

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UBER TECHNOLOGIES, INC.
Petitioner

v.

FARE TECHNOLOGIES LLC
Patent Owner

Case IPR2023-00746
U.S. Patent No. RE46,727

DECLARATION OF DAVID HILLIARD WILLIAMS

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I, David Hilliard Williams of Edwards, Colorado, declare that:

I. Introduction

1. My name is David Hilliard Williams, and I have been retained by counsel for Petitioner Uber Technologies, Inc. (“Uber” or “Petitioner”) as an expert witness to provide assistance regarding U.S. Patent No. RE46,727 (EX1001, “the ’727 Patent”). Specifically, I have been asked to consider the validity of claims 1-4, 7, 8, 11-13, 17-20, 26-31, and 37-41 of the ’727 Patent (the “Challenged Claims”) in view of prior art, anticipation and obviousness considerations, and understanding of a person of ordinary skill in the art at the time of the invention (“POSITA”) as it relates to the ’727 Patent. I have personal knowledge of the facts and opinions set forth in this declaration and believe them to be true. If called upon to do so, I would testify competently thereto.

2. I am being compensated for my time at my standard consulting rate. I am also being reimbursed for expenses that I incur during the course of this work. My compensation is not contingent upon the results of my study, the substance of my opinions, or the outcome of any proceeding involving the challenged claims. I have no financial interest in the outcome of this matter or on the pending litigation between Petitioner and Patent Owner.

3. My analysis here is based on my years of education, experience, and my investigation and study of relevant materials, including those cited herein.

4. I may rely upon these materials, my knowledge and experience, and/or additional materials to rebut arguments raised by the Patent Owner. Further, I may also consider additional documents and information in forming any necessary opinions, including documents that may not yet have been provided to me.

5. My analysis of the materials produced in this proceeding is ongoing and I will continue to review any new material as it is provided. This declaration represents only those opinions I have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information and on my continuing analysis of the materials already provided.

II. Background and Qualifications

6. I am an expert in the field of transportation services, mobile location, and telematics. I have summarized in this section my educational background, work experience, and other relevant qualifications. Attached hereto as Appendix A, is a true and correct copy of my *curriculum vitae* describing my background and experience.

7. I received a B.S. degree in Electrical Engineering from Purdue University in 1983 with top honors. I received an MBA degree in Information Systems Management from The University of Texas at Austin in 1987, also with top honors.

8. I have over 30 years of experience in transportation and wireless/mobile

location services, including experience designing, implementing, and managing numerous location-based service (LBS) applications such as navigation, fleet management, telematics, asset management, mobile social networking, family tracking, and mobile resource management, as well as working in all fields within the location services ecosystem including all forms of location determination technologies, map data, handset technologies, and associated Information Technology systems including identification, authentication, privacy, security, and other related capabilities such as network engineering and operations.

9. I am currently the President of the company E911-LBS Consulting, and I have been with the company since 2002. As the President of E911-LBS Consulting, I provide services across the entire wireless value chain, particularly with respect to technology and business strategic planning and product design and development associated with LBS, Global Positioning Satellite (GPS) systems, E911, WiFi-Based and other medium/long-range Real-Time Location Systems (RTLS), Radio Frequency Identification (RFID), Bluetooth, Near Field Communications (NFC), and beacon-based and other short-range communications/location systems, and other location determination and sensing technologies and services.

10. I am also President of company E911-LBS Forensics Engineering, providing location-related forensics services in criminal and civil forensics investigations. Such work often includes performing telematics-related forensics

services, e.g., analyzing the location and other sensors of a vehicle to determine/validate where it was and what it (and its driver) were doing at a given time, place, and context.

11. I have extensive expertise in all aspects of LBS delivery across the wireless location ecosystem including enabling network, map data, geospatial platform, chipset, data management, device, and location determination infrastructure and integration providers. I am an expert in all related aspects of LBS, including data privacy and security management.

12. In the mid to late 1990s, while Associate Partner in Accenture's Communications and High Technology Strategy Practice, I worked with several communications companies helping to design the business and technology strategy and underlying network requirements new forms of voice and data communications products, as well as key requirements for such products user interface mechanisms (e.g., phones, vehicles, etc.). This included work for AT&T, Bell Atlantic (later Verizon Wireless), and Sprint.

13. From early 1998 to 2000 I led the development of Nextel's Location-Based Services product strategy and underlying IT and networking architecture as an Associate Partner in Accenture's Communications and High Technology Strategy consulting practice. This work included identifying and developing the requirements for several of Nextel's key market segments, including taxi operators,

fleet managers, and field/sales personnel-dispatching companies.

14. In the early 2000s, I worked with several dot-com startups in various industries, particularly focused on the design of remote data collection mechanisms and associated communications infrastructure.

15. In 2003, I led the development of part of AT&T Wireless's E911 infrastructure, including the development of systems, processes, and reporting infrastructure to manage and track the deployment of time difference of arrival-based location determination technologies. I managed the testing and Federal Communications Commission reporting of network location inaccuracies, with a particular focus on detecting and troubleshooting out-of-norm technology deployment and inaccurate location conditions.

16. From 2005 to 2007, I worked with NAVTEQ—the leading provider of map data and services essential to creating LBS applications—to develop the company's web developer website content and tools. Specifically, I designed and managed the site map and overall content, including the development of comprehensive technical and business web content for all NAVTEQ map product and service lines. Through the developer site, application developers and business managers became intimately familiar with map data, Geographical Information System (GIS) platforms, and location-based services to successfully develop and launch their LBS applications. For example, I developed the content to highlight

key types of map data and to provide technical details on how NAVTEQ data and tools can be used in LBS design for various consumer and business applications, including “productization” of several commercial vehicle/fleet operations application data sets, technical requirements, and marketing materials. Also in 2007 I ghost-wrote a study on Traffic/dynamic map data and system providers in the United States on behalf of ABI Research, a market research consultancy.

17. My AT&T work included extensive involvement with and implementation leadership of numerous mobile location applications, including AT&T Navigator, AT&T FamilyMap, Loopt mobile social networking, 411-with-LBS, and Slifter Local Search. It also included extensive involvement with various aspects of worker and vehicle/fleet management tracking. In particular, I was the Product Manager for the several of the joint AT&T-Telenav Mobile Resource Management applications, as well as various fleet management solutions. This role and work required extensive knowledge of how the various applications worked, including fleet management/telematics applications, and even required design modifications in order for it to “fit into” AT&T’s network and IT infrastructure, as well as to implement AT&T’s privacy and security policies. The work also included designing/modifying AT&T’s network and IT infrastructure to allow/enable the applications to seamlessly work with AT&T’s location infrastructure and various IT systems used for functions including Sales, Customer Care, Fulfillment,

Billing/Accounts Receivable, and various network and IT operations. Among associated activities, my efforts included closely working with AT&T Legal to develop and implement AT&T's location privacy policies. These efforts in both data privacy and people tracking resulted in a patent: U.S. Patent 8,613,109, titled "Method and Apparatus for Providing Mobile Social Networking Privacy," that issued on December 17, 2013, of which I was the only non-employee inventor.

18. I also have many years of Information Technology experience. For example, as a consultant in the Information Technology practices of Deloitte Consulting (originally Touche Ross), Booz Allen & Hamilton, and Andersen Consulting (now Accenture), I served in key technology development and technology leadership roles in numerous projects designing and implementing mainframe, mini-computer, and client-server based computing systems across a wide variety of industries and a wide variety of functions/applications. I also led the design and development of a number of different communications networks associated with those computing systems, including wide- and local-area networks, utilizing both wired and wireless technologies, involving private and public (e.g., Internet-based) communications backbones and key user interfaces. This communications system expertise includes underlying expertise in the electrical characteristics of communications signals, extending back to the early 1980s with my Electrical Engineering degree from Purdue University in 1983 and my work as an

EE in the design of the Analog-to-Digital Signal Converter unit for the F-15 fighter jet radar system while with Hughes Aircraft Company Radar Systems Division from 1983-1985.

19. Further, I have authored multiple books on wireless location, including:

- The Definitive Guide to GPS, RFID, Wi-Fi, and Other Wireless Location-Based Services (2005 and 2009 versions);
- The Definitive Guide to Wireless E911; and
- The Definitive Guide to Mobile Positioning and Location Management (co-author).

20. As part of my consulting experience prior to the patent priority date, I have significant work in the taxi and transportation industries. In the late 1980s – early 1990s, I worked with Stevens Transportation, a long-haul trucking company, to computerize their business operations and management infrastructure, requiring detailed knowledge of the industry. Further, in the late 1990s/early 2000s as part of the Nextel work described above, understanding of the taxi industry was a key part of that work in multiple respects. First, Nextel utilized bandwidth formerly allocated to specialty mobile radio networks, particularly taxi fleet operators, as the basis of its iDEN network operations. Part of the functionality of this network included the Push-To-Talk walkie talkie-type functionality used by such operators and others, and formed part of the basis of several of the LBS applications involved in the

product and IT/Networking architecture work I led.

21. Additionally, the work included detailed understanding an LBS requirements definition for several of Nextel's key market segments, including the taxi segment. This work included identifying and supporting the ability to monitor and tracking taxis and more broadly enabling fleet management for commercial vehicle fleet management operations, including historical trip data capture and "breadcrumbing" individual taxi pickups delivery, and route tracking for subsequent management analysis.

22. I have also served as an expert in certain legal proceedings, including transportation-related companies including Geotab, FedEx, Heil, Lyft, Macropoint, Volkswagen, and Toyota, as well as numerous criminal and civil forensics cases involving vehicle tracking and telematics systems. A list of cases in which I have testified at trial, hearing, or by deposition (including those during the past five years) is provided in my *curriculum vitae*.

III. Level of Ordinary Skill in the Art

23. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a person of ordinary skill in the art ("POSITA") at the time of the alleged invention, which I understand is August 18, 1998, the filing date of U.S. Patent No. 6,122,591 ("the '591 Patent"). I understand that the factors considered in determining the ordinary level of skill in

a field of art include the level of education and experience of persons working in the field; the types of problems encountered in the field; the teachings of the prior art, and the sophistication of the technology at the time of the alleged invention. I understand that a POSITA is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a POSITA would also have knowledge from the teachings of the prior art, including the art cited below.

24. I understand that another expert retained by Uber, Dr. Ray Mundy, has addressed the question of the level of ordinary skill in the art previously and he concluded that on or before August 18, 1998, a POSITA of the '727 Patent would have working knowledge of the taxicab and transportation industry.

25. Taking the factors identified above into consideration, I agree with Dr. Mundy's determination of the level of ordinary skill in the art for the '727 Patent.

26. Before August 18, 1998, my level of skill in the art was at least that of a POSITA. As mentioned above, I worked with Stevens Transportation (long-haul trucking) in the late 1980s/early 1990s, as well as work involving taxi-related location-based services requirements while working with Nextel starting in early 1998. I am qualified to provide opinions concerning what a POSITA would have known and understood at that time, and my analysis and conclusions herein are from the perspective of a POSITA as of that date.

IV. Materials Considered and Relied Upon

27. In reaching the conclusions described in this declaration, I have relied on the documents and materials cited herein as well as those identified in this declaration, including the '727 Patent and the prosecution history of the '727 Patent. These materials comprise patents, related documents, and printed publications. Each of these materials is a type of document that experts in my field would have reasonably relied upon when forming their opinions.

28. I have also relied on my education, training, knowledge, and personal and professional experience in the relevant technologies and systems that were already in use prior to, and within the timeframe of the earliest priority date of the claimed subject matter in the '727 Patent, which is August 18, 1998.

- EX1001: U.S. Patent No. RE46,727 (“the '727 Patent”)
- EX1002: Prosecution History of the '727 Patent
- EX1003: U.S. Patent No. 6,122,591 (“the '591 Patent”)
- EX1004: Prosecution History of the '591 Patent
- EX1006: International Publication No. WO 97/18521 (“Smith”)
- EX1007: European Patent Publication No. 0 032 607 B1 (“Baumann”)
- EX1008: Korean Patent Publication No. 1998-016705 (“Choi”), including certified translation
- EX1009: Uber’s Opening Claim Construction Brief, Dkt. 31, Case No. 6:22-cv-00317-ADA-DTG, Western District of Texas

- EX1010: Plaintiff Fare Technologies LLC’s Opening [sic, Responsive] Claim Construction Brief, Dkt. 34, Case No. 6:22-cv-00317-ADA-DTG, Western District of Texas
- EX1011: Uber’s Claim Construction Reply Brief, Dkt. 35, Case No. 6:22-cv-00317-ADA-DTG, Western District of Texas
- EX1012: Joint Claim Construction Statement, Dkt. 37, Case No. 6:22-cv-00317-ADA-DTG, Western District of Texas
- EX1013: Corrected Plaintiff Fare Technologies LLC’s Sur-Reply Claim Construction Brief, Dkt. 38, Case No. 6:22-cv-00317-ADA-DTG, Western District of Texas
- EX1014: Uber’s Response to Plaintiff’s Sur-Reply Claim Construction Brief, Dkt. 42, Case No. 6:22-cv-00317-ADA-DTG, Western District of Texas
- EX1015: U.S. Patent No. 4,212,069 (“Baumann ’069”)

V. Legal Standards

29. I am not a lawyer and do not provide any legal opinions, but I have been advised that certain legal standards are to be applied by technical experts in forming opinions regarding meaning and validity of patent claims. I have applied the legal standards described below, which were provided to me by counsel for the Petitioner.

30. It is my understanding that assessing the validity of a U.S. patent based on a prior art analysis requires two steps. First, one must construe the terms of the patent claims to understand what meaning a POSITA would have given the terms. Second, after the claim terms have been construed, one may then assess validity by

comparing a patent claim to the prior art. I understand that the teaching of the prior art is viewed through the eyes of a POSITA at the time the invention was made. My analysis as to what constitutes a relevant a POSITA is set forth above.

A. Legal Standards for Prior Art

31. I understand that a patent or other publication must first qualify as prior art before it can be used to invalidate a patent claim.

32. I understand that a U.S. or foreign patent qualifies as prior art to a patent if the date of issuance of the U.S. or foreign patent is prior to the invention of the patent. I further understand that a printed publication qualifies as prior art to a patent if the date of publication is prior to the invention of the patent. My understanding is that, for such prior art references, a patentee may attempt to show that the claimed invention was conceived prior to the issuance of the U.S. foreign patent or publication of the printed materials. To do so, it is my understanding that patentee must prove with corroborating evidence that the named inventors conceived of the complete claimed invention before the prior art and were diligent in reducing the claimed inventions to practice.

33. I understand that, regardless of the date of invention, a U.S. or foreign patent qualifies as prior art to a patent if the date of issuance of the U.S. or foreign patent is more than one year before the earliest effective filing date of the patent. I further understand that a printed publication constitutes prior art to a patent if the

publication occurs more than one year before the earliest effective filing date of the patent, again regardless of the date of invention of the patent.

34. I understand that a U.S. patent or published U.S. application qualifies as prior art to a patent if the application for that patent was filed in the United States before the invention of the patent. My understanding is that, for such prior art references, a patentee may attempt to show that the claimed invention was conceived prior to the filing in the United States of the purported prior art U.S. patent or application. To do so, it is my understanding that patentee must prove with corroborating evidence that the named inventors conceived of the complete claimed invention before the prior art and were diligent in reducing the claimed inventions to practice.

35. I understand that documents and materials that qualify as prior art can be used to invalidate a patent claim as anticipated or as obvious.

B. Legal Standard for Priority Date

36. I understand that the “priority date” or “earliest effective filing date” of a patent is the date on which it is filed, or the date on which an earlier-filed U.S. or international patent application was filed if the patentee claims the benefit of priority to that earlier-filed U.S. or international patent application. The ’727 Patent is a reissue of the ’591 Patent, which was filed on August 18, 1998. For purposes of this declaration, I have assumed that the ’727 Patent is entitled to a priority date of

August 18, 1998, and I have not evaluated or formed an opinion on whether the claims of the '727 Patent are actually entitled to that date.

C. Legal Standard for Anticipation

37. I understand that a patent claim is invalid as “anticipated” if each and every limitation of the claim as construed by the Court is found, either expressly or inherently, in a single device or method that predates the claimed invention, or is described in a single previous publication or patent that predates the claimed invention. I understand that in order to anticipate a claim, a prior art reference must do more than merely disclose each element of the claim, but rather the prior art reference must disclose all of the elements of the claimed invention arranged as is recited by the claim. I understand that extrinsic evidence may be used to interpret the allegedly anticipatory reference and to shed light on what it would have meant to a person of ordinary skill in the art. I understand that the purpose of such extrinsic evidence is to educate the decision-maker to what the reference meant to persons of ordinary skill in the field of the invention, not to fill gaps in the reference.

D. Legal Standard for Obviousness

38. My understanding is that a patent claim is invalid as obvious only if the subject matter of the claimed invention “as a whole” would have been obvious to a POSITA at the time the invention was made. To determine the differences between a prior art reference (or a proposed combination of prior art references) and the

claims, the question of obviousness is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. Also, obviousness grounds cannot be sustained by mere conclusory statements. Rather, it is necessary to provide some articulated reasoning with rational underpinning to support the legal conclusion of obviousness.

39. I understand that a patent claim that comprises several elements is not proved obvious by simply showing that each of its elements was independently known in the prior art. In my evaluation of whether any claim of the '727 Patent would have been obvious, I considered whether the Petition, or any evidence submitted in this proceeding, presented an articulated reason with a rational basis that would have motivated a POSITA to combine the elements or concepts from the prior art in the same way as in the claimed invention.

40. It is my understanding that there is no single way to define the line between true inventiveness on one hand—which is patentable—and the application of common sense and ordinary skill to solve a problem on the other hand—which is not patentable. For instance, factors such as market forces or other design incentives may be the source of what produced a change, rather than true inventiveness.

41. I understand that the decision-maker may consider whether the change was merely the predictable result of using prior art elements according to their known functions, or whether it was the result of true inventiveness. The decision-

maker may also consider whether there is some teaching or suggestion in the prior art to make the modification or combination of elements recited in the claim at issue. Also, the decision-maker may consider whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way. The decision-maker may also consider whether the claimed invention would have been obvious to try, meaning that the claimed innovation was one of a relatively small number of possible approaches to the problem with a reasonable expectation of success by those skilled in the art.

42. I have been instructed by counsel that if any of these considerations are relied upon to reach a conclusion of obviousness, the law requires that the analysis of such a consideration must be made explicit. I understand that the decision-maker must be careful not to determine obviousness using the benefit of hindsight and that many true inventions might seem obvious after the fact. I understand that the decision-maker should consider obviousness from the position of a POSITA at the time the claimed invention was made, and that the decision-maker should not consider what is known today or what is learned from the teaching of the patent.

43. I understand that in order to determine whether a patent claim is obvious, one must make certain factual findings regarding the claimed invention and the prior art. Specifically, I understand that the following factors must be evaluated to determine whether a claim is obvious: the scope and content of the prior art; the

difference or differences, if any, between the claim of the patent and the prior art; the level of ordinary skill in the art at the time the claimed invention was made; and, if available, the objective indicia of non-obviousness, also known as “secondary considerations.”

44. I understand that the secondary considerations include: commercial success of a product due to the merits of the claimed invention; a long felt need for the solution provided by the claimed invention; unsuccessful attempts by others to find the solution provided by the claimed invention; copying of the claimed invention by others; unexpected and superior results from the claimed invention; acceptance by others of the claimed invention as shown by praise from others in the field or from the licensing of the claimed invention; teaching away from the conventional wisdom in the art at the time of the invention; independent invention of the claimed invention by others before or at about the same time as the named inventor thought of it; and other evidence tending to show obviousness. I understand that, to establish a secondary consideration, the evidence must demonstrate a nexus between that secondary consideration and the claimed invention.

VI. Overview of the '727 Patent

A. Subject Matter Overview

45. The '727 Patent is titled “TAXI TRIP METER SYSTEM WITH INDICATION OF FARE AND DISTANCE VIOLATIONS.” The '727 Patent

issued on February 20, 2018 from U.S. Patent Application No. 14/723,731 (“the ’731 Application”) filed on May 28, 2015. (See EX1001, Cover.) The ’731 Application is a reissue application for the ’591 Patent. (*Id.*) The ’591 Patent issued on September 19, 2000 from U.S. Patent Application No. 09/136,144 (“the ’144 Application”) filed on August 18, 1998. (*Id.*)

46. The ’727 Patent contains 41 claims. I have been asked to opine on the validity of the Challenged Claims, claims 1-4, 7, 8, 11-13, 17-20, 26-31, and 37-41, which are listed in the table below.

Challenged Claims of U.S. Patent No. RE46,727
[1pre] A taxi trip meter system for a taxi, comprising:
[1a] a computer;
[1b] a trip meter connected to said computer, said trip meter for measuring an actual trip distance traveled by said taxi between a starting point and a destination point;
[1c] a location sensor providing geographical location information about said taxi to said computer; and
[1d][i] instructions loaded in said computer instructing said computer
[1d][ii] to calculate an estimated shortest trip distance between said starting point and said destination point
[1d][iii] to compare said estimated shortest trip distance with said actual trip distance, and
[1d][iv] to indicate a distance violation when said estimated shortest trip distance is exceeded by said actual trip distance by a predetermined distance margin.

[2] The taxi trip meter system of claim 1, wherein said location sensor comprises a GPS receiver.
[3] The taxi trip meter system of claim 1, further including a transmitter connected to said computer for transmitting violation information.
[4] The taxi trip meter system of claim 1, further including a display connected to said computer for displaying violation information.
[7pre] A taxi trip distance violation detection method, comprising:
[7a] determining a starting point for a trip;
[7b] determining a destination point for said trip;
[7c] determining an estimated shortest trip distance between said starting point and said destination point;
[7d] determining an actual trip distance traveled by a vehicle after said trip is completed;
[7e] comparing said estimated shortest trip distance with said actual trip distance; and
[7f] indicating a distance violation when said estimated shortest trip distance is exceeded by said actual trip distance by a predetermined distance margin.
[8] The taxi trip distance violation detection method of claim 7, wherein said estimated shortest trip distance comprises a driving distance through known roads.
[11] The taxi trip distance violation detection method of claim 7, further including recording an actual route traveled during said trip for subsequent review for excusable causes for said distance violation.
[12Pre] An automated taxi fare estimating method, comprising:
[12a] using a computer including street information accessible thereon,

[12b][i] the computer including program instructions
[12b][ii] to receive geographical location information from at least one network connected location sensor and
[12b][iii] to access the street information based on the received geographical location information,
[12c][i] the computer program instructions comprising:
[12c][ii] receiving geographical location information from the at least one location sensor;
[12c][iii] determining a starting point for a trip based on the received geographical location information;
[12c][iv] determining a destination point for said trip;
[12c][v] determining an estimated shortest trip distance between said starting point and said destination point based on the street information or on a straight-line distance determined between the starting point and destination point;
[12c][vi] determining an estimated waiting time encountered in traffic during said trip based on the geographical location information and the street information; and
[12c][vii] determining an estimated taxi fare based on said estimated shortest trip distance and said estimated waiting time.
[13] The taxi fare estimating method of claim 12, wherein said estimated shortest trip distance comprises a driving distance through known roads.
[17] The taxi fare estimating method of claim 12, further including recording an actual route traveled during said trip for subsequent review for excusable causes for said fare violation.
[18] The taxi trip meter system of claim 1 wherein the computer is in network communication with the trip meter.

