

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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TESLA, INC.,  
Petitioner

v.

INTELLECTUAL VENTURES II LLC,  
Patent Owner.

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IPR No. 2025-00342

U.S. Patent No. 7,336,805

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**DECLARATION OF DR. ADITI MAJUMDER IN SUPPORT OF  
PATENT OWNER'S PRELIMINARY RESPONSE**

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## **I. Introduction And Qualifications**

1. I, Aditi Majumder, submit this declaration on behalf of Intellectual Ventures II LLC, (“Patent Owner”) to provide my opinions concerning the validity of claims 1, 2 and 6-11 (the “Challenged Claims”) of U.S. Patent No. 7,336,805 (the “‘805 patent,” Ex.1001), in support of Patent Owner’s Preliminary Response to the Petitioner for *Inter Partes* review of the ‘805 patent, which I understand was filed by Tesla Inc., (“Tesla”, the “Petitioner”) and accompanied by a Declaration of Dr. Erez Rodriguez (the “Rodriguez Declaration”), among other exhibits.

2. I am more than eighteen years of age, and I am a citizen of the United States, currently residing in the State of California.

3. In formulating my opinions, I have relied upon my knowledge, training, and experience in relevant art. My qualifications, along with a more detailed summary of my background and publications, are stated more fully in my *curriculum vitae*, which has been provided as Exhibit 2008. Here, I provide a concise summary of my qualifications.

4. I am a Professor in the Department of Computer Science in the School of Information and Computer Sciences (ICS) in University of California, Irvine (UCI).

5. I have founded Summit Technology Laboratory (STL) in 2015 to translate the research in my lab at UCI into a commercial entity. I am currently the

President and CTO of STL. During 2015-Present, I led the development of an automated projection mapping software, Artemis<sup>TM</sup>, using advanced computer vision technologies., built the company from scratch to a 10 member entity. I helped procure \$6.5M in SBIR funding from federal agencies to build the product and engage customers to start generating revenue.

6. I have also held the positions of Technical Advisor for Walt Disney Imagineering and Cubic Defense, helping them with computer vision based techniques for their immersive environments.

7. I have also been a Technical Advisor for Ostendo Technologies to help them build their first product on projection based desktop curved display that won the Best Display Award in CES 2009.

8. I have coauthored two books, one of which titled, "Introduction to Visual Computing: Core concepts in Computer Vision, Graphics and Image Processing," is considered a text book for UG or G courses of Visual Computing. In addition, I have authored two book chapters, and 80+ journal and refereed conference articles. I have been the recipient of the NSF CAREER award and have won Best Paper awards in reputed venues like IEEE Virtual Reality, IEEE Visweek, IEEE Projector Camera Systems and 3DTV conference. I have been a Link Foundation Fellow and Given's Associate Student Fellow of Argonne National Laboratories.

9. I have been the co-editor of several reputed publications like IEEE Computer Graphics and Applications and IEEE Transactions on Visualization and Computer Graphics. I have chaired highly reputed conferences like IEEE Virtual Reality, ACM Virtual Reality Software and Technology, and IEEE Workshop on Projector-Camera Systems. My work has received around 4000 citations with an h-index of 36 (based on Google Scholar).

10. I am a named inventor on several patents and published patent applications corresponding to the areas of my professional work. Accordingly, I have a general understanding of the U.S. patent prosecution process and of the novelty and non-obviousness requirements for patentability. Example patents include:

- US Patent 11,160,470- “Motion Tracking Apparatus and Method,” Bruce J. Tromberg, Kyle Cutler, Chris Van Wagenen, Seung-ha Lee, Thomas O’Sullivan, Gopi Meenakshisundaram, **Aditi Majumder**, Albert Cerussi, “, Nov 2021
- US Patent 9,218,061- “Video frame synchronization for a federation of projectors using camera feedback,” **Aditi Majumder**, Kiarash Amiri, Shih-Hsien Yang, Magda El Zarki, Fadi Kurdahi, Dec 2015.
- US Patent 9,183,771 – “A Projector with Enhanced Resolution Via Optical Pixel Sharing,” Behzad Sajadi, **Aditi Majumder**, M. Gopi, Nov 2015.
- US Patent 9,195,121- “Markerless Geometric Registration Of Multiple Projectors (With Or Without Distortions) On Cylindrical And Other Extruded Surfaces Using An Uncalibrated Camera,” Behzad Sajadi, **Aditi Majumder**, Nov 2015.

- US Patent 9,052,584 -"Color Seamlessness in Tiled Displays"- **Aditi Majumder**, M. Gopi, Behzad Sajadi, , June 2015.
- US Patent 9,064,312- "Augmented Reality Using Projector Camera Enabled Devices," Behzad Sajadi, **Aditi Majumder**, June 2015.
- US Patent 8,872,799 -"Scalable distributed/cooperative/collaborative paradigm for multi-user interaction with projection-based display walls," **Aditi Majumder**, Oct, 2015.
- US Patent 8,098,265- " Hierarchical multicolor primaries temporal multiplexing system," Hussein El-Ghoroury, **Aditi Majumder**, Robert G. Brown, Jan 2012.
- US Patent 7,942,530- ""Apparatus and Method for Self Calibrating Multi-Projector Displays Via Plug and Play Projectors," **Aditi Majumder**, Ezekiel Bhasker and Pinaki Sinha, May 2011.
- US Patent 7,038,727- Method to Smooth Photometric Variation Across Multi-Projector Displays, " **Aditi Majumder** and Rick Stevens, May 2006.

11. I believe that my extensive industry experience and educational background qualify me as an expert in the relevant field of visual computing, including image processing, computer vision and computer graphics.

12. I am knowledgeable of the relevant skill set that would have been possessed by a hypothetical person of ordinary skill in the art ("POSITA") at the time of the claimed invention of the '805 patent, which I have treated as June 16, 2004 for purposes of this proceeding. I have the necessary expertise to provide my informed opinions in this IPR, and I am an expert in the art of the '805 Patent, due

to the following:

- I received my undergraduate, master's, and doctoral degrees in computer science and engineering, computer science, and computer science, respectively;
- I have extensive experience in visual computing. I have been conducting state-of-the-art research in the use of image processing, computer vision and graphics for a variety of disciplines including immersive environments, spatially augmented reality, computational photography, data visualization and rendering for the last three decades;
- I have supervised 10+ doctoral students in computer science and related fields and many of these students are currently employed by companies such as Facebook, Amazon, and Microsoft.

## **II. Summary Of Materials Reviewed And Considered**

13. The opinions contained in this Declaration are based on the documents I reviewed and my knowledge and professional judgment. In forming the opinions expressed in this Declaration, while drawing on my experience, I reviewed the following documents:

|         | <b>Description</b>               |
|---------|----------------------------------|
| Paper 2 | Petition For Inter Partes Review |

|        | <b>Description</b>                                                                     |
|--------|----------------------------------------------------------------------------------------|
| EX1001 | United States Patent No. 7,336,805 B2 (“the ‘805 Patent”)                              |
| EX1002 | Prosecution history of the ‘805 patent (‘805 File History)                             |
| EX1003 | Declaration of Dr. Jeffrey Rodriguez (“Rodriguez Decl.”)                               |
| EX1005 | “Visual Perception of Obstacles and Vehicles for Platooning,” Broggi et al. (“Broggi”) |
| EX1006 | “Object Recognition Using Alignment,” Daniel Huttenlocher (“Huttenlocher”)             |
| EX1007 | U.S. Patent No. 5,434,927 to Brady et al. (“Brady”)                                    |
| EX2006 | R. Sedgewick, Algorithms in C, Addison-Wesley Pub. Comp. Inc., 1990                    |

14. My opinions are additionally guided by my appreciation of how a person of ordinary skill in the art (POSITA) would have understood the claims of the ‘805 patent at the time of the invention, which I have been asked to assume is June 16, 2004. For the purpose of this declaration, I will use the definition of POSITA as provided by Dr. Rodriguez (Ex 1003) and described in Section IV.

