

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

MAKOR ISSUES & RIGHTS LTD.,
Patent Owner.

Case IPR2017-00815
Patent No. 6,480,783 B1

Before HYUN J. JUNG, BEVERLY M. BUNTING, and
ROBERT L. KINDER, *Administrative Patent Judges*.

KINDER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

Google, LLC¹ (“Petitioner”) filed a Petition pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1 and 3 of U.S. Patent No. 6,480,783 B1 (“the ’783 patent”). Paper 2. Makor Issues & Rights Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 6. Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review of all challenged claims but not on all challenged grounds of unpatentability. (Paper 7, “Dec.”).

During the trial, Patent Owner filed a Patent Owner Response (Paper 14, “PO Resp.”), and Petitioner filed a Reply to the Patent Owner Response (Paper 19, “Pet. Reply”). Patent Owner also filed a Motion for Observations on the Cross-Examination of Dr. Michael S. Braasch (Paper 22), to which Petitioner responded (Paper 24). An oral hearing was held on May 3, 2018, and a copy of the transcript has been made part of the record. Paper 27 (“Tr.”).²

On April 24, 2018, the Supreme Court held that a decision to institute under 35 U.S.C. § 314 may not institute on less than all claims challenged in the petition. *SAS Inst. Inc. v. Iancu*, 138 S.Ct. 1348, 1359–60 (2018). On April 26, 2018, the Office issued Guidance on the Impact of SAS on AIA Trial Proceedings, which states that “if the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition.”

<https://www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/trials/guidance-impact-sas-aia-trial>. Subsequently, on May 8, 2018,

¹ Petitioner submitted an updated mandatory notice indicating that “Google Inc., converted from a corporation to a limited liability company and changed its name to Google LLC, on September 30, 2017.” Paper 10.

² Both parties requested to present arguments collectively for IPR2017-00815–818. See Papers 21, 23.

we issued an Order modifying the Decision on Institution to include review of all challenged claims and all grounds presented in the Petition. Paper 26. Specifically, the ground challenging claims 1 and 3 as unpatentable based on TravTek and Seda under 35 U.S.C. § 103 was included in the trial. *Id.*; *see also* Paper 28 (ordering supplemental briefing). The parties submitted supplemental briefing addressing this added ground – Patent Owner’s Supplemental Response (Paper 29, “PO Supp. Resp.”) and thereafter Petitioner’s Supplemental Reply (Paper 30, “Pet. Supp. Reply”). The parties jointly agreed to waive supplemental oral hearing related to the additional issues. *See* Ex. 3001.

We have jurisdiction under 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of the claims for which we instituted trial. Based on the final trial record, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1 and 3 of the ’783 patent are unpatentable.

I. BACKGROUND

A. *Real Party in Interest*

Petitioner names itself and Waze Inc. as the real parties-in-interest. Pet. 1.

B. *The ’783 patent (Ex. 1001)*

The ’783 patent is titled “Real Time Vehicle Guidance and Forecasting System Under Traffic Jam Conditions.” Ex. 1001, (54). The ’783 patent issued on November 12, 2002, from U.S. Patent Application No. 09/528,134 filed on March 17, 2000. *Id.* at (45), (21), (22).

The ’783 patent generally relates to “[a] system and method for real time vehicle guidance by [a] Central Traffic Unit [(CTU)].” *Id.* at Abst.

(57). The Specification describes a vehicle guidance system, which includes vehicles equipped with Individual Mobile Units (IMUs) including Global Positioning System (GPS) units for determining their present position. *Id.* The IMUs are linked communicatively to the CTU computer server. *Id.* The system uses a group of Sample Mobile Units (SMUs) equipped with RF transmitters that communicate their position to the CTU at predetermined time intervals. *Id.* The CTU uses the reported positions of the sample vehicles to create and maintain a network of real time traffic load disposition information for various geographical areas. *Id.* The IMUs may use the real time traffic load disposition information to determine an optimal travel route. *Id.* As explained in the '783 patent, "[t]he CTU broadcasts the updated traffic data collected from a number of sample vehicles via Multicast Broadcasting System thereby enabling the IMUs to dynamically update the desired optimal travel routes." Ex. 1001, 1:10–14.

The Specification of the '783 patent also describes the ability to detect a bottleneck or traffic jam situation when it arises and to estimate a current travel time for a corresponding section of road. *Id.* at Abst. (57). The '783 patent describes three methods for determining travel time over a road segment: (i) theoretical travel times, (ii) regular empirical travel times, and (iii) current travel times. Ex. 1001, 11:46–12:38. Theoretical travel times are based on a calculation of road or section length and maximum speed allowed on the section. *Id.* at 11:46–58. Theoretical travel times are replaced by regular empirical travel times after the CTU monitors all SMU vehicles and records their travel times along sections of roads. *Id.* at 11:59–62. These regular travel times are averaged and transformed into empirical speed coefficients and stored in a central database associated with

a number of categories such as type of road, day of the week, or month. *Id.* at 11:62–66. After sufficient data has been accumulated to estimate accurately regular empirical travel times along a section, the CTU will provide those regular empirical travel times rather than theoretical travel times. *Id.* at 12:5–10.

Current travel times are times obtained from a number of vehicles that have recently traveled along a section of road. Ex. 1001, 12:11–22. The travel times are monitored in real time and the corresponding data for these times are stored in special data structures. *Id.* The data structures for the current travel times contain Exit Lists (EXLs), which are multicasted at short time intervals from the CTU to end-user databases and made available for use by route-finding routines. *Id.* at 12:12–22. A goal of the current travel time monitoring and use “is to detect bottleneck situations, and to modify estimated Current Travel Time (CTT) accordingly.” *Id.* at 12:29–31. The ’783 patent describes “[t]he criterion for using CTT rather than Regular Travel Times (RTT) for various sections is that EXL contains recent enough data.” *Id.* at 12:31–33.

C. Illustrative Claim

Claim 1 is independent and claim 3 is dependent from claim 1. Claim 1 is illustrative of the claims at issue and reproduced below:

1. Multi-layer vehicular navigation system, where preferred starting point and destination point of the navigation route are significantly geographically different from each other, the system comprising:

- a wireless communications system for communicating with client vehicles, and a computer system operatively connected to the communications system, the computer system performing a hierarchically computed route search based on current and statistical section data by choosing roads with fastest

classifications first, the computer system further combining data from intermediate layers subsequently and slowest rated roads last and then applying predicted road section coefficients corresponding to each route section;

receiving device for collecting GPS data at predetermined time intervals from sample vehicles moving within a predefined geographical region;

map database containing digital road maps of a predefined geographical region together with predetermined relevant data on road factors;

said computer system operatively connected to the communications system capable of processing in real time said GPS data and transforming them into appropriately structured data suitable for being stored on the computer;

a database suitable for storing and updating statistical data on traffic loads on individual roads;

statistical application for collecting structured GPS data, computing individual statistical travel time estimates (regular times) for predetermined roads, and storing the results;

statistical means application for periodical updating of the said statistical data using statistical criteria for determining volumes of data necessary for obtaining valid and reliable estimates; and

computational tools for automatic identification of real time traffic jam conditions at various locations of the individual roads by utilizing the sample vehicles for measuring time delays.

Id. at 19:30–20:2.

D. Related Proceedings

The parties state that the '783 patent is asserted in *Makor Issues & Rights Ltd. v. Google Inc.*, Case No. 1:16-cv-00100 (D. Del.). Pet. 2; Paper 4. Including the instant proceeding, Petitioner has filed the following related petitions:

1. IPR2016-01535 (U.S. Patent No. 6,480,783 B1);

2. IPR2016-01536 (U.S. Patent No. 6,615,130 B1);
3. IPR2016-01537 (U.S. Patent No. 6,615,130 B1);
4. IPR2017-00815 (U.S. Patent No. 6,480,783 B1);
5. IPR2017-00816 (U.S. Patent No. 6,480,783 B1);
6. IPR2017-00817 (U.S. Patent No. 6,480,783 B1);
7. IPR2017-00818 (U.S. Patent No. 6,615,130 B1).

