start position based on detecting a home locator in the environment," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose a "position of the robot is relative to either an initial location or one or more features in the environment," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose "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," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a

person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '576 patent, to the extent the references charted in any of Exhibits D1–D8 do not disclose "size of the range of each one of the plurality of nodes is variable based on confidence in location of each node of the plurality of nodes," it would have been obvious to combine the charted references according to the combinations listed in Section III.E.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to robotic mapping and route planning, and/or relate to autonomous robotic floor cleaners. As of the asserted priority date of the '576 Patent, the commercial and academic interest in autonomous robotics—particularly as applied to floor cleaners—was substantial motivation to improve robotic mapping, navigation, and object avoidance. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on autonomous mapping, navigation, and floor cleaners, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and route planning, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would have therefore would have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.E.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

#### d. Secondary Considerations of Non-Obviousness

A patentee bears the burden of production with respect to evidence of secondary considerations of non-obviousness. *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1373 (Fed. Cir. 2018). As of the date of these Initial Non-Infringement and Invalidity Contentions, Plaintiff has not identified any evidence of secondary considerations. Avidbots reserves the right to present additional evidence and argument regarding secondary considerations of non-obviousness to the extent Plaintiff purports to identify any such evidence. In any event, as shown in these Initial Non-Infringement and Invalidity Contentions, other companies and individuals described, built, and/or patented the exact same concepts in the '576 Patent before Plaintiff ever did—often many years before. Even where others' invention(s) occurred around the same time as the '576 Patent, such simultaneous invention demonstrates the obviousness of the '576 Patent.

### 4. Priority 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 documentation, Plaintiff has the burden of proof and has not demonstrated an earlier priority date.

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

### 1. Identification of Prior Art[26]

Avidbots identifies the following prior art now known to Avidbots that anticipate or render obvious one or more of the Asserted Claims of the '436 Patent. Each of the following patents,

[26] *See supra* note 3.

publications, systems, and products is prior art under at least one or more of 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.

**a. Patents and Patent Publications**

| Patent / Publication No. | First Named Inventor | Date of Issue / Publication |
|---|---|---|
| U.S. Patent No. 8,542,875 | Lalitha M. Eswara | Sept. 24, 2013 |
| U.S. Patent No. 9,076,214 | Shohei Tsutsumi | Jul. 7, 2015 / Feb. 14, 2013 |
| U.S. Patent Pub. 2013/004,4951 | Der-Chun Cherng | Feb. 21, 2013 |
| U.S. Patent No. 7,965,890 | Eran Marcus | June 21, 2011 |
| U.S. Patent No. 9,208,384 | William Y. Conwell | Dec. 8, 2015 / Nov. 14, 2008 |
| U.S. Patent No. 7,502,065 | Naoto Nakahara | Mar. 10, 2009 |
| U.S. Patent No. 9,122,948 | Jiajun Zhu | Sept. 1, 2015 / Oct. 5, 2011 |
| U.S. Patent Pub. 2006/0188168 | Vitaly S. Sheraizin | Aug. 24, 2006 |
| 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 |
| WO 2011/146259 A2 | Michael T. Rosenstein | Nov. 24, 2011 |
| U.S. Patent No. 8,300,890 | Deepak Gaikwad | Oct. 30, 2012 |
| U.S. Patent No. 5,793,900 | Illah Reza Nourbakhsh | Aug. 11, 1998 |

**b. Printed Publications**

| Citation | Publication Date |
|---|---|
| Suzuki and Abe, *Topological Structural Analysis of Digitized Binary Images by Border Following* | 1983 |
| 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 |