### **III. Legal Standards**

15. I am not an attorney. However, I have been informed by counsel of certain legal standards and have applied those standards, described below, in

formulating my opinions.

16. I understand that the claims of a patent define the limits of a patentee's exclusive rights. I understand that to determine the scope of the claimed invention, courts may construe claim terms, the meaning of which the parties may dispute. I understand that claim terms should generally be given their ordinary and customary meaning as understood by a person of ordinary skill in the art at the time of filing of the patent application.

17. I understand that claims must be construed in light of and consistent with the intrinsic evidence. In this context, I understand that intrinsic evidence includes the claims themselves, the written disclosure in the specification, and the patent's prosecution history. I understand that the specification is always highly relevant to the claim construction analysis and often is the single best guide to the meaning of a disputed term. I understand that extrinsic evidence may also be considered when construing claims and may include, for example, technical dictionaries, technical publications and books, treatises, and expert testimony, though the intrinsic record will be more persuasive as to the meaning of a particular term.

18. I understand that one or more prior art references can render a patent claim obvious to a person of ordinary skill in the art if the differences between the subject matter set forth in the patent claim and the prior art are such that the subject

matter of the claim would have been obvious at the time the claimed invention was made. In analyzing obviousness, I understand that it is important to consider the scope of the claims, the level of skill of a person of ordinary skill in the relevant art, the scope and content of the prior art, the differences between the prior art and the claims, and “secondary considerations” of non-obviousness, which I also understand can include, for example, evidence of commercial success of the invention, evidence of a long-felt need that was solved by an invention, evidence that others copied an invention, or evidence that an invention achieved an unexpected result.

19. I understand that the claimed subject matter can be obvious when a person of ordinary skill in the art would have been motivated to combine pre-existing elements, and that combination yields no more than what a person of ordinary skill in the art would have expected. I also understand that, in assessing whether a claim is obvious, one must consider whether the claimed improvement is more than the predictable use of prior art elements according to their established functions. I understand that there need not be a precise teaching in the prior art directed to the specific subject matter of a claim because one can take account of the inferences and creative steps that a person of ordinary skill in the art would employ. However, I further understand that obviousness cannot be based on the hindsight combination of components selectively culled from the prior art.

20. I understand that for a reference to qualify as a relevant prior art reference in an obvious analysis, the reference must be “analogous”—meaning it is from the same field of endeavor as the patented technology, and if not, then the reference must be reasonable pertinent to the particular problem facing the inventors of the patent at issue. I also understand that a reference is reasonably pertinent if a person of ordinary skill in the art would have reasonably consulted those references and applied their teachings in seeking a solution to the problem facing the inventors.

#### **IV. Level Of Skill in the Art and Perspective Applied in This Declaration**

21. I understand that certain issues relating to validity must be judged from the perspective of a person of ordinary skill in the art (“POSITA”). I further understand that factors that may be considered in determining the level of skill of a person of ordinary skill in the art include, but are not limited to, (1) the type of problems encountered in the art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) the educational level of active workers in the field.

22. I have been informed and understand that a person of ordinary skill in the art is a hypothetical person who is presumed to be aware of all pertinent prior art, thinks along conventional wisdom in the art, and is a person of ordinary creativity. Importantly, this hypothetical person is of ordinary skill in the art to

which the claimed subject matter pertains.

23. With respect to the '805 patent, as per Dr. Rodriguez's declaration, "A person of ordinary skill in the art ("POSITA") in the field of the '805 patent, as of June 16, 2004, would have had a bachelor's degree in electrical engineering, computer engineering, computer science, or a related subject, and four years of work experience in image processing, automated vehicle control/navigation, or a related field. Additional education would offset a lesser amount of experience, and vice versa.." EX1003, ¶14

24. I agree with Dr. Rodriguez, and have applied the above-defined perspective of a person of ordinary skill in the art, as of Jun 16, 2004, in forming and expressing my opinions. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art at that relevant time.

25. At the time of the earliest priority date for the '805 Patent (June 16, 2004), I met the qualifications to be a POSITA, and I believe that I also have a sufficient level of knowledge, experience, and education to provide expert opinions in the field of the '805 Patent.

26. While my own level of skill exceeded that of the ordinary level of skill as of June 16, 2004, I am well-acquainted with the actual performance and capabilities of a person of ordinary skill in the art as defined above. For example, during the relevant timeframe, I was supervising and evaluating the performance

of such individuals, such as my graduate students who were performing research in this area. Furthermore, my participation in professional organizations and in conferences and other events exposes me to the state of the industry and the level of experience of individuals who, like I did, had at least the ordinary level of skill.

## **V. Claim Construction**

27. In my analysis, I have applied the plain and ordinary meanings of the claim terms in the ‘805 Patent, as a person of ordinary skill in the art would have understood them in the context of that patent on June 16, 2004. And it is my opinion that the prior art set forth in the Petition fails to disclose or render obvious the subject matter of the challenged claims under any reasonable construction and interpretation of the challenged claims’ terms, including their plain meanings, as well as the constructions Petitioner’s expert, Dr. Rodriguez, proposes.

28. I reserve the right to further explain how skilled artisans would understand terms in the ‘805 Patent’s claims, including but not limited to the terms discussed above, in the event the Board institutes an *inter partes* review of the ‘805 Patent.

## **VI. The ‘805 Patent**

### **A. Overview**

29. Based on my review of U.S. Patent No. 7,336,805 (the “‘805 Patent”), and from the perspective of a person of ordinary skill in the art at the time

of the invention, the ‘805 Patent discloses a novel and technically sophisticated system for assisting the guidance of a motor vehicle—particularly trucks—to fixed destinations such as cargo bays, docking stations, or parking platforms [EX1001 1:6-8]. Unlike conventional approaches that depend on pre-installed infrastructure such as painted lane markings or specialized fiducial symbols at the destination site, the invention described in the ‘805 Patent enables guidance to such locations using only geometric cues extracted from real-world image data [EX1001 2:32-43].

30. The invention is fundamentally destination-driven. The term “destination,” as used in the ‘805 Patent, refers to a stationary and contextually meaningful endpoint at which a vehicle may be guided to stop [EX1001 1:10-14]—such as a warehouse cargo door or loading platform. A key attribute of such a destination is that it is both fixed and geometrically identifiable from the vehicle’s sensor data [EX 1001 Fig 2, 3:40-45]. The system does not rely on the presence of unique markings or specific symbols affixed to the destination. Instead, it detects and verifies destinations solely by analyzing the geometric structure of the environment [EX1001 3:1-13], particularly the presence of objects whose shape and location are consistent with known destination types. A moving vehicle, by contrast, is not a destination in this sense; the system is not designed to follow arbitrary objects but rather to recognize and compute paths toward physical

locations that match the geometric profiles of plausible endpoints [EX1005 164, 166, 175].