E. Evidence Relied Upon

Petitioner relies on the following references:

U.S. Patent No. 6,401,027 B1, filed May 24, 1999, issued June 4, 2002 (Ex. 1006, “Xu”);

U.S. Patent No. 5,845,227, filed Feb. 9, 1996, issued Dec. 1, 1998 (Ex. 1007, “Peterson”);

U.S. Patent No. 5,519,619, filed Mar. 14, 1994, issued May 21, 1996 (Ex. 1019, “Seda”);

U.S. Patent No. 5,475,387, filed Jan. 6, 1995, issued Dec. 12, 1995 (Ex. 1020, “Matsumoto”); and,

TravTek System Architecture Evaluation, July 1995 (Ex. 1004, “TravTek”).

Petitioner relies on the declaration and rebuttal declaration of Michael S. Braasch, Ph.D. (Exs. 1003, 1023). Patent Owner relies on the declarations of Alex A. Kurzhanskiy, Ph.D. (Exs. 2001, 2003). The parties rely on other exhibits as discussed below.

F. Instituted Grounds of Unpatentability

We instituted the instant trial based on the following grounds of unpatentability. *See* Dec. 31–32, Paper 26, 3.

References	Basis	Claims Challenged
TravTek and Seda	§ 103(a) ³	1 and 3
Xu, Matsumoto, and Peterson	§ 103(a)	1 and 3

G. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Under the broadest reasonable interpretation standard, and absent any special definitions, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms or phrases must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to

³ The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (Sept. 16, 2011), took effect on March 16, 2013. Because the application from which the ’783 patent issued was filed before that date, our citations to Title 35 are to its pre-AIA version.

be read from the specification into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Petitioner proposes a construction for two claim terms — “GPS data” and “road section coefficients.” Pet. 7–9. In Reply, Petitioner addresses whether certain terms are subject to 35 U.S.C. § 112 ¶ 6,⁴ and provides a proposed claim interpretation of “traffic jam.” Pet. Reply 1–9, 17–25; Paper 11. In turn, Patent Owner proposes a construction of the claim limitation “traffic jam” as well as addressing whether certain other terms are subject to 35 U.S.C. § 112 ¶ 6. PO Resp. 5–13; Paper 12. Having considered the evidence presented, we determine that only express construction of the terms “GPS data,” “traffic jam,” and “road section coefficients” are necessary for purposes of this Decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”). Additionally, we address the issue of whether certain terms are in means-plus-function format.

1. “GPS data”

Claim 1 requires a “receiving device for collecting GPS data at predetermined time intervals from sample vehicles moving within a predefined geographical region.” Ex. 1001, 19:44–46.

Petitioner contends that “GPS data” means “data that was determined using signals received from GPS satellites or that is related to use of such

⁴ On September 20, 2017, the Board requested additional claim construction briefing related to whether specific claim limitations should be interpreted pursuant to 35 U.S.C. § 112 ¶ 6. Paper 9. Petitioner and Patent Owner both submitted additional briefing (Papers 11, 12) related to § 112 issues.

signals.” Pet. 8. Petitioner relies on the Specification, which provides examples of GPS data as: “present positions, the position time, their IDs, and their speed vectors at specific time intervals.” *Id.* (quoting Ex. 1001, 2:67–3:3). Petitioner argues that these examples demonstrate that information may either be generated from a GPS signal, derived from multiple GPS signals over time, or are related to use of such signals. *Id.*

In our Decision on Institution, we determined that the additional language (“or that is related to use of such signals”) is not reasonable. Dec. 8–9. Our review of the passage in the ’783 patent cited by Petitioner (Ex. 1001, 2:67–3:3) reveals that it discloses how “SMU vehicles communicate to CTU their GPS data” and not as Petitioner suggests how the GPS data is determined. Dec. 9. Thus, we determined that the additional clause Petitioner proposes extends the meaning of GPS data to capture data or information in a manner unrelated to the ’783 patent. *Id.* Neither party has challenged our initial determination.

Based on the final trial record, and for the reasons set forth in the Decision on Institution, we construe “GPS data” to mean *data that was determined using signals received from GPS satellites*. See Dec. 9.

2. “Traffic jam”

Claim 1 requires “computational tools for automatic identification of real time traffic jam conditions at various locations of the individual roads by utilizing the sample vehicles for measuring time delays.” Ex. 1001, 19:66–20:2.

Patent Owner’s Contentions

Patent Owner contends that

“traffic jam” means an abnormal slowdown or bottleneck – one that is worse than a statistically computed, regular travel time on a section of a route. . . . A typical or routine slowdown, *e.g.*, the typical daily congestion during rush hour, does not qualify as a “traffic jam” within the ambit of the ’783 Patent claims.

PO Resp. 5. Patent Owner asserts that its proposed construction distinguishes “traffic jam” and “routine congestion” based on the language of claim 1 as well as the Specification. *Id.* Specifically, Patent Owner argues that “[a] person of ordinary skill in the art would understand that ‘statistical travel time estimates (regular times) for predetermined roads’ would necessarily include regularly-occurring congestion.” *Id.* Patent Owner supports its position by first noting that “claim 1 further goes on to recite the computation of ‘traffic jams,’ by using ‘sample vehicles to measure time delays,’ which a person of ordinary skill in the art would understand must therefore be distinct from regular, statistical, congestion.” *Id.* at 6 (citing Ex. 2003 ¶ 7).

Patent Owner also directs us to column 12 of the ’783 patent that distinguishes between the use of “Current Travel Times” and “Regular Travel Times” – the former being used when an unpredictable change in traffic conditions is detected, but the latter being typically used for route guidance using empirical statistical travel times. *Id.* Patent Owner notes that in the absence of a bottleneck, the “Regular Travel Times” will be used for route guidance. *Id.* (citing Ex. 1001, 12:35–38, 16:43–45). Patent Owner argues that “[i]t is during atypical slowdowns that ‘current travel times, which reflect sudden and unpredictable changes in traffic conditions,’ are used instead of Regular Travel Times.” *Id.* at 7. Patent Owner points to two such examples, “when (1) there is a sufficient number of vehicles

reporting a bottleneck in a sufficiently recent time period,” and (2) when vehicles have spent considerably more time in a section than a corresponding Regular Travel Time. *Id.* at 6 (citing Ex. 1001, 12:31–38). Patent Owner concludes that “[t]he ‘traffic jam’ determination that is disclosed and claimed in the ’783 Patent is a determination of an *abnormal* slowdown.” *Id.* at 7 (citing Ex. 2003 ¶¶ 8–9). Based on its understanding, Patent Owner thus defines “traffic jam” as an “unpredictable (irregular or abnormal) slowdown of all traffic on a segment during a time frame, relative to the regular, statistically established travel time for that segment during that time frame.” *Id.* at 7 (citing Ex. 2003 ¶¶ 10–11).

Petitioner’s Contentions

Petitioner did not propose a construction for the term “traffic jam” in its Petition, but addresses Patent Owner’s position in its Reply. *See* Pet. Reply 1–8. Petitioner contends that we should adopt the plain and ordinary meaning of “traffic jam,” and that Patent Owner has proposed an “improperly narrow construction” of traffic jam. *Id.* at 1. Petitioner argues that Patent Owner’s proposed construction is also not supported by the Specification, not supported by extrinsic evidence, and is inconsistent with Patent Owner’s own expert testimony. *Id.* at 1–7.