| Citation | Publication Date |
|---|---|
| Basic Research Series: Optical Information Technology State-of-the-Art Report | 1993 |
| J.M. Rueger, Electronic Distance Measurement, 4th Ed. | 1996 |
| J.M. Rueger, Electronic Distance Measurement, 3rd Ed. | 1990 |
| 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 |
| David G. Lowe, *Object Recognition from Local Scale-Invariant Features* | 1999 |
| Srenivas Varadarajan, Lina J. Karam, and Dinei Florencio, *Background Recovery from Video Sequences Using Motion Parameters* | 2009 |
| Srenivas Varadarajan, Chaitali Chakrabarti, Lina J. Karam, and Judit Martinez Bauza, *A Distributed Psycho-Visually Motivated Canny Edge Detector* | 2010 |
| Srenivas Varadarajan and Lina J. Karam, *An Improved Perception-Based No-Reference Objective Image Sharpness Metric Using Iterative Edge Refinement* | 2008 |
| Qian Xu, Chaitali Chakrabarti, and Lina J. Karam, *A Distributed Canny Edge Detector and its Implementation on FGPA* | 2011 |
| Mejdl Safran and Steven Haar, *Arduino and Android Powered Object Tracking Robot* | Nov. 7, 2012 |
| Girshick, Ross, et al., *Rich feature hierarchies for accurate object detection and semantic segmentation (v3)*, Proceedings of the IEEE conference on computer vision and pattern recognition | May 7, 2014 |
| Kaiqi Huang, Liangsheng Wang, Tieniu Tan, and Steve Maybank, *A Real-Time Object Detecting and Tracking System for Outdoor Night Surveillance* | 2008 |
| 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* | Nov. 1986 |

**c. Prior Art Products and 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) |

| Product / System |
|---|
| Locus Robotics |
| Google Self-Driving Car Project (n/k/a Waymo) |
| BMW M235i |

**2. Anticipation**

Avidbots has identified the following prior art known to Avidbots as anticipating the Asserted Claims of the '436 Patent. Each of the references cited below anticipates the Asserted Claims, either expressly or inherently as understood by a person of ordinary skill in the art, depending on the Court's interpretation of the claims. In some instances, Avidbots has treated certain prior art as anticipatory, where certain elements are present based on at least Plaintiff's apparent claim construction in its Infringement Contentions. Exhibits E1–E8 are charts setting forth where in the prior art references each element of the Asserted Claims of the '436 Patent are found. Where Avidbots charts a prior art product or system based on patents and/or printed publications related to that product/system, Avidbots reserves the right to rely on such patents and/or printed publications alone as anticipatory references to the Asserted Claims of the '436 Patent. Avidbots has diligently pursued anticipatory prior art, and has charted the art that appears at this time to be anticipatory. In light of Brain's deficient infringement contentions and the compressed early case schedule pursued at Brain's insistence, and because these contentions are initial and not final, Avidbots reserves the right to add additional anticipatory references be them patent, published, or system art, as its diligence locates that art and/or as Brain's positions in this case (and/or the known facts of the case) develop such that additional anticipatory art exists.

| Exhibit | Reference |
|---|---|
| E-1 | JPH10206150 ("Matsuyama") |
| E-2 | JP2012189874 ("Asakura") |
| E-3 | JP2009216600 ("Oita") |

| Exhibit | Reference |
|---|---|
| E-4 | U.S. Patent No. 8,542,875 ("Eswara") |
| E-5 | U.S. Patent No. 9,076,214 ("Tsutsumi") |
| E-6 | U.S. Patent Pub. No. 2013/0044951 ("Cherng") |
| E-7 | U.S. Patent No. 9,122,948 ("Zhu") |
| E-8 | Product and System Art Identified in Table III.F.1.c |
| E-9 | WO 2011/146259 A2 ("Rosenstein") |

**3. Obviousness**

To the extent that Plaintiff argues that any of the above references do not anticipate the Asserted Claims of the '436 Patent, the claims are invalid as obvious under 35 U.S.C. § 103 in view of these references alone, in combination with the knowledge of a POSITA, and in combination with other references as described below. Exhibits E1-E8 and Section III.F.1 further identify specific examples of art that alone or in combination render obvious the limitations of the Asserted Claims of the '436 Patent. Additional evidence of obviousness can be found in the references identified in the section identifying prior art patents, publications, and systems.

While some of the above identified prior art may anticipate the asserted claims, this presents no obstacle to also relying on this reference as a basis for invalidity based on obviousness. It is established law that "a rejection for obviousness under § 103 can be based on a reference which happens to anticipate the claimed subject matter." *In re Meyer*, 599 F.2d 1026, 1031 (C.C.P.A. 1979). And to the extent any prior art item cited herein may not fully disclose a limitation of an asserted claim or is alleged by Plaintiff to lack disclosure of the limitation, such limitation is present and identified in another prior art item as shown in the attached claim charts. It would have been obvious to combine the disclosed claim elements based on the teachings of other art in existence at that time, the general knowledge of a person of ordinary skill in the art, and the recognition of similarities between the art and the claimed features. On such basis, on an