31. Technically, the invention implements a multistage image analysis pipeline. It begins by acquiring image data from the environment using an onboard imaging sensor, which may be a camera or another sensing modality such as lidar or millimeter-wave radar. The acquired image is subjected to edge detection and segmentation. That is, the system identifies discontinuities in image intensity—edges—and segments these into discrete components that represent boundaries or features of physical objects in the scene [EX1001 2:32-35, 8:3-4, 3:37-38].

32. The critical next step is organizing these edge segments into what the patent calls a “mathematical tree structure” [EX1001 2:36-37, 3:38-39, 8:25-26]. In the field of computer science, and as understood by a person of ordinary skill at the time in light of the patent’s incorporation of Robert Sedgewick’s textbook *Algorithms in C*, a tree is a connected, acyclic graph in which one node is designated as the root, and every other node is connected by exactly one path to that root [EX2006 36]. This structure is essential for representing hierarchical relationships. In the context of the ‘805 Patent, it allows the system to store and traverse the interrelationships among all detected edge segments in a structured and computationally efficient way [EX1001 2:36-37].

33. The purpose of using a tree rather than a simple list or disjointed

grouping (what computer scientists would call a “forest”) is to enable the system to apply rule-based analysis—such as tree traversal algorithms—to identify groupings of edges that correspond to known geometric forms, like rectangles or squares. This step is critical because many destinations—such as the face of a loading dock or cargo door—exhibit consistent and expected geometric structures that can be inferred from the configuration of edge segments. The tree structure enables the system to search for such configurations in a principled, hierarchical fashion [EX1001 4:51-64, 5:8-18].

34. After candidate geometric forms are identified, they are subjected to a plausibility analysis using a matching algorithm—most notably the Iterative Closest Point (ICP) algorithm, which aligns a candidate object with a stored geometric model and measures the fit [EX1001 5:29-36]. The better the match, the more plausible the object is as a destination. This plausibility filtering step serves to eliminate spurious detections and refine the set of candidate destinations.

35. The system then performs an additional acceptance analysis, in which it evaluates whether the image formation of the candidate object is consistent with what would be expected given the known properties of the imaging sensor—such as its height, angle, and field of view. For example, a destination that is rectangular in the real world may appear as a trapezoid in the image due to perspective distortion. The system uses this knowledge to filter out false positives that do not

conform to expected appearance models [EX1001 5:1-18]. Accordingly, the system is able to locate a specific physical location in the vehicle's environment that the system identifies as a suitable endpoint for the vehicle to approach and stop at, such as a docking station, loading platform, or parking bay.

36. Finally, from the remaining accepted candidates, the system selects the most proximate destination and computes a trajectory to guide the vehicle to that endpoint. The calculated path is optimized not just in terms of distance, but in consideration of the vehicle's steering geometry and movement constraints [EX1001 6:16-39]. This trajectory may be displayed to a human driver or used as the basis for semi-autonomous or fully autonomous vehicle control [EX 1001 40:41].

37. In summary, the '805 Patent discloses a highly structured and destination-aware vehicle guidance system that operates without the need for artificial landmarks or pre-installed infrastructure. It extracts geometric features from raw image data, stores and processes these features in a single connected tree structure, identifies plausible fixed destinations based on known geometric patterns, and computes an optimized trajectory to reach such destinations. Therefore, the '805 Patent provides a robust, marker-free vehicle docking assistant that autonomously identifies and localizes geometric destinations in the environment and computes optimized trajectories to guide a motor vehicle safely

and accurately to its final stopping point. This invention reflects a significant advancement in the field of autonomous or assisted vehicle guidance and is distinctly different from reactive systems that merely follow dynamic objects such as other vehicles.

**B. Sedgewick’s textbook Algorithms in C.**

38. Based on my review of the ‘805 Patent and my understanding of the field as a computer vision and data structures expert, it is clear that the patent relies directly on Robert Sedgewick’s textbook Algorithms in C to define and ground a core structural component of the invention—namely, the “mathematical tree structure” recited in the claims and described throughout the specification.

39. The ‘805 Patent explicitly references Chapter 4 of Sedgewick’s text [EX1001 4:45-52], stating:

“Many different proven methods for creating and organizing such a hierarchical tree structure are available to one skilled in the art; reference is made here exemplarily to the comprehensive compilation and discussion of widely varying tree structures by Robert Sedgewick (R. Sedgewick, Algorithms in C, Chapter 4, Addison-Wesley Pub. Comp. Inc., 1990).” [EX1001 4:45-52]

40. This is not a passing citation. In my expert opinion, this incorporation of Sedgewick’s work performs a critical definitional role. It signals to a person of ordinary skill in the art that the term “tree structure” is to be interpreted according

to the formal conventions of computer science as set forth by Sedgewick. In this context, a “tree” is a connected, acyclic graph with a designated root node, in which every other node is connected to the root by exactly one unique path. The tree structure implies global connectivity and hierarchical organization, not merely any grouping or clustering of data.

41. This distinction has significant technical consequences. In the invention disclosed by the ‘805 Patent, edge segments extracted from image data are stored and organized in a single mathematical tree structure. The purpose of this organization is to enable systematic traversal using known algorithms (such as those described in Sedgewick) to identify groupings of edges that correspond to typical geometric shapes—e.g., rectangles or squares—that may represent fixed destinations. The tree structure allows these relationships to be efficiently analyzed and filtered using rule-based techniques that exploit the tree’s hierarchy and connectivity.

42. A disconnected grouping of edges, by contrast—what Sedgewick would call a forest—lacks this unified structure and does not support traversal or hierarchical inference across the entire set of segments. In such a case, no single root exists, and no path necessarily links all elements. Consequently, a forest of disconnected graphs does not satisfy the “mathematical tree structure” requirement, either from the standpoint of the claim language or the technical

framework explicitly adopted by the patent.

43. Accordingly, the ‘805 Patent uses Sedgewick’s Algorithms in C not merely for background, but to supply an authoritative, technical meaning for the claimed “mathematical tree structure.” This incorporation provides both legal and technical clarity: the tree must be a single, connected, acyclic data structure [EX2006 36] that encodes the interrelationships of all relevant edge segments within the scene. Accordingly, when viewed in light of Sedgewick’s explanation—explicitly referenced in the ‘805 Patent—a tree structure is not merely any hierarchical grouping, but a connected, acyclic graph with exactly one path between the root and every other node. Instead, a POSITA would understand “a mathematical tree structure” “to mean a single connected hierarchical data structure in which each node has exactly one parent (except for the root) and in which there exists exactly one path between the root and every other node.

44. This is a foundational element of the invention and distinguishes the ‘805 Patent’s approach from systems that merely group segments or features without establishing global structure or hierarchy.

## **VII. The Claims 1-2, and 6-11 Of The ‘805 Patent Would Not Have Been Obvious.**

45. Petitioner challenges claims 1-2, and 6-11 (the “Challenged Claims”) of the ‘805 Patent based on several grounds.

46. In my opinion, none of the claims of the ‘805 Patent would have been

obvious over Petitioner's prior art, for reasons I explain below. I will first review the Petitioner's prior art. Then I will address each of the grounds.

**A. Overview of Broggi**

47. Broggi et al. (EX1005), titled "Visual Perception of Obstacles and Vehicles for Platooning," describes the visual perception and control system implemented on the ARGO experimental autonomous vehicle, developed at the University of Parma. A primary focus of the paper is the implementation of platooning—a driving mode in which an autonomous vehicle automatically follows a preceding vehicle using real-time visual tracking [EX1005 161].