Petitioner first contends that Patent Owner’s construction is improper “because it is narrower than Makor’s assertions during litigation.” *Id.* at 1. Petitioner next argues that the Specification does not provide a lexicographer definition for “traffic jam,” and further does not articulate the outermost boundaries for “traffic jam.” *Id.* at 2–3. Petitioner contends that the Specification’s discussion of “Current Travel Times” and “bottlenecks” cannot be used to import limitations into the claim term “traffic jam”

because the claim language does not refer to the former two terms. *Id.* Also, Petitioner argues that, although “traffic jam” and “bottleneck” may be overlapping, they are not otherwise coextensive because the “patent uses ‘traffic jam’ and ‘bottleneck’ side-by-side in the same sentence.” *Id.* at 3–4 (citing Ex. 1001, Abst. (“information on current traffic jams and slow-down bottleneck situations”)). Thus, according to Petitioner, “[e]ven if it was legally proper to construe ‘traffic jam’ and ‘bottleneck’ as coextensive (which it is not), the narrow constructions still could only be proper if the outermost limits of ‘bottleneck’ were narrowly limited [as] it is sometimes used in the preferred embodiment.” *Id.* at 4. Even still, Petitioner notes that the term “bottleneck” would also have to be construed according to its ordinary meaning, which Petitioner maintains is far broader than the narrow constructions. *Id.*

According to Petitioner, the claim language does not impart a special meaning to “traffic jam” because the claim “simply recites ‘computing individual statistical travel time estimates,’ a computation which is necessary regardless which construction is applied.” *Id.* at 5 (citing Ex. 1023 ¶¶ 10–11). Next, Petitioner argues “the claimed ‘automatic identification of real time traffic conditions’ makes no reference to using the ‘individual statistical travel time estimates.’” *Id.* (quoting Ex. 1001, 12:26–35). Thus, according to Petitioner, “the claim is necessarily broader than solely contemplating a comparison of real time traffic to statistical travel times to identify traffic jams.” *Id.*

Finally, Petitioner relies on dictionary definitions of “traffic jam” to argue the ordinary meaning encompasses any significant slowdown, such as “congestion, and resultant stoppage, of traffic, e.g. at a busy junction.” Pet.

Reply 6 (quoting Ex. 1031, 4). Petitioner points out that Patent Owner’s expert similarly agreed that, in ordinary contexts, “traffic jam” would encompass “historical congestion or realtime congestion that also had a historical analog.” *Id.* at 6 (citing Ex. 1028 and Ex. 1030, 19:16–20:17).

Discussion

In construing the claims, our analysis begins with, and remains centered on, the language of the claims themselves. *See Interactive Gift Express, Inc. v. CompuServe Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001). “[C]laims are not to be read in a vacuum, and limitations therein are to be interpreted in light of the specification in giving them their ‘broadest reasonable interpretation.’” *In re Marosi*, 710 F.2d 799, 802 (Fed. Cir. 1983) (quoting *In re Okuzawa*, 537 F.2d 545, 548 (CCPA 1976)). “[T]he broadest *reasonable* interpretation must be reasonable in light of the claims and specification.” *PPC Broadband, Inc. v. Corning Optical Commc’ns RF, LLC*, 815 F.3d 747, 755 (Fed. Cir. 2016). The broadest reasonable interpretation does not mean the broadest possible interpretation, our construction “cannot be divorced from the specification and the record evidence.” *In re NTP, Inc.*, 654 F.3d 1279, 1288 (Fed. Cir. 2011).

The disagreement between the parties as to the scope of “traffic jam” is focused on whether the term should be construed in a broader lay sense as proposed by Petitioner (Pet. Reply 5–7) or whether the term should be construed in accordance with the more specific descriptions found in the Specification as proposed by Patent Owner (PO Resp. 5–10). As addressed in more detail below, we decline to adopt Patent Owner’s proposed claim construction in whole because it adds unnecessary ambiguity. For example, “irregular or abnormal” do not add clarity to the definition. PO Resp. 8. If a

feature is not necessary to give meaning to what the inventor means by a claim term, it would be “extraneous” and should not be read into the claim. *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). The Specification, however, does convey that the term “traffic jam” is not used in a layman’s sense, but instead used as a description of a situation arising from a data comparison meeting certain criteria as discussed below.

We first examine the claim as a whole with a focus on the disputed language. The claim language itself requires “computational tools for automatic identification of *real time* traffic jam conditions at various locations of the individual roads *by utilizing the sample vehicles for measuring time delays.*” Ex. 1001, 19:66–20:2 (emphasis added). By qualifying the claimed traffic jam as being determined in real time, and by using “sample vehicles for measuring time delays,” a person of ordinary skill in the art would understand that traffic jams are more immediate, e.g., real time, than the regular, statistical, congestion described in the ’783 patent. PO Resp. 6 (citing Ex. 2003 ¶ 7) (“[C]laim 1 further goes on to recite the computation of ‘traffic jams,’ by using ‘sample vehicles to measure time delays,’ which a person of ordinary skill in the art would understand must therefore be distinct from regular, statistical, congestion.”). The claim also requires “collecting structured GPS data” and “computing individual statistical travel time estimates (regular times) for predetermined roads.” Ex. 1001, 21:21–24. Reading the claim as a whole suggests that a “traffic jam” must be a sudden unpredictable change of traffic on a segment as compared to these regular times. See Ex. 2003 ¶ 7.

The Specification confirms our interpretation. For example, the Specification describes a “real time traffic Guidance System, which is capable of providing [an] optimal route from the present position of a vehicle to a desired target destination when traffic jams may be present.” *Id.* at 2:13–21. The Specification also describes “a true real time system” that collects and stores three types of data, including: (1) temporary changes in road conditions, (2) regular predictable changes such as everyday slowdowns in rush hour, and (3) “[s]udden unpredictable changes such [as] traffic accidents, traffic congestion due to sudden and drastic changes in traffic arrangements.” *Id.* at 2:36–48. The Specification describes “Travel Times Data” similarly separated into three categories, including a third category of “[s]udden unpredictable changes such [as] traffic accidents, traffic congestion due to sudden and drastic changes in whether [sic] conditions, etc.” *Id.* at 9:47–10:7. The third category of data is meant to encompass traffic jam situations because the Specification further describes, “[a]s to factors in the third category, it appears that even empirical travel times may be unsuitable for describing *traffic conditions arising from sudden and unexpected circumstances which might drastically influence traffic conditions.*” *Id.* at 10:37–50 (emphasis added). As explained in the Specification, “[t]his last feature provides the present invention with truly real time capabilities.” *Id.* Based on these descriptions, the term “traffic jam” is meant to convey real time traffic conditions arising from sudden and unexpected circumstances that might drastically influence traffic conditions.

Moreover, the Specification describes using GPS data of vehicles to obtain “Regular Empirical Travel Times,” which are described as times correlated to regular predictable changes for a particular segment, such as

everyday slowdowns in rush hour. *Id.* at 11:59–12:10. The Specification teaches that data from regular travel times may be stored in a central database and attached to sections of roads according to a number of categories, such as type of road or day of the week. *Id.* at 11:60–12:4, 12:31–33. The regular travel time described in the Specification corresponds to the claim limitation of “collecting structured GPS data, computing individual statistical travel time estimates (regular times) for predetermined roads, and storing the results.” *Id.* at 21:21–24. This language specifically ties the regular time value to a “predetermined road,” and additional claim limitations require storing the results of the regular times according to subdivisions based on time factors. As discussed below, regular times are used to determine whether a traffic jam situation exists.