[19] The taxi fare estimating method of claim 12 wherein the estimated taxi fare is determined on a remote computer in network communication with a taxi trip meter.
[20] The taxi fare estimating method of claim 12 wherein the estimated shortest trip distance is determined using the geographical location information.
[26] The taxi fare estimating method of claim 12, wherein the estimated waiting time is determined using route information available on a computer, wherein the route information includes traffic light or traffic congestion information.
[27] The taxi fare estimating method of claim 12, wherein a computer determines the fare from a remote location and communicates the fare over a network connection.
[28] The taxi fare estimating method of claim 12, the method steps further comprising: communicating the estimated fare to a rider upon or after completion of the trip.
[29] The taxi fare estimating method of claim 12, the method steps further comprising: determining an actual fare based upon an actual trip distance or an actual trip duration; and indicating a fare violation if the actual fare exceeds the estimated fare by a predetermined permissible margin.
[30Pre] An automated taxi trip meter system, the system comprising:
[30a] a computer in network communication with at least one location sensor, the computer including street information accessible thereon and program instructions for performing the program steps comprising:
[30b] receiving geographical location information from the at least one location sensor;
[30c] determining a starting point for a trip based on the geographical location information;
[30d] determining a destination point for the trip;

[30e] accessing the street information using the geographical location information;
[30f] determining an estimated shortest trip distance between the starting point and the destination point based on the street information or on a straight-line distance determined between the starting point and destination point;
[30g] determining an estimated waiting time in traffic during the trip based on the street information; and
[30h] determining an estimated fare based on the estimated shortest trip distance and the estimated waiting time.
[31] The taxi trip meter system of claim 30 wherein the estimated waiting time is determined using the geographical location information.
[37] The taxi trip meter system of claim 30, wherein the estimated shortest trip distance is determined using actual street route information available on the computer.
[38] The taxi trip meter system of claim 30, wherein the estimated waiting time is determined using route information available on the computer, wherein the route information includes at least one of traffic light or traffic congestion information.
[39] The taxi trip meter system of claim 30, wherein the computer determines the fare from a remote location and communicates the fare over a network connection.
[40] The taxi trip meter system of claim 30, the program steps further comprising: communicating the estimated fare to a rider upon or after completion of the trip.
[41] The taxi trip meter system of claim 30, the program steps further comprising: determining an actual fare based upon an actual trip distance or an actual trip duration; and indicating a fare violation if the actual fare exceeds the estimated fare by a predetermined permissible margin.

47. The ‘727 Patent relates to a taxi trip meter system that monitors the operations of a taxi to detect if the taxi driver has taken, for example, an unnecessarily long route. (EX1001, 1:26-29.) The trip meter system includes “a computer 10 receiving taxi fare information from a taximeter 11, trip distance information from a trip meter 12, and geographical location information from a location sensor 13.” (*Id.*, 2:22-26.) The system starts “when the taximeter is activated or a specific initiating input is provided to the computer.” (*Id.*, 2:39-43.) At that point, the system determines “the geographical starting point.” (*Id.*) “When the vehicle has reached its destination and the trip is ended ... when the taximeter is deactivated or a specific terminating input is provided to the computer, the geographical destination point is determined.” (*Id.*, 2:44-49.) “The starting and ending points are determined with the location sensor and the street information loaded in the computer.” (*Id.*, 2:49-51.)

48. “Based on available street information, the optimal route and shortest trip distance between the starting and ending points are estimated ... with any suitable method well known in the art.” (*Id.*, 2:58-61.) In addition, the system determines “[a] permissible margin over the estimated shortest trip distance.” (*Id.*, 2:65-67.) Thereafter, “[t]he actual trip distance is compared to the estimated shortest trip distance.” (*Id.*, 3:4-5.) “If the estimated shortest trip distance is exceeded by the actual trip distance by the permissible margin, a distance violation is indicated.”

(*Id.*, 3:5-8.) “The indication for the violation may be provided in various forms, e.g., as a transmission to the taxi company headquarters through the transmitter, as information on the display, or as a printout from the printer.” (*Id.*, 3:8-11.)

49. The ’727 Patent also describes a fare violation embodiment. (*Id.*, Abstract.) In addition to estimating the shortest trip distance, this embodiment also estimates waiting time in traffic. “An estimated waiting time in traffic along the optimal route is determined ... based on location traffic information and the time of day to account for traffic lights, traffic congestion, etc.” (*Id.*, 3:51-54.) Thereafter, an estimated fare can be determined “based on the estimated shortest trip distance and estimated waiting time.” (*Id.*, 3:54-57.) “If the estimated fare is exceeded by the actual fare by the permissible margin, a fare violation is indicated” in the same manner as described with respect to the distance violation. (*Id.*, 3:63-4:2.)

B. File History of the ’727 Patent

50. I reviewed the file history of the ’727 Patent. The ’727 Patent is a reissue of the ’591 Patent, which included claims 1-17. The reason provided for the reissue was that “[t]he inventor or the inventor’s attorney failed to previously present narrower claims, which are being added by this reissue application.” (EX1002, 12¹.) During the reissue proceedings, claim 12 was amended, claim 14 was canceled, and

¹ Page cites are to the PDF page numbers and not to internal document page numbers. This includes cites to EX1002, 1004, 1006, 1008-1009.

claims 18-41 were added. These amendments are shown in brackets for matter that was deleted and italics for matter that was added. (EX1001, 1:6-11, 5:49-6:6.)

51. During reissue, Patent Owner twice amended claim 12 in order to overcome a 35 U.S.C. § 101 rejection. (EX1002, 116, 124, 166, 173, 186, 193.) With respect to claim 12, Patent Owner also argued that U.S. Patent No. 4,212,069 (“Baumann ’069”) does not disclose “the claimed location sensor,” and “does not rely on use of vehicle geographical location information data obtained from a location sensor as claimed.” (*Id.*, 199.)

52. I also reviewed the file history of the ’591 Patent. The Patent Office issued a single office action rejecting all claims as being anticipated by U.S. Patent No. 5,917,434 (“Murphy”). (EX1004, 45-46.) With respect to Murphy, Applicant stated that “Murphy discloses a taxi meter with a GPS location sensor.” (*Id.*, 6.) The start and end of the trip are marked using the GPS location sensor, but “[t]he trip distance is measured by a trip distance module based on input from odometer pulses.” (*Id.*)

53. While Murphy measures actual distance, Patent Owner argued that it does not calculate an estimated shortest trip distance. (*Id.*, 7.) Therefore, Patent Owner asserted that Murphy cannot perform a comparison between the actual distance and the estimated shortest trip distance, or provide an indication of a distance violation when the actual distance exceeds the estimate by a predetermined

distance margin. (*Id.*, 6-7.) As a result, Patent Owner concluded that Murphy cannot “alert[] a passenger to being taken for an unnecessarily long ride.” (*Id.* (emphasis omitted).) In addition, with respect to claim 12, Patent Owner argued that Murphy also does not determine an estimated waiting time encountered in traffic and, thus, cannot provide an estimated fare for a passenger before the ride begins. (*Id.*, 8.)

C. Interpretation of the ’727 Patent Challenged Claims

54. For purposes of my analysis in this IPR proceeding, I understand that the terms that appear in the claims of the ’727 Patent should be interpreted according to their plain and ordinary meaning under the *Phillips* standard. In determining the ordinary and customary meaning, I understand that the words of a claim are first given their plain meaning that those words would have had to a POSITA at the time of the alleged invention. I also understand that the claims, specification, and file history also may be used to better construe a claim insofar as the plain meaning of the claims cannot be understood. Moreover, I understand that even treatises and dictionaries may be used under limited circumstances to determine the meaning attributed by a POSITA to a claim term at the time of filing.

55. I also understand that the words of the claims should be interpreted as they would have been interpreted by a POSITA at the time the invention was made (not today). For purposes of my analysis here, I have used the August 18, 1998, the priority date of the ’727 Patent as the date of invention. Without exception, however,

my analysis of the proper meaning of the recited claim elements (under the *Phillips* standard) in this declaration would be correct if the date of invention was anywhere in the late 1990s or early 2000s.

56. I reviewed the proposed claim constructions provided by the parties in *Fare Technologies LLC v. Uber Technologies, Inc.*, Case No. 6:22-cv-00317-ADA-DTG, Western District of Texas, including Dr. Mundy's declaration. (EX1009-EX1014.) Both parties argued that the following four terms should be given their plain and ordinary meanings, but Uber provided an understanding of what that plain ordinary meaning would be to a POSITA in 1998 as shown below.

- Taxi: "an automobile licensed for hire as a taxi or taxicab and fitted with a meter"
- Trip Meter: "a device in the taxi that determines distance traveled using input collected from the taxi"
- Starting Point: "geographical location where the ride began"
- Destination Point: "geographical location where the ride ended"

57. I have reviewed the parties' briefing, including the Declaration of Dr. Mundy and the other evidence provided by the parties. I have also relied on my knowledge of the taxicab and the transportation industry in 1998. I agree that the plain and ordinary meanings of these terms as proposed by Uber above are correct, and I have used these meanings in my evaluation of the prior art and in my opinions

as to the validity of the Challenged Claims.

58. Uber also argued that the term “waiting time encountered in traffic” found in claim 12 is indefinite because it has at least three possible meanings in the context of the ’727 Patent. (EX1009, 17-20.) If a court found that this term was not indefinite, Uber proposed the construction as “amount of time spent stopped or below a predefined speed threshold.” (*Id.*, 20-22.) For purposes of my declaration, I have used this proposed construction in my evaluation of the prior art and in my opinions as to the validity of claim 12. I have also identified where the prior art also teaches other possible meanings, such as the difference between optimal and current trip time, or time when a taxi is in traffic. (*Id.*, 18.)

VII. Overview of the Cited References

59. General descriptions provided for the following references and combinations thereof are incorporated into each subsection and mapping of the claims that includes citations to these references.

A. Smith (EX1006)

60. Smith was not cited during the prosecution of the ’727 Patent. Smith discloses a fully automated dispatching system for “taxis, ambulances, or other vehicles.” (EX1006, 3:5-7.) Smith’s “invention encompasses systems which make use of existing AVL [Automatic Vehicle Locator] technology to compute routing and mileage based on invoiced pickup and destination sites, and then compare the

mileage of the computed route to the mileage charged in the invoice.” (*Id.*, 12:16-21.) “Such a system might be used by an insurance or governmental agency to locate excessive mileage charges.” (*Id.*, 12:11-15.)

B. Baumann (EX1007)

61. Baumann was not cited during the prosecution of the ’727 Patent. Baumann discloses a “[f]are computation and dispatching method.” (EX1007, Title.) Baumann uses “a central control system for monitoring not only the fare needs of the taxi fleets, but for enabling central computation of the fares, estimated trip time information and other needs for over-lapping trip passengers, without penalty to a deviated rider, together with the sophisticated use of experience in the peculiarities of different routes, traffic patterns and exigencies or difficulties of travel at different times of day or weather and the like.” (*Id.*, 1:54-65.) “The fare calculation for a specific trip requires obtaining origin and destination coordinates, retrieving and adjusting the appropriate distances and times, computing the fare, and displaying the results.” (*Id.*, 9:6-10.)

62. I’ve been informed that Baumann is not related to Baumann ’069, which was cited during prosecution of the ’727 Patent. Both Baumann patents, however, are directed to similar subject matter. Patent Owner argued that Baumann ’069 does not disclose the claimed location sensor or the use of data from the sensor as found in claim 12. (EX1002, 199.) However, the other references that

I considered in combination with Baumann, i.e., Smith and Choi, disclose these purportedly missing limitations as described further below and were not previously before the Patent Office. The Patent Office found that Baumann '069 taught all of the remaining limitations of claim 12. (*Id.*, 148-151.) The Patent Owner did not deny that Baumann '069 taught the remaining limitations in claim 12. (*Id.*, 199.)

C. Choi (EX1008)

63. Choi was not cited during the prosecution of the '727 Patent. Choi discloses “[a] taxi meter using [an] automatic navigation system.” (EX1008, Title.) “[M]ore specifically, [Choi discloses] a taxi meter and a driving system using a Global Positioning System (hereinafter abbreviated as GPS) capable of recording and reading the taxi passenger pick-up and drop-off points and the current location data using radio waves received by a Global Positioning System.” (*Id.*, 10.) “The taxi meters (14, 24, 54) record the total business data (total mileage, business distance, income, vehicle speed, number of business, etc.), and the location data (N, E) of the GPS receivers (13, 23, 53), and by analyzing the recorded data with a computer, it is possible to check the place where the passenger is picked up and dropped off and the business status through the computer monitor, which enables efficient management.” (*Id.*)

VIII. Ground 1: Smith Anticipates Claims 7, 8, and 11

A. Smith Anticipates Claim 7

64. As described in the following paragraphs, Smith discloses all of the limitations found in claim 7 of the '727 Patent. To the extent it is argued that further evidence is required for particular limitations, a POSITA would have found these claims obvious either based on Smith alone (Ground 2) or in view of Smith and Baumann (Ground 3).

[7pre] A taxi trip distance violation detection method

65. The '727 Patent states that “[r]iders who are unfamiliar with the area being traversed are sometimes cheated by unscrupulous taxi drivers who take a roundabout route to inflate the fare.” (EX1001, 1:26-29.) To address this problem, the '727 Patent describes identifying a distance violation if the actual distance traveled exceeds the shortest trip distance by a permissible margin. (*Id.*, 1:63-65.)

66. Similarly, Smith describes identifying a distance violation. Smith’s “invention relates to dispatching or controlling of taxis, ambulances, or other vehicles.” (EX1006, 3:5-7.) In particular, the “invention encompasses systems which make use of existing AVL technology to compute routing and mileage based on invoiced pickup and destination sites, and then compare the mileage of the computed route to the mileage charged in the invoice.” (*Id.*, 12:16-21.) When the trip is done, Smith determines if the trip distance “is appropriate” for the services

provided. (*Id.*, Claim 33.) Smith's determination of appropriate mileage detects a distance violation as discussed in further detail with respect to limitation [7f].

[7a] determining a starting point for a trip

67. The '727 Patent states that "[w]hen a trip is begun at block 21, e.g., when the taximeter is activated or a specific initiating input is provided to the computer, the geographical starting point is determined at block 22, and the starting time is marked at block 23." (EX1001, 2:39-43.) This portion of the '727 Patent supports the plain and ordinary meaning of "starting point" as the "geographical location where the ride began."

68. Smith's system uses a dispatch file to store information regarding vehicle dispatching. (EX1006, 22:18-23:2.) This dispatch file includes "[t]he pickup and destination addresses and their latitudes and longitudes" and they "are indicated in the tenth through fifteenth fields of the data record." (*Id.*, 29:14-16.) These data fields are shown below, in an excerpt of Smith's Figure 3A. (*Id.*, 100.)

Dispatch File	
1	Transport ID Number
2	Status Flag (= " ", "D", "C", or "F")
3	Date of Service
4	Appointment Time (= <time> or "ASAP")
5	Lead Time
6	Transport Type (Wheelchair/Basic/AdvancedLifeSupport)
7	Vehicle ID Number
8	Driver Employee Number
9	Attendant Employee Number
10	Pickup Location
11	Pickup Latitude
12	Pickup Longitude
13	Destination Location
14	Destination Latitude
15	Destination Longitude

69. The latitudes and longitudes in the eleventh and twelfth fields shown above are the geographical starting point of a trip. Smith describes using “commercially available Automatic Vehicle Locator (AVL) systems which automatically track (typically via satellite navigation) the locations of managed vehicles.” (*Id.*, 5:3-10.) AVL systems around 1998 were typically used by public transportation agencies, emergency services, and transportation/delivery companies, which had the resources to invest in the technology and/or major business requirements for such technology. The systems were primarily used for tracking vehicle locations, monitoring schedules and routes, and improving dispatch efficiency.

70. There were two types of AVL systems in service in 1998: passive and active. Passive AVL systems stored location information and other relevant data to an onboard storage device for later retrieval and reporting. Active AVL systems could report vehicle information, such as location, speed, and stops, to users/management by obtaining data from global positioning system (GPS) satellites and could report events in near real-time (live) through cellular, radio, or satellite communication modems. Using the (active) AVL system, Smith determines the location of a vehicle, including the latitude and longitude coordinates associated with a trip. Smith’s pickup latitude and longitude is the geographical location where the ride began, for example.

71. Smith explains how it uses the AVL system to obtain the latitude and longitude of the starting point (and destination point) of a trip. Smith explains that the “dispatching procedure 26 generates a request to the AVL system to determine the latitude and longitude of the vehicle.” (*Id.*, 57:12-14.) Next, “[i]n handling a latitude/longitude response, ... the communications process updates 220 the latitude and longitude fields (fields 11-12 and 14-15) in the dispatch record.” (*Id.*, 78:6-12.)

72. In this way, Smith describes storing the “pickup/destination latitude/longitude” that Smith’s computer aided dispatch (“CAD”) system requests, which is the latitude and longitude obtained by the AVL system (via the vehicle), then sent to the central CAD system/computer, and stored in the Dispatch file. I understand as part of Smith’s dispatching procedure, it sends a request to the AVL system, in the format shown in Figure 3N-1, for the latitude and longitude of the pickup and destination location. (*Id.*, 57:12-16.) The AVL system is then responsible for sending back a response, in the format shown in Figure 3N-2, which includes the longitudes and latitudes for the pickup and destination locations. (*Id.*, 77:19-25.) Finally, when Smith’s CAD system receives the response, it updates the dispatch record with longitudes and latitudes for pickup and destination locations. (*Id.*, 58:1-5; 77:7-14.)

73. Accordingly, the starting and destination points are determined in Smith when the AVL system determines the latitude and longitude of the vehicle to

be populated in the dispatch record for the pickup location.

[7b] determining a destination point for said trip

74. The '727 Patent states that “[w]hen the vehicle has reached its destination and the trip is ended at block 25, e.g. when the taximeter is deactivated or a specific terminating input is provided to the computer, the geographical destination point is determined at block 26, and the ending time is marked at block 27.” (EX1001, 2:44-49.) This portion of the '727 Patent supports the plain and ordinary meaning of “destination point” as the “geographical location where the ride ended.”

75. In the same way that Smith determines a pickup point for a trip, as discussed with respect to limitation [7a], it also determines a destination point. The latitudes and longitudes in the fourteenth and fifteenth fields shown above in the excerpt from Smith’s Figure 3A are the geographical destination point of a trip. Using the AVL system, Smith can determine the location of a vehicle, including the destination point of a trip. Smith’s destination point is the geographical location where the ride ended.

[7c] determining an estimated shortest trip distance between said starting point and said destination point

76. The '727 Patent states that “[b]ased on available street information, the optimal route and shortest trip distance between the starting and ending points are estimated at block 31 with any suitable method well known in the art.” (EX1001,

2:58-61.) The '727 Patent further provides that “[t]he shortest trip distance is preferably determined for an actual street route, but if the computer is not provided with street information, the straight-line distance between the starting and end points may be considered as the estimated shortest trip distance.” (*Id.*, 2:61-65.)

77. Smith also describes estimating the shortest distance between the starting and destination points using an actual street route. As described in Smith’s claim 33, the disclosed system “determin[es] a shortest route from said starting point to said ending point.” (EX1006, Claim 33.) Smith estimates the shortest route with the AVL system that “include[s] a street map database and search algorithm through which the AVL can identify a street route from one address to another upon request from the dispatcher.” (*Id.*, 6:1-4.) A POSITA understands that routing algorithms, such as those used in active AVL systems like the one used by Smith, can determine the shortest distance between the starting point and the ending point.

78. Smith describes that “[a]n important feature of the automated dispatching system is that a dispatching process instruction to a vehicle identifies a route to be followed by the vehicle.” (*Id.*, 11:19-22.) This feature “will heighten awareness of mileage charges and result in a demand for systems to review mileage charges (no matter how generated) and compare the mileage charges to the mileage for an optimal routing.” (*Id.*, 12:4-11.) Shortest distance is one example of an optimal route. Other optimal routes can include shortest time, least dangerous, or

some combination of a variety of factors. The '727 Patent discusses the “optimal route” in its specification, but only claims the narrower example of “shortest trip distance” in Claim 7. (EX1001, 2:58-61, Claim 7.) Likewise, Smith refers to “optimal routing” in its specification, but claims the narrower example of “shortest route” in its claim 33. (EX1006, Claim 33.)

[7d] determining an actual trip distance traveled by a vehicle after said trip is completed

79. The '727 Patent states that “[t]he actual trip distance is determined at block 29 with input from the trip meter or with street information.” (EX1001, 2:52-54.) For example, “the trip distance may be determined with GPS and map data.” (*Id.*, 4:37-39.)

80. Smith determines actual trip distance after a vehicle completes a trip. Smith’s system maintains a “dispatch record ... for tracking the vehicle activity.” (EX1006, 31:13-15.) “This information is ... transferred to invoice records upon completion of the task.” (*Id.*, 31:16-20.) “Invoice file 34 contains information for generating an invoice for the activities performed by vehicles 20 upon customer request.” (*Id.*, 23:17-19.)

81. Smith’s invoice information is used to determine actual trip distance once the trip is completed for the purpose of computing the mileage charges. (*E.g.*, *id.*, 66:14-71:12, 101 (Fig. 3B).) As described in Smith’s claim 33, the records in a database document transportation services, including starting and ending point, and

the mileage travelled. (*Id.*, Claim 33.) To determine the mileage travelled, the trip necessarily needs to be complete. A POSITA understands that Smith’s mileage charged is the actual trip distance traveled.

82. Smith also discloses that “the present invention, will ... compare the mileage charges to the mileage for an optimal routing.” (*Id.*, 12:4-11.) As mentioned, shortest distance is one example of an optimal route. Smith further explains that “the present invention encompasses systems which make use of existing AVL technology to compute routing and mileage based on invoiced pickup and destination sites, and then compare the mileage of the computed route to the mileage charged in the invoice.” (*Id.*, 12:16-21.) And Claim 33 compares the mileage purported travelled to the mileage to the shortest route. (*Id.*, Claim 33.)

83. A POSITA would understand that the invoice distance (or the “mileage purportedly travelled”) is the actual distance travelled by the taxi, ambulance, or other monitored vehicle. This could be done in a variety of ways, including by use of the vehicle’s odometer or a taxi’s tripmeter. Indeed, as Smith confirms, the charges for ambulances and taxis in 1998 were largely, if not exclusively, based in some manner on distance travelled.