48. In the context of Broggi, platooning refers specifically to the automated trailing of a target vehicle by analyzing its appearance and motion in camera images [EX1005 166]. The ARGO system uses a monocular camera setup to detect the lead vehicle, relying on the observation that vehicles typically exhibit strong bilateral symmetry and consistent geometric proportions. The detection algorithm computes symmetry maps based on pixel intensity as well as horizontal and vertical edge gradients to robustly localize candidate vehicles, even in the presence of noise such as reflections or background patterns [EX1005 170].

49. Once a vehicle is detected, the system fits a bounding box to the symmetrical region and estimates the vehicle's distance using stereo triangulation. The initial distance estimate is refined by comparing the bounding box in the left

and right stereo images, and applying a simple disparity-based triangulation method. This refinement process assumes that the rear of the target vehicle can be approximated as a planar surface, and that lighting variations between views are minimal [EX1005 171].

50. For trajectory control, the ARGO system employs a gain-scheduled proportional controller that adjusts the follower vehicle's steering angle based on the perceived lateral offset from the lead vehicle. During operation, the system continuously tracks the detected vehicle by correlating the bounding box contents between successive image frames, enabling the ARGO vehicle to maintain alignment with the lead vehicle as both vehicles move [EX1005 173, 174].

51. Platooning, as implemented in ARGO, is thus a reactive control strategy that maintains vehicle alignment through continuous visual tracking of the lead vehicle. The functionality is designed to operate on public roads using only passive sensors—namely, low-cost stereo cameras—and leverages computationally efficient image processing techniques to support real-time operation. The work presented in Broggi represents an early and influential approach to visual-based vehicle following and demonstrates the feasibility of real-time convoying with consumer-grade hardware and vision algorithms.

## **B. Overview of Huttenlocher**

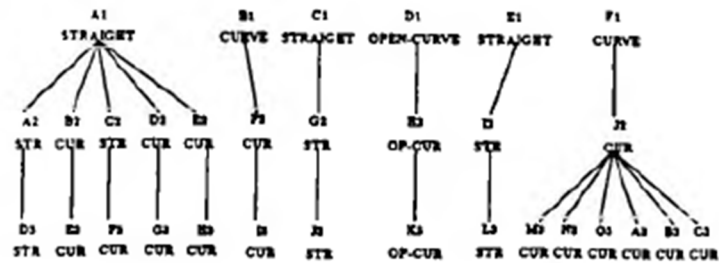
52. Huttenlocher et al., titled “Object Recognition Using Alignment”

(EX1006), presents a model-based computer vision framework for recognizing rigid objects in two-dimensional images by aligning geometric features—such as edges and vertices—from an observed scene to predefined object models. The central focus of the reference is on estimating transformations (translation, rotation, and scale) that bring model features into correspondence with observed image features, even under conditions of partial occlusion or noise [Ex 1006 370, 371].

53. The method begins by extracting primitive geometric features from the image, typically straight line segments and corner points. Using small subsets of matched features, the algorithm generates hypotheses about the transformation parameters that would align the observed features with those of a known model. A probabilistic framework is then used to score each hypothesis based on the number and quality of matching features under the proposed transformation [Ex1006 371, 372].

54. Figure 4 (reproduced below) in the Huttenlocher reference plays a critical role in illustrating the structure and process by which edge features are grouped and analyzed. The figure shows six labeled clusters of image features—designated A1 through F1—each consisting of line segments that appear to correspond to parts of an object's contour. These groupings are intended to represent localized collections of straight edge segments extracted from an image

using edge detection [EX 1006 374].



55. Importantly, as shown in Figure 4, these clusters (A1–F1) are not organized into a single connected data structure. Each grouping is spatially and logically independent of the others; there is no shared root node, no explicit encoding of parent-child relationships, and no data structure that links one group to another in a hierarchical or traversable manner. In essence, Figure 4 illustrates what in computer science would be called a “forest” of disconnected subgraphs [EX 2006 37]—distinct groups of edges lacking a unifying structure—rather than a “tree” in the mathematical sense defined by Sedgewick’s Algorithms in C. There is no representation of the interrelationship among all detected edges across the entire scene.

56. In the Huttenlocher framework, the primary goal is to match each of these independent feature clusters against known object models using alignment transformations, not to build a global representation of the scene. The process is hypothesis-driven and model-directed: each cluster is evaluated individually to determine whether it can be transformed into alignment with a stored model shape

[EX 1006 372].

57. In summary, while Huttenlocher's Figure 4 illustrates a grouping of geometric edge features, these groupings are isolated and flat. The reference does not describe or suggest organizing the full set of edge features into a connected, rooted, acyclic graph—i.e., a mathematical tree—as would be required for hierarchical feature traversal or global structural analysis. The methodology focuses on local alignment and probabilistic model matching, rather than on representing and analyzing the interrelationships among all features within the image.

**C. Brady - US5434927**

58. Brady et al., U.S. Patent No. 5,434,927 (EX1007), is directed to a machine vision system for the classification and tracking of vehicles in roadway scenes using real-time video input. The system is designed to support intelligent transportation applications such as traffic monitoring, incident detection, and vehicle counting. It combines traditional edge detection techniques with fuzzy set theory and neural network-based classification to identify and track vehicles across successive image frames [EX 1007 1:8-11].

**D. Bertozzi- “Automatic Vehicle Guidance: The Experience of the ARGO Autonomous Vehicle”**

59. Bertozzi et al., in “Automatic Vehicle Guidance: The Experience of the ARGO Autonomous Vehicle” (EX1008), provides a detailed account of the

development, architecture, and testing of the ARGO vision-based autonomous vehicle platform. The reference serves both as a technical survey and as a retrospective on the design decisions and system limitations encountered in deploying ARGO in real-world traffic scenarios.

60. A key component discussed in the text is platooning, defined as the automatic following of a manually driven lead vehicle. ARGO's platooning functionality is based entirely on visual perception—specifically, on detecting and tracking the rear end of the vehicle directly ahead using camera-based symmetry detection and bounding box correlation. Once the target vehicle is located, its position is refined through geometric estimation techniques, ARGO adjusts its steering using a proportional control loop driven by the observed lateral and longitudinal displacement [EX1008 61-81].

61. In summary, Bertozzi (EX1008) confirms that ARGO's platooning capability is designed as a reactive, visually driven following behavior, rather than as an intentional guidance system capable of identifying fixed destinations or computing optimized travel paths. The system exemplifies a real-time control loop tethered to the dynamics of a single detected vehicle, with no architectural support for goal-directed navigation or geometric reasoning about the environment as a whole.

#### **E. Ground 1: The Challenged Claims Would Not Have Been**

**Obvious In View of Broggi, Huttenlocher, and in combination with Brady.**

62. The opinion of the Dr. Rodriguez (Ex 1003) and Tesla the Petition (Paper 2) does not address the key innovations and claim 1 in the '805 Patent. In addition to the distinctions between the '805 Patent and the Exhibit 1005, 1006, 1007 and 1008 which I have described in the previous section, the references do not disclose the following.

**1. The Petition fails by mischaracterizing Broggi's reactive platooning as the '805 Patent's proactive, destination-based guidance system.**

63. The '805 Patent discloses a system and method for guiding a motor vehicle to a fixed, plausible destination using image data. Specifically, the invention enables vehicle guidance to endpoints such as docking stations, parking bays, or cargo doors without requiring artificial landmarks or visual markers. It accomplishes this by acquiring image data through an onboard sensor, extracting edge features, organizing those features into a mathematical tree structure, and applying a multistage exclusionary method to identify and validate potential destinations [EX1001 21-53].