The Specification further describes detecting a “bottleneck situation,” which we determine is used synonymously with “traffic jam.” *Id.* at 12:26–38. For example, the Abstract describes updating travel times based on “new information on current traffic jams and slow-down bottlenecks.” *Id.* at Abst. The Specification uses the terms “traffic jam” and “slow-down bottleneck” in the same context to convey situations where sample vehicles have spent considerably more time than “a regular time stored in the database.” Ex. 1001, Abst., 12:36–37 (“considerably more time on S than the corresponding [Regular Travel Times] RTT”). In one embodiment for detecting a bottleneck, or traffic jam, a “Current Travel Time” (CTT) is used and compared to the “Regular Travel Time” (RTT) when a time interval is “short enough to consider the detected bottleneck to be current” and when each vehicle “has spent considerably more time” on a segment “than the

corresponding RTT.” *Id.* at 12:29–38. Such a situation is “interpreted as a bottleneck” or traffic jam. *Id.*

The traffic jam discussion in the Background of the Invention is not particularly probative of how that term should be construed in the context of the ’783 patent. The background explains how another patent (U.S. Patent No. 5,699,056) defines a situation as a jam. *See* Ex. 1001, 1:48–52 (“defines a situation as a jam if the average speed is less than a predetermined value”). The context makes clear that the ’783 patent distinguishes how it determines a traffic jam compared to the ’056 patent. *See id.* at 1:53–2:10 (“solution contains a number of problematic points that require further development” and “[a]verage speeds will in this case give no indication of this dynamic change, the same being true of a dissipating jam”). We do not view the discussion of “a jam” in the Background of the Invention as particularly helpful in determining the scope of the claim term “traffic jam” because that description also dissuades using average speeds that are “incapable of catching a trend.” *Id.* at 2:7.

Thus, the Specification consistently equates a traffic jam to situations where sudden and unpredictable changes in traffic conditions result in considerably more time spent on a segment, as compared to regular times. *See id.* at Abst., 2:43–45, 10:5–7, 10:37–43, 12:36–37. Based on the Specification discussed above, and reading claim 1 as a whole, we determine that “traffic jam identification” based on measured time delays of sample vehicles requires a baseline “regular time” for comparison to determine whether or not a traffic jam condition exists. Based on the final trial record, we construe “traffic jam,” broadly, but reasonably, as *a sudden*

unpredictable change of traffic in a segment as compared to regular times, i.e., individual statistical travel time estimates.

3. “*predicted road section coefficients*”

Claim 1 requires “applying predicted road section coefficients corresponding to each route section.” Ex. 1001, 19:42–43.

Relying on the testimony of Dr. Braasch, Petitioner contends that this claim limitation should be interpreted as “coefficients associated with road sections in a route search.” Pet. 7 (citing Ex. 1003 ¶ 36). Petitioner points out that the “patent specification never mentions the term ‘road section coefficient’ (and thus does not provide a lexicographic definition for the phrase), but it does refer to several other types of coefficients.” *Id.*

Petitioner notes that the Specification discusses:

- “traffic volume coefficients” (Ex. 1001, 8:23–25);
- “speed coefficients” which include “empirical speed coefficients” and “theoretical speed coefficients” (*id.* at 9:48–55; 10:29–36; 11:26–34; 11:62–65”); and,
- “new time coefficients” (*id.* at 16:58–65), which are weighting factors used to reflect delays due to “road disturbances such as road accidents” (*id.* at 16:58–65; 19:19–22).

Pet. 7. Petitioner argues that by using a generic term “road section coefficients,” the Specification is not meant to limit the term to any of these specific examples of coefficients, but would encompass each. *Id.*; Tr. 5:4–7:6, *id.* at 7:4–6 (“the predicted road section coefficients are simply known values, known road section coefficients that relate to a road section used to predict something in the future”). Similarly, as Dr. Braasch testifies:

a POSITA would have understood that the use of the generic term “road section coefficients” in claim 1 indicates that the term was not intended to be limited to any specific example coefficient described by the ’783 patent specification, but rather was intended to encompass the broader category of any coefficient or weighting factor associated with a road section.

Ex. 1003 ¶ 36. Further, Dr. Braasch also explained that a person of ordinary skill in the art would not understand “the plain and ordinary meaning of the term ‘predicted’” to “require a value that is ‘dynamic / variable.’”

Ex. 1023 ¶ 27. Thus, according to Petitioner, the broadest reasonable interpretation of “road section coefficient” is a coefficient associated with a road section. Pet. 7–8.

Patent Owner does not advocate for a specific claim construction, but in its argument, Patent Owner contends that the “predicted road section coefficients” cannot be static coefficients because such coefficients are not predicted. PO Resp. 22. Patent Owner makes the argument that “[f]or coefficients to be ‘predicted,’ by definition, these coefficients must be dynamic / variable, and must estimate something in the future.” *Id.* at 23. Patent Owner, however, does not provide any citation to support this contention. *See id.*

Patent Owner further contends “that ‘coefficient,’ in the context pertinent to this claim, is a multiplicative factor applied to the ‘theoretical’ speed for the segment. *Id.* (citing Ex. 1001, 11:28–30). Thus, according to Patent Owner, “the ‘coefficients’ in question are provided to transform the theoretical travel times, based on static factors, such as the speed limit, into predicted times based on historical and current measurements.” *Id.*; Tr. 42:6–24.

Based on the final record, including the intrinsic evidence before us, we find Petitioner’s proposed construction more persuasive. Patent Owner attempts to import an overly narrow construction for “predicted road section coefficients” by demanding that all such coefficients must be “dynamic” or “variable.” See PO Resp. 23. Patent Owner does not point to any portion of the Specification showing that dynamic or variable coefficients are required by the claim. Patent Owner relies on one example from the Specification (*id.* at 23), but “empirical speed coefficients” are merely one of several examples of coefficients disclosed by the ’783 patent. See *supra*. None of the coefficients in the Specification are described as being “predicted,” “dynamic,” or “variable” in the ’783 patent. Thus, we do not find an intent to limit the “predicted road coefficients” to any one coefficient identified. Therefore, the term “road section coefficients” is not limited to one optional example in the Specification. Accordingly, “road section coefficients” means *coefficients associated with road sections in a route search*. These coefficients must also be capable of being applied to each route section as further required by the surrounding claim language. See Ex. 1001, 19:42–43.

4. “receiving device for collecting GPS data at predetermined time intervals from sample vehicles moving within a predefined geographical region” [1.2]

Pursuant to our request, the parties have also provided briefing addressing whether certain claim limitations fall within 35 U.S.C. § 112 ¶ 6. The discussion below addresses those terms briefed at our request.

Petitioner argues that this limitation is not subject to interpretation pursuant to 35 U.S.C. § 112 ¶ 6. Pet. Reply 17–19. Patent Owner contends “[t]his language is not in mean-plus-function format,” and “[t]here is

sufficient structure recited in the limitation itself, which would be understood by a person of ordinary skill in the art.” PO Resp. 11.

We determine that this language is not in means-plus-function format and likewise find it unnecessary to otherwise construe the clause.

5. *“statistical application for collecting structured GPS data, computing individual statistical travel time estimates (regular times) for predetermined roads, and storing the results” [1.6]*

Patent Owner contends that “[t]his term is in means-plus-function format, requiring construction in accordance with 35 U.S.C. § 112 ¶ 6.” PO Resp. 12; Paper 12, 5. Patent Owner recognizes that “the limitation does not contain the word ‘means,’ giving rise to a presumption that § 112 ¶ 6 should be applied,” but argues that “the term includes three functions, ‘collecting structured GPS data,’ ‘computing individual statistical travel time estimates,’ and ‘storing the results.’” *Id.* According to Patent Owner, “[t]hese functions are recited in conjunction with a nonce phrase, ‘statistical application for,’ and there is no structure or acts in the limitation itself.” *Id.* Patent Owner argues that “[t]wo of the functions . . . are easily understood by a person of ordinary skill in the art and thus, on their own, contain sufficient structure / acts to otherwise escape construction under § 112 ¶ 6,” but the limitation “‘computing individual statistical travel time estimates’ is a further, and more complex function, for which there is no structure or other acts recited in the limitation itself.” *Id.* at 12–13. Neither Patent Owner, nor its expert Dr. Kurzhanskiy, provide any further explanation to support this theory. *See id.*; Ex. 2001 ¶¶ 8–10.