[7e] comparing said estimated shortest trip distance with said actual trip distance

84. The ’727 Patent states that “[t]he actual trip distance is compared to the estimated shortest trip distance at block 33.” (EX1001, 3:4-5.)

85. Smith also discloses comparing the estimated shortest trip distance with the actual trip distance.

Indeed, it is expected that the ability to automatically generate routes, and to automatically provide them to vehicles, in accordance with the present invention, will heighten awareness of mileage charges and result in a demand for systems to review mileage charges (no matter how generated) and **compare the mileage charges to the mileage for an optimal routing**. Such a system might be used by an insurance or governmental agency to locate excessive mileage charges, or used by a transit company to pre-screen invoices before they are rejected by an insurance or governmental agency. Accordingly, the present invention encompasses systems which make use of existing AVL technology to compute routing and mileage based on invoiced pickup and destination sites, and then **compare the mileage of the computed route to the mileage charged in the invoice**.

(EX1006, 12:4-21 (emphasis added).)

86. As described previously, “shortest distance” is one example of an optimal route. This is confirmed by Smith’s claim 33 in which the claimed system “compar[es] a mileage associated with said shortest route to said mileage purportedly travelled.” (*Id.*, Claim 33.) Smith describes an example of this comparison. “Governmental agencies could, and perhaps in the near future may, begin verifying the mileage charged by ambulance carriers by computing a route from the pickup to destination locations and comparing the mileage of the computed route to the mileage actually charged by the carrier.” (*Id.*, 58:19-24.) While this example is for an ambulance service, it also applies to taxi service, which is also highly regulated. (See, e.g., EX1009, 9-10) Both ambulance and taxi services are

subjected to numerous regulations, ranging from licensing to safety. Both services also are potentially subject to audits and penalties associated with regulatory violations.

[7f] indicating a distance violation when said estimated shortest trip distance is exceeded by said actual trip distance by a predetermined distance margin

87. The '727 Patent states that “[i]f the estimated shortest trip distance is exceeded by an actual trip distance by a permissible margin, a distance violation is indicated.” (EX1001, Abstract and 1:63-65.) “The indication for the violation may be provided in various forms, e.g., as a transmission to the taxi company headquarters through the transmitter, as information on the display, or as a printout from the printer.” (*Id.*, 3:8-11.)

88. Smith also describes indicating a distance violation when the actual trip distance exceeds the estimated shortest distance by more than a predetermined margin. After performing the comparison as described with respect to the previous limitation, the comparison can be used “to determine if said mileage purportedly travelled is appropriate for said services.” (EX1006, Claim 33.) For example, Smith’s “system might be used by an insurance or governmental agency to locate excessive mileage charges, or used by a transit company to pre-screen invoices before they are rejected by an insurance or governmental agency.” (*Id.*, 12:11-15.)

89. Using the example of an ambulance service, Smith’s system could

“automatically perform such verification upon an ambulance service invoice to determine if the mileage charges on the invoice are within parameters set by a Government or insurance agency.” (*Id.*, 59:9-13.) Thus, here again, Smith discloses indicating a distance violation when an invoice fails the verification process. Smith’s use of the phrase “within parameters” indicates that there is some allowable distance margin that would be acceptable. While the ’727 Patent does not explain what a distance margin is, a POSITA would understand that this margin is a variance from the shortest distance. Smith’s parameters perform the same purpose, namely, to provide some window where distance is still appropriate even if it is not the shortest distance.

90. A POSITA understands that Smith’s “parameters” are a distance margin because Smith does not expect, nor does it make sense, for an insurance or governmental agency to expect a vehicle to take the shortest possible route every time. In fact, there may be reason to take a route that is not the shortest, e.g., to avoid an accident or to travel on main streets. However, the deviation from the shortest distance should be within reason. That is why Smith’s system “automatically” performs a “verification” to determine whether actual mileage is “within parameters set by a Government or insurance agency.” (*Id.*) it wants to determine if the actual mileage is close enough to the shortest distance, which is exactly what a POSITA understands a “distance margin” to be.

91. Further, in my experience, systems for evaluating transportation invoices for reimbursement, like the one disclosed in Smith’s claim 33, provide the payor (e.g., the government or insurance company) with an indication of invoices that were not appropriate for reimbursement. That indication could take many forms, including communicating the comparison or the distance violation itself, flagging the invoice for review or rejection, or automatically rejecting the invoice. A POSITA would understand that each form is an indication of a distance violation since the form either expressly identifies the distance violation or identifies an action (e.g., flagging or rejecting the invoice) that Smith’s system would not take but for a distance violation—thereby indicating that a distance violation must have occurred.

92. Here, Smith’s claim 33 is directed to ensuring that charges for transportation services submitted for reimbursement are appropriate. Thus, when Smith’s system determines that the mileage travelled is not appropriate based on a comparison to the shortest trip distance, I understand that it provides an indication of a distance violation so that the insurance or government entity knows which charges to reimburse and which charges not to pay. Thus, Smith’s system not only detects the distance violation, but indicates that the violation occurred by providing notice that the driver took an inappropriate route.

93. While Smith’s examples are in the context of an ambulance service, Smith describes that “methods and apparatus described herein could be used for any

kind of vehicles, not limited for example to taxis and ambulances.” (*Id.*, 80:24-81:2.)

As such, a POSITA understands that this example works for taxi services as well.

94. Thus, it is my opinion that Smith discloses all of the limitations of claim 7 of the '727 Patent.

B. Smith Anticipates Claim 8

8. *The taxi trip distance violation detection method of claim 7, wherein said estimated shortest trip distance comprises a driving distance through known roads.*

95. Claim 8 depends from claim 7. Accordingly, I incorporate my discussion of claim 7. While the '727 Patent only uses the term “known roads” in the claims, the specification describes two ways of estimating the shortest distance: a computer provided with street information and a straight-line distance. (EX1001, 2:61-65.) A computer provided with street information is able to calculate the driving distance through known roads. As described with limitation [7c], Smith’s AVL system has a computer provided with a street map database, which includes information about streets. (EX1006, 6:1-4.) Using this database, Smith’s AVL system estimates the shortest distance that is the driving distance through known roads as opposed to a straight-line distance.

96. Thus, it is my opinion that Smith discloses all of the limitations of claim 8 of the '727 Patent.

C. Smith Anticipates Claim 11

11. The taxi trip distance violation detection method of claim 7, further including recording an actual route traveled during said trip for subsequent review for excusable causes for said distance violation.

97. Claim 11 depends from claim 7. Accordingly, I incorporate my discussion of claim 7. The '727 Patent states that “[a] recording of the actual route being traveled is begun at block 44” and “[t]he recording of the actual route is stopped at block 48.” (EX1001, 3:31-40.) “When a violation is indicated, the recorded route may be reviewed by the taxi company or government authority for excusable causes, such as accidents, parades, road closures, etc.” (*Id.*, 4:39-42.)

98. Smith discloses recording an actual route traveled during said trip for subsequent review for excusable causes for said fare violation. Smith uses “a database server 10 for storing records indicating requested vehicle services and associated information.” (EX1006, 14:17-19.) Smith describes these records as follows.

It will be noted that the dispatch records, which accumulate over time, include sufficient information to collectively determine the movements of each vehicle throughout each business day. Accordingly, these records can be collectively analyzed to determine the extent to which vehicles are being properly utilized and to potentially develop and revise marketing and vehicle positioning strategies for optimizing performance. Furthermore, these records may be used to generate detailed reports of nearly every format indicating the utilization of a particular vehicle, the on-time performance of a particular driver or crew, and any other kind of reporting information that management may seek in order to understand and improve operation of the dispatching operation.

(*Id.*, 33:17-34:7.) Smith’s description above regarding the collection vehicle data is consistent with my understanding of how traffic data was collected, processed, and used in the 1990s. In one example, Smith records the routes “to locate excessive mileage charges.” (*Id.*, 12:11-15.) A POSITA would understand that these dispatch records can be reviewed to identify reasons for a taxi fare that is higher than expected. For example, the fare may be higher because the taxi was “stalled in traffic.” (*Id.*, Claim 26.) As another example, a road closed for repair may be identified for vehicle positioning strategies as well as a being a reason a trip took longer.

99. Thus, it is my opinion that Smith discloses all of the limitations of claim 11 of the ’727 Patent.

IX. Ground 2: Smith Renders Claims 7, 8, and 11 Obvious

100. While it is my opinion that Smith discloses all of the limitations of claims 7, 8, and 11 of the ’727 Patent, I recognize that Smith’s disclosure focuses on an ambulance implementation. With this focus, Smith does not distinguish taxi operations from ambulance operations. For example, Smith does not describe that taxis can also be hailed on the street in addition to being scheduled ahead of time. In contrast, an ambulance is typically located at a known location, e.g., a hospital, and when a call comes in, the ambulance is dispatched to where the patient is located, e.g., a home.

101. One understands that applying Smith’s system to taxis may result in

receiving data regarding for starting and destination points in a different manner than for ambulance trips. For example, the starting point of a taxi ride is the latitude and longitude of where the driver starts the taximeter (e.g., raises the flag) at the beginning of a trip. Similarly, the destination point of the taxi ride is the latitude and longitude of where the driver stops the taximeter (e.g., lowers the flag) at the end of a trip. So when Smith discloses receiving the location of the vehicle during a trip, including the starting and ending points of the trip, a POSITA understands that applying these disclosures to Smith's system for taxis results in receiving data regarding the geographic location of the taxi at the starting and destination points.

102. Thus, a POSITA would understand to implement Smith's system for taxis, the taxi meter, which was in most, if not all, taxis in 1998, could be used in connection or conjunction with Smith's AVL system for providing the latitude and longitude of the pickup and destination locations. Specifically, such a system, as further described with respect to the Smith and Baumann combination, would provide the vehicle's GPS location using Smith's AVL location capabilities, when the taxi driver started the taximeter, indicating the start of a trip, and when the driver stopped the taximeter, indicating the end of a trip.

103. Using the taximeter to determine the starting point and destination point of a trip is consistent with Smith's disclosure of communicating with a vehicle about when a ride begins (e.g., when it is dispatched) (EX1006, 32:16-33:9) and when a

ride ends (*e.g.*, when it reaches its destination) (*Id.*, 9:11-14, 32:16-33:9). Smith also discloses receiving the location of a vehicle (*Id.*, 57:12-14, 77:19-25).

104. The taximeter, and associated trip meter, also can provide the actual trip distance to Smith's system for use in comparison to the calculated shortest trip distance to determine if a distance violation occurred. And a POSITA would understand to use that distance in the comparison in Smith's claim 33 if not available elsewhere in Smith's system. A POSITA also understands that the taximeter and associated trip meter cannot provide the actual trip distance until after the taxi driver has stopped the taxi meter and that, therefore, any determination of the actual trip distance would not occur until after the trip is completed.

105. Additionally, a POSITA understands that ambulance and taxi services are paid differently. In the ambulance context, governmental agencies or insurance companies play a role in paying for rides. That is not the same with taxis where the rider pays the fare. In the context of taxi service, it is a rider, not the insurance company or Government agency, that needs to be notified if a driver has taken an unnecessarily long route to inflate the fare. In either case, Smith's system would compare the shortest route to the distance traveled and then provide the payor of the transportation service with the information necessary to determine what charges to pay or reject. Thus, applying Smith to taxi services results in notifying a rider of the distance violation after the trip is completed so that the rider can determine how

much the taxi driver should be paid.

106. In addition to quickly informing the taxi rider of a distance violation, both a taxi dispatcher and operator would be interested in learning about distance violations as soon as possible. There is no better time to correct “bad” behavior than when it is occurring. From a dispatch standpoint it would potentially cut down on overall violations (e.g., taxi driver realizes he is caught, and stops such behavior immediately). Similarly, the taxi driver may not realize what they are doing inappropriately, and finds out immediately with little to no penalty, versus finding out days later and getting walloped with a huge penalty resulting from numerous violations over several days that he was clueless about. Thus, a POSITA would be motivated to indicate distance violations soon after trips are completed.

107. Moreover, Smith’s claim 33 recites “to determine if said mileage purportedly travelled is appropriate for said services.” (*Id.*, Claim 33.) The word “appropriate” here means that there must be an analysis of the actual trip distance whether the vehicle is a taxi or an ambulance. So, when Smith uses parameters set by Government or insurance agency, one understands that in the taxi context there would be a similar predetermined distance margin from the shortest trip distance. This is especially true because Smith discloses automatically identifying excess mileage charges, which requires some predetermined criteria to do so. (*Id.*, 59:9-13.) Thus, as discussed previously, a POSITA understands Smith to disclose a

predetermined margin because the system must allow for some variations between the shortest distance and the actual distance to, at least, allow for minor detours and other deviations from the shortest distance route. Those are the “parameters” referenced in Smith.

X. Ground 3: Smith in Combination with Baumann Renders Obvious Claims 1-4, 7-8, 11-13, 18-20, 26-31, 37-41

A. A POSITA Would Have Reason to Combine Smith with Baumann

108. It would be obvious for a POSITA to combine Smith and Baumann. Both references describe dispatching systems for taxis. In addition, both references describe using a central control system to monitor the activities of a taxi.

109. Moreover, the combination of Smith and Baumann is straightforward. Smith states that its invention is related to taxi operations. (*Id.*, 3:5-7.) However, Smith’s disclosure is mostly focused on its ambulance implementation, rather than its taxi implementation. Baumann provides a disclosure of technical details about the operations of taxis, most, if not all, of which a POSITA already knows, including that a taxi has a trip meter and how taxi fares are calculated. Accordingly, to the extent that a POSITA had any questions about Smith’s taxi implementation, they would turn to a technical reference such as Baumann for those details.

110. For claims 1-4, 7-8, and 11 directed towards the ’727 Patent’s distance violation embodiment, a POSITA would understand that Smith’s taxi includes a trip meter for measuring actual trip distance because that is how taxis operated in 1998.

Thus, the combination of Smith and Baumann does not change the operation of Smith at all. As discussed, Baumann just fills in well-known details that Smith did not describe.

111. In particular, the application of Smith to taxis requires a measurement of the trip distance traveled by the taxi. A POSITA would understand that an obvious way to obtain the distance traveled by a taxi is through the trip meter and thus it would be obvious to connect Smith's AVL system to a trip meter, including the trip meter of Baumann, in order to furnish the computer with the distance traveled by the taxi.

112. Moreover, a POSITA would be motivated to combine Baumann's connected taximeter with Smith's AVL system in order to use the taximeter's "flag" signals that indicate the start and end of a taxi trip. Using those "flag" signals allows for Smith's system to know exactly when the taxi ride began and ended. Smith can then use those signals to obtain the latitude and longitude of the vehicle at those points. (*Id.*, 57:12-16, 77:19-25, Figs. 3N-1 & 3N-2.)

113. In addition to these reasons, from a business standpoint it would make sense to combine Baumann's trip meter into Smith's taxi system as the mileage associated with a taxi's usage would be one of the biggest individual expenses incurred by the taxi company. Knowing exactly how much of a taxi's usage was employed in transporting passengers, versus the taxi mileage associated with looking

for passengers (e.g., driving around looking for fares) or the taxi driver's personal usage, would play a key role in the business accounting expenses incurred by the company (e.g., allocating mileage and capital depreciation expenses to various categories including actual taxi passenger delivery operations). Tracking such trip mileage could also play a major role in ensuring that cash receipts (the only way of paying for a taxi for many years) matched charged receipts, and in turn how and how much the driver was paid (particularly if the taxi driver worked for the taxi company, as opposed to owning the vehicle and/or leasing a taxi medallion, etc.).

114. In addition, a POSITA seeking to implement Smith's system in taxis would be motivated to use Baumann's disclosure of the technical operation of taxis in order to most efficiently implement Smith's system. A POSITA would want to take advantage of all the functionality provided by a taxi's trip meter and taximeter, which might not be in some ambulances.

115. For claims 12-13, 17-20, 26-31, and 37-41 directed towards the '727 Patent's fare estimating embodiment, it would be obvious for a POSITA to include Baumann's fare estimation routine in Smith's invoice verification process. As discussed, at the conclusion of a trip, Smith teaches performing calculations in order to estimate an optimal route, which could be the shortest trip distance. (*Id.*, 12:4-11.) Baumann teaches that a fare estimating method, and not just a distance estimating method, is better for use in taxis because taxis calculate their fares based

not just on distance, but also waiting time in traffic. (EX1007, 6:11-21.) Accordingly, a POSITA implementing Smith's taxi system would be motivated to not only to perform distance checks, as recited in Smith's claim 33 but, in performing checks for an "optimal route," a POSITA would know to calculate an estimated fare for the ride using Baumann's system. That system determines waiting time as an estimate—i.e., without referencing the actual waiting time as determined by the taxi meter. (*Id.*, 10:24-65.)

116. Smith also has all of the equipment and data necessary to determine actual waiting time in traffic and actual taxi fare as described by Baumann. (*Id.*, 6:11-17.) Moreover, the combination of Smith and Baumann discloses the traffic light and traffic congestion information taught by the '727 Patent for determining estimated waiting time in traffic and estimated taxi fare. Smith also has additional capabilities not taught by the '727 Patent, including the ability to determine "whether the vehicle is caught in traffic or moving smoothly to its destination." Smith could use such data to estimate the waiting time encountered in traffic.

117. To the extent that Smith does not disclose specific implementation details for a taxi system, such as fare calculation, those details are expressly taught in Baumann. As Baumann discloses, a taxi fare is calculated based on the distance traveled and the waiting time in traffic. Thus, in implementing Smith's invoices verification system, it would be important to a POSITA to rely on Baumann to

provide those fare calculation details, including how to calculate waiting time in traffic, which Baumann discloses as time spent below a speed threshold. Accordingly, a POSITA would be motivated to combine Smith and Baumann so as to provide a more accurate taxi fare, which is a combination of both distance and time as taught by Baumann.

118. From a business standpoint it would again make great business sense to combine Smith's taxi implementation with Baumann's ability to estimate waiting time—including traffic-related—and determining an estimated taxi fare. A monitoring system like Smith's has little economic value if it does not accurately capture both the actual and estimated taxi fare. Thus, it is imperative that a taxi implementation of Smith use the correct formulas and methods to calculate those fares. Baumann provides those formulas and methods.

119. Traffic, and the associated waiting time, for a taxi/taxi operator is a dynamic, variable cost (as well as revenue-generator), and one that can have very significant impact not only on a customer's fare but also on the efficiency of a taxi/taxi fleet's operations and operational planning. For example, a taxi assigned to a 4 square block radius might have the planner anticipating 20 fares over the course of an 8-hour shift. However, if the taxi only incurs 15 fares, particularly on a regular basis, it would be important for the planner (and driver) to know why, including adjusting the waiting time assumptions the planner had been using to more

accurately reflect reality for that shift period.

120. The ability to break down the time spent into waiting versus total travel time would help tremendously in knowing this (particularly if compared to other driver behavior), and help the planner perhaps to change the taxi's coverage area to improve that taxi's fare (and tip) potential. For example, taxi fares are typically based on waiting time, not total travel time, so optimizing overall taxi fare potential might mean reducing total travel time per trip (to increase the number of fares) without necessarily reducing paid waiting time. Alternatively, optimizing a taxi's tip potential might mean reducing both total travel time per trip (to increase the number of tips) and reducing waiting time per trip (to increase rider satisfaction).

121. Or, alternatively, the planner might compare the fares/fare volume for other taxis in that same area in the same time period to determine if a driver is not behaving in the best interests of the taxi operator, including taking inefficient routes (and thus reducing the time available for picking up other fares during that shift). Further, from a revenue maximization standpoint, such waiting time information could help the operator to better adjust travel versus waiting time customer charges² to better optimize the revenue from short distance (but long trip time) fares, improving customer satisfaction (many taxi customers dislike paying for waiting

² In some cities waiting time, as well as travel time, are tightly regulated and not adjustable by taxi operators.

time/not moving) and perhaps improving fare volume. In addition or alternatively, such waiting time-based fare adjustments could provide significant business flexibility. For example, it could enable different types of fare categories, e.g., long-haul vs. short-haul; enable being able to better match fares with associated expenses; and even provide flexibility in how vehicles are assigned and deployed (e.g., more efficient vehicles at slow/no speeds (high “city mileage”) being assigned to slow, dense city traffic areas).

B. Smith in Combination with Baumann Renders Obvious Claim 1

122. As described in the following paragraphs, Smith in combination with Baumann renders obvious claim 1 of the ’727 Patent. Claim 1 is a system claim that is similar to the method claim 7 discussed in Ground 1. As a system claim, claim 1 includes limitations directed towards system components not found in claim 7. To the extent Smith does not describe these components, Baumann does.

[1pre] A taxi trip meter system for a taxi

123. Figure 1 of the ’727 Patent depicts “a block diagram of the present taxi trip meter system.” (EX1001, 2:11-12.) This system “is mounted in a vehicle, e.g., a taxi, and includes a computer 10 receiving taxi fare information from a taximeter 11, trip distance information from a trip meter 12, and geographical location information from a location sensor 13.” (*Id.*, 2:22-26.) In 1998, one would understand that a taxi is “an automobile licensed for hire as a taxi or taxicab and

fitted with a meter.” The meter in the ’727 Patent is taximeter 11.

124. As described with respect to claim 7, Smith’s “invention relates to dispatching or controlling of taxis, ambulances, or other vehicles.” (EX1006, 3:5-7.) Smith describes “a fully automated dispatching system which, at least under normal operating conditions, eliminates the human dispatcher from dispatching operations.” (*Id.*, 7:15-20.) To do so, Smith uses “existing AVL technology to compute routing and mileage based on invoiced pickup and destination sites, and then compare the mileage of the computed route to the mileage charged in the invoice.” (*Id.*, 12:16-21.)

125. Additionally, Baumann discloses a “[f]are computation and dispatching method.” (EX1007, Title.) Baumann’s method uses a central control system to monitor the fare needs of taxi fleets. (*Id.*, 1:54-65.) Baumann describes that “[t]rip and fare data are continuously accumulated and may be accessed manually or by the computer, with the meter distance fare rate and time fare rate being adjustable to accommodate virtually any fare rate structure.” (*Id.*, 5:14-19.) Baumann further describes how a taxi’s fare rate structure works.

The meter unit will permit fare rate structure adjustments using wire jumpers that determine the cents/minute, cents/mile, and threshold velocity (i.e. the point at which the instantaneous time fare rate is the same as the distance fare rate). Below the threshold velocity, fares are based on time; above, only on distance.

(*Id.*, 6:11-17.) In these passages, Baumann is describing the plain and ordinary

meaning of a taxi, which is an automobile licensed for hire as a taxi or taxicab and fitted with a meter. Regulatory agencies, such as a taxi commission, set the meter distance fare rate, the time fare rate, and the threshold velocity.