64. The system selects plausible destinations based on geometric matching against known shapes (e.g., rectangles), uses plausibility and acceptance filters to ensure fidelity to physical constraints and sensor perspective, and calculates an optimized trajectory based on positional parameters and vehicle

dynamics to guide the vehicle to that endpoint [EX 1001 3:12-23].

65. The term “potential destination” as used in the ‘805 Patent refers to a fixed, stationary location that can be plausibly interpreted as an endpoint for stopping. Examples include cargo doors and loading platforms. The claims require identification of such locations using image data, followed by trajectory planning to reach them.

**a. Broggi Does Not Teach a “Potential Destination” as Claimed**

66. Broggi (EX1005) describes a vision-based system for autonomous driving in which the ARGO vehicle performs “platooning” by visually following a preceding vehicle. Platooning, as defined in Broggi, is “the automatic following of the preceding vehicle” that requires continuous localization and tracking of a moving target vehicle. This mode of operation is reactive by design [EX1005 164].

67. The Petition asserts that Broggi discloses or renders obvious a “potential destination” by identifying the position of the vehicle ahead. This interpretation is fundamentally flawed. A moving object, such as a preceding car, is not a valid destination under the ‘805 Patent, because it is not a stationary location at which the host vehicle can be guided to stop. To treat such a vehicle as a “potential destination” would lead to collision, not guidance.

68. The ‘805 Patent repeatedly emphasizes that potential destinations are fixed locations suitable for docking or stopping, such as a cargo door or loading

platform. The specification explains that the invention is intended to guide trucks to such endpoints using image-based geometric analysis [EX1005 3:40-43, 3:24-26, 2:53-55, 2:23-25]. For example, the Abstract of the ‘805 Patent states:

“Many day-to-day driving situations require that an operator of a motor vehicle guide the motor vehicle along a specific course and **bring the vehicle to a stop at a specific location, for example in a parking bay or at a loading platform.** To assist a vehicle operator in such situations, a method and a suitable device for implementing this method, include detecting the potential target objects in the image data of an image sensor and identifying the potential target objects as **potential destinations** in a multistage exclusionary method, whereupon a trajectory describing an optimized travel path is computed at least in relation to the most proximate destination.” [EX1001, Abstract]

69. Accordingly, a POSITA would understand that the “potential destinations” recited in the ‘805 Patent are positions to “bring the vehicle to a stop at a specific location, for example, in a parking bay or at a loading platform. Therefore, the POSITA would not consider a transient object with unpredictable motion to be a destination in this context. In fact, if the location of the preceding vehicle was “potential destination,” the vehicles would collide, which is clearly an undesirable result.

**b. The Preceding Vehicle in Broggi Is Not a “Destination”**

70. The Petition argues that because the ‘805 Patent refers to a “destination” as an object (e.g., a cargo door), any object, including a moving

vehicle, could qualify. This is an oversimplification that ignores the structural and functional role of the destination in the invention.

71. In the ‘805 Patent, the destination is not just any object in the scene—it is one that meets a series of geometric and contextual criteria suggesting it is a valid endpoint for docking or stopping, like the entrance to a cargo bay or docking door. The cargo door, for example, is used as a reference to perform plausibility analysis and to derive trajectory parameters. It is part of a multistage validation process that filters out implausible candidates and selects a final target for guidance [EX1001 7:1-55].

72. Broggi performs no such function. For example, the platooning system described in Broggi does not involve the detection or recognition of a fixed or predefined destination. The preceding vehicle is not validated through a geometric exclusion process, is not stationary, and does not serve as a ground-truth endpoint for parking. It is simply a reference for visual tracking.

73. In the ‘805 Patent, the cargo door plays a dual role. First, it is the ground-truth endpoint that the vehicle must reach, and second, it is the geometric model against which candidate image features are evaluated and filtered through multiple stages of exclusion. Ultimately, the cargo door’s correct identification enables the system to store its positional data and calculate a reliable trajectory for guiding the truck into position, completing the docking task.

74. Broggi does not perform any of these functions with the preceding vehicle.

**c. Broggi Does Not Calculate an Optimized Travel Path to a Destination**

75. The Petition contends that Broggi discloses calculating an “optimized travel path” by adjusting the steering angle of the ARGO vehicle to follow the preceding vehicle. This is a mischaracterization of both Broggi and the ‘805 Patent.

76. In Broggi, ARGO maintains lateral alignment by continuously tracking the position of the lead vehicle and applying a gain-scheduled proportional controller to adjust steering [EX1005 173]. Specifically, once the preceding vehicle is localized, ARGO uses its position to calculate a dynamic steering error, which reflects the lateral offset between ARGO’s heading and the centerline of the detected vehicle. This error signal is then filtered and scaled based on vehicle speed, forming the input to a gain-scheduled proportional controller that continuously adjusts ARGO’s trajectory to maintain proper alignment. The preceding vehicle’s role is thus not passive; it actively dictates ARGO’s movement by serving as the moving destination that guides both directional and positional control.

77. This is a reactive control mechanism. It does not involve path planning to a fixed endpoint. ARGO has no knowledge of where the preceding vehicle is going and no ability to evaluate alternative paths.

78. The ‘805 Patent, by contrast, requires calculating a trajectory based on the positional parameters of a validated destination. This trajectory is optimized with respect to constraints such as vehicle geometry and steering dynamics. It is not simply a reactive adjustment—it is a planned, computed path to a known location.

79. The following analogy illustrates the contrast. Consider the difference between a person using GPS navigation to drive to a known restaurant versus a person blindly following another car without knowing where it’s going.

80. In the first scenario, the GPS system calculates a destination-driven, optimized path based on road conditions, distance, and travel time. The driver knows exactly where they’re going, and the system computes a trajectory that actively assists the driver in reaching that specific location in the most efficient way possible. This reflects what is required in the challenged claims: the system must calculate at least one trajectory describing an optimized travel path using positional parameters specifically to assist vehicle guidance to a destination.

81. In the second scenario—the one described in Broggi—the driver simply follows the taillights of the car in front, regardless of where that car is headed. There is no understanding of the endpoint, no route optimization, and no calculated guidance to an actual destination. The leader car could be heading to the store, to the mountains, or even circling a parking lot—the follower has no idea. It

adapts its path in real-time solely to maintain alignment and distance with the vehicle ahead, not to reach a defined endpoint. This is akin to ARGO's platooning: it calculates steering corrections based on the preceding car's movements, but it never plans a path to a known or optimized destination.

82. The '805 Patent claims the first scenario—a proactive, planned path to a defined destination.

**d. Broggi's Reactive System as Further Explained by Bertozzi Lacks Destination Awareness**

83. Bertozzi (EX1008), which further documents the ARGO system, confirms that the platooning functionality is reactive and visually dependent. ARGO adjusts its path solely in response to visual tracking of a moving vehicle. It does not compute or store destination models, does not identify docking locations, and does not perform any forward planning. The system has no environmental awareness beyond what is needed to track a single moving object.

84. ARGO's behavior is dictated entirely by the motion of the vehicle ahead. If that vehicle turns or stops, ARGO responds accordingly—but without knowing why or where it is going. There is no identification of a final goal, and no optimization beyond maintaining relative position. This is fundamentally different from what the '805 Patent claims.

85. In conclusion, it is my expert opinion that Broggi does not teach, suggest, or render obvious any of the core elements required by the challenged

claims of the ‘805 Patent. The Petition relies on a misreading of Broggi and a misunderstanding of the claim language. Broggi’s platooning system is reactive, destination-agnostic, and lacks the structured, geometric reasoning central to the invention of the ‘805 Patent.