Petitioner argues that “Makor must ‘**demonstrate[]** that the claim term fails to recite[] sufficiently definite structure’ to overcome the presumption against application of 112/6,” and Patent Owner has failed to provide such

analysis. Pet. Reply 19 (quoting *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2016) (emphasis added in Pet. Reply)). Petitioner further argues that the Petition provided ample evidence indicating that § 112 ¶ 6 should not apply to this element [1.6]. As explained by Dr. Braasch, a POSITA would have understood element [1.6] to have “sufficiently definite meaning” as articulated in *Williamson*, because a POSITA would have understood “computing individual statistical travel time estimates” to simply describe averaging collected travel times. *Id.* at 21 (quoting Ex. 1003 ¶ 153).

Dr. Braasch explains that “based on my knowledge and experience in the field of navigation systems, it is clear that the claim recitation of ‘computing individual statistical travel times estimates (regular times) for predetermined roads’ also would have been understandable to a POSITA as reciting definite structure.” Ex. 1023 ¶ 35. As testified by Dr. Braasch, a person of ordinary skill would have recognized that this limitation “simply indicates averaging of collected statistical travel times for various road segments covered by the system.” *Id.* (“Calculating an average is a basic mathematical function and therefore, as would have been recognized by a POSITA, calculation of an average of collected statistical travel times also constitutes a basic computer function.”).

We determine that the claim limitation “statistical application for collecting structured GPS data . . .” is not in means-plus-function format because it does not recite traditional “means-for” language and also because the claim limitation has sufficiently definite structure. We find Dr. Braasch’s testimony persuasive that a POSITA would have understood “computing individual statistical travel time estimates” to simply describe

averaging collected travel times. Ex. 1023 ¶ 35; Ex. 1003 ¶ 153. We agree with Petitioner’s argument that, “the ’783 patent discloses that the ‘statistical or empirical travel times’ are ‘averages by necessity.’” Pet. Reply 21 (quoting Ex. 1001, 10:26–29) (citing Ex. 1023 ¶ 37).

Patent Owner has also taken inconsistent positions between IPRs with respect to this limitation. In IPR2017-00818, U.S. Patent No. 6,615,130 is challenged. Regarding claim 6 of that patent, Patent Owner states: “Patent Owner believes that none of the terms in claim 6 are subject to interpretation under 35 U.S.C. § 112 ¶ 6.” IPR2017-00818, Paper 14, 12. Claim 6, similar to claim 1 at issue in this proceeding, requires “statistical application for collecting structured GPS data, computing individual statistical travel time estimates (regular times) for predetermined roads, and storing the results.” IPR2017-00818, Ex. 1001, 22:10–13. *See* Tr. 10:15–12:8 (counsel for Petitioner arguing “but that the exact same language in the ‘818 proceeding on the ‘130 patent is not subject to 112-6” and “[s]o if the position is that that language somehow provides structure for this part of that element in the ‘130, which is apparently the position because that’s what they say in the Patent Owner response for ‘818, then that same virtually identical language in the ‘783 Claim 1 and Claim 4 also then would provide structure”). Patent Owner has not explained persuasively why the same claim language would invoke § 112 ¶ 6 in this proceeding, but not in IPR2017-00818.

As noted, the presumption of § 112 ¶ 6 does not apply, and Patent Owner fails to provide sufficient analysis of evidence in the Specification related to the claim phrase and certainly never proffers evidence showing why this particular term is “more complex” as alleged. *See Williamson*, 792

F.3d at 1348. We determine that this language is not in means-plus-function format and likewise find it unnecessary to otherwise construe the clause.

6. *“statistical means application for periodical updating of the said statistical data using statistical criteria for determining volumes of data necessary for obtaining valid and reliable estimates” [1.7]*

Both parties are in agreement that § 112 ¶ 6 does not apply to this limitation because the term “statistical means application” in element [1.7] refers to the mathematical term “statistical means” (i.e., akin to “statistical averages”) modifying the noun “application.” Pet. Reply 17–19; PO Resp. 13 (“referring to the statistical mean function, a type of averaging”); Tr. 15:9–19. We adopt the position advanced by the parties that § 112 ¶ 6 should not apply and determine that no additional claim construction is required for these terms.

7. *“computational tools for automatic identification of real time traffic jam conditions at various locations of the individual roads by utilizing the sample vehicles for measuring time delays” [1.8]*

Petitioner argues that this limitation is not subject to interpretation pursuant to 35 U.S.C. §112 ¶ 6. Pet. Reply 17–19. Patent Owner contends “[t]his language is not in mean-plus-function format,” and is “not subject to construction pursuant to 35 U.S.C. §112 ¶ 6.” PO Resp. 10–11.

We determine that this language is not in means-plus-function format and likewise find it unnecessary to otherwise construe the clause, except for the traffic jam limitation addressed above.

II. ANALYSIS

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375,

1378 (Fed. Cir. 2015). To prevail, Petitioner must establish the facts supporting its challenge by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

A. Principles of Law

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). We analyze the following grounds based on obviousness in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). In that regard, Petitioner’s expert, Dr. Braasch, testifies that:

a POSITA would have had a combination of experience and education in electrical engineering and navigation systems. This

typically would consist of a minimum of a bachelor degree in electrical engineering or a related engineering field plus 2-5 years of work and/or research experience in the field of electrical engineering and its subfield of navigation systems.

Ex. 1003 ¶ 19. Patent Owner does not contest this level of skill for the person of ordinary skill in the art.

Based on the final trial record before us, we adopt generally Dr. Braasch's assessment of a person of ordinary skill in the art. Namely, that the person of ordinary skill in the art would have (1) a bachelor of science in electrical engineering or a related engineering field, and (2) 2–5 years of experience in the field of navigation systems.

C. Obviousness Ground Based on TravTek and Seda

We originally denied institution of claims 1 and 3 on the basis that these claims would have been unpatentable as obvious over TravTek and Seda under 35 U.S.C. § 103(a). *See* Dec. 12–20. As noted above, we later instituted review of these claims. Paper 26. Based on the final trial record before us, including consideration of prior briefing and related decisions addressing the issues before us, we are not persuaded that Petitioner has established by a preponderance of the evidence that claims 1 and 3 are unpatentable over TravTek and Seda for the reasons explained below.

1. TravTek (Ex. 1004)

TravTek has a date stamp indicating publication in July 1995. Pet. 4; Ex. 1004, 2. Petitioner also provides the Declaration of Lisa Rowlison de Ortiz (Ex. 1018), the Head of Catalog and Metadata Services at University of California-Berkeley Library, as evidence that TravTek was publicly available on January 2, 1997, or earlier. Pet. 4–5.

TravTek describes a system providing motorists in Orlando, Florida with traffic information and route selection. Ex. 1004, 8, 20, 31.⁵ The “Foreword” of TravTek describes “an advanced driver information and traffic management system that provided a combination of traveler information services and route navigation and guidance support to the driver.” *Id.* at 4. “One of the primary objectives of the TravTek system was to provide drivers with routes that minimized their individual travel times to their destinations.” *Id.* at 38. TravTek states that “[l]ink travel time data were received automatically from the probe vehicles, freeway management system, and arterial control management system.” *Id.* at 5 (Form DOT F 1700.7). TravTek explains that “the time required for the TravTek vehicle to travel a link was determined by monitoring the time it crossed the beginning and end of the link.” *Id.* at 88.