126. In addition, Baumann also discloses a trip meter in the form of a “speedometer cable [SC] sensor” that is “connected to [a] vehicle driveshaft.” (*Id.*, 6:38-44, Fig. 1.) The SC sensor outputs 1/10 mile pulses, which is used to determine vehicle mileage. (*Id.*, 5:57-65.) In these passages, Baumann is describing the plain and ordinary meaning of a trip meter, which is a device in the taxi that determines distance traveled using input collected from the taxi.

127. Further, Baumann discloses a “taxi meter” and that “the meter distance fare rate and time fare rate [are] adjustable to accommodate virtually any fare rate structure.” (*Id.*, 5:14-19, Fig. 1.) Baumann also discloses “local meter displays” and a “vehicle printer.” (*Id.*, 2:16-27, 7:49-50.) Smith further discloses a location sensor in the form of “satellite-based vehicle tracking circuitry.” (EX1006, 9:3-10.) Both Smith and Baumann disclose transmitters for communicating between the taxi and the central computer. (EX1006, 6:7-12; EX1007, 4:50-53, 5:20-28.) Accordingly, the combination of Smith’s “fully automated vehicle dispatching, monitoring and billing system” (“Smith’s System”) and Baumann’s central control system and the taxi vehicle equipment (“Baumann’s System”) disclose the taxi trip meter system shown in Fig. 1 of the ‘727 Patent.

[1a] a computer

128. The '727 Patent states that the “[c]omputer 10 may be any type of programmable processor, and is preferably loaded with detailed street and highway information, e.g., from a CD-ROM street navigation program.” (EX1001, 2:27-30.)

129. Smith also discloses a computer. Generally, Smith describes an automated dispatching system that includes “processing circuitry [that] may be a microcomputer running a multitasking operating system, a network of computers, or any other arrangement of computing hardware, including an arrangement of computers spread geographically in a wide-area network. There may be multiple processes to dispatch and monitor vehicles, running simultaneously on networked computers or in a multitasking operating system.” (EX1006, 8:18-9:2.)

130. For example, Smith describes that “[d]ispatchers 16 may interact with the database and server 10 and an AVL system 16 to perform dispatching of vehicles 20 in the same manner as is performed in known dispatching systems Particularly, dispatchers 16 may review request records in database server 10, and in response to these records interact with AVL system 18 to request vehicle location information and routing information and to relay dispatching commands and request status updates from vehicles over wireless communication links 22.” (*Id.*, 15:20-16:5.)

131. In addition, Smith discloses that “AVL systems may also include a

street map database and search algorithm through which the AVL can identify a street route from one address to another upon request from the dispatcher.” (*Id.*, 6:1-4.) Smith uses “existing AVL technology to compute routing and mileage based on invoiced pickup and destination sites, and then compare the mileage of the computed route to the mileage charged in the invoice.” (*Id.*, 12:16-21.) Smith identifies that AVL “systems can be purchased from various vendors including DCS, Inc., Teletrak, American TriTech, and EAI.” (*Id.*, 20:1-7.). For example, in 1998 American TriTech offered the below AVL and mapping system for ambulances:³

3

<http://web.archive.org/web/19980415114525/http://www.tritech.com/Products/va.htm>

VisiCAD for Ambulance



Product:

Engineered to meet the demanding requirements of ambulance providers, VisiCAD™ for Ambulance is the industry's first computer-aided dispatch system with integrated mapping that runs entirely on the Microsoft® Windows NT™ platform. VisiCAD incorporates automatic vehicle location, high-resolution integrated mapping functionality, comprehensive graphical reports, and an emergency medical triage system. This combination of features enables ambulance services to increase productivity, streamline operations and improve patient care.

Features:

- Automatic Vehicle Location - satellite communication and tracking technology.
- Integrated Mapping System - high-resolution on-screen map of service area.
- Comprehensive Graphical Reports - map-based reports provide picture of call data by area.
- Microsoft Windows-based System - Microsoft Windows NT platform and high-performance SQL Server™ Database. Three-tiered client/server architecture.
- Personal Computer vs. Mainframe - comprehensive dispatch system runs on IBM compatible personal computers.
- Emergency Medical Triage System - ProQA™ and caller instruction system.

Market:

- Private Ambulance Providers
- Public Ambulance Providers

Technical Support:

American TriTech provides 24 hour, 7 days-a-week live technical support via a toll free number. The company also provides automated upgrades.

132. Smith also describes that “[u]nder normal circumstances, the interactions with database server 10 and AVL system 18 are fully automated and are performed by communications processes 24, dispatching processes 26 and vehicle monitoring processes 28, which automatically dispatch and monitor vehicles in response to orders reflected in records and database 10.” (EX1006, 16:13-20.) A POSITA understands that Smith’s automated processing is performed by a computer.

[1b] a trip meter connected to said computer, said trip meter for measuring an actual trip distance traveled by said taxi between a starting point and a destination point

133. The ’727 Patent states that the trip meter is used to determine actual distance. (EX1001, 2:52-54.) The ’727 Patent also distinguishes a trip meter determining actual distance versus using street information. (*Id.*) “The trip meter may be eliminated, and the trip distance may be determined with GPS and map data.” (*Id.*, 4:37-39.) Additionally, the ’727 Patent describes that “[t]he trip meter may be indirectly connected to the computer through the taximeter.” (*Id.*, 4:45-47.) In 1998, a person of skill in the art would understand that a trip meter is “a device in the taxi that determines distance traveled using input collected from the taxi.”

134. While Smith discloses a system for dispatching and controlling taxis (EX1006, 3:5-7), it does not describe the technical details of a taxi, including the use of a trip meter. A POSITA understands that a trip meter measures the actual trip distance of a taxi ride. (EX1009, 11-12.) Well before the priority date of the ’727

Patent, taxis were outfitted with trip meters for determining actual distance. As described in Uber’s Opening Claim Construction Brief:

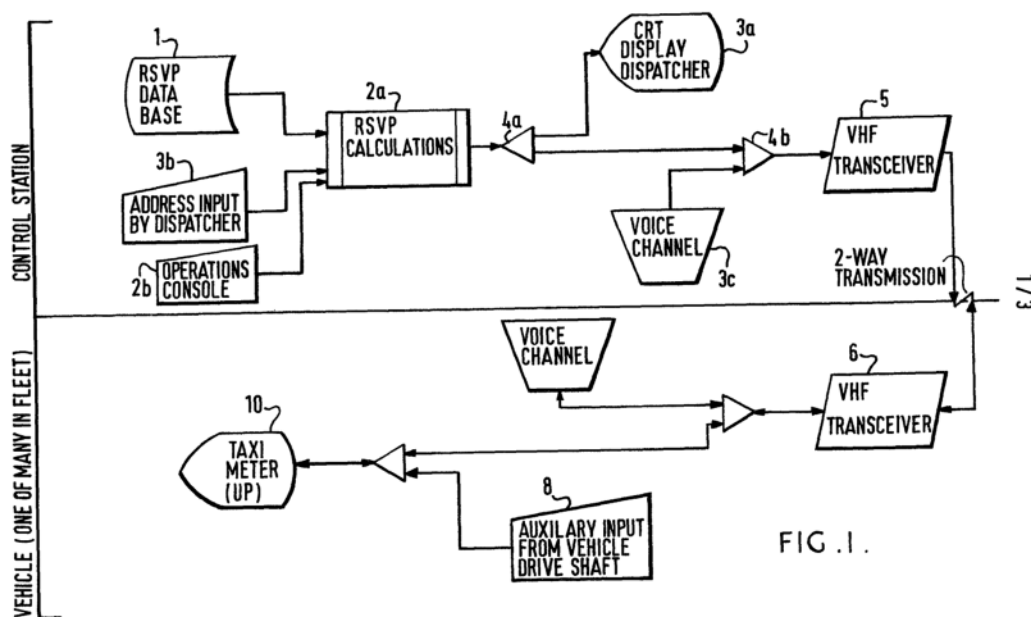
Initially, the meter measured distance traveled by attaching a cable to the non-driving wheel and counting the revolutions. (Ex. 5, *Is the Fare Fair*, at 3.) Thereafter, the “meter [was] attached to the taxi’s transmission instead of the wheel.” (*Id.*) “To get the distance traveled, the meter relies on a sensor attached to the cab’s transmission. The sensor sends an electric pulse to the meter every time the cab travels a given distance.” (Ex. 9, *How Taxi Meters Work*, at 3; *see also*, Ex. 10, *Oka*, 1:12-16; Ex. 11, *Ricard*, 6:55-61.) Other meter designs received inputs from the taxi’s odometer. (Ex. 12, *Murphy*, 4:45-48; Ex. 10, *Oka*, 2:62-68.)

(*Id.*, 11-12; *see also, id.*, 398-404, 448-495.) Further, as discussed with respect to Claim 7, a POSITA would understand that where Smith discusses determining the actual distance of a trip, or the actual mileage for a trip, it could be done with a device like a trip meter.

135. Baumann describes a trip meter. Baumann refers to the device in the vehicle that determines actual distance as a “speedometer cable (SC) sensor.” (EX1007, 5:57-60.) The speedometer cable sensor is “connected to [a] vehicle driveshaft.” (*Id.*, 6:38-44, Fig. 1.) This sensor outputs 1/10 mile pulses that can be used to determine the vehicle’s mileage from a starting point to a destination point. (*Id.*, 5:60-6:4.) Baumann’s trip meter, the speedometer cable sensor, is a device in a taxi that determines distance traveled using input collected from the taxi. The starting point and destination point for the trip meter are determined when the taxi trip meter system is activated when the driver hits the “flag” button and deactivated

when that button is pressed again. (*Id.*, 5:35-40.)

136. Baumann also discloses that the speedometer cable sensor is indirectly connected to a computer. The computer is at a control station, which is shown in Baumann's Figure 1 below. "The Central Computer 2a will perform all calculations, communications processing, and real-time monitoring in the system." (*Id.*, 3:62-64.) Baumann's Figure 1 also shows that the speedometer cable sensor 8 provides input to the taxi meter 10, which then communicates with the control station via a transceiver 6. This two-way communication between the taxi and the control station occurs via a communications link. (*Id.*, 5:20-28.) Baumann discloses a trip meter indirectly connected to the computer through the taxi meter.



137. Accordingly, it would be obvious to a POSITA to use a trip meter, like the one disclosed in Baumann, in Smith's AVL system to measure actual trip

distance. Smith's claim 33 uses the "mileage purportedly travelled" to determine if trip mileage is "appropriate." (EX1006, Claim 33.) In the taxi context, this mileage is the distance measured by the trip meter, which Baumann describes as the "conventional taxi mode." (EX1007, 5:29-33.) A POSITA understands that Smith's taxis would also operate in this conventional mode and use the actual trip distance obtained from the trip meter as that is how taxis operated in 1995 when Smith was filed. Smith's system would also benefit from switching between conventional taxi mode and computer-controlled mode, as described by Baumann, as Smith's system could continue operating even when its AVL system cannot receive GPS signals from the vehicle fleet. (*Id.*, 5:5-14, 5:29-33 (switching to conventional taxi mode when there are technical problems).)

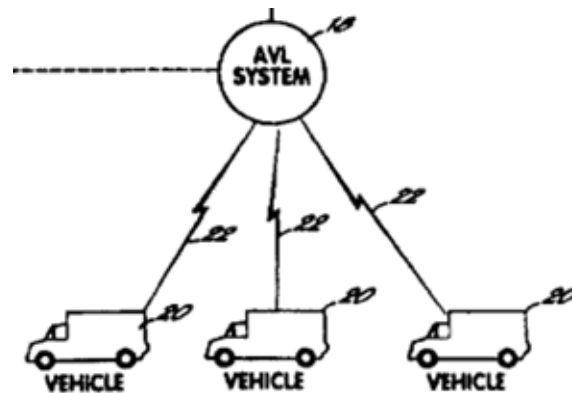
[1c] a location sensor providing geographical location information about said taxi to said computer

138. The '727 Patent states that a computer receives "geographical location information from a location sensor 13." (EX1001, 2:22-26.) "Location sensor 13 may be any type of device that indicates the precise geographical location of the vehicle, such as a GPS (global positioning satellite) receiver." (*Id.*, 2:30-33.)

139. Smith discloses a location sensor that provides the taxi's geographical information to a computer. "In particular, satellite-based vehicle tracking circuitry may be used to track the locations of the vehicles, and the vehicle locations forwarded via satellite or radio to the processing circuitry for using in vehicle

monitoring.” (EX1006, 9:5-10.) Smith is describing the use of a GPS receiver when it describes using “satellite-based vehicle tracking circuitry.” A GPS receiver receives the latitude and longitude of the vehicle being tracked. The latitude and longitude data provides the geographical location of the vehicle.

140. Smith uses the location sensor to “evaluate the vehicle’s movements and position to determine if it has arrived at or is en route to an appointed location.” (*Id.*, 9:11-14.) The bottom portion of Smith’s Figure 1, shown below, depicts vehicles 20 transmitting location information over wireless communication links 22 to the AVL system 18, which is a computer.



[1d.i] instructions loaded in said computer instructing said computer

141. The '727 Patent describes that methods shown in Figures 2 and 3 are “preferably implemented as software or firmware in the computer.” (EX1001, 2:37-39, 3:26-27.)

142. Smith discloses that “[t]he AVL system 18 includes algorithms to derive routing for drivers from identified pickup points to identified destination

points.” (EX1006, 52:19-21.) For example, “[t]hese algorithms will respond to the information in the request shown in Fig. 3L-1, and generate a response of the kind illustrated in Fig. 3L-2.” (*Id.*, 52:21-24.) In this context, Smith disclosure of algorithms is the same as instructions. Smith’s algorithms are implemented in software or firmware.

143. In addition, Smith discloses that the processing circuitry performs dispatching and monitoring processes. (*Id.*, Abstract, Claims 1-4, 32.) Smith discloses that the processing circuitry can be running “multiple processes to dispatch and monitor vehicles, running simultaneously on networked computers or in a multitasking operating system.” (*Id.*, 8:23-9:2; *see also*, claim 4 (claiming parallel processing).) These disclosures regarding processes running simultaneously or in parallel are describing instructions loaded in a computer and instructing that computer to execute those instructions.

144. In addition, Smith discloses software for performing tasks in its automated dispatching system. (*Id.*, 18:11-20:17.) For example, Smith discloses “Life-TRAK” software, which can be used for “automated vehicle location and vehicle communication” among other tasks. (*Id.*, 18:19-19:8.) This software is “preferably written in a source code language.” (*Id.*, 19:9-13.) All of these examples demonstrate that Smith discloses that instructions are loaded in a computer for instructing the computer’s operations.

[1d.ii] to calculate an estimated shortest trip distance between said starting point and said destination point

145. The '727 Patent states that “[b]ased on available street information, the optimal route and shortest trip distance between the starting and ending points are estimated at block 31 with any suitable method well known in the art.” (EX1001, 2:58-61.) The '727 Patent does not provide any examples for calculating the estimated shortest trip.

146. As described with limitation [7c] and incorporated here, Smith discloses calculating an estimated shortest trip distance from the starting point to a destination point. Smith’s claim 33 “determin[es] a shortest route from said starting point to said ending point.” (EX1006, Claim 33.) Smith calculates a route using “existing AVL technology” to calculate the shortest trip distance between a starting and destination point. (*Id.*, 12:16-21.)

147. As also discussed, Baumann discloses using a “flag button” on a taximeter to indicate the start and end of a taxi ride during conventional taxi mode. (EX1007, 5:35-40.) In 1998, a taxi driver would start and stop the taximeter to indicate the start and end of a trip. As Smith evaluates whether a trip distance is “appropriate” (*see, e.g.*, EX1006, Claim 33), a POSITA understands that Smith needs to determine the geographic location of the starting and destination points of a taxi ride. A POSITA would further understand that Smith could use Baumann’s flag button to determine when to obtain the geographic location of the starting and

destination points of the taxi ride.

[1d.iii] to compare said estimated shortest trip distance with said actual trip distance

148. As described with respect to limitation 7[e] and incorporated here, Smith discloses comparing the estimated shortest trip distance with the actual trip distance. (*See, also, id.*, 12:4-21, 58:19-24, Claim 33.) The mileage associated with the shortest route is the estimated shortest trip distance, while the mileage purportedly traveled is the actual trip distance. Smith performs the comparison using “existing AVL technology.” (*Id.*, 12:16-21.)

[1d.iv] to indicate a distance violation when said estimated shortest trip distance is exceeded by said actual trip distance by a predetermined distance margin

149. As described with respect to limitation [7f] and incorporated here, Smith discloses indicating a distance violation when the actual trip distance exceeds the estimated shortest distance by more than a predetermined margin. (*See, also, id.*, 12:11-15, 59:9-13, Claim 33.)

150. Baumann further supports providing this indication as Baumann discloses providing fare information to a rider in order to ensure that the rider is charged a proper fare. (EX1007, *e.g., id.*, 1:54-65, 5:5-14.) Accordingly, a POSITA implementing Smith’s system that determines if a taxi took an “appropriate” route would take advantage of Baumann’s rider notification process to notify a rider that the driver took an inappropriate route.

151. As described above, Smith teaches all of the limitations of claim 1 except the trip meter limitation. While Smith does not disclose a trip meter, it was well-known that taxis included trip meters and Smith's taxis would have included a trip meter. In other words, the trip meter limitation is inherently disclosed by Smith as it was well known by a POSITA that taxis have trip meters to measure the distance traveled.

152. As Smith describes that its automatic dispatching system is for dispatching and controlling taxis, a POSITA would be motivated to look at descriptions of what taxi equipment was used in 1998. There are numerous examples of how taxis operated in 1998, including the use of a trip meter. Baumann discloses a trip meter in the form of a speedometer cable sensor connected to the vehicle's drive shaft. In addition to Baumann's trip meter being a conventional device at that time, it is indirectly connected to a computer at the central control station via a taxi meter in the same manner as disclosed in the '727 Patent. As a result, the combination of Smith and Baumann discloses the taxi trip meter system shown in the '727 Patent's Figure 1.

153. Thus, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 1 of the '727 Patent.

C. Smith in Combination with Baumann Renders Obvious Claim 2

154. Claim 2 depends from claim 1. Accordingly, I incorporate my

discussion of claim 1. As I described with respect to limitation [1c], Smith discloses a GPS receiver when it describes using “satellite-based vehicle tracking circuitry.” (*See, also*, EX1006, 9:3-10.) It would be obvious to combine Smith and Baumann for the reasons described with respect to claim 1. Thus, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 2 of the ’727 Patent.

D. Smith in Combination with Baumann Renders Obvious Claims 3 and 4

155. Claims 3 and 4 depend from claim 1. Accordingly, I incorporate my discussion of claim 1. As described with respect to limitations [1d.iv] and [7f], Smith discloses indicating a distance violation.

156. Smith does not explicitly disclose a transmitter or display for transmitting or displaying violation information, a POSITA would understand that given the automated nature of Smith, when the violation information is provided to taxi customers, it could be done using the transmitter connected to Smith’s AVL System. For example, Smith discloses that the AVL system can provide “textual communication between dispatchers and the vehicles through mobile data terminals (MDT’s) mounted in the vehicle, which typically make use of underlying cellular communication networks.” (*Id.*, 6:7-12.) To communicate via cellular communication networks, the computer would have a transmitter as found in claim 3. In addition, the MDT would have a display so that the vehicle driver can read the

textual communications as found in claim 4. The violation information can be transmitted over Smith's transmitter and be displayed on the display of the MDT like any other message. It would merely require transmitting different textual messages.

157. Baumann also discloses transmitting and displaying information. Baumann's computer "interface supported one or two base station transmitters and was capable of adequately communicating with up to 500 vehicles." (EX1007, 4:42-53.) In addition, Baumann's "vehicle display may show the trip fare and estimated trip time of each hire generated by the Central Computer." (*Id.*, 5:5-14.) A POSITA would understand that in addition to trip fare and trip time, the vehicle display could display violation information. It would be obvious to combine Smith and Baumann for the reasons described with respect to claim 1.

158. Thus, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claims 3-4 of the '727 Patent.

E. Smith in Combination with Baumann Renders Obvious Claims 7, 8, and 11

159. As described in Ground 1, it is my opinion that Smith discloses all of the limitations of claims 7, 8, and 11. As described in Ground 2, I recognize that while Smith is directed "to dispatching or controlling of taxis, ambulances, or other vehicles," (EX1006, 3:5-7), Smith focuses on the ambulance embodiment. To the extent that the Board finds that Smith does not fully disclose taxi operations,

Baumann does. For example, Baumann describes a “conventional taxi mode” where the taxi driver uses “a flag button” to start and end a ride. (EX1007, 5:29-40.) Baumann’s central computer receives information from the taxi meter in this mode. (*Id.*, 6:22-37.) A POSITA understands that Smith could use this flag button and communications with the central computer, in combination with Smith’s GPS systems, to identify the starting and destination points of a taxi ride. In addition, the combination would allow Baumann’s trip meter to provide actual distance to Smith’s system when a driver presses the flag button at the end of a trip.

160. Additionally, Baumann discloses how to calculate an estimated taxi fare, which can then be shown on a vehicle display. (*Id.*, 2:16-27, 5:5-14, 6:26-30, 10:23-11:16.) The estimated taxi fare is generated by Baumann when Baumann is operating in “computer-controlled mode.” (*Id.*, 5:5-14, 5:29-33.) Baumann also teaches that this estimated taxi fare can be used in place of the taxi meter’s actual taxi fare. (*Id.*) This is similar to how the ‘727 Patent mentions that the “estimated fare based on the optimal route may be used as the actual fare to completely eliminate the possibility of cheating.” (EX1001, 4:35-37.) Baumann also discloses a vehicle printer “for printed receipts.” (EX1007, 7:49-50) Thus, Baumann discloses the taxi equipment that is able to notify a user when Smith’s system identifies a trip where the distance traveled was not “appropriate.”

161. Claims 8 and 11 depend from claim 7. As described in Sections

VIII.A.2 and VIII.A.3, Smith discloses the limitations found in these claims. Thus, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claims 7, 8, and 11 of the '727 Patent.

F. Smith in Combination with Baumann Renders Obvious Claim 12

162. As described in the following paragraphs, Smith in combination with Baumann renders obvious claim 12 of the '727 Patent. Claim 12 is directed to solving a different problem than that addressed by claims 1 and 7. In particular, Claim 12 is directed to the fare violation method as described with reference to Figure 3 of the '727 Patent, rather than claims 1 and 7, which detect a distance violation as described with reference to Figure 2 of the '727 Patent.