86. The Petition fails to demonstrate that Broggi discloses identification of a stationary “potential destination” based on geometric features. It does not disclose use of a multistage exclusionary process to validate candidate destinations. Nor does it describe calculation of an optimized trajectory to a known endpoint or a proactive guidance system with environmental awareness. None of these features are present in Broggi.

**e. Neither Huttenlocher nor Brady Cures the  
Fundamental Deficiencies in Broggi**

87. In my expert opinion, neither Huttenlocher (EX1006) nor Brady (EX1007) supplies the limitations missing from Broggi, and neither reference, alone or in combination with Broggi, renders the challenged claims of the ‘805 Patent unpatentable. Huttenlocher is primarily concerned with geometric alignment for object recognition. It describes techniques for matching image features—such as edges and corners—to known object models by estimating transformation parameters like rotation and scaling. However, Huttenlocher does not identify fixed endpoints for vehicle guidance. It does not extract positional parameters for plausible destinations, does not validate potential docking locations

through multistage filtering, and does not calculate any vehicle trajectory—optimized or otherwise. Its focus is on recognition, not navigation.

88. Brady, similarly, is directed to machine vision for vehicle detection and classification using edge intensity, fuzzy logic, and neural network-based recognition. While Brady segments image regions and classifies vehicles for traffic monitoring, it does not disclose or suggest any form of trajectory computation, destination modeling, or geometric validation. It contains no mechanisms for identifying stationary objects suitable for docking, no evaluation of candidate destinations based on contextual plausibility, and no computation of an optimized path that accounts for vehicle constraints or endpoint location.

89. Even if a person of ordinary skill were to combine Huttenlocher or Brady with Broggi, the resulting system would remain reactive and destination-agnostic. Adding object recognition or classification capabilities does not overcome Broggi's lack of fixed destination awareness, structured geometric analysis, or optimized path planning. The combined system would still track a moving lead vehicle and react to its movements, without understanding or computing a trajectory to a specific stopping point. The integration of perception enhancements into Broggi's control loop does not produce the destination-driven guidance system claimed in the '805 Patent.

90. Accordingly, the deficiencies in Broggi are not cured by either

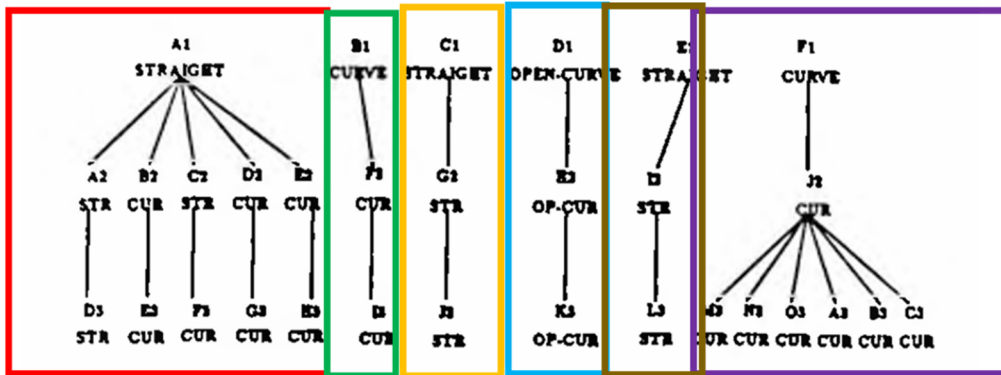
Huttenlocher or Brady, and the combination of these references fails to teach or suggest the key limitations of the ‘805 Patent. None of these references disclose a system that identifies fixed, plausible destinations, validates them using contextual geometric criteria, and calculates an optimized travel path for vehicle guidance to such destinations. As such, the asserted combinations do not render the challenged claims unpatentable.

**2. The Petition fails to show that Huttenlocher or any cited reference discloses the claimed “mathematical tree structure” of the ‘805 Patent.**

91. In my expert opinion, the Petition fails to demonstrate that Huttenlocher or any other cited reference discloses the “mathematical tree structure” required by the challenged claims of the ‘805 Patent. The ‘805 Patent expressly incorporates the definition of a tree structure from Sedgewick’s *Algorithms in C*, which describes a tree as a connected, acyclic graph with a single designated root and exactly one path between that root and every other node. This definitional standard sets a clear framework: any data structure that contains multiple disconnected subtrees, lacks a single root, or fails to preserve unique paths between nodes is not a tree, but rather a forest.

92. Despite this, Petitioner relies heavily on Huttenlocher’s Figure 4 and claims it discloses a “mathematical tree structure.” But Figure 4 in Huttenlocher clearly shows a disconnected set of labeled edge segments—A1 through F1—that

do not share a common root and have no traversable paths linking them together. As shown in Patent Owner’s annotated version of the reference (below), there is no hierarchical relationship among these edge segments. Instead, they are isolated groupings, with no known interrelationships and no integrated structure.



93. The Petition attempts to characterize these separate components as a “multi-rooted tree,” but that terminology is both ambiguous and inconsistent with the definition of a mathematical tree adopted by the ‘805 Patent. Under Sedgewick’s definition, a structure with multiple roots or disconnected nodes is not a tree at all. It is a forest—a collection of independent trees. A forest does not and cannot meet the claim limitation of a “mathematical tree structure” that stores the interrelationships of a plurality of edge segments.

94. The ‘805 Patent uses the tree structure to represent the inter-relationship between the edge segments: “the image data are broken down into individual edge segments, and their inter-relationships are stored in a mathematical

tree structure.” EX1001 7-Col3-line 37.

95. However, the multi-scale description, as Huttenlocher calls the multi-rooted tree, is not used to represent relationships between the edge segments, but to differentiate one from the other.” Using this multi-scale description, the straight segment A1 at level 1 in the tree is differentiated from the other straight segments C1 and E1”. EX 1006 18. So not only structurally, but even functionally, the mathematical tree structure of the ‘805 Patent is fundamentally different from the multi-rooted tree of Huttenlocher.

**a. The Petition Misrepresents the Tree Structure  
Required by the ‘805 Patent**

96. As stated in the ‘805 Patent:

“Many different proven methods for creating and organizing such a hierarchical tree structure are available to one skilled in the art; reference is made here exemplarily to the comprehensive compilation and discussion of widely varying tree structures by Robert Sedgewick (R. Sedgewick, Algorithms in C, Chapter 4, Addison-Wesley Pub. Comp. Inc., 1990).” EX1001, 4:45-51

97. Sedgewick unambiguously defines a tree as a structure in which exactly one path exists between the root and each node. If there is no path or more than one path, the structure is not a tree. As Sedgewick further explains, removing the root of a tree leaves a forest, consisting of multiple trees without a shared ancestor. This is precisely the type of structure shown in Huttenlocher’s Figure 4.

There is no indication in the reference that a common root exists, nor any traversal path linking all nodes.

98. Therefore, the Petition's reliance on Huttenlocher is based on a fundamental mischaracterization of both the cited reference and the intrinsic definition adopted by the '805 Patent. The structure depicted in Figure 4 is not a tree, and it does not satisfy the requirement of storing interrelationships among edge segments in a singular, mathematical tree structure. As a result, under the definition provided by Sedgewick the structure depicted in Huttenlocher constitutes, at best, a forest of disconnected graphs, not a mathematical tree.