“Using information provided by the TMC, software in the vehicle continuously determined the optimum route that minimized the travel time to a destination.” *Id.* at 38. TravTek further discloses that “the double ended search process continued to search for a minimum travel time path . . . until a connected path was formed between the origin and the destination.” *Id.* at 79. In a similar manner, TravTek describes rerouting drivers around areas of congestion and incidents. *Id.* Vehicles in the network would receive once a minute updates of the travel times on links in the TravTek network, and additionally, “the vehicle continuously searched for routes that provided a significant time savings to the driver.” *Id.*

⁵ For articles cited by Petitioner, we rely on Petitioner’s inserted page numbering set forth at the bottom right of each page. See 37 C.F.R. § 42.63(d)(2).

2. *Seda (Ex. 1019)*

Seda discloses “[a] route planning method, and apparatus, for constructing a route connecting a given origin location and a given destination location from a hierarchical map database having more than one layer, where each layer represents a different level of detail.” Ex. 1019, Abst. Seda describes a hierarchical map database with more than one layer, wherein “[e]ach layer represents the same geographical area in successive detail.” *Id.* at 1:50–52. An open list of road segments may be extracted from an initial planning layer of the hierarchical map database. *Id.* at 4:13–19. In one embodiment, a best candidate road segment is selected from the open list of road segments “based on a traditional A* method.” *Id.* at 4:20–32. The A* method is described as an estimation technique to rate potential routes that does so by summing an actual cost of a partially planned route under consideration and an estimate of the cost to complete the route in order to select a best route. *Id.* Seda then describes another planning layer that can be selected from the more than one layer of the hierarchical map database. *Id.* at 4:33–43. “Here the selection is dependent on a distance between the given destination location and a location associated with the candidate road segment.” *Id.*

3. *Discussion*

Claim 1 recites “computational tools for automatic identification of real time traffic jam conditions at various locations of the individual roads by utilizing the sample vehicles for measuring time delays.” Ex. 1001, 19:66–20:2 (the “traffic jam limitation”). Claim 1 also requires “the computer system performing a hierarchically computed route search based on current and statistical section data by choosing roads with fastest

classifications first, the computer system further combining data from intermediate layers subsequently and slowest rated roads last.” *Id.* at 19:35–41 (“the hierarchically computed route limitation”). Below, we consider the parties’ contentions with respect to each of these two limitations and determine that, based on the final trial record, Petitioner has not established by a preponderance of the evidence that the asserted prior art teaches either limitation.

Traffic Jam Limitation

The issue of whether TravTek teaches the traffic jam limitation was decided by us in IPR2016-01535, and again more recently in IPR2017-00816 and IPR2017-00817. Because the ground based on TravTek and Seda was newly instituted at the end of the current trial proceeding, and because the issue of whether TravTek teaches the traffic jam limitation has been fully briefed and considered in related proceedings, we adopted the parties’ agreement to limit supplemental briefing to the issue of whether Seda teaches the hierarchically computed route limitation discussed in detail below. *See* Paper 28; Ex. 3001.

According to Petitioner, the TravTek system uses time delays measured by sample vehicles to compute real-time traffic on the roads and the current conditions are used in the routing (and rerouting) calculations. Pet. 40–41 (citing Ex. 1004, 76, 94–96, 61, 44, 20, 29, 38, 65, 55; Ex. 1003 ¶ 95). Petitioner contends TravTek teaches calculating an optimal route using “generated, current (real-time) traffic information” and TravTek provides output displays in the form of “[c]ongestion level displays and map color displays in the vehicle.” *Id.* (quoting Ex. 1004, 76, 44, 20, 29, 38, 65) (emphasis omitted). Petitioner also notes that TravTek recognizes

incidents or congestion and the impact on route selection and provides drivers with the opportunity to accept new routings taking into consideration the changed conditions. *Id.* at 41 (citing Ex. 1004, 22).

Patent Owner disputes Petitioner’s analysis in arguing that TravTek fails to teach the traffic jam limitation. *See* Prelim. Resp. 10–12; Ex. 2003 ¶¶ 12–15. Specifically, Dr. Kurzhanskiy testifies that “TravTek does not disclose any comparison of current road conditions with regular travel times for determining ‘real time traffic jam[s]’ as claimed in the ’783 Patent,” and the “Dynamic Link Message” that uses “Free flow link time” “has no concept of what would be normal congestion versus abnormal congestion.” Ex. 2003 ¶¶ 13, 14.

We have considered Petitioner’s arguments, including those made at oral hearing and in related cases as fully discussed in IPR2017-00816 and IPR2017-00817.

Based on the final record, and consistent with our decisions in IPR2016-01535, IPR2017-00816, and IPR2017-00817, Petitioner has not provided sufficient arguments or credible evidence to support a finding that TravTek teaches the traffic jam limitation. Specifically, Petitioner has not persuasively shown how TravTek teaches the use of measured time delays of sample vehicles for computing a real time traffic jam. As explained above, we construe the term “traffic jam” to mean “a sudden unpredictable change of traffic in a segment as compared to regular times, i.e., individual statistical travel time estimates,” and thus, the claimed “measuring time delays” must also be in relation to regular times. Claim 1 also requires that the traffic jam identification is determined by utilizing the sample vehicles

for measuring time delays. Petitioner has not directed us to record evidence sufficient to show that TravTek teaches these claim elements.

Petitioner's analysis of TravTek picks and chooses pieces of the reference while ignoring its overall structure and operation. For example, with respect to the traffic jam limitation, the original Petition is void of any discussion of the data fusion process actually used to determine potential congestion in TravTek. *See* Pet. 40–41; Ex. 1004, 57–63. Petitioner instead relied on the data fusion process as teaching a different claim limitation, i.e., the “regular times” claim limitation, which correlates with regular predictable changes in traffic congestion. Pet. 35–36. TravTek explains that “[d]ata fusion was the process by which all incoming traffic information was received and evaluated *to derive an estimate* on a minute by minute basis of the link travel times in the system.” Ex. 1004, 57 (emphasis added). Although TravTek teaches routing around areas of congestion, such a function does not inherently teach or suggest the traffic jam limitation because the data fusion process does not make a comparison between vehicle times to determine if an unpredictable change in link time exists, as further explained below. The data fusion process also does not compare current probe vehicle times with historic travel times.

We understand TravTek as disclosing a ratio of (current link time) / (free flow link time) (Ex. 1004, 63) and the data fusion process determines the current link time input to this equation – the data fusion process itself does not compare times. *Id.* at 57–63. TravTek's ratio or formula, however, does not rely upon *a time delay measurement derived from sample vehicles*. First, the free flow link time is based on a posted speed limit and not regular times obtained from vehicle probe data. *See* Ex. 1004, 58–60, 63. Second,

the data obtained from a probe vehicle is one of six data sources that might be used in estimating the current link time. *Id.* Each of the six data sources has “an associated score that determined its priority of consideration,” and the score of the data source begins to decay with time. Ex. 1004, 58. TravTek uses a data fusion process to determine which of these six data sources should be used to estimate the current link time. *Id.* at 58, 59. TravTek describes that “[a]t any point in time, the data source with the maximum score was considered the best estimate and the data from that source was assigned to the link travel time.” *Id.* at 59. The link travel time ratio (current link time) / (free flow link time) is described as “1 of 32” encoded ratios. Ex. 1004, 63–64 (Table 4). As explained in more detail below, even if vehicle probe data is used in the data fusion process, Petitioner’s arguments and evidence fail to demonstrate that the vehicle probe data is used to measure time delays to determine if unusual congestions exists as compared to regular times. *See id.* at 58–64.