element-by-element basis, subject to the limitations on combinations set forth below, Avidbots expressly intends to combine one or more prior art items identified herein with each other to address any further contentions from Plaintiff that a particular prior art item supposedly lacks one or more elements of an asserted claim. In other words, Avidbots contends that each charted prior art item can be combined with other charted prior art items if a particular prior art item lacks or does not explicitly disclose an element or feature of an asserted claim. To the extent Avidbots contends that any one or more prior art references in a combination disclose an element of an Asserted Claim as set forth in Avidbots's respective claim charts attached hereto, Avidbots reserves the right to rely on any one or more of such references, whether alone or in combination, as disclosing or rendering obvious that particular claim limitation.

Specifically, Avidbots asserts that any one of the below combinations would render the Asserted Claims of the '436 patent obvious under Section 103:

- Rosenstein and Zhu;
- One or two of Rosenstein and Zhu with any one, two, three, four, or five of Matsuyama, Asakura, Oita, Eswara, Tsutsumi, and Cherng; or
- Any of the above combinations in further combination with any one, two, or three system prior art references.

**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 '436 Patent generally relates to the detection of objects or targets using processing of optical data. *See* '436 Patent, Col. 1:23-25. In some embodiments, the object detection methodology is performed by a vehicle navigation application. *Id*. at Col. 22:4-6. As shown by the prior art references disclosed herein and by those set forth in the '436 Patent and file history, object detection using optical data for vehicle navigation, including the use of sensors to gather the optical data, was well-known as of the asserted priority date of the '436 Patent.

**c. Motivations to Combine Prior Art**

A person of ordinary skill in the art would have been motivated to combine the above identified prior art items according to the combinations listed in Section III.F.3. A person of skill in the art would have been motivated to combine these references according to these categories because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. Further, a person of skill would be motivated to combine these references according to these categories because the references teach and/or suggest that a person of skill do so. For example, Rosenstein and Zhu are each charted patents that disclose the detection of an object by a robot by obtaining at least one image of the robot's surroundings through the use of sensors and analyzing that image to detect the presence of an object. Matsuyama, Asakura, Oita, Eswara, Tsutsumi, and Cherng teach how to determine the presence of an object, including by employing a contrast method. Further, any elements claimed in the Asserted Claims would have been obvious to a person of ordinary skill in the art and predictable solutions resulting from routine optimization. Certain of these rationales are discussed more specifically below. The fact that others are not discussed more specifically

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

As set forth below, it would have been obvious to a person of ordinary skill in the art to combine the teachings of similar prior art references to render the Asserted Claims obvious. The references identified in the exemplary combinations set forth below are analogous prior art and for at least the reasons set forth below, a person of ordinary skill in the art would have had reasons for combining them. The various teachings, suggestions, and/or reasons to modify any of the references and/or to combine any two or more references come from various sources, including the prior art (specific and as a whole), common knowledge, common sense, predictability, expectations, industry trends, design incentives or need, market demand or pressure, market forces, the nature of the problem faced, and/or the knowledge possessed by one of ordinary skill in the art.

Furthermore, to the extent that Plaintiff argues any modification of a base reference is required to meet the claim elements, such modification was routine and predictable, within the skill of a person of ordinary skill in the art, and a person of ordinary skill in the art would have had a reasonable expectation of success in making such a combination.

The following are exemplary motivations to combine:

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "determining the presence of the object based on comparing a contrast parameter of the at least one image to a threshold, the contrast parameter corresponding to a maximum absolute deviation of pixels within the at least one image from a reference value, and the threshold being dynamically configured based on one or more parameters," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—

was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "causing the controller to selectively activate the actuator based on the determination that the object is within the range of the apparatus," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already

succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "wherein the contrast parameter corresponds to partitioning of the at least one image into a low spatial frequency portion and a high spatial frequency portion," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "detecting the object at multiple locations from the apparatus based on the sensor being at a slanted angle" it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing

of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "whether the apparatus is approaching the object or the object is approaching the apparatus," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also

understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "wherein the sensor comprising a linear array of photo sensitive elements," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "wherein the sensor comprises one or more sensing layers axially displaced from one another, each one of the one or more sensing layer comprise a plurality of photo sensitive layers," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "partitioning a first image, from the plurality of images, into at least two subimages comprising two different energy spectra or regions of the first image," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object

avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "applying filtering and/or cropping operations to the at least one of the two sub-images prior to the determination of a contrast parameter criterion," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could

reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '436 Patent, to the extent the references charted in any of Exhibits E1–E8 do not disclose "applying an asymmetrical filter to the data from the at least one sensor to facilitate detection of objects at a target orientation," it would have been obvious to combine the charted references according to the combinations listed in Section III.F.3. A person of skill in the art would be motivated to combine these references because they each disclose features related to the detection of objects or targets using processing of optical data and/or relate to object detection for vehicle navigation. As of the asserted priority date of the '436 Patent, the commercial and academic interest in object detection using the processing of optical data—particularly as applied to the navigation of an apparatus—was substantial motivation to improve optical data processing, navigation, and object avoidance. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. A person of skill in the art would have been motivated to combine various teachings on the processing of optical data and navigation, including as it related to object detection and avoidance. A person of skill in the art working on robotic floor cleaners would have known that others were also developing techniques for robotic navigation, object avoidance, and optical data processing, and would have been motivated to research those systems and techniques. Furthermore, a person of skill would have attempted many techniques and systems to determine what would yield the best results, including by looking at other research and development in the field. A person of skill would also understand that the art contained many methods which accomplish substantially similar results, and would therefore have understood that disclosure of one method discloses all methods that could reasonably be substituted for the chosen method. Additionally, a person of skill in the art would have had a reasonable expectation of success, as others in the art had already succeeded in disclosing this limitation. *See, e.g.*, Section III.F.1.c, Prior Art Products and Systems. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

**d. Secondary Considerations of Non-Obviousness**

A patentee bears the burden of production with respect to evidence of secondary considerations of non-obviousness. *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1373 (Fed. Cir. 2018). As of the date of these Initial Non-Infringement and Invalidity Contentions, Plaintiff has not identified any evidence of secondary considerations. Avidbots reserves the right to present additional evidence and argument regarding secondary considerations of non-obviousness to the extent Plaintiff purports to identify any such evidence. In any event, as shown in these Initial Non-Infringement and Invalidity Contentions, other companies and individuals described, built, and/or patented the exact same concepts in the '436 Patent before Plaintiff ever did—often many years before. Even where others' invention(s) occurred around the same time as the '436 Patent, such simultaneous invention demonstrates the obviousness of the '436 Patent.

**4. Priority Date**

U.S. Application No. 15/845,891 (hereinafter, "the '891 application"), which led to the '436 Patent, was filed on December 18, 2017. The '891 application purports to be a continuation of U.S. Application No. 14/321,736 (hereinafter, "the '736 application"), which was filed on July 1, 2014. To the extent that Plaintiff asserts that the '436 Patent is entitled to an earlier priority date based on any provisional application or documentation, Plaintiff has the burden of proof and has not demonstrated an earlier priority date.

## IV. INVALIDITY UNDER 35 U.S.C. § 112

Avidbots alleges that the Asserted Claims are invalid under 35 U.S.C. § 112 for failing to satisfy the written description and enablement requirements (Section 112(a)) and/or as indefinite (Section 112(b)). Avidbots reserves all rights to amend their Initial Non-Infringement and 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.

## A. Legal Standards

### 1. Invalidity Under 35 U.S.C. § 112(a) (Written Description / Non-Enablement)

35 U.S.C. § 112(a) requires that the specification contain a written description of the invention. "[T]he hallmark of written description is disclosure." *Boston Scientific Corp. v. Johnson & Johnson*, 647 F.3d 1353, 1361–62 (Fed. Cir. 2011) (citation omitted). The test for whether a specification adequately describes an invention is "whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date. . . . [T]he test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art . . .. [It] is a question of fact." *Ariad Pharms., Inc. v. Eli Lilly and Co*., 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc); *Boston Scientific*, 647 F.3d at 1362.