**b. Petitioner's Expert Mischaracterizes Huttenlocher's Figure 4 as a "Mathematical Tree Structure"**

99. Petitioner's argument relies entirely on the assumption that a tree and a forest are equivalent. Huttenlocher describes a multi-rooted tree, and as the Petitioner's expert has already conceded, "where the subtree corresponding to each root", "any two nodes are connected by exactly one path". In other words, nodes belonging to different subtrees such as A1, B1 etc. are not connected by exactly one path. They are in fact not at all connected. Huttenlocher does not use a tree structure, but a multirooted tree structure, also called a forest, as defined by Sedgewick. In fact, a mathematical tree structure excludes disconnected structures and forests, which aligns with both the claim language and the specification. So Huttenlocher's data structure cannot be claimed to be a "mathematical tree

structure”, because it is not a tree at all. However, the ‘805 Patent requires a tree with the property that any two nodes in the structure are connected by exactly one path.

100. Figure 4 in Huttenlocher illustrates disconnected clusters of edge segments that do not share a common ancestor and cannot be traversed through a single path. For instance, there is no sequence of branches connecting D3 and F1—a fact that alone refutes the claim that the structure is a tree.

101. The expert further contends that Figure 4 stores interrelationships among edge segments based on granularity and relative position. But Huttenlocher itself makes no such claim. Instead, the reference states only that segments are labeled by type and scale. There is no discussion of organizing those segments into a single, traversable data structure that captures interrelationships among all components. The expert’s interpretation reads in a structure that is simply not disclosed.

102. As shown below, the segments in Figure 4 of Huttenlocher do not form a unified tree; they form a forest, and there is no evidence in the reference of any interconnection among the disjointed components.

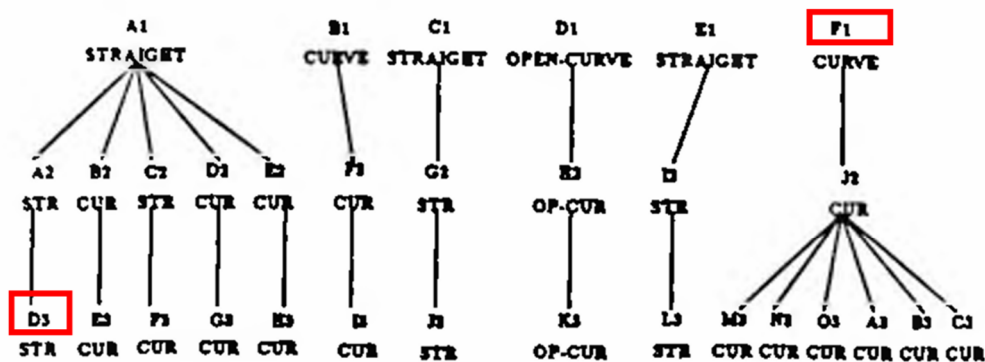


**Figure 4. Multi-scale segmentation tree corresponding to the curvature scale-space segmentation in Figure 3.**

EX1006, 18

103. Accordingly, Figure 4 does not identify any relationship between ‘A1 Straight,’ ‘B1 Curve,’ ‘C1 Straight,’ ‘D1 Open Curve,’ ‘E1 Straight,’ and ‘F1 Curve.’

104. In contrast, the Challenged Claims refer to “the plurality of edge segments” and require their interrelationships to be stored in “a mathematical tree structure,” the claim demands that one tree structure contains the relationships among all the identified segments. Allowing multiple disjoint tree structures—i.e., a forest—would defeat the purpose of this language. If edge segments were split across several trees, then no single tree would store the interrelationships of the entire plurality. Instead, each tree would capture relationships only among a subset of segments, with no interrelationship stored between segments in different trees.

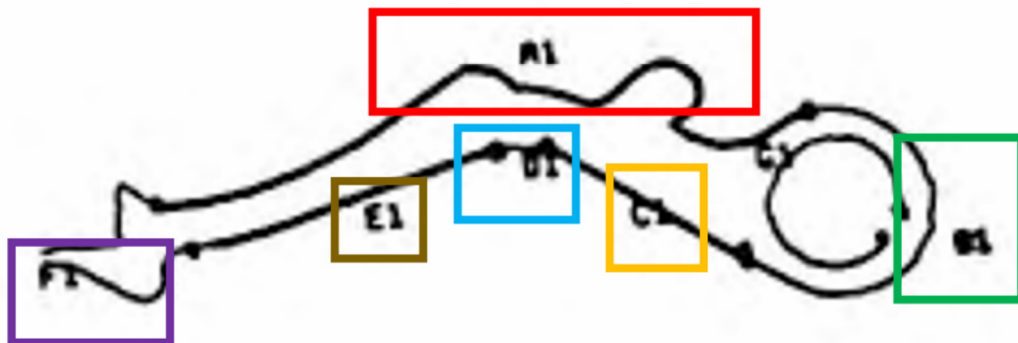
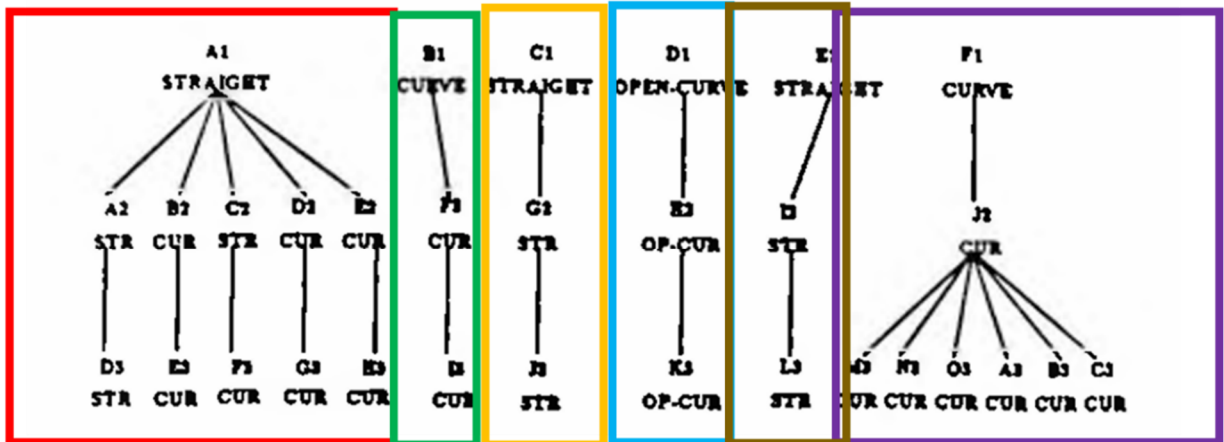
105. Simply put, a collection of separate trees cannot collectively qualify

as “a tree structure” because they do not capture the interrelationships between segments in different trees.

**c. Petitioner’s Expert Improperly Attempts to Supply Missing Claim Limitations Not Disclosed in Huttenlocher**

106. Petitioner’s expert attempts to fill gaps in the prior art by asserting that interrelationships are implied in Figure 4. However, the expert cites no passage in Huttenlocher to support this claim, and none exists. Figure 4 simply does not disclose a data structure that connects all edge segments. The expert’s statement that the figure “stores interrelationships based on granularity and relative position” is conclusory and unsupported.

107. A visual inspection of the annotated version of Figures 3 and 4 (below) confirms that the labeled edge segments do not share any structural relationship. They are not part of a hierarchy. There is no single path between segments, no common ancestor, and no indication that they are organized in a tree structure. Therefore, as shown in Patent Owner’s annotated combined version of Huttenlocher’s Figure 3 (bottom) and Figure 4 (top), Figure 4 does not show the inter-relationships between the edge segments ‘A1 Straight,’ ‘B1 Curve,’ ‘C1 Straight,’ ‘D1 Open Curve,’ ‘E1 Straight,’ and ‘F1 Curve’.