163. Claim 12 was amended twice during the reissue prosecution. After the second amendment, the Patent Office rejected claim 12 based on the combination of Baumann '069 and U.S. Patent No. 6,067,502 to Hayashida. (EX1002, 148-151.) In response, Patent Owner argued that “HAYASHIDA has been grossly mischaracterized in that the ‘route calculations’ of HAYASHIDA are not for vehicle location and route calculations as in the claimed invention.” (*Id.*, 199.) Smith was not cited during the prosecution of the '727 Patent, and as described below, discloses using “vehicle geographical location information data obtained from a location sensor” for “vehicle location and route calculations.” (*Id.*) Baumann, like Baumann '069, discloses all of the other limitations, which was not disputed by

Patent Owner during prosecution of the '727 Patent.

[12pre] An automated taxi fare estimating method

164. The '727 Patent states that “[a] taxi fare is typically determined by a taximeter based on trip distance and waiting time in traffic.” (EX1001, 1:24-25.) The '727 Patent’s second embodiment depicted in Figure 3 shows that “an estimated taxi fare is calculated based on the estimated shortest route.” (*Id.*, 2:2-3.) More specifically, “[a]n estimated fare is determined at block 52 based on the estimated shortest trip distance and estimated waiting time.” (*Id.*, 3:54-57.) The term “automated” is not in the specification of the '727 Patent, and only found in the claims.

165. Smith’s “invention relates to dispatching or controlling of taxis.” (EX1006, 3:5-7.) In particular, the “invention encompasses systems which make use of existing AVL technology to compute routing and mileage based on invoiced pickup and destination sites, and then compare the mileage of the computed route to the mileage charged in the invoice.” (*Id.*, 12:16-21.) Smith discloses that “the vehicle monitoring process ... generates an invoice record having the format shown in Fig. 3B, using the information in the dispatch record, and then writes the resulting invoice record to the invoice file 34 for later use in generating invoices for the services rendered by the vehicle.” (*Id.*, 66:14-20.)

166. Baumann discloses determining an estimated taxi fare. “[T]he fare may

be calculated on the basis of estimated travel distance and travel time.” (EX1007, 8:40-44.) Baumann uses a central control system to “introduce[] compensations and corrections based upon the particular routes and time of day with its differing traffic and similar circumstances, and, in addition, may select the most expeditious, economical or otherwise suitable routes for the driver to take.” (*Id.*, 1:65-2:11.) In this way, Baumann can provide fare estimations that “compensat[e] for traffic conditions, weather, and routing from historical and statistical data relating to the same.” (*Id.*, 2:28-38.)

[12a] using a computer including street information accessible thereon

167. The ’727 Patent states that “[c]omputer 10 may be any type of programmable processor, and is preferably loaded with detailed street and highway information, e.g., from a CD-ROM street navigation program.” (EX1001, 2:27-30.)

168. As previously described, Smith discloses an Automatic Vehicle Locator (AVL) system that includes computing capability. In particular, the AVL system of Smith can “compute routing and mileage based on invoiced pickup and destination sites, and then compare the mileage of the computed route to the mileage charged in the invoice.” (EX1006, 12:16-21.) As Smith explains, “AVL systems may also include a street map database and search algorithm through which the AVL can identify a street route from one address to another upon request from the dispatcher.” (*Id.*, 6:1-4.) These passages make clear that the AVL system of Smith

includes a computer. That computer is used to perform the required computing, perform the algorithms, and use the street map database.

169. Baumann discloses “a computer at a central control station.” (EX1007, 2:59-3:18.) Baumann “stor[es] information in a computer at a central control station relating to routes and distances between street addresses.” (*Id.*) In particular, Baumann stores street information in an Address-Coordinate File, which includes “a Street Name File” and “associates state plane coordinates with all streets addressed in the service area.” (*Id.*, 8:53-64.) Thus, Baumann also discloses using a computer including street information accessible thereon.

[12b.i] the computer including program instructions

170. As described with limitation [1d.i], the '727 Patent states that the methods shown in Figures 2 and 3 are “preferably implemented as software or firmware in the computer.” (EX1001, 2:37-39, 3:26-27.) As previously described, Smith discloses that the AVL system includes routing algorithms, which are program instructions. (EX1006, 52:19-24.)

171. Additionally, Baumann describes that the computer includes program instructions. As one example, Baumann’s “Fig. 3 is a flow-chart in block diagram form of the calculation scheme for the computer program used in the invention.” (EX1007, 3:36-38.) Baumann also describes using “a PDP 11/10 mini-computer” with a “terminal equipped with a paper tape reader/punch, used for entering

programs” that “were developed by using a disk based operating system with text editing capabilities.” (*Id.*, 3:64-4:18.)

[12b.ii] to receive geographical location information from at least one network connected location sensor

172. As described with limitation [1c], the ’727 Patent describes a location sensor as any “device that indicates the precise geographical location of a vehicle, such as a GPS (global positioning satellite) receiver.” (EX1001, 2:30-33.) The phrase “network connected” is only used in the claims as amended during the reissue examination. During that prosecution, the Patent Owner stated that “[i]t is well known that access to a computer includes a network connection,” and that a “location sensor and a computer can exchange ... data over a computer network.” (EX1002, 194-195.)

173. Like the ’727 Patent, Smith discloses “satellite-based vehicle tracking circuitry may be used to track the locations of the vehicles, and the vehicle locations forwarded via satellite or radio to the processing circuitry for using in vehicle monitoring.” (EX1006, 9:3-10.) Further, Smith’s AVL system “automatically track[s] (typically via satellite navigation) the locations of managed vehicles.” (*Id.*, 5:3-10; *see also*, 29:14-16, 32:16-33:9, 61:24-62:5, 64:15-19.) Thus, the AVL system of Smith, including its computer, receives geographical location information in the same manner as described in the ’727 Patent.

[12b.iii] to access the street information based on the received geographical location information

174. The '727 Patent states that “[c]omputer 10 ... is preferably loaded with detailed street and highway information, e.g., from a CD-ROM street navigation program.” (EX1001, 2:27-30.) The '727 Patent does not describe how to access the street information using geographical location information received from a location sensor.

175. Smith discloses accessing the street information using the geographical location information. “[T]he dispatching procedure 26 generates a request to the AVL system to determine the latitude and longitude of the vehicle.” (EX1006, 57:12-14.) The “latitude and longitude of the vehicle,” which the AVL system can populate using GPS information, is the received geographical location information. Smith’s AVL system “include[s] a street map database.” (*Id.*, 6:1-4.) The street map database includes street information.

176. In addition, Smith’s “vehicle monitoring may evaluate the vehicle’s movements and position to determine if it has arrived at or is en route to an appointed location.” (*Id.*, 9:11-14.) “[T]he vehicle monitoring process 28 is responsible for monitoring the status and progress of the vehicle.” (*Id.*, 60:22-25.) With this process, Smith’s system accesses the street information using the latitude and longitude data it received from the vehicle’s GPS receiver and can determine if the vehicle has arrived at the starting point or reached the destination point. (*See, e.g., id.*, 29:14-

16, 32:16-33:9, 61:24-62:5, 64:15-19.) Accordingly, Smith accesses street information (i.e., the street map database) based on the geographic information received from the vehicle.

[12c.i] the computer program instructions comprising

177. As described with limitations [1d.i] and [12b.i], the '727 Patent describes that the methods shown in Figures 2 and 3 are “preferably implemented as software or firmware in the computer.” (EX1001, 2:37-39, 3:26-27.) As previously described with limitations [1d.i] and [12b.i], Smith discloses computer program instructions.

[12c.ii] receiving geographical location information from the at least one location sensor

178. This limitation is nearly identical to limitation [12b.ii.]. Accordingly, I incorporate my discussion regarding limitation [12b.ii] here.

[12c.iii] determining a starting point for a trip based on the received geographical location information

179. As I described with respect to limitation [7a], the '727 Patent states that “[w]hen a trip is begun at block 21, e.g., when the taximeter is activated or a specific initiating input is provided to the computer, the geographical starting point is determined at block 22, and the starting time is marked at block 23.” (EX1001, 2:39-43.) In contrast to claim 7, this limitation requires that the starting point be determined using the geographical location information received from a network connected location sensor. The '727 Patent does not describe how activating a

taximeter or inputting a specific initiating input results in determining a starting point with the geographical information.

180. As described with limitation [7a], Smith discloses using its AVL system to generate the latitude and longitude of the pickup and destination locations and then updating the dispatch file with that information. These data fields are shown below, in an excerpt of Smith's Figure 3A.

Dispatch File	
1	Transport ID Number
2	Status Flag (= " ", "D", "C", or "F")
3	Date of Service
4	Appointment Time (= <time> or "ASAP")
5	Lead Time
6	Transport Type (Wheelchair/Basic/AdvancedLifeSupport)
7	Vehicle ID Number
8	Driver Employee Number
9	Attendant Employee Number
10	Pickup Location
11	Pickup Latitude
12	Pickup Longitude
13	Destination Location
14	Destination Latitude
15	Destination Longitude

Smith uses its AVL system to “automatically track (typically via satellite navigation) the locations of managed vehicles.” (*Id.*, 3:3-10; *see also*, 27:14-16, 30:16-31:9, 59:24-60:5, 62:15-19.) As a result, Smith is able to determine the starting point of a trip using the geographical location information it received from the vehicle, i.e., its pickup latitude and longitude.

181. Furthermore, as also discussed with regard to limitation [7a], a POSITA would know to use the taxi meter, such as the taxi meter disclosed in Baumann, as an indication of the pickup and destination locations. As explained there, the pickup

location would occur when the driver hits the “flag” button on the taximeter signifying the start of a taxi ride. A POSITA would know to provide that “flag” signal to Smith’s AVL system as a trigger to capture and store the GPS location for the latitude and longitude of the pickup location.

[12c.iv] determining a destination point for said trip

182. As described with limitation 7[b], Smith discloses determining the destination point for a trip using the AVL system, namely the destination location, latitude, and longitude shown in Smith’s Figure 3A. (*See, also*, EX1006, 5:3-10, 22:18-23:2, 29:14-16.)

183. As this limitation does not expressly require the use of the location sensor, Baumann also discloses determining a dropoff point for a trip. “Under normal operating conditions, the Dispatch Console of the Central Control station 3a and 3b may be used to enter origin or pick-up and destination or deposit address data.” (EX1007, 4:30-36.) This is the same language that the Patent Office cited from Baumann ’069 for this limitation during prosecution of the ’727 Patent. (EX1002, 148.)

184. Moreover, as with the “starting point” discussed in the prior limitation and as discussed with respect to limitation [7b], a POSITA would also know to use the “flag” signal to indicate the destination of a taxi trip, which could be used with Smith’s AVL system to record the latitude and longitude of that location.

[12c.v] determining an estimated shortest trip distance between said starting point and said destination point based on the street information or on a straight-line distance determined between the starting point and destination point

185. This limitation starts with limitation [7c] and then adds that the estimate must be “based on the street information or on a straight-line distance determined between the starting point and destination point.” (See EX1001, 2:61-65.)

186. As described with limitation [7c], Smith discloses using an AVL system to estimate the shortest trip distance, which “include[s] a street map database and search algorithm through which the AVL can identify a street route from one address to another.” (EX1006, 6:1-4.) As described in claim 33, Smith’s system “determin[es] a shortest route from said starting point to said ending point.” (*Id.*, Claim 33.) Based on these disclosures, a POSITA would understand that Smith discloses determining the shortest distance between a starting point and ending point based on street information.

187. Baumann also discloses determining an estimated shortest trip distance between said starting point and said destination point based on the street information. Baumann describes that “distance data are obtained from a Time/Distance File which, ... contains shortest-time-path distances” and “[a]n Address-Coordinate File ... associates state plane coordinates with all streets addressed in the service area.” (EX1007, 8:44-56; *see also*, EX1002, 149 (“The Time/Distance File contains shortest-time-path distances...”).) Baumann estimates the shortest trip distance “by

adjusting the ... distance in the Time/Distance File by a correction factor based on the information available in the Address-Coordinate File.” (EX1007, 8:56-61.) Thus, a POSITA would also understand that Baumann also determines shortest distance based on street information.

[12c.vi] determining an estimated waiting time encountered in traffic during said trip based on the geographical location information and the street information

188. The '727 Patent states that “[a]n estimated waiting time in traffic along the optimal route is determined at block 51 based on location traffic information and the time of day to account for traffic lights, traffic congestion, etc.” (EX1001, 3:51-54.)

189. The '727 Patent does not disclose how to determine an estimated waiting time encountered in traffic. The '727 Patent explains that “[a] taxi fare is typically determined by a taximeter based on trip distance and waiting time in traffic.” (EX1001, 1:24-25.) While the '727 Patent does not disclose how to determine an estimated waiting time in traffic, Baumann discloses the potential meanings identified in Uber’s opening claim construction brief (EX1009, 17-20) as described as follows.

190. Baumann describes that a taxi fare can be computed by a taximeter using a combination of a distance fare rate and a time fare rate. (EX1007, 5:14-19.) “Below the threshold velocity, fares are based on time; above, only on distance.”

(*Id.*, 6:16-17.) This aligns with the construction Uber proposed if a court found that the term was definite, i.e., the “amount of time spent stopped or below a predefined speed threshold.”

191. In addition, Baumann’s central control system estimates trip time using traffic patterns in addition to other data. (*Id.*, 1:54-65, *see also*, 2:59-3:19 (estimating times of transit).) By using the central control system, Baumann can estimate waiting time without using the taxi meter, which provides an actual waiting time below the threshold velocity. To estimate trip time, Baumann uses stored historical and statistical data, such as the traffic patterns, to compensate for traffic conditions. (*Id.*, 2:28-38.) Baumann’s description of traffic data is consistent with my understanding of how traffic data was collected, processed, and used in the 1990s. At that time, traffic data was collected, using a variety of visual/camera-based, sensor-based, and even manual methods, and analyzed to identify traffic patterns based on time of day, day of week, weather, accidents, and other events that impact traffic. This historical data and static information, such as stop lights, speed limits, and road curvatures, were used to provide expected delays in travel times.

192. In particular, “distance data are obtained from a Time/Distance File which, ... contains ... travel times during uncongested periods, and travel times during congested periods for trips between all possible pairs of traffic zones. ” (*Id.*, 8:44-61; *see also*, EX1002, 149 (“The Time/Distance File contains ... travel times

during uncongested periods, and travel times during congested periods for trips between all possible pairs of traffic zones.”.)

193. Smith discloses that the data gathered from the vehicle “could be used to determine, for example, whether the vehicle is caught in traffic or moving smoothly to its destination.” (EX1006, 81:24-82:1; *see also*, 10:21-25 (using data to determine if vehicle is stalled in traffic), Claim 26 (same).) In addition, Smith stores dispatch records that “include sufficient information to collectively determine the movements of each vehicle throughout each business day.” (*Id.*, 33:17-21.) Thus, Smith could use Baumann’s techniques to estimate waiting time with the optimal or shortest routes as Smith has the data and equipment to determine an estimated waiting time encountered in traffic for “optimizing performance.”

[12c.vii] determining an estimated taxi fare based on said estimated shortest trip distance and said estimated waiting time

194. The ’727 Patent states that “[a]n estimated fare is determined at block 52 based on the estimated shortest trip distance and estimated waiting time, and displayed at block 53.” (EX1001, 3:54-57.) The ’727 Patent does not disclose how to determine the estimated fare.

195. Baumann suggests determining an estimated taxi fare based on estimated shortest trip distance and estimated waiting time. “[T]he fare may be calculated on the basis of estimated travel distance and travel time.” (EX1007, 8:40-44.) As previously described, Baumann’s central control system determines both

the estimated shortest distance and estimated waiting time, so it has the ability to calculate the estimated taxi fare based on these inputs. Unlike the '727 Patent, Baumann discloses how to determine an estimated taxi fare based on the estimated shortest trip distance and waiting time. (*Id.*, 10:23-11:63.)

196. A POSITA would understand that an estimated taxi fare should be based on the formula to calculate the actual taxi fare, which Baumann explains as “[b]elow the threshold velocity, fares are calculated based on time; above, only on distance.” (*Id.*, 6:16-17.) Thus, as I discussed previously in my the section discussing the motivations to combine Smith and Baumann (Section VIII.C.1), based on the teachings of Smith to monitor vehicles to ensure there are no excess charges, a POSITA would understand to estimate a taxi fare using an estimate of waiting time, which is used when calculating actual taxi fares, not just distance as in ambulances. Further, as also discussed, Smith provides the distance of a trip and Baumann explains how to determine how much of that trip is likely below a speed threshold due to traffic issues.

197. Thus, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 12 of the '727 Patent.

G. Smith in Combination with Baumann Renders Obvious Claim 13

13. The taxi fare estimating method of claim 12, wherein said estimated shortest trip distance comprises a driving distance through known roads.

198. Claim 13 depends from claim 12. Accordingly, I incorporate my

discussion of claim 12. This limitation is the same as found in claim 8. Accordingly, I incorporate my discussion of claim 8, which concluded that Smith discloses all of the limitations of claim 8 of the '727 Patent. Baumann also discloses determining an estimated shortest trip distance using the known road information found in the Time/Distance and Address-Coordinate files, which were “originally developed by the South-western Pennsylvania Regional Planning Commission (SPRPC).” (EX1007, 8:44-56.) A POSITA understands that this data would include information for known roads in southwestern region of Pennsylvania. For example, the Address-Coordinate File includes “a Street Name File,” which would include the names of roads located in this region. (*Id.*, 8:62-64.) It would be obvious to combine Smith and Baumann for the reasons described with respect to claim 12.

199. Thus, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 13 of the '727 Patent.

H. Smith in Combination with Baumann Renders Obvious Claim 17

17. The taxi fare estimating method of claim 12, further including recording an actual route traveled during said trip for subsequent review for excusable causes for said fare violation.

200. Claim 17 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. Claim 17 is identical to claim 11, which depends from claim 7 and is described with respect to Ground 1. Thus, I also incorporate my discussion of claim 11. It would be obvious to combine Smith and Baumann for the reasons

described with respect to claim 12. For the same reasons, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 17 of the '727 Patent.

I. Smith in Combination with Baumann Renders Obvious Claim 18

18. The taxi trip meter system of claim 1 wherein the computer is in network communication with the trip meter.

201. Claim 18 depends from claim 1 (not claim 12). Accordingly, I incorporate my discussion of claim 1.

202. As I described with respect to limitation [1b], Baumann discloses a trip meter connected to a computer. In particular, Baumann discloses 2-way transmissions between the vehicle's VHF transceiver and the control station's VHF transceiver. (EX1007, Fig. 1.) When Baumann describes "[d]igital radio transmission along the communications link between the central station and the vehicles ... may provide the means for computer-based control of the entire fleet," it is describing network communications between the computer at the central station and the taxi meter within the vehicles. (*Id.*, 5:20-28.) The trip meter provides inputs to the taxi meter, which then communicates the trip meter data to the central station. (*See, e.g., id.*, Fig. 1.) As Baumann discloses this limitation and it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 1, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 18 of the '727 Patent.

J. Smith in Combination with Baumann Renders Obvious Claim 19

19. The taxi fare estimating method of claim 12 wherein the estimated taxi fare is determined on a remote computer in network communication with a taxi trip meter.

203. Claim 19 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. I also incorporate my discussion of claim 18 with respect to the “computer in network communication with a taxi trip meter.”

204. Smith discloses a remote computer where its AVL system operates. “Under normal circumstances, the interactions with database server 10 and AVL system 18 are fully automated and are performed by communications processes 24, dispatching processes 26 and vehicle monitoring processes 28, which automatically dispatch and monitor vehicles in response to orders reflected in records and database 10.” (*Id.*, 14:13-20; *see also* Fig. 1.)

205. Baumann likewise discloses determining an estimated taxi fare on a remote computer that is at a central station. “The Central computer 2a will perform all calculations, communications processing, and real-time monitoring in the system.” (EX1007, 3:62-64.) The central station is located in a network that communicates with a fleet of vehicles via “base station transmitters.” (*Id.*, 4:50-53; 5:20-28.) Baumann’s description of a central station, vehicle fleets, and digital radio communications indicates that the central station is remote from the taxis that include the trip meters. As Smith and Baumann disclose this limitation and it would be obvious for a POSITA to combine Smith and Baumann as described with respect

to claim 12, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 19 of the '727 Patent.

K. Smith in Combination with Baumann Renders Obvious Claim 20

20. The taxi fare estimating method of claim 12 wherein the estimated shortest trip distance is determined using the geographical location information.

206. Claim 20 depends from claim 12. Accordingly, I incorporate my discussion of claim 12.

207. As described with limitations [7c] and [12c.v], Smith and Baumann both disclose determining an estimated shortest trip distance between said starting point and said destination point based on the street information. Smith depicts latitude and longitude, i.e., geographical location information, in its dispatch file. (See, e.g., EX1006, Fig. 3A.) Baumann uses Time/Distance and Address-Coordinate files, which includes geographical location information, such as state plane coordinates, to estimate the shortest trip distance. (See, e.g., EX1007, 8:44-56.) As both Smith and Baumann disclose this limitation and it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 12, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 20 of the '727 Patent.

L. Smith in Combination with Baumann Renders Obvious Claim 26

26. The taxi fare estimating method of claim 12, wherein the estimated waiting time is determined using route information available on a computer, wherein the route information includes traffic light or traffic congestion information.

208. Claim 26 depends from claim 12. Accordingly, I incorporate my discussion of claim 12.

209. As described with respect limitation [12c.vi], Baumann uses a Time/Distance File stored on a computer that “contains shortest-time-path distances, travel time during uncongested periods, and travel time during congested periods for trips between all possible pairs of traffic zones.” (EX1007, 8:44-53.) With this file, Baumann estimates waiting time by using stored historical and statistical data, such as the traffic patterns, to compensate for traffic conditions. (*Id.*, 2:28-38.) In particular, this data includes travel times during uncongested and congested periods for trips. (*Id.*, 8:28-31.) Accordingly, this information can be used to determine which portions of the trip were below the speed threshold for waiting time. Thus, Baumann discloses that the route information includes traffic congestion information as claimed.

M. Smith in Combination with Baumann Renders Obvious Claim 27

27. The taxi fare estimating method of claim 12, wherein a computer determines the fare from a remote location and communicates the fare over a network connection.

210. Claim 27 depends from claim 12. Accordingly, I incorporate my discussion of claim 12.

211. As described with respect to claim 19 and incorporated here, Baumann discloses that a remote computer in network communication with a taxi trip meter

determines an estimated taxi fare. Claim 27 adds that the fare is communicated over the network connection. Baumann transmits the fare over a radio communication link to the appropriate vehicle. (EX1007, 2:59-3:19 (“said calculated fares ... selectively addressed to the corresponding vehicle”), 7:57-62 (“information sent along the radio communications link”).) A POSITA understands that communicating the fare over a communication link is the same as communicating the fare over a network connection. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 12, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 27 of the ’727 Patent.

N. Smith in Combination with Baumann Renders Obvious Claim 28

28. The taxi fare estimating method of claim 12, the method steps further comprising: communicating the estimated fare to a rider upon or after completion of the trip.