The Petition lacks sufficient analysis of the data fusion process and evidence demonstrating how it would relate to the traffic jam limitation as we have construed it. *See* Pet. 40 (citing Ex. 1004, 76, which states a vehicle may function as a probe to determine current travel times “for integration in the current link travel time data base” but providing no additional explanation). Petitioner’s conclusory analysis does not explain how the vehicle probe data would be used in the data fusion process for measuring time delays of vehicles for determining whether a traffic jam condition exists. Although Petitioner cites to TravTek’s mention of congestion level displays that represent the status of each traffic link, (Pet. 41) this argument is not persuasive for several reasons, including that

these outputs are based on the ratio that may or may not use vehicle probe data. Further, even if vehicle probe data has been used, the level of congestion depicted on the display is not representative of real time delays of sample vehicles compared to regular times. Instead, the displayed congestion represents a ratio of current link time, which is determined through a data fusion process that may or may not use vehicle probe data, compared to the free flow link time, or posted speed limit. Ex. 1004, 63 (“Congestion level displays . . . were determined both by the types of links represented and by the associated ratio.”). Further, TravTek teaches that the data fusion process only derives an estimate of the link travel times in the system. Ex. 1004, 57, 126 (“It selected the travel time source believed to provide the ‘best’ estimate of actual conditions on the link.”).

Regardless, even if vehicle probe data is used in the ratio above (as an input to the numerator “current link time”), it is not used as the claim requires, and Petitioner has not shown how probe data from vehicles is compared to a regular time. See Ex. 1004, 58–63. Whether the vehicle probe data of TravTek is used is dependent on a “fuzzy logic” process involving “quality of data and aging” and not whether any time delay between vehicles may exist, as required. *Id.* at 58 (“[f]uzzy logic . . . deals with ambiguities and vagueness in data”), 59 (“A weight and decay time was assigned to each of the six data source[s]. . . . At any point in time the data source with the maximum score was considered the best estimate and the data from that source was assigned the link travel time.”), 126.

Based on the final trial record, Petitioner’s arguments and evidence do not establish persuasively how TravTek compares vehicle probe data to a regular time in order to determine time delays. For example, “[t]he link

travel times were encoded as 1 of 32 ratios,” and Petitioner has not established how these ratios can represent time delays between vehicles in order to determine whether an unpredictable change in traffic conditions may exist, i.e., a traffic jam, as compared to regular travel times. There is no disclosure in TravTek that compares current road conditions from sample vehicles with a regular travel time in order to determine congestion.

We also do not agree that use of “historical data” teaches the traffic jam limitation. *See, e.g.*, Tr. 24:21–29:2. TravTek notes that historical data is one of the “six different data sources,” and “historical travel times were sometimes the only candidates for input to the data fusion process.” Ex. 1004, 58, 60. Petitioner’s arguments and evidence do not persuasively show how this historical data would meet the traffic jam limitation. Using historical data as the current link time in the ratio above ($((\text{Current link time}) / (\text{Free flow link time}))$) would result in a ratio based on historical time divided by the posted speed limit (free flow link time). Ex. 2003 ¶ 14 (“comparing Current Link Time with Free flow link time, has no concept of what would be normal congestion versus abnormal congestion”). TravTek’s single link travel time ratio represents one data point, and Petitioner does not explain persuasively how this one data point relates to determining a real time traffic jam based on measuring time delays of vehicles – there is no way to determine current real time delay using just historical data and Petitioner directs us to no teaching in TravTek of a direct comparison of this historic data to current vehicle link probe times.

For the foregoing reasons, we are not persuaded by Petitioner’s contention that TravTek teaches the traffic jam limitation.

Hierarchically Computed Route Limitation

As noted above, claim 1 requires, in pertinent part, “the computer system performing a hierarchically computed route search based on current and statistical section data by choosing roads with fastest classifications first, the computer system further combining data from intermediate layers subsequently and slowest rated roads last.” Ex. 1001, 19:35–41 (“the hierarchically computed route limitation”).

Petitioner asserts that TravTek teaches most limitations of claim 1 and relies on a combination of TravTek and Seda for certain limitations, such as the hierarchically computed route limitation. For example, Petitioner contends “[w]hile TravTek does not expressly disclose a top-down hierarchical search in which fastest classifications of roads are searched first followed by intermediate layers and slowest rated roads last, such route planning processes were commonly implemented in prior art systems.”

Pet. 17. Petitioner argues that

Seda plainly suggests such a route determination process. Seda describes an example in which roads are classified into four layers (layers 0 to 3) with layer 0 representing the greatest level of detail (showing all local roads); layer 1 representing a lower level of detail with “all of the local road segments . . . eliminated”; layer 2 representing even less detail, with “collector road segments” eliminated, and layer 3 representing “limited access, for instance highway, road segments.”

Id. (quoting Ex. 1019, 1:33–48). Petitioner notes that Seda discloses a route planning process incorporating the hierarchical map database by selecting an initial planning layer and then a best candidate road segment from the current layer. *Id.* at 18. Petitioner then contends that because first selected roads (i.e., the best candidate road segment) may contain highways, Seda

chooses the roads with the fastest classifications first. Thereafter, another planning layer is selected from the hierarchical map database that may contain roads classified below highways, and then finally a layer using collector or local roads is selected in the process. *Id.* at 17–18. According to Petitioner, Seda’s system continues the route search process by traversing to downward layers to get more detail. *Id.* at 19. Thus, Petitioner asserts “Seda discloses choosing slowest rated roads (e.g., local roads) last” as required by claim 1. *Id.* at 19–20 (“Therefore, Seda discloses choosing fastest rated roads (layer 3) first, intermediate layers subsequently (layers 2 and 1), and slowest rated roads last (layer 0).”).

Patent Owner disputes whether Seda teaches the hierarchically computed route limitation. PO Supp. Resp. 1–4. Patent Owner’s primary contention is that the Seda’s disclosed layers are not classified based on speed. *Id.* at 2. According to Patent Owner, each of Seda’s layers “represents a different level of detail,” but such detail is not based on a classification of speed. *Id.* (quoting Ex. 1019, 3:13–17). Patent Owner notes that “Seda does not disclose the use of segment travel time as a cost metric,” but instead “Seda uses *distance* as a cost metric and applies an A* optimization to find the shortest route.” *Id.* (citing Ex. 1019, 2:56–60 (“construct optimal routes in terms of allocating planning resources effectively and generating a *shortest route*”)).

Patent Owner next contends that Seda does not progress downward through its layers, instead Seda’s algorithm can proceed both downward and upward in its hierarchy, and therefore, Seda does not teach choosing roads with fastest classifications first and choosing slowest rated roads last as required by claim 1. *Id.* As argued by Patent Owner, Seda’s algorithms do

not progress down through its hierarchy, but instead the algorithms perform “traversing between layers.” *Id.* (citing Ex. 1019, 2:58 (“traversing between layers”), 5:35–44). Patent Owner argues that “[b]ecause Seda cannot deal with congestion as part of optimizing a route on a given level, it alters the order of processing to route around congestion by jumping levels where necessary to do so.” *Id.* at 4. “Thus,” according to Patent Owner, “even if Seda groups road segments by speed, which Patent Owner asserts it does not, it still fails to meet the claimed limitation of ‘fastest classifications first . . . slowest rated roads last.’” *Id.* Patent Owner notes that although “Seda discloses use of the A* algorithm (*id.* at 4:20-32), but its classifications and its costs are based on distance.” *Id.* This is in comparison to the disclosure of algorithm A* in the ’783 patent, which “is applied to travel times not distances.” *Id.* (citing Ex. 1001, 14:6–9, Ex. 1019, 4:33–37). As such, Patent Owner argues that “Seda provides an insufficient basis to find it obvious to introduce the element of the Hierarchical Element.” *Id.*

Petitioner responds that “Seda’s layers are based on road speed classifications in precisely the same conventional manner as the preferred embodiment of the ’783 patent.” Pet. Supp. Reply 1 (emphases omitted). Petitioner argues that “Seda’s highest classification layer is identified in the same manner proposed in the ’783 patent’s ‘hierarchy of road layers’ in which the highest classification layer for the ’783 Patent includes ‘interstate and state highways,’” and that “Seda’s ‘layer 3 would only represent limited access, for instance highway, road segments.’” *Id.* (citing Ex. 1001, 14:26–30; Ex. 1003 ¶¶ 48, 58–59). Petitioner notes that the “disputed portion of claim 1 states that the computer system chooses ‘slowest rated roads last,’” but “this is precisely how Seda’s system operates,” because “Seda’s system

continues to ‘traverse downwardly’ through the layers until the route is completed.’” Pet. Supp. Reply 7 (citing Ex. 1019, 4:55–5:54; 2:15–18).