108. This is not a matter of expert interpretation; it is a matter of what is and is not disclosed in the prior art. Petitioner cannot fill in missing claim limitations with expert opinion when those limitations are not taught or suggested in the reference itself. Therefore, the assertion that Huttenlocher discloses the claimed tree structure is without basis and must be rejected.

**d. Brady and Broggi Do Not Disclose or Suggest the Claimed Mathematical Tree Structure and Cannot Remedy Huttenlocher's Deficiencies**

109. Neither Brady nor Broggi discloses or suggests the mathematical tree structure required by the challenged claims. Brady discusses classification and

tracking using image segmentation and fuzzy logic but contains no reference to data structures that store interrelationships among edge segments. It does not describe any traversal, hierarchical organization, or unified structure. Similarly, Broggi, which relates to reactive vehicle platooning, does not discuss edge segmentation, much less tree-based data structures.

110. Neither reference provides the missing structure, and neither cures the deficiencies of Huttenlocher. The Petition presents no rationale for how these references could be combined to yield the required tree structure. Adding object classification or reactive tracking capabilities to a forest of disconnected segments does not produce a mathematical tree.”

111. In sum, the Petition’s attempt to satisfy the “mathematical tree structure” limitation fails as a matter of both law and fact. The cited references do not disclose, teach, or suggest a connected, acyclic, rooted data structure that stores the interrelationships among all edge segments. The Petition relies on conclusory expert opinion to fill this gap, but the references themselves do not support the claims made. Because this critical limitation is not met, the challenged claims of the ‘805 Patent cannot be shown unpatentable on this ground.

**F. Ground 2: The Challenged Claims Would Not Have Been Obvious In View of Broggi, Huttenlocher, Brady in further combination with Bertozzi.**

112. In my expert opinion, Petitioner’s reliance on Bertozzi does not

remedy the foundational deficiencies in Broggi, Huttenlocher, or Brady with respect to the limitations of the challenged claims of the ‘805 Patent. Rather than supplying any missing disclosure, Bertozzi confirms that the ARGO system—developed by the same research group responsible for Broggi—is focused on reactive convoying and lane-following behaviors, not on destination-driven navigation, optimized path computation, or mathematical tree structures for image data analysis.

113. Bertozzi provides a retrospective and summary of the ARGO project, describing the system’s ability to perform tasks such as lane keeping, obstacle detection, and “convoy driving.” Notably, “convoy driving” is defined as a mode where a trailing vehicle automatically follows a manually driven lead vehicle, maintaining a safe distance and alignment. This behavior is consistent with Broggi’s definition of “platooning,” and Bertozzi offers no evidence that the ARGO system is capable of detecting or navigating to fixed destinations such as loading docks or parking bays. There is no disclosure that ARGO engages in any multistage exclusionary method for validating geometric features as docking targets, nor any indication that the system extracts positional parameters for such objects.

114. Instead, ARGO’s operation relies entirely on real-time detection of the preceding vehicle’s location, followed by proportional control adjustments

based on lateral and longitudinal offsets. The system does not plan a trajectory to an endpoint; it merely adjusts its heading and speed based on the relative position of a dynamic object. This is reactive behavior, not the proactive, destination-based guidance claimed in the '805 Patent.

115. Furthermore, Bertozzi is silent on the organization of edge segments into any mathematical tree structure. The reference does not describe or suggest storing edge features in a hierarchical or connected form, let alone in a tree structure meeting the strict definition incorporated into the '805 Patent via Sedgewick. As explained above, the '805 Patent requires that interrelationships among edge segments be stored in a single, acyclic, connected structure with a designated root. Bertozzi does not disclose any such data organization, and there is no mention of applying tree traversal or multiscale validation based on a structured graph.

116. Thus, rather than bridging any of the evidentiary gaps in the combination of Broggi, Huttenlocher, and Brady, Bertozzi merely confirms that ARGO's architecture is built around local perception and reactive adjustments to moving vehicles. It lacks the elements central to the claimed invention, including destination identification, optimized trajectory computation, and structured representation of edge data.

117. In summary, Bertozzi offers no teaching or suggestion of the core

limitations recited in the challenged claims. It does not identify or validate fixed “potential destinations.” It does not calculate any optimized path to such destinations. And it does not organize image data into a mathematical tree structure. Instead, it reinforces the reactive nature of ARGO’s operation, demonstrating that the cited references, even when considered collectively, do not disclose or render obvious the destination-based guidance system of the ‘805 Patent. Accordingly, Petitioner’s reliance on Bertozzi fails to cure the deficiencies of Broggi, Huttenlocher, and Brady, and Ground 2 remains legally and technically deficient.

### **VIII. Summary**

118. In conclusion, the ‘805 Patent discloses a vehicle guidance system that fundamentally departs from conventional reactive methods typified by Broggi, Bertozzi, and similar prior art. The ‘805 Patent introduces a destination-centric approach that begins with the detection of fixed, contextually meaningful endpoints—such as cargo doors or loading platforms—identified purely from environmental image data without reliance on artificial infrastructure. This is accomplished through a technically rigorous pipeline that extracts edge segments, organizes them into a single mathematical tree structure, and applies a multi-stage process of geometric validation, plausibility filtering, and acceptance analysis. The final stage computes an optimized vehicle trajectory tailored to the positional

characteristics and constraints of the selected destination.

119. None of the prior art references cited by Petitioner—Broggi, Huttenlocher, Brady, or Bertozzi—disclose or suggest the claim limitations recited in the ‘805 Patent. Broggi and Bertozzi are directed to reactive platooning systems that merely follow moving vehicles and lack any capability for fixed destination recognition or optimized trajectory planning. Huttenlocher focuses on object alignment but fails to disclose a connected, rooted, and acyclic tree structure as required by the claims. Its Figure 4 is a forest of disconnected subgraphs, not a unified data structure for storing edge segment interrelationships. Brady, for its part, is concerned with fuzzy logic-based object classification and tracking, and offers no insight into structured geometric reasoning or trajectory computation.

120. Furthermore, the ‘805 Patent’s reliance on Sedgewick’s Algorithms in C, provides critical definitional clarity to the claim term “mathematical tree structure.” It mandates a specific, unified, and traversable data structure that stands in stark contrast to the disconnected feature clusters shown in the prior art. Petitioner’s attempt to bridge the gap through conclusory expert assertions lacks evidentiary support and is contradicted by both the references themselves and the intrinsic record.

121. In light of these distinctions, and from the perspective of a person of ordinary skill in the art, the challenged claims of the ‘805 Patent would not have

been obvious. The combination of references fails to teach or suggest the key elements of the claimed invention: destination recognition based on geometric analysis, the use of a mathematical tree structure to store edge interrelationships, and the computation of an optimized trajectory to a validated endpoint. Accordingly, the Petition has not established unpatentability, and the claims of the '805 Patent remain valid and non-obvious.

## **IX. Conclusion**

122. For the foregoing reasons, it is my opinion that Claim 1 of the '805 Patent would not have been obvious over the prior art in Petitioner's Petition for *inter partes* review.

123. Since Claims 2, and 6-11 are dependent claims corresponding to Claim 1, they would not have been obvious over the prior art in Petitioner's Petition for *inter partes* review for the same reasons as discussed above.

124. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 13, 2025, in Irvine, California.



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Dr. Aditi Majumder