212. Claim 28 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. During the reissue proceedings, Patent Owner explained that the specification “indicates that a purpose of the invention is to present information in different forms to a user (i.e., a ‘rider.’). This includes a radio transmitter, a display, or a printer connected to a computer to ‘enable the output of driver evaluation information.’” (EX1002, 126 (discussing claim 30, which issued as claim 28); *see also*, EX1001, 3:8-11.)

213. As described with limitation [12c.vii], Baumann determines an

estimated taxi fare based on estimated travel distance and time. Baumann also discloses automatically transmitting estimated fares to a vehicle for display. (EX1007, Claim 1.) “The fare calculation for a specific trip requires obtaining origin and destination coordinates, retrieving and adjusting the appropriate distances and times, computing the fare, and displaying the results.” (*Id.*, 9:6-10.) The fare is displayed “until the vehicle operator turns the display off as by depressing the flag button. This will allow separate fares for each trip.” (*Id.*, 5:47-50.) Thus, a POSITA understands that Baumann’s fares are displayed at the end of a trip. In addition, Baumann discloses “a vehicle printer ... for printed receipts.” (*Id.*, 7:49-50.) Baumann’s printed receipts would be provided to the driver upon or after completion of the trip. A POSITA would understand that the estimated fare calculated by Baumann’s Central Computer is provided to a rider in the same way as the Patent Owner described during the reissue proceedings.

214. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 12, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 28 of the ’727 Patent. Additionally, a POSITA would be motivated to modify Smith because Smith’s system automatically checks if a ride is appropriate as found in claim 33, which would occur after a trip is completed. Further, as Smith discloses transmitting such information to government and insurance agencies in the

form of an invoice, or detecting that an invoice is inappropriate, a POSITA would understand that in a taxi implementation, such a communication should be provided to the rider, who is the person that pays for a taxi ride.

O. Smith in Combination with Baumann Renders Obvious Claim 29

29. The taxi fare estimating method of claim 12, the method steps further comprising: determining an actual fare based upon an actual trip distance or an actual trip duration; and indicating a fare violation if the actual fare exceeds the estimated fare by a predetermined permissible margin.

215. Claim 29 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. During the reissue proceedings, Patent Owner explained that the specification “provides that the actual fare may be computed by the taxi meter.” (EX1002, 126 (discussing claim 31, which issued as claim 29).)

216. Baumann describes that a vehicle can operate “in conventional taxi mode or the computer-controlled mode.” (EX1007, 5:29-33.) As described with respect to claim 12, when Baumann operates in computer-controlled mode, it calculates an estimated fare. When Baumann operates in conventional taxi mode, it determines an actual fare with a taxi meter. “The meter unit will permit fare rate structure adjustments using wire jumpers that determine the cents/minute, cents/mile, and threshold velocity (i.e. the point at which the instantaneous time fare rate is the same as the distance fare rate). Below the threshold velocity, fares are based on time; above, only on distance.” (*Id.*, 6:11-17.) Baumann describes that “[t]rip and fare data are continuously accumulated in the meter, and may be accessed manually or

by the computer.” (*Id.*, 6:30-34.)

217. As described, Baumann has the ability to determine both the estimate fare and the actual fare. Baumann’s computer calculates the estimate fare and can retrieve the actual fare from the meter. While Baumann does not describe comparing these two types of fares, performing such a comparison would be a straightforward calculation. For example, a POSITA would look to Smith, which discloses the use of a comparison to provide an indication of a violation.

218. As described with limitations [7e] and [7f], Smith performs a comparison of shortest trip distance to actual trip distance to determine whether there is a distance violation. Smith provides an example in the context of ambulance services. “Governmental agencies could, and perhaps in the near future may, begin verifying the mileage charged by ambulance carriers by computing a route from the pickup to destination locations and comparing the mileage of the computed route to the mileage actually charged by the carrier.” (EX1006, 58:19-24.) Smith’s example also allows for a predetermined margin, e.g., the parameters set by the Governmental agency. “Furthermore, it is a related aspect of the invention to automatically perform such verification upon an ambulance service invoice to determine if the mileage charges on the invoice are within parameters set by a Government or insurance agency.” (*Id.*, 59:9-13.)

219. Because Smith indicates that its invention is relevant to taxis, a

POSITA would understand in the taxi context that customers are charged a fare, which may be a combination of distance and time charges depending on the ride. (See, e.g., EX1007, 5:14-19, 6:11-17.) Thus, when applying Smith’s comparison to Baumann, a POSITA would compare actual and estimated fares to determine whether a fare was inflated by an unscrupulous driver. As a result, a combination of Smith and Baumann would result in an indication of a fare violation.

220. As it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 12, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 29 of the ’727 Patent.

P. Smith in Combination with Baumann Renders Obvious Claim 30

221. Claim 30 is an independent claim that is similar to claim 12. Accordingly, I incorporate my discussion of claim 12. Below is a table that compares the limitations of claims 12 and 30. Based on this comparison, it is my opinion that claim 30 is obvious in view of Smith and Baumann for the same reasons as I described above for claim 12.

COMPARISON OF CLAIM 12 AND 30	
Claim 12	Claim 30
[12Pre] An automated taxi fare estimating method, comprising:	[30Pre] An automated taxi trip meter system, the system comprising: ⁴
[12a] using a computer including street information accessible thereon,	[30a] a computer in network communication with at least one

⁴ To the extent that there is a difference between the preambles, a “taxi trip meter system” is disclosed by the combination of Smith and Baumann, as I discuss with regard to the preamble for claim 1.

[12b][i] the computer including program instructions	location sensor, the computer including street information accessible thereon and program instructions for performing the program steps comprising:
[12b][ii] to receive geographical location information from at least one network connected location sensor and	
[12b][iii] to access the street information based on the received geographical location information,	See limitation [30e]
[12c][i] the computer program instructions comprising:	See limitation [30a]
[12c][ii] receiving geographical location information from the at least one location sensor;	[30b] receiving geographical location information from the at least one location sensor;
[12c][iii] determining a starting point for a trip based on the received geographical location information;	[30c] determining a starting point for a trip based on the geographical location information;
[12c][iv] determining a destination point for said trip;	[30d] determining a destination point for the trip;
See limitation [12b][iii]	[30e] accessing the street information using the geographical location information;
[12c][v] determining an estimated shortest trip distance between said starting point and said destination point based on the street information or on a straight-line distance determined between the starting point and destination point;	[30f] determining an estimated shortest trip distance between the starting point and the destination point based on the street information or on a straight-line distance determined between the starting point and destination point;
[12c][vi] determining an estimated waiting time encountered in traffic during said trip based on the geographical location information and the street information; and	[30g] determining an estimated waiting time in traffic during the trip based on the street information; and
[12c][vii] determining an estimated taxi fare based on said estimated shortest trip distance and said estimated waiting time.	[30h] determining an estimated fare based on the estimated shortest trip distance and the estimated waiting time.

Q. Smith in Combination with Baumann Renders Obvious Claim 31

31. The taxi trip meter system of claim 30 wherein the estimated waiting time is determined using the geographical location information.

222. Claim 31 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. This limitation is included in limitation [12c][vi]. Accordingly, I incorporate my discussion of limitation [12c][vi]. Because Baumann estimates the waiting time using the geological location information found in the Time/Distance and Address-Coordinate files, and it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 12, it is my opinion that claim 31 is obvious in view of Smith and Baumann.

R. Smith in Combination with Baumann Renders Obvious Claim 37

37. The taxi trip meter system of claim 30, wherein the estimated shortest trip distance is determined using actual street route information available on the computer.

223. Claim 37 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. Claim 37 is similar to claim 20, which provides that the estimated shortest trip distance is determined using geographical location information. Accordingly, I incorporate my discussion of claim 20.

224. Street route information can include geographical location information. Smith discloses both geographic information and other street route information. Smith's "AVL systems may also include a street map database and search algorithm through which the AVL can identify a street route from one address to another."

(EX1006, 6:1-4.) Smith’s dispatch file includes pickup and destination locations in addition to the latitudes and longitudes of those locations. (*Id.*, Fig. 3A.) Similarly, Baumann discloses both geographic information and other street route information. “The Address-Coordinate File associates state plane coordinates with all street addresses in the service area.” (EX1007, 8:32-34.)

225. As both Smith and Baumann discloses this limitation and it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 12, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 37 of the ’727 Patent.

S. Smith in Combination with Baumann Renders Obvious Claim 38

38. The taxi trip meter system of claim 30, wherein the estimated waiting time is determined using route information available on the computer, wherein the route information includes at least one of traffic light or traffic congestion information.

226. Claim 38 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. These are the same limitations as found in claim 26. Accordingly, I incorporate my discussion of claim 26.

T. Smith in Combination with Baumann Renders Obvious Claim 39

39. The taxi trip meter system of claim 30, wherein the computer determines the fare from a remote location and communicates the fare over a network connection.

227. Claim 39 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. This is the same limitation as found in claim 27. Accordingly, I incorporate my discussion of claim 27.

U. Smith in Combination with Baumann Renders Obvious Claim 40

40. The taxi trip meter system of claim 30, the program steps further comprising: communicating the estimated fare to a rider upon or after completion of the trip.

228. Claim 40 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. This is the same limitation as found in claim 28. Accordingly, I incorporate my discussion of claim 28.

V. Smith in Combination with Baumann Renders Obvious Claim 41

41. The taxi fare estimating method of claim 30, the program steps further comprising: determining an actual fare based upon an actual trip distance or an actual trip duration; and indicating a fare violation if the actual fare exceeds the estimated fare by a predetermined permissible margin.

229. Claim 41 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. This is the same limitation as found in claim 29. Accordingly, I incorporate my discussion of claim 29.

XI. Ground 4: Baumann in Combination with Choi Renders Obvious Claims 12, 13, 17, 19-20, 26-28, 30-31, and 37-40

A. A POSITA Would Have a Reason to Combine Baumann with Choi

230. As described above, and as was found during examination, Baumann teaches all of the limitations of claim 12 except those related to the use of a location sensor. Choi discloses those limitations. Both Baumann and Choi are directed towards improved taxi meter systems. Baumann uses a central control system that can compute fares that considers “time of day, traffic conditions, minimal routing

and the like.” (EX1007, 1:1-12.) Choi also has a central computer that it uses to calculate “the operating efficiency of each driving route.” (EX1008, 11.)

231. It would be obvious for a POSITA to combine Baumann and Choi in a manner such that the combination provides the method of claim 12. Both Baumann and Choi describe improvements to managing taxicab services. Both references also use a central computer to perform analysis. Baumann has all of the equipment, processes, and data necessary to estimate a taxi fare. It would be a straightforward task to include the GPS data collected by Choi in Baumann’s fare computation and dispatching method.

232. Specifically, Choi’s “invention is to provide a taxi meter using a Global Positioning System capable of recording and reading the taxi passenger pick-up and drop-off locations and current location data.” (EX1008, 10.) As discussed, Baumann discloses the use of a taxi meter for calculating taxi fares, including for detecting the passenger pick-up and drop-off locations. Further, as Baumann is directed to estimating a fare for a given route, and is thus location dependent, it is important for Bauman to receive the GPS locations of those pickup and drop-off locations, as taught by Choi.

233. As mentioned in Ground 3, [12c.vii] above, there are also many business reasons to fully enable a taxi platform with location sensing ability as well as the ability to estimate taxi fare based on said estimated shortest trip distance and

said estimated waiting time, including optimizing the efficiency of individual and multi-taxi operations, revenue maximization across different types of fare/traffic zones, and improving customer satisfaction and potentially fare volume. The ability to determine location of the taxi during waiting periods is a key enabler of such business benefits. Put another way, knowing waiting time *without* knowing the locations involved has much less benefit: it doesn't allow (or at least significantly inhibits) effective location-based fare and/or operational adjustments, nor does location-less waiting data enable the ability to better analyze the causes of key issues such route-related issues and even non-optimal driver behavior (e.g., waiting times seem to increase dramatically near Joe's coffee shop). Choi's GPS capability would provide such location enablers, providing detailed, accurate information for dissecting operations and making adjustments, as well as better tailoring fares to customer's location needs and expectations.

B. Baumann in Combination with Choi Renders Obvious Claim 12

234. As described in the following paragraphs, Baumann in combination with Choi renders obvious claim 12 of the '727 Patent. As described with respect to Ground 3, Baumann discloses all of the limitations of claim 12 other than the "location sensor" limitations and the limitations using "geographical location information" received from the location sensor. Choi was not cited during the prosecution of the '727 Patent, and as described below, discloses using "vehicle

geographical location information data obtained from a location sensor” for “vehicle location and route calculations.”

[12pre] An automated taxi fare estimating method

235. As previously described with regard to the combination of Smith and Baumann for this limitation, Baumann discloses determining an estimated taxi fare. “[T]he fare may be calculated on the basis of estimated travel distance and travel time.” (EX1007, 8:40-44.) Baumann uses a central control system to “introduce[] compensations and corrections based upon the particular routes and time of day with its differing traffic and similar circumstances, and, in addition, may select the most expeditious, economical or otherwise suitable routes for the driver to take.” (*Id.*, 1:65-2:11.) In this way, Baumann can provide fare estimations that “compensat[e] for traffic conditions, weather, and routing from historical and statistical data relating to the same.” (*Id.*, 2:28-38.)

[12a] using a computer including street information accessible thereon

236. As previously described with regard to the combination of Smith and Baumann for this limitation, Baumann discloses “a computer at a central control station.” (*Id.*, 2:59-3:18.) Baumann “stor[es] information in a computer at a central control station relating to routes and distances between street addresses.” (*Id.*, 2:59-3:19.) In particular, Baumann stores street information in an Address-Coordinate File, which “associates state plane coordinates with all street addresses in the service

area.” (*Id.*, 8:32-34.)

237. In addition, Choi discloses a computer that includes street information. With respect to Figure 7, Choi describes that “the computer (62) has previously stored map.” (EX1008, 11.) A map in this context is understood to include street information. The map is accessible to the computer as it can be “displayed on the monitor (61)” as shown in Figure 7. (*Id.*)

[12b.i] the computer including program instructions

238. As previously described with regard to the combination of Smith and Baumann for this limitation, Baumann discloses that the computer includes program instructions. As one example, Baumann’s “Fig. 3 is a flow-chart in block diagram form of the calculation scheme for the computer program used in the invention.” (EX1007, 3:36-38.) Baumann also describes using “a PDP 11/10 mini-computer” with a “terminal equipped with a paper tape reader/punch, used for entering programs” that “were developed by using a disk based operating system with text editing capabilities.” (*Id.*, 3:64-4:18.)

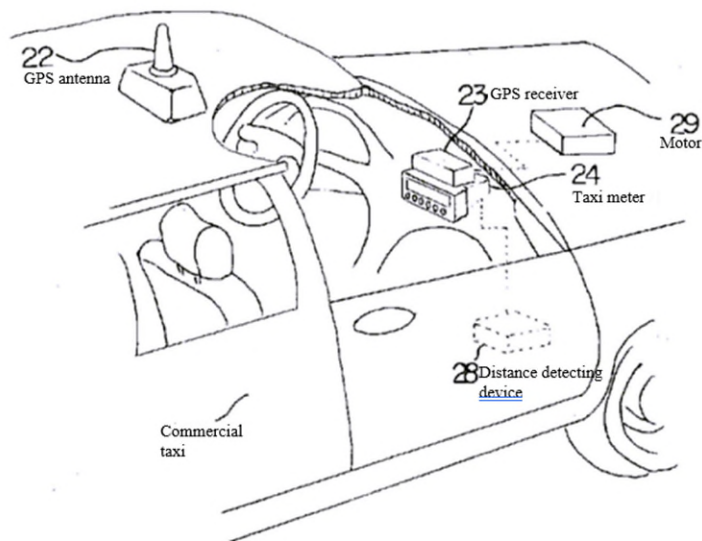
239. Choi also describes that the computer that includes program instructions. For example, Choi describes that recorded data can be analyzed by computer. (EX1008, 10.) One skilled in the art understands that a computer uses program instructions to analyze data.

[12b.ii] to receive geographical location information from at least one network connected location sensor

240. Choi's "invention is to provide a taxi meter using a Global Positioning System capable of recording and reading the taxi passenger pick-up and drop-off locations and current location data." (EX1008, 10.) "When location information is received from the five satellites of the GPS receivers 13, 23, and 53 shown in Fig. 1 through an antenna installed in a taxi and sent to the GPS receivers 13, 23, and 53, a three-dimensional location is obtained and from the three-dimensional locations, latitude data (N) and longitude data (E) are sent to the taxi meter as location data (N, E)." (*Id.*, 11.)

241. Choi's Figure 2 depicts a taxi with a GPS receiver and a GPS antenna for receiving geographical location information. (*Id.*, 13.) As Choi receives geographical location information in the same manner as described in the '727 Patent, Choi discloses program instructions to receive geographical location information from at least one network connected location sensor.

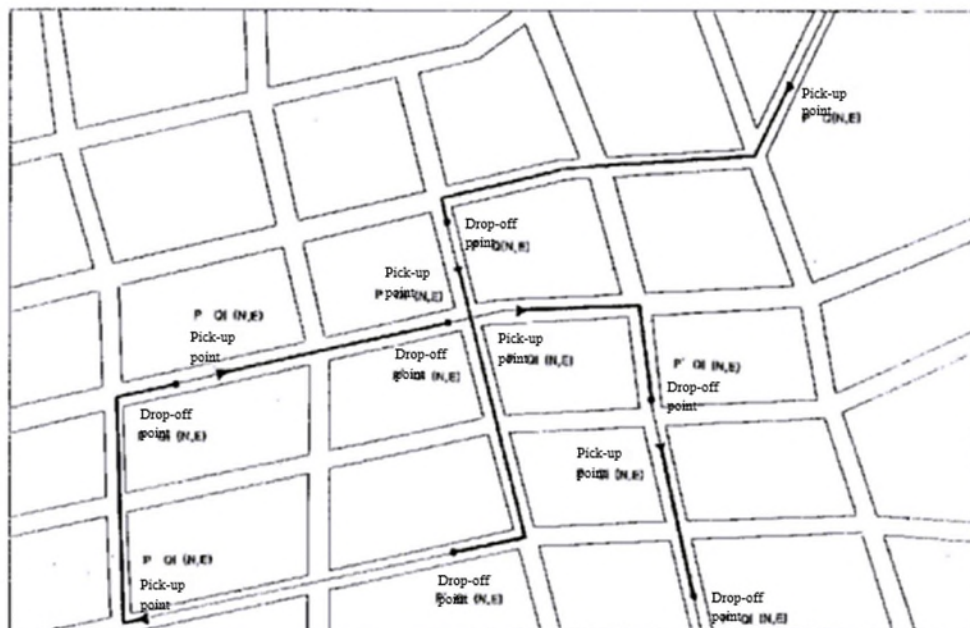
Fig. 2



[12b.iii] to access the street information based on the received geographical location information

242. Choi's computer has access to street information from "a previously stored map." (*Id.*, 11.) "In addition, among the total driving routes of the taxi read by the computer (62), the driving route data value is displayed in the corresponding area of the map of the computer (62), with P as the point at which the passenger is picked up and P' as the point at which the passenger is dropped off, which are displayed on the monitor." (*Id.*) Choi's computer necessarily has program instructions to access the map using the geographical information to be able to display a route on the monitor. Choi's Figure 6 shows an example of displaying routing data. (*Id.*, 15.)

Fig. 6



[12c.i] the computer program instructions comprising

243. As previously described with limitation [12b.i], Choi discloses computer program instructions.

[12c.ii] receiving geographical location information from the at least one location sensor

244. This limitation is nearly identical to limitation [12.b.ii]. Accordingly, I incorporate my discussion regarding limitation [12.b.ii] here.

[12c.iii] determining a starting point for a trip based on the received geographical location information

245. Choi determines a starting point for a trip based on geographical location information. Choi discloses “a taxi meter and a driving system using a Global Positioning System (hereinafter abbreviated as GPS) capable of recording

and reading the taxi passenger pick-up ... using radio waves received by a Global Positioning System.” (EX1008, 10.) “When the business state driving button or the surcharge button (37) is pressed, the current location of the vehicle that picked up the passenger is stored as the value of Qi (N, E) in the taxi meter’s memory cell (40).” (*Id.*, 11.) As a result, Choi is able to determine the starting point of a trip using the geographical location information it received from the GPS when one of the buttons are pushed indicating a start of the trip. A POSITA would be motivated to combine Choi’s starting point determination with Baumann, which determines a starting point of a trip without geographic location information, to provide more accurate information.

[12c.iv] determining a destination point for said trip

246. As previously described with regard to the combination of Smith and Baumann for this limitation, Baumann discloses determining a destination point for a trip. “Under normal operating conditions, the Dispatch Console of the Central Control station 3a and 3b may be used to enter origin or pick-up and destination or deposit address data.” (EX1007, 4:30-36.)

247. Choi also discloses determining a destination point for the trip. Choi discloses “recording and reading the taxi passenger ... drop-off points ... using radio waves received by a Global Positioning System.” (EX1008, 10.) “When the empty taxi button (37) is pressed, the vehicle location of the point at which the passenger

is dropped off is stored in the taxi meter as the value of driving route data Qi (N, E).” (Id., 11.) As a result, Choi is able to determine the destination point of a trip using the geographical location information it received from the GPS when the empty taxi button is pressed. As with the starting point, a POSITA would be motivated to combine Choi’s destination point determination with Baumann, which determines a destination point of a trip without geographic location information, to provide more accurate information.

[12c.v] determining an estimated shortest trip distance between said starting point and said destination point based on the street information or on a straight-line distance determined between the starting point and destination point

248. As previously described with regard to the combination of Smith and Baumann for this limitation, Baumann discloses determining an estimated shortest trip distance between said starting point and said destination point based on the street information. Baumann describes that distance data are obtained “from a Time/Distance File which, ... contains shortest-time-path distances” and “[a]n Address-Coordinate File ... associates state plane coordinates with all streets addressed in the service area.” (EX1007, 8:44-56.) Baumann estimates the shortest trip distance “by adjusting the ... distance in the Time/Distance File by a correction factor based on the information available in the Address-Coordinate File.” (Id., 8:56-61.)

[12c.vi] determining an estimated waiting time encountered in traffic during said trip based on the geographical location information and the street information

249. As previously described with regard to the combination of Smith and Baumann for this limitation, Baumann's central control system estimates trip time using traffic patterns in addition to other data. (*Id.*, 1:54-65, *see also*, 2:59-3:18 (estimating times of transit).) To estimate trip time, Baumann uses stored historical and statistical data, such as the traffic patterns, to compensate for traffic conditions. (*Id.*, 2:28-38.) This information includes travel times during uncongested and congested periods for trips. (*Id.*, 8:28-31.) In particular, "distance data are obtained from a Time/Distance File which, ... contains ... travel times during uncongested periods, and travel times during congested periods for trips between all possible pairs of traffic zones. An Address-Coordinate File... associates state plane coordinates with all streets addressed in the service area. The time ... for a trip between a specific origin and destination pair [is] obtained by adjusting the zone-to-zone time ... in the Time/Distance File by a correction factor based on the information available in the Address-Coordinate File." (*Id.*, 8:44-61.) Accordingly, based on this disclosure, and Baumann's disclosures about waiting time fares, a POSITA would understand how to estimate the amount of time of a trip that was spent below the speed threshold.