The enablement requirement of Section 112 demands that the patent specification enable "those skilled in the art to make and use the full scope of the claimed invention without 'undue experimentation.'" *Genentech, Inc. v. Novo Nordisk A/S*, 108 F.3d 1361, 1365 (Fed. Cir. 1997) (quoting *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993)). "[T]he scope of the claims must be

less than or equal to the scope of the enablement." *Nat'l Recovery Tech., Inc. v. Magnetic Separation Sys., Inc.*, 166 F.3d 1190, 1196 (Fed. Cir. 1999). In other words, the claims must be enabled over their entire claimed range. *See id.* (finding lack of enablement because the "claim [] [was] broader than the enablement as taught in the specification").

**2. Invalidity Under 35 U.S.C. § 112(b) (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).

**B. Section 112 Invalidity of U.S. Patent No. 10,001,780**

**1. Lack of Written Description / Enablement**

Avidbots contends that the following Asserted Claims of the '780 Patent are invalid under 35 U.S.C. Section 112(a). Each Asserted Claim identified below (and each Asserted Claim that depends therefrom) is invalid under Section 112(a) because the specification of the Asserted Patent

fails to provide a sufficient written description and/or enabling disclosure. For each listed term or phrase, Avidbots believes the term or phrase is invalid under 35 U.S.C. Section 112(a), as is any limitation including such terms or phrases, including through claim dependency, for the same reason(s).

- "force function" (claim 4, 6, 11, 12). The Asserted Claims do not meet the written description or enablement requirements of 35 U.S.C. § 112 for at least the reason that the patent specification does not provide support for the full scope of the claims to the extent Brain 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).
- "interpolation" (claims 1, 2, 3, 9, 14). The Asserted Claims do not meet the written description or enablement requirements of 35 U.S.C. § 112 for at least the reason that the patent specification does not provide support for the full scope of the claims to the extent Brain 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).
- "translation and rotation of the interpolation route pose" (claim 14). The Asserted Claims do not meet the written description or enablement requirements of 35 U.S.C. § 112 for at least the reason that the patent specification does not provide support for the full scope of the claims to the extent Brain 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). For example, nowhere does the specification explain how translation and/or rotation of the interpolation route pose is accomplished.

**2. Indefiniteness**

Avidbots contends that the following Asserted Claims of the '780 Patent are invalid under 35 U.S.C. Section 112(b). Each Asserted Claim identified below (and each Asserted Claim that depends therefrom) is invalid under Section 112(b) because they fail to inform, with reasonable certainty, those skilled in the art about the scope of the claimed invention. For each listed term or phrase, Avidbots believes the term or phrase is invalid under Section 112(b), and any limitation including such term or phrase is also indefinite. Therefore, identification of a term or phrase below necessarily identifies any broad term/phrase or claim limitation in which the identified term or phrase appears.

- "interpolation" (claims 1, 2, 3, 9, 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 Asserted Claims fail to inform whether the term "interpolation" is coextensive with mathematical interpolation methods or if it requires some other, unidentified, step.
- "translation and rotation of the interpolation route pose" (claim 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).

**C. Section 112 Invalidity of U.S. Patent No. 10,379,539**

**1. Lack of Written Description / Enablement**

Avidbots contends that the following Asserted Claims of the '539 Patent are invalid under 35 U.S.C. Section 112(a). Each Asserted Claim identified below (and each Asserted Claim that depends therefrom) is invalid under Section 112(a) because the specification of the Asserted Patent

fails to provide a sufficient written description and/or enabling disclosure. For each listed term or phrase, Avidbots believes the term or phrase is invalid under 35 U.S.C. Section 112(a), as is any limitation including such terms or phrases, for the same reason(s).

- "[large]/[small]/[ ] footprint" (claims 3, 8, 10, 14, 16). The Asserted Claims do not meet the written description or enablement requirements of 35 U.S.C. § 112 for at least the reason that the patent specification does not provide support for the full scope of the claims to the extent Brain 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).
- "interpolation" (claims 6, 13). The Asserted Claims do not meet the written description or enablement requirements of 35 U.S.C. § 112 for at least the reason that the patent specification does not provide support for the full scope of the claims to the extent Brain 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).
- "translating and rotating in response to repositioning of the respective pose" (claim 12). The Asserted Claims do not meet the written description or enablement requirements of 35 U.S.C. § 112 for at least the reason that the patent specification does not provide support for the full scope of the claims to the extent Brain 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).
- "processor" (claim 14). The Asserted Claims do not meet the written description or enablement requirements of 35 U.S.C. § 112 for at least the reason that the patent specification does not provide support for the full scope of the claims to the extent Brain