[12c.vii] determining an estimated taxi fare based on said estimated shortest trip distance and said estimated waiting time

250. As previously described, Baumann discloses determining an estimated

taxi fare based on estimated shortest trip distance and estimated waiting time. “[T]he fare may be calculated on the basis of estimated travel distance and travel time.” (*Id.*, 8:40-44.) Unlike the ’727 Patent, Baumann discloses how to determine an estimated taxi fare based on the estimated shortest trip distance and waiting time.

As discussed with regard to the combination of Smith and Baumann for this limitation, Baumann discloses estimating a taxi fare based on the estimated shortest trip distance and estimated shortest waiting time. Further a POSITA would understand how to apply that approach to the formula for an actual taxi fare disclosed by Baumann, which would be provide an accurate estimate of a taxi fare.

251. Thus, it is my opinion that Baumann in combination with Choi discloses all of the limitations of claim 12 of the ’727 Patent.

C. Baumann in Combination with Choi Renders Obvious Claim 13

13. The taxi fare estimating method of claim 12, wherein said estimated shortest trip distance comprises a driving distance through known roads.

252. Claim 13 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. As described with limitation [12c.v], Baumann discloses determining an estimated shortest trip distance between said starting point and said destination point based on the street information. This street information is for “known roads.” For example, Baumann uses a database of road information “originally developed by the South-western Pennsylvania Regional Planning

Commission (SPRPC).” (*Id.*, 8:44-56.) A POSITA understands that this data would include information for known roads in southwestern region of Pennsylvania. For example, the Address-Coordinate File includes “a Street Name File.” (*Id.*, 8:62-64.) The Street Name File would include the street names of known roads.

253. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion that Baumann in combination with Choi discloses all of the limitations of claim 13 of the ’727 Patent.

D. Baumann in Combination with Choi Renders Obvious Claim 17

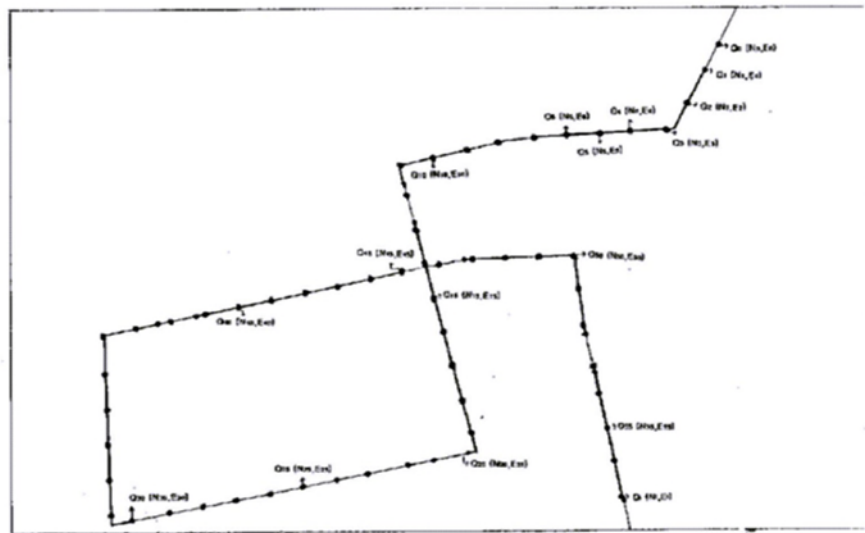
17. The taxi fare estimating method of claim 12, further including recording an actual route traveled during said trip for subsequent review for excusable causes for said fare violation.

254. Claim 17 depends from claim 12. Accordingly, I incorporate my discussion of claim 12.

255. Choi discloses recording the actual route traveled. “The taxi meters (14, 24, 54) record the total business data (total mileage, business distance, income, vehicle speed, number of business, etc.), and the location data (N , E) of the GPS receivers (13, 23, 53), and by analyzing the recorded data with a computer, it is possible to check the place where the passenger is picked up and dropped off and the business status through the computer monitor, which enables efficient management.” (EX1008, 10.) Choi discloses that “the taxi’s location data (N, E) is

stored every 10 seconds as driving distance data $Q_1, Q_2, Q_3, \dots, Q_i$ as shown in Fig. 9 in $Q_1 (N, E), Q_2 (N, E), Q_3 (N, E), \dots, Q_i (N, E)$.” (*Id.*, 11.) Choi’s Figure 9 is shown below. (*Id.*, 16.)

Fig. 9



256. As a result of storing this information, “the operating efficiency of the entire driving route can be calculated and taxi dispatching can be made efficient by the operating efficiency of each region.” (*Id.*, 11) “Also, it can prevent illegal operation such as the driver operating outside the clock or not using the meter, in addition to promoting safe driving by issuing a corrective order to the driver based on the recorded data.” (*Id.*) A POSITA would understand that Choi’s review of the recorded route information would also identify if there were excusable causes for an increased fare.

257. As Choi discloses this limitation and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion

that Baumann in combination with Choi discloses all of the limitations of claim 17 of the '727 Patent.

E. Baumann in Combination with Choi Renders Obvious Claim 19

19. The taxi fare estimating method of claim 12 wherein the estimated taxi fare is determined on a remote computer in network communication with a taxi trip meter.

258. Claim 19 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. As described with respect to claim limitation [12c.vii], Baumann determines an estimated taxi fare. Baumann determines the estimated taxi fare at the control station. (EX1007, 2:59-3:18, 3:62-64 (“The Central computer 2a will perform all calculations, communications processing, and real-time monitoring in the system.”), 10:23-11:63, Fig. 1.) As seen in Baumann’s Figure 1, the central control station that includes the computer is remote from the vehicle, such as a taxi that includes a trip meter.

259. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion that Baumann in combination with Choi discloses all of the limitations of claim 19 of the '727 Patent.

F. Baumann in Combination with Choi Renders Obvious Claim 20

20. The taxi fare estimating method of claim 12 wherein the estimated shortest trip distance is determined using the geographical location information.

260. Claim 20 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. As described with limitation [12c.v], Baumann discloses determining an estimated shortest trip distance between said starting point and said destination point based on the street information. Baumann uses Time/Distance and Address-Coordinate files, which includes geographical location information such as state plane coordinates, to estimate the shortest trip distance. (See, e.g., EX1007, 8:44-49.)

261. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion that Baumann in combination with Choi discloses all of the limitations of claim 20 of the '727 Patent.

G. Baumann in Combination with Choi Renders Obvious Claim 26

26. The taxi fare estimating method of claim 12, wherein the estimated waiting time is determined using route information available on a computer, wherein the route information includes traffic light or traffic congestion information.

262. Claim 26 depends from claim 12. Accordingly, I incorporate my discussion of claim 12.

263. As described with respect limitation [12c.vi], Baumann uses a Time/Distance File stored on a computer that “contains shortest-time-path distances, travel times during uncongested periods, and travel times during congested periods for trips between all possible pairs of traffic zones. (EX1007, 8:49-53.) With this file, Baumann estimates waiting time by using stored historical and statistical data, such as the traffic patterns, to compensate for traffic conditions. (*Id.*, 2:28-38.) In particular, this data includes travel times during uncongested and congested periods for trips. (*Id.*, 8:28-31.) Thus, Baumann discloses that the route information includes traffic congestion information.

264. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion that Baumann in combination with Choi discloses all of the limitations of claim 26 of the ’727 Patent.

H. Baumann in Combination with Choi Renders Obvious Claim 27

27. The taxi fare estimating method of claim 12, wherein a computer determines the fare from a remote location and communicates the fare over a network connection.

265. Claim 27 depends from claim 12. Accordingly, I incorporate my discussion of claim 12. As described with respect to claim 19 and incorporated here, Baumann discloses that a remote computer in network communication with a taxi trip meter determines an estimated taxi fare. Claim 27 adds that the fare is

communicated over the network connection. Baumann transmits the fare over a radio communication link to the appropriate vehicle. (EX1007, 2:59-3:19 (“transmitting along said links, said calculated fares ... selectively addressed to the corresponding vehicle”), 7:57-62 (“information sent along the radio communications link”).) A POSITA understands that communicating the fare over a communication link is the same as communicating the fare over a network connection.

266. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion that Baumann in combination with Choi discloses all of the limitations of claim 27 of the '727 Patent.

I. Baumann in Combination with Choi Renders Obvious Claim 28

28. The taxi fare estimating method of claim 12, the method steps further comprising: communicating the estimated fare to a rider upon or after completion of the trip.

267. Claim 28 depends from claim 12. Accordingly, I incorporate my discussion of claim 12.

268. Baumann discloses communicating the estimated fare to a rider at the end of a trip via display and printer. Baumann’s claim 1 includes a limitation directed towards “automatically displaying said transmitted fares.” (*Id.*, 12:31-32.) “The fare calculation for a specific trip requires obtaining origin and destination

coordinates, retrieving and adjusting the appropriate distances and times, computing the fare, and displaying the results.” (*Id.*, 9:6-10.) The fare is displayed “until the vehicle operator turns the display off as by depressing the flag button. This will allow separate fares for each trip.” (*Id.*, 5:47-50.) Thus, Baumann’s fares are displayed at the end of a trip. In addition, Baumann discloses “a vehicle printer ... for printed receipts.” (*Id.*, 7:49-50.) Baumann’s printed receipts would be provided to the driver upon or after completion of the trip.

269. As Baumann discloses this limitation and it would be obvious for a POSITA to combine Smith and Baumann as described with respect to claim 12, it is my opinion that Smith in combination with Baumann discloses all of the limitations of claim 28 of the ’727 Patent.

J. Baumann in Combination with Choi Renders Obvious Claim 30

270. Claim 30 is an independent claim that is similar to claim 12 as shown in the chart in Section X.P. Accordingly, I incorporate my discussion of claim 12. Based on the comparison between claims 12 and 30 found in Ground 3, it is my opinion that claim 30 is obvious in view of Baumann and Choi for the same reasons as I described above for claim 12.

K. Baumann in Combination with Choi Renders Obvious Claim 31

31. The taxi trip meter system of claim 30 wherein the estimated waiting time is determined using the geographical location information.

271. Claim 31 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. This limitation is included in limitation [12c][vi]. Accordingly, I incorporate my discussion of limitation [12c][vi]. Because Baumann estimates the waiting time using the geological location information found in the Time/Distance and Address-Coordinate files, and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion that claim 31 is obvious in view of Baumann and Choi.

L. Baumann in Combination with Choi Renders Obvious Claim 37

37. The taxi trip meter system of claim 30, wherein the estimated shortest trip distance is determined using actual street route information available on the computer.

272. Claim 37 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. Claim 37 is similar to claim 20, which provides that the estimated shortest trip distance is determined using geographical location information. Accordingly, I incorporate my discussion of claim 20.

273. Baumann discloses both geographic information and other street route information. “The Address-Coordinate File associates state plane coordinates with all street addresses in the service area.” (EX1007, 8:32-34.) As Baumann discloses

this limitation and it would be obvious for a POSITA to combine Baumann and Choi as described with respect to claim 12, it is my opinion that Baumann in combination with Choi discloses all of the limitations of claim 37 of the '727 Patent.

M. Baumann in Combination with Choi Renders Obvious Claim 38

38. The taxi trip meter system of claim 30, wherein the estimated waiting time is determined using route information available on the computer, wherein the route information includes at least one of traffic light or traffic congestion information.

274. Claim 38 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. These are the same limitations as found in claim 26. Accordingly, I incorporate my discussion of claim 26.

N. Baumann in Combination with Choi Renders Obvious Claim 39

39. The taxi trip meter system of claim 30, wherein the computer determines the fare from a remote location and communicates the fare over a network connection.

275. Claim 39 depends from claim 30. Accordingly, I incorporate my discussion of claim 30. This is the same limitation as found in claim 27. Accordingly, I incorporate my discussion of claim 27.

O. Baumann in Combination with Choi Renders Obvious Claim 40

40. The taxi trip meter system of claim 30, the program steps further comprising: communicating the estimated fare to a rider upon or after completion of the trip.

276. Claim 40 depends from claim 30. Accordingly, I incorporate my

discussion of claim 30. This is the same limitation as found in claim 28. Accordingly, I incorporate my discussion of claim 28.

XII. Additional Remarks

277. I currently hold the opinions expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

278. I have reviewed the accompanying Petition for *Inter Partes* Review of the '727 Patent and, given the information set forth in this declaration, I agree with the reasoning and conclusions of the grounds of challenge in the petition. Based on my own analysis, I agree that: (1) Smith discloses all of the limitations of and renders unpatentable claims 7, 8, and 11; (2) Smith in combination with Baumann discloses all of the limitations and renders unpatentable claims 1-4, 7-8, 11-13, 17-20, 26-31, and 37-41; and (3) Baumann in combination of Choi discloses all of the limitations and renders unpatentable claims 12, 13, 17, 19-20, 26-28, 30-31, and 37-40.

* * *

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

Dated: March 27, 2023

By: 

David Hilliard Williams
Edwards, Colorado

APPENDIX A

David Hilliard Williams

203-423-9015; dwilliams@LBSGlobe.com; www.E911-LBS.com

Expertise

- Location-Based Services (LBS)
 - GPS Systems; Network-Based Location Determination Systems
 - Wireless 911 (E911); NG911 Technology, Processes, Operations, and Funding
 - Internet of Things (IoT); Real-Time Location Systems (RTLS)
 - Non-Cellular/Indoor/Sensor-based Location Systems, including: RFID, Wi-Fi/WPS, BLE/Bluetooth, Beacon-based RTLS; NFC/DSRC; RF Fingerprint systems; Wearable systems; Hybrids/Combinations
 - Expert Witness Litigation Support, Patent/Intellectual Property Development and Protection Services
 - GPS/Cellphone Criminal and Civil Matter Forensics, using CDRs, RTT, PCMD, NELOS, EVDO, Geotab, Paraben, CellHawk, and Cellebrite
 - Accident/Incident Reconstruction
 - Internet of Things (IoT) Ecosystem (Sensors, Identification, Verification, Authentication, Interfaces, Edge, Network, Cloud, Data Network Management, Data Management, Analytics, Network Topologies, Integration)
 - Location & IoT Data Privacy and Security; Device/User ID, Verification, Authentication
 - Sensor Design; Sensor System Architecture and Interface Design; Sensor Arrays
 - Wireless Communications Standards, e.g. Bluetooth/BLE, Zigbee, Wi-Fi, WPAN, etc.
 - Microcontroller Design, Sensor Controls Design, IoT Design/Systems Integration
 - Location Data Aggregation, Anonymizing
 - LIDAR/Radar Data Sourcing; Crowdsourcing
 - Indoor Positioning & App Ecosystem Design
 - IoT, Home, Office, and Industrial Automation System Design and Integration; Control System Design, including Remote Management, Monitoring, and Control; User Interface Design
 - Safety and Security, Home Automation, Home Energy Management Application and Architecture Design/Implementation
 - Smart Card, Contactless Payment Systems
 - Mobile Resource Management (MRM) Tracking and Management; Vehicle, Fleet/ELD/AOBRD, Worker/Driver, and Freight/Trailer & Asset Tracking/Mgmt.
 - Telematics; Vehicle/Engine/ECM Tracking/Monitoring, Vehicle-to-Vehicle and Internal Vehicle Communications Networks and Operating and Analytics Ecosystems including CAN and other Protocols/Systems
 - Intelligent Transportation Systems
 - Connected Cars/Autonomous Vehicles (AV)
 - Navigation Systems; PNDs; Geofencing; Route Optimization; Device/App Personalization
 - Location-Based/Dependent Advertising, Search
 - Map Data, Digital Mapping, Media/Advertising Interfacing/Management, GIS, & IoT IT
 - Mobile Social/Business Networking;
 - LBS and IoT Enterprise/Consumer Product & Technical Strategy, Design and Build
 - Location/Context-Centric Enterprise Process Reengineering, Integration, & Interoperability
 - SMART location, SMART Home, SMART Wearables, SMART Buildings, SMART Cities
 - Context/Presence-Based LBS and IoT
 - M2M, Smart Grid/Energy Systems
 - Engineering, Network, and IT Process Design and Organizational Capabilities Assessment
 - LBS Big Data and Cloud Computing
-

Professional Summary

David Hilliard Williams is an internationally-known expert in the wireless/mobile location and Internet of Things (IoT) fields and President and Founder of E911-LBS Consulting. He specializes in wireless and IoT-based product and technology development and implementation, as well as Intellectual Property (IP)/patent and forensics litigation services

involving technologies such as Global Positioning Satellite (GPS) systems; Network-based location determination technologies such as TDOA, ECID, and AFLT; Wireless 911 (E911) and Next Generation 911; Real-Time Location Systems (RTLS) including Radio Frequency Identification (RFID) systems, Wi-Fi-based positioning systems (WPS), BLE/Beacon-based location systems, Bluetooth, Near Field Communications (NFC), and alternative RTLS (Ultrasound, Infrared); Wearable Tags/Sensor tracking systems; Zigbee/Mesh networks; Pattern Matching; and various hybrids and combinations, as well as a broad array of IoT sensors and other systems, network (wireline and wireless, all generations), user interface, and technology enablers for management, monitoring, tracking, and control purposes, including in remote control/distributed ecosystems and associated use cases.

Mr. Williams is expert in the full range of business and consumer location-based services (LBS) and IoT applications enabled by these technologies, including safety, security, and intruder detection/monitoring, energy management, vehicle/fleet tracking/management, telematics and vehicle/engine/component/driver monitoring and analytics, local search, navigation systems, presence/context-aware apps, mobile resource management, asset and freight management, wearable tags/sensors, financial/mobile wallet, mobile hospitality/POS systems, supply chain management, family tracking, mobile social and business networking, proximity-based entertainment and leisure, gaming, and intelligent transportation systems.

Mr. Williams has extensive expertise in all aspects of LBS and IoT delivery across the mobile and IoT ecosystems including enabling sensors, network communications, location determination technologies, geofencing design, map data, location data/database management, geospatial platform/Geographical Information Systems, GPS and other chipsets, data management, control system design, remote management/utilization of such control systems, and device, infrastructure and integration provider integration and management. Mr. Williams has developed and implemented industry-leading product and technology solutions for numerous LBS and IoT applications and markets and provides consulting and research services to some of the leading carriers and enterprises in the U.S., Asia, and Europe. His client list includes Apple, AT&T, BJ's Wholesale Club, Draft Kings, Ecobee, FedEx, GE, Geotab, Green Mountain Grill, Google, Heil, the Houston Police Department, HP/Aruba, the L.A. County District Attorney's Office (both prosecution and public defender), Lyft, Macropoint, Nextel, NAVTEQ, Overhead Door, Peschke, Prova, Qualcomm, Samsung, Snap, Sprint, Target, Toyota, Twilio, Verizon Wireless, VIVINT, Volkswagen, Zillow, and ZIM.

Mr. Williams has successfully represented both prosecutors and defendants in patent, ITC, and criminal litigation (including assisting State Public Defender entities), as well as both sides of civil trade secrets, product liability, fraud, and other litigation. He has been deposed 31 times and has testified 10 times, including [successfully](#) in The Eastern District Court of Texas (winning both infringement and invalidity matters), and in [winning](#) in ITC Court. In total he has provided expertise in matters involving over 150 patents and over 50 criminal and civil matters. His credentials in wireless/mobile/IT technologies are established to the 1980s.

Mr. Williams is expert in smart location technology issues in the Internet of Things (IoT), telematics, and connected/driverless car fields, particularly in their utilization of sensor, location and context information through the practical envisioning and design of: consumer/enterprise use matters and associated application and user interface design; sensor

design and deployment strategies; process (re)engineering; IT integration; data aggregation, segmentation, analysis, and management; scalability; and security and privacy issues, requirements, collaboration structures, and ongoing management. He is expert on Big Data, data mining/analytics, and emerging AI issues associated with location and IoT data.

With over thirty-five years in location, networking/communications, control, and information technology solutions design, selection, implementation and ongoing management, Mr. Williams has extensive experience in the activities and issues needed to get applications to market, including planning and design at the application, system, interface/integration, network, IT, operational and customer facing levels. He has been published and quoted by leading magazines and newspapers about mobile services, including The New York Times, CBS News.com, The Columbus (Ohio) Dispatch, The Boston Globe, Computerworld, Directions Mag, Mission Critical Communications, Popular Mechanics, and RFID Journal. Mr. Williams has authored five books on wireless location, including *The Definitive Guide to IoT Sensors (In Development)*, *The Definitive Guide to GPS, RFID, Wi-Fi, and Other Wireless Location-Based Services (two versions, third in development)*, *The Definitive Guide to Wireless E911*, and (co-authored) *The Definitive Guide to Mobile Positioning and Location Management*. Mr. Williams has authored dozens of research reports, and tracks and analyzes leading companies in the LBS, IoT, and public safety industries particularly with respect to their product and technology strategies, competitive capabilities and implementation issues. He is expert on all public policy and technology issues related to emergency services/public safety, location data privacy and security, and LBS and IoT privacy protection policies, systems, and support infrastructure. He opines on location privacy issues in various forums. He is the sole or a named inventor on eight (8) patents involving mobile location and context, sensors, IoT, sensors, and various other technologies and associated methods.

Employment History

From: 2002 **E911-LBS Consulting**

To: Present

Position: *President and Founder*

Provides services across the entire wireless value chain, particularly with respect to technology and business strategic planning and product design, development, implementation, and ongoing management and operations, plus specialized services such IP/Patent litigation associated with Location Based Services and applications, GPS, E911, IoT, RTLS, RFID, Wi-Fi, NFC, BLE/Bluetooth, beacons, & other location technologies and associated ecosystems. Projects include:

- Provided expert witness, technical consulting, and research analysis services with respect to location-based services-related intellectual property/patent protection, licensing, and litigation (details in separate litigation support section).
- Provide forensics expertise in examination of mobile location-related events and associated data for civil and criminal matters (both prosecutor/plaintiff and defense entities).

- Developed, implemented, managed, and marketed a portfolio of LBS applications and broader offers for leading North American wireless carrier. Responsible for all dimensions of product lifecycle and associated budgets. Work included the development and launch of several LBS applications including mobile social networking, family tracking, local search, 411 w/ location, and mobile worker, fleet, and asset management. Location technologies utilized include GPS, Wi-Fi positioning, RFID, Bluetooth, Cell ID (CID), ECID, and TDOA. Worked extensively with network engineering to troubleshoot/refine new location-determination infrastructure to address/improve location accuracy, privacy and security issues.
- Conducted geofencing accuracy compliance analysis for ride-sharing company auditing their driver airport compliance record. Involved extensive use of JSON/GeoJSON records.
- Conducted comprehensive technical and intellectual property analysis of Real-Time Location Systems (e.g. RFID, Wi-Fi Positioning, Bluetooth, Infrared/Ultrasound, Others) market for European client looking to assert location-related patents.
- Provided technical guidance for mobile payments/wallet startup utilizing RFID, NFC and other technologies as key location enablers. Identified key issues and redeveloped successful patent application after initial USPTO rejection.
- Conducted technical and intellectual property analysis for Fleet Management/Telematics operator and service provider assessing potential infringement candidates.
- Conducted market research and developed market research on Telematics industry, both overall as well as tailored for specific auto manufacturers.
- Conducted analysis of location aggregation market for client interested in acquisition in that industry space.
- Ghost-wrote comprehensive study on Traffic data collection, processing, and reporting technologies, markets, and associated companies on behalf of ABI Research.
- Provided E911 consulting expertise in support of new spectrum regulatory approval and technical implementation issues for startup carrier.

- Managed the design, collection, and analysis of E911 infrastructure deployment of western region of major wireless carrier. Data collected focused on technical issues associated with TDOA (Time Difference of Arrival) technology implementation, and collection and reporting of location accuracy data for FCC reporting purposes.
- Developed the site map and primary content for the NAVTEQ (now HERE) Network for Developers (N4D) LBS web ecosystem – <http://developer.navteq.com>. Responsible for designing and managing the site map and overall content, identifying key contributors and materials, and utilizing a variety of fragmented information to develop broad and deep technical, digital media and business content to assist various expertise levels of application developers and business management to become intimately familiar with map data, GIS platforms, and LBS applications and underlying technologies and to provide the information and guidance to successfully develop and launch their LBS applications.
- Managed the development of the Nextel (now Sprint/T-Mobile) Location-Based Services strategy. Efforts included market and technical analysis of likely LBS offerings and integrating those findings with Nextel’s broader wireless voice and data strategies. Work included prioritizing applications based on focus group findings, business matter attractiveness, ease of implementation, impact on network infrastructure, and synchronization and integration with GPS terminal and E911 mandate rollout plans. Managed network engineering and consulting team to design network modifications to best support the additional demands of LBS applications and underlying bandwidth-consuming digital media content. Product strategy including researching and incorporating context-aware/presence concepts into product/device and network engineering plans.
- Developed navigation platform strategy for major international auto manufacturer. Assessed direction and technology requirements of in-car and portable navigation device (PND) technologies; developed strategy for in-car navigation platform.
- Developed numerous LBS company research reports using proprietary multi-point “report card” addressing numerous business and technology strategy dimensions and issues.
- Authored multiple books on wireless location, including *The Definitive Guide to IoT Sensors and IoT Use Cases (In Development)*, *The Definitive Guide to GPS, RFID, Wi-Fi, and*

Other Wireless Location-Based Services (2005/2009 versions, new version in development), The Definitive Guide to Wireless E911, and (co-authored) The Definitive Guide to Mobile Positioning and Location Management.

- Advised numerous small companies and startups such as i360Hygiene, LOCAID, Finder Technologies, Orion GPS, and XYVerify on LBS-related issues to enhance value propositions on business, product and technology dimensions to enhance attractiveness to potential investors/acquisition candidates.

From: 2009 **AT&T Mobility**

To: 2010

Position: *Senior Product Manager – Enterprise LBS*

Led the development, implementation, and marketing of numerous enterprise location-based services across all sales, marketing and operational channels. Work included responsibility for all dimensions of product lifecycle and associated budgets. Products managed included telematics, fleet/vehicle management, asset/freight management, and mobile resource management GPS/LBS apps on a variety of platforms such as Telenav. Played key role in design of company-wide location services product and implementation roadmap.

From: 2007 **AT&T Mobility**

To: 2009

Position: *Consumer LBS Product Realization Manager (Consultant)*

Responsible for the design, development, implementation, and ongoing lifecycle management of several high-profile Consumer LBS applications and associated operational support. Overall application design and implementation responsibilities included AT&T FamilyMap, Loopt Mobile Social Networking, 411 with location, Slifter Local Search, and CaddyHawk Game systems. Work included design, troubleshooting, and implementation of AT&T location-related network, application, user interface, digital media and content delivery, and privacy infrastructure and associated issues such as accuracy and privacy (efforts resulted in patent co-invention).

From: 1993 **Accenture**

To: 2002

Position: *Associate Partner - Communications & High-Technology Strategy; Information & Technology Strategy practices*

Responsible for development of wireless location practice. Led development of business, technology, and product strategies for numerous communications and technology-centric companies looking to enter new markets. Specialized in new product design, development, and implementation, as well as network infrastructure design need to support next generation, high bandwidth-consuming digital media

content and associated infrastructure. Efforts included assisting AT&T (re)enter local service, (then) Bell Atlantic launch long distance services, (then) GTE design and implement Intelligent Network and High Value Network services, Nextel (later part of Sprint, and now T-Mobile) develop their location-based services product strategy and enabling network and IT architectures, and Omnipoint (later part of T-Mobile) network integration strategy, as well as leading the design and implementation of voice and data communications networks and associated data management capabilities in numerous industries including communications, computer, transportation, hospitality/retail, energy, agriculture, and banking/financial services. Worked with utilities such as Ameren, Georgia Power, and Duke Energy to identify strategic opportunities utilizing technology and communications in utility-associated infrastructure and other capabilities.

From: 1991 **Booz Allen & Hamilton**
 To: 1993
 Position: *Senior Associate – Information Technology Practice*
 Provided and led consulting services for communications industry and other Information Technology-intensive companies in developing technology strategies for addressing new marketing opportunities and internal operational issues.

From: 1987 **Deloitte Consulting (Originally Touche Ross)**
 To: 1991
 Position: *Senior Manager*
 Provided consulting services for technology-intensive companies in developing business and product strategies for addressing new marketing opportunities and internal operational issues.

From: 1983 **Hughes Aircraft Company**
 To: 1985
 Position: *Electrical Engineer – Radar Development*
 Microcomputer and digital system design engineer on the F-15 fighter radar system as part of analog to digital platform conversion and associated tracking and control systems design. System involved designing multi-microprocessor-based system to interface to/with wide array of on-board, ground control, and other in-flight communications/control sensors/sensor arrays and systems.

Litigation Support Experience

Date: 2022-2023 **Vorys**
 Matter: BJ's Wholesale Club
 Project: Providing expert consulting, support, and declarations for IPR matters involving location-related in-store ordering, fulfillment, and customer service aspects of e-commerce and m-commerce services.

Date: 2022-2023 **Kilpatrick Townsend & Stockton LLP**
Matter: Apple
Project: Provide expert consulting, support, and reports for IPRs, invalidity and non-infringement proceedings involving eight (8) patents involving sharing of location information between multiple devices for a variety of use cases.

Date: 2022-2023 **Venable LLP**
Matter: Verizon Wireless dba Cellco Partnership
Project: Provide expert consulting, support, and declaration for IPR matters involving georeferencing and specialty messaging techniques.

Date: 2022-2023 **Hall Griffin**
Matter: Ben's Asphalt
Project: Provided technical expertise in assessing technical aspects of telematics breach-of-contract lawsuit. Successfully settled.

Date: 2022-2023 **Wolf, Greenfield & Sacks, P.C.**
Matter: Snap
Project: Providing expert consulting, support, and report for IPR matter involving social-based location, mapping, matching, and display technologies. Deposition.

Date: 2022-2023 **Dreifuss Bonacci & Parker**
Matter: Pacific Controls Inc.
Project: Providing expert consulting, report, and testimony in regards to contractual dispute between Telematics Service Provider and equipment manufacturer. Deposition.

Date: 2021-2022 **Greenberg Traug**
Matter: HP Enterprises, Aruba
Project: Providing expert consulting, report, and testimony in support of non-infringement and invalidity analysis in EDTX matter involving beacons/beaconing technologies, methods, and associated systems. Depositions (2).

Date: 2021-2023 **Keker, Van Nest & Peters LLP**
Matter: Google, Ecobee, and VIVINT (v. Ecofactor) (WDTX)
Project: Provided/ing expert consulting, report, and testimony in support of invalidity analysis involving HVAC remote monitoring and control and associated sensors, systems, and communications capabilities. Deposition and Testimony; Ecobee and VIVINT trials pending.

Date: 2021-2022 **Baker Botts**
Matter: Lyft (multiple matters)
Project: Providing expert consulting, support, and report for matters involving location-related applications technologies including GPS,

Bluetooth, Wi-Fi positioning, RFID, and road sensors/readers.

- Date: 2022 **Winston & Strawn LLP**
Matter: ZIM Integrated Shipping
Project: Provided expert consulting in EDTX invalidity and non-infringement case involving method and apparatus for shipping information patents.
- Date: 2020-2021 **Lowe Graham Jones**
Matter: Green Mountain Grill (IoT Connected Grill) (ITC Court)
Project: Provided expert consulting, report, and testimony in ITC case involving Internet of Things (IoT), remote monitoring and control, cloud services, and various short-range communications technologies. Involves non-infringement, DI, Invalidity, and Inventorship. Deposition and Testimony.
- Date: 2021 **Munger, Tolles & Olson LLP**
Matter: Google
Project: Provided expert consulting and support for EDTX matter involving invalidity/non-infringement of smart cards and payment systems and associated capabilities such as Secure Elements.
- Date: 2021 **Jackson Walker L.L.P.**
Matter: Prova
Project: Provide expert consulting, support, and report for IPR involving buyer verification/tracking and inventory management/tracking utilizing RFID technology.
- Date: 2020-2023 **Latham & Watkins LLP**
Matter: Overhead Door (OHD-Garage Door Manufacturer) (ITC Court)
Project: Provided expert consulting, report, and testimony in ITC case involving Internet of Things (IoT), remote monitoring and control, and various short-range communications technologies. Deposition and Testimony in ITC court. Support in Customs and Enforcement.
- Date: 2020-2021 **Ropes & Gray LLP**
Matter: Target
Project: Providing expert consulting, support, and report for IPRs for several patents involving short-range communications technologies and associated identification and location determination methods and techniques including Bluetooth, RFID, and Wi-Fi. Depositions seven (7) involving nine (9) patents.
- Date: 2020-2022 **Baker Botts**
Matter: Draft Kings
Project: Providing expert consulting, support, and report for IPRs for several patents involving validating gaming customers location in

appropriate online gaming jurisdictions/geofencing. Depositions (2)

- Date: 2020 **Baker Botts**
Matter: Lyft
Project: Provided expert consulting, support, and report for IPRs involving Intelligent Transportation systems, geofences, and location technologies including GPS, Bluetooth, Wi-Fi positioning, RFID, and road sensors/readers. Deposition.
- Date: 2020-2023 **Finnegan & Henderson**
Matter: Google (3)
Project: Providing expert consulting, support, and report for IPRs involving user experience sharing, software registration, and device/user tracking involving a variety of location technologies.
- Date: 2019-2023 **Lynch Thompson LLP**
Matter: Heil
Project: Providing technical/engineering expertise in trade secrets matter involving Internet of Things, RFID, Telematics, Vehicle Sensors, & Big Data for waste vehicle manufacturer. Deposition.
- Date: 2018-2020 **Lawgivers (Trinidad and Tobago)**
Matter: A&V Oil and Gas
Project: Provided expert support, report, and testimony in arbitration matter involving government of T&T. Focused on (in)accuracies of GPS-based vehicle tracking system relative to a variety of key events. Testimony at trial.
- Date: 2019-2020 **Perkins Coie**
Matter: Zillow
Project: Provided expert support, report, and deposition for non-Infringement matter for major real estate services firm and associated subsidiaries involving a wide array of location determination technologies on smartphones.
- Date: 2019-2020 **Baker Botts**
Matter: Lyft
Project: Provided expert support, report, and deposition in support of Claim Construction brief associated with non-infringement matter.
- Date: 2016-2021 **Sterne Kessler Goldstein Fox**
Matters: Google (Multiple matters); Google (Nest, Multiple matters)
Projects: Providing expert support, reports, and deposition for several IPRs of location/context-related patents on behalf of leading Internet services company utilizing a wide variety of communications and location technologies.

- Date: 2013, 2019/2020
Projects: **XYVerify (3)**
Patent Re-Submission and Approval; Patent Application Creation (Re)wrote patent applications for LBS/financial verification system using multiple location determination methods including RFID, Bluetooth, WPS, and GPS. Efforts enabled patents to be approved after initial rejection by USPTO.
- Date: 2013-2023
Matters: **Civil and Criminal Forensics**
Project: Various
Provided/Providing cellphone, vehicle, specialty device, and computer-based location forensics expertise in over 50 criminal and civil matters involving numerous location determination technologies and associated applications and systems. Criminal matters include homicide, attempted murder, assault (multiple types), arson (building and field), armed robbery, breaking and entering, and property crime. Civil matters include trade secrets, product liability, accident liability, fraud, and employment matters.
- Applications/Platforms for criminal and civil forensics analysis include cellular records, 911 records, Facebook/Instagram/Messenger/social media apps, Google/search, Google tracking apps (e.g. Timeline, others), vehicle tracking systems, specialty GPS (e.g. GPS ankle bracelets, special devices) surveillance and safety systems, smart home systems, aviation, vehicle infotainment systems, and connected cars, Expert/knowledgeable in numerous forensic technologies, tools, and accident/incident reconstruction methods including CDR, NELOS, PCMD, RTT, EVDO, Cellebrite, Paraben, Google Earth/Timeline, and Hawk Analytics/CellHawk, as well as specialized knowledge on iOS and Android smartphone location determination techniques and data collection, analysis, and management of all types including KML/KMZ, (Geo)JSON, CSV, (E)WKT/WKB, Shapefile, ESRI, and other GIS vector/raster systems, technologies, formats, and models.
- Date: 2019
Matter: **Sterne Kessler Goldstein Fox**
Project: Volkswagen
Provided expert support for IPR involving Location-Based Messaging in automotive related use matter/environments.
- Date: 2017-2018
Matter: **Finnegan & Henderson**
Project: Fed Ex
Provided expert support, consulting, reports, deposition, and trial testifying for infringement and district court invalidity proceedings on behalf of leading transportation/shipping company in The Eastern District Court of Texas. Deposition and Testimony.
- Date: 2017-2018 **Polsinelli**

Matter:	Uber
Project:	Provided expert support and reports for Trade Secrets matter involving major shared transportation provider.
Date:	2017-2018 Renner Otto
Matters:	Macropoint; Timekeeping Systems Inc.
Projects:	Providing consulting, expert services, report and deposition in invalidity matters for transportation and employee tracking patents.
Date:	2016-2018 Paul Hastings
Matters:	Samsung (2 matters)
Project:	Provided expert services for Inter Partes Review (IPR) of multiple location, safety, and security patents on behalf of major telecommunications equipment and services provider.
Date:	2016-2017 European Firm
Matter:	Patent Infringement/Claim Chart Analysis
Project:	Provided consulting, market analysis, and claim chart development for patent holder involving RTLS-related repeater technologies, particularly using WPAN/Zigbee networks.
Date:	2016-2017 Baker Botts
Matter:	Twilio
Project:	Provided location/E911-related expert services, report, and deposition for IPR of mobile registration patent on behalf of Voice & Video, Messaging, and Authentication APIs provider.
Date:	2016 Los Angeles District Attorney's Office
Matter:	People v. Dawud Abdulwali
Project:	Provided expert services on location technologies used to identify and trace accused arsonist on behalf of L.A. District Attorney's (Prosecutors) office.
Date:	2016-2017 Fitzpatrick, Cella, Harper & Scinto
Matter:	Geotab
Project:	Providing expert support, reports, and deposition for infringement defense of multiple asserted patents on behalf of fleet management/telematics provider in EDTX.
Date:	2015-2016 The Ogg Law Firm PLLC
Matter:	City of Houston Police Department
Project:	Provided expert services/testimony regarding veracity of Automatic Vehicle Locator (AVL) systems in officer suspension matter.
Date:	2015-2016 Sterne Kessler Goldstein Fox
Matter:	VIVINT
Project:	Providing expert support, reports, and deposition for IPR involving

several location-related patents for home security/energy company.

- Date: 2015 **Hogan Lovells**
Matter: Apple
Project: Provided expert support for multiple location-related patent Inter Partes Review (IPR) and infringement proceedings for leading mobile platform, application and services provider.
- Date: 2015 **Thompson Hine LLP**
Matters: Macropoint
Project: Provided expert support for patent litigation efforts involving fleet management devices, software, and services.
- Date: 2013-2014 **Williams & Connolly**
Matter: State of Maryland
Project: Provided expert services in assessing validity of GPS tracking bracelet/system in parole violation matter.
- Date: 2013-2014 **Cravath, Swaine & Moore**
Matter: Qualcomm
Project: Provided expert litigation support, technical consulting, and advisory services in Anti-Trust matter regarding location services technologies, platforms, and standards.
- Date: 2014 **Patterson Thuenete Pedersen, P.A.**
Matter: Kaspersky Internet Security
Project: Provided expert litigation support and technical consulting in patent countersuit involving internet security services.
- Date: 2014 **Sullivan & Cromwell LLP, others**
Matter: Peschke
Project: Provided expert support and technical consulting in location services infringement patent dispute involving interactive mapping applications. Effort included providing deposition testimony.
- Date: 2012-2013 **Covington & Burling**
Matter: Samsung (ITC Court)
Project: Provided expert litigation support and technical consulting and advisory services in International Trade Commission matter.
- Date: 2011-2013 **Connolly Bove Lodge & Hutz**
Matter: Enovsys
Project: Provided expert litigation support and technical consulting and advisory services for pursuit of LBS patent royalties and infringement settlements.
- Date: 2011-2013 **Voxson**

Matters:	Various
Project:	Provided expert litigation support and technical consulting and advisory services for pursuit of E911 and LBS patent infringement royalties and settlements.
Date:	2010-2012 Morrison & Foerster LLP
Matter:	Cellco Partnership (dba Verizon Wireless)
Project:	Provided expert advisory and report services in support of IPR re-examination process of E911 and LBS patents.
Date:	2011-2012 Dovel & Luner
Matter:	TrackBeam
Project:	Provided market/technical consulting, expertise and research analysis of LBS patents to identify potential licensing candidates.
Date:	2011 SNR Denton
Matter:	Wavemarket
Project:	Provided market and technical consulting and advisory services for defense of LBS patent lawsuits.
Date:	2010 State of New Jersey
Project:	Provided wireless location consulting expertise in development of economic growth strategy for State of New Jersey.
Date:	2007-2008 General Electric
Project:	Provided consulting research and guidance on LBS and E911 technology, GE-owned patents, prior artwork, technology direction.

Education

<u>Year</u>	<u>College/University</u>	<u>Degree</u>
1987	The University of Texas at Austin (1 st in graduating class)	MBA, Information Systems Management
1983	Purdue University, West Lafayette, Indiana (Top honors; Tau Beta Pi, Eta Kappa Nu)	BSEE, Digital System Design emphasis

Patents

- "Method and apparatus for providing mobile social networking privacy." (U.S. Patent Number 8,613,109, issued on December 17, 2013).
- "Systems and methods of using wireless location, context, and/or one or more communication networks for monitoring for, preempting, and/or mitigating pre-identified behavior." (U.S. Patent Number 10,477,342, Issued November 12, 2019).
- "Systems and methods for monitoring for and preempting pre-identified restriction violation-related behavior(s) of persons under restriction." (U.S. Patent Number 10,497,242, Issued December 3, 2019).
- "Systems and methods for providing location-based security and/or privacy for restricting user access." (U.S. Patent Number 10,555,112, Issued February 4, 2020).
- "Systems and methods for developing, monitoring, and enforcing agreements, understandings, and/or contracts." (U.S. Patent Number 10,853,897, Issued 12/1/2020).
- "Systems and methods for monitoring for and preempting pre-identified restriction violation-related behavior(s) of persons under restriction." (U.S. Patent Number 10,861,307, Issued December 8, 2020).
- "Systems and methods for monitoring for and lowering the risk of addiction-related or restriction violation-related behavior(s)." (U.S. Patent Number 11,388,546, Issued July 12, 2022).
- "Systems and methods for monitoring for and preempting the risk of a future occurrence of a quarantine violation." (U.S. Patent Number 11,412,353, Issued August 9, 2022).
- Numerous other patents pending.

Publications

Books:

1. The Definitive Guide to IoT Sensors (In development)
2. The Practical Guide to The Internet of Things (IoT): Use Matters and Enabling Technologies (In development)
3. The Definitive Guide to GPS, RFID, Wi-Fi, and Other Wireless Location-Based Services (2 versions, plus version in development)
4. The Definitive Guide to Wireless E911
5. The Definitive Guide to Mobile Positioning and Location Management (Co-authored)

Articles/Quotations:

1. Medium.com (Predict). January 31, 2023. "ChatGPT and Its Impact on Criminal Forensics (and Criminals).
2. Medium.com. October 3, 2022. "What if GPS Fails?"

3. Location Data Privacy posts/blog. Ongoing at www.E911-LBS.com.
4. Linked In. March 3, 2020. "Facial Recognition: Good, Bad, or Ugly?"
5. The Columbus Dispatch. February 17, 2017. "Experts: GPS monitors couldn't save OSU student's life"
6. E911-LBS.com. May 2012. "The Pacifier Generation – How Wireless is Impacting Our Society"
7. Nbizmag.com. Summer 2008. "How Will the Convergence of LBS Technologies Affect Business?"
8. Directions Magazine. November 30, 2005. "The Deadline for the E911 Mandate Approaches...Where Do Things Stand?"
9. Computerworld. May 23, 2005. "Beyond The Supply Chain: The Impact of RFID on Business Operations and IT Infrastructure"
10. RFID Journal. June 12, 2005. "IT's Impact on RFID"
11. Directions Magazine. July 29, 2004. "The Strategic Implications of the Wal-Mart RFID Mandate"
12. Directions Magazine. February 25, 2004. "RFID-Hot Technology with Wide-Ranging Applications"
13. WirelessDevNet.com. 1/30/2003. "It's The (Location-Based) Applications – Stupid!"

Languages/Tools

- C/C++, Java, Basic, Cobol, Fortran, Pascal, APL, Assembly, Others
- CDR, NELOS, PCMD, RTT, EVDO, Cellebrite, Paraben, Google Earth/Timeline, Hawk Analytics/CellHawk, as well as specialized knowledge on iOS and Android smartphone location determination techniques.
- Data collection, analysis, and management of all types including KML/KMZ, (Geo)JSON, CSV, (E)WKT/WKB, Binary, Shapefile, ESRI, and other GIS vector/raster systems, technologies, formats, and models.

Associations and Achievements

- IEEE, NENA, APCO. Certified in Emergency Management Response (CERT)