Based on the record before us, Petitioner’s arguments and evidence do not establish persuasively that the proposed combination of TravTek and Seda teaches the hierarchically computed route limitation. Ex. 1001, 19:35–41. We first note that the claimed hierarchically computed route limitation is “based on current and statistical section data” such that this specific data is used to perform the hierarchically computed route search to choose roads with fastest classifications first and slowest rated roads last. *Id.* This hierarchical classification is tied to the current and statistical data that determines which roads are actually fastest. The claimed hierarchical classification thus does not depend upon their classification as a highway or a local street for example. Petitioner confuses a road’s “rating” based on level of detail in Seda with actual speed classifications based on current and statistical section data as claimed. Classification from fastest to slowest based on current and statistical section data would be oblivious to road type. We are not convinced that Petitioner has presented sufficient evidence and testimony to establish by a preponderance of the evidence that TravTek and Seda teach this limitation as claimed.

The initial classifications established in Seda are based on a “best candidate road segment.” Ex. 1019, 4:20–32. The additional planning layers in Seda are “dependent on a distance between the given destination location and a location associated with the candidate road segment.” *Id.* at 4:33–43. Seda’s mention of “congestion” (see step 319 in Fig. 3) is a follow on step that allows the avoidance of layers with congestion such that when congestion is present, the process traverses downwardly from the current

layer to a layer having more detail (step 323). Seda, however, does not establish a classification of roads based on fastest to slowest.

Petitioner equates Seda's classification of highways and local roads based on level of detail or route distance to choosing fastest rated roads (layer 3) first, intermediate layers subsequently (layers 2 and 1), and slowest rated roads last (layer 0). *See* Pet. 19–20. Seda's categorization based on level of map detail (road type) or distance does not teach a hierarchy route search “based on current and statistical section data” to identify roads with the fastest classifications to slowest as required by claim 1. *See* Ex. 1001, 19:36–41. Selection and use of travel times instead of distances is distinct as discussed in the '783 patent. For example, the '783 patent differentiates the A* method based on distance stating that “[i]n the present invention, algorithm A* is applied to travel times not distances. As indicated above, when feasible, current travel times are being used as a basis for forecasting future travel times, see FIG. 21.” *Id.* at 14:6–9. In comparison, Seda appears to adopt the A* algorithm based on either “actual cost” or distance. *See* Ex. 1019, 4:20–37 (“Here, the selection is dependent on a distance between the given destination location and a location associated with the candidate road segment.”).

Petitioner's arguments and evidence has not establish by a preponderance of the evidence that Seda teaches the hierarchically computed route limitation because Seda does not establish a classification of roads based on fastest to slowest. Ex. 1001, 19:35–41.

4. Summary

Petitioner does not rely on Seda to rectify the deficiency in TravTek related to the traffic jam limitation. Considering the final record before us,

we conclude that Petitioner has not proven by a preponderance of the evidence that claim 1 is unpatentable as obvious based on the combination of TravTek and Seda. Claim 3 depends from claim 1, and likewise includes both the traffic jam limitation and the hierarchically computed route limitation, which we determine are not taught by TravTek and Seda.

D. Obviousness Ground Based on Xu, Matsumoto, and Peterson

We instituted review on the basis that claims 1 and 3 would have been unpatentable as obvious over Xu, Matsumoto, and Peterson under 35 U.S.C. § 103(a). Dec. 32. Based on the final trial record before us, we are persuaded that Petitioner has established by a preponderance of the evidence that claims 1 and 3 are unpatentable as obvious over Xu, Matsumoto, and Peterson for the reasons explained below.

1. Xu (Ex. 1006)

Xu “relates to traffic data collection and intelligent routing systems for highway vehicles and, in particular, to a system and method for remotely collecting real-time traffic data and providing traffic forecasts and travel guidance for drivers of vehicles equipped to utilize the system.” Ex. 1006, 1:6–11. The Specification, in particular the Background of the Invention, states that “[t]here are several known methods for collecting traffic data.” *Id.* at 3:23–24. Xu goes on to describe external vehicle sensing systems used to collect traffic volume and vehicle speed, then Xu states “a method for collecting dynamic traffic data using equipment installed in vehicles is required.” *Id.* at 3:47–48.

Xu describes a traffic data collection system where “[e]ach vehicle **20** is equipped with an in-vehicle device **21** which receives global positioning

information data from [GPS] satellites **42**.” *Id.* at 6:31–34. In-vehicle device relays road positions of the vehicle to a traffic service center (TSC). *Id.* at 6:40–45. As depicted in Xu Figure 1 below, “[t]he [TSC] **60** uses the road positions of all vehicles **20** and the information obtained from the external party data sources to provide real-time road traffic conditions for the roadway system **10** and broadcasts the traffic conditions via the communication station **50**.” *Id.* at 6:49–54.

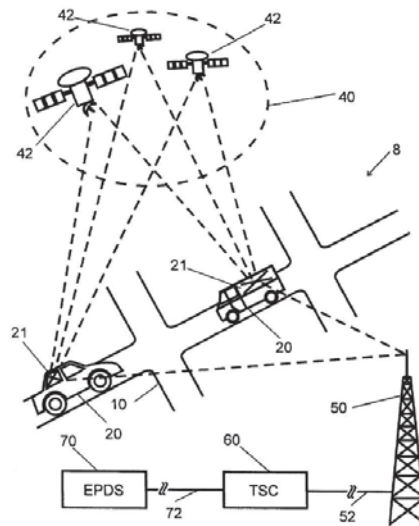


Figure 1

Xu Figure 1 represents a block diagram of the remote traffic data acquisition and intelligent vehicle highway system.

The TSC uses positions of vehicles and information obtained from the external party data sources to provide real-time road traffic conditions to vehicles, which then use the information to provide real-time optimum route planning. *Id.* at 6:50–60. Xu notes that optimal travel routes may be recommended based on either real-time or forecast traffic conditions. *Id.*

Xu also discloses providing route planning optimization along multiple links of a route. *Id.* at 5:18–26. Xu further describes how abnormal traffic conditions may affect travel forecasts. *Id.* at 12:66–13:6. Xu states

that “[i]f there is congestion on a link which is not normally congested and the congestion is completely due to traffic volume, the [TSC] receives a plurality of traffic data indicating that the link is experiencing an unusual congestion, by comparing the current traffic status with the normal traffic condition.” *Id.* Xu then uses the traffic data related to the unusual congestion to adjust the next traffic forecast. *Id.*

2. *Peterson (Ex. 1007)*

Peterson “provides a method and apparatus for supplying traffic information to users and more particularly to such a method and apparatus for assisting the users in selecting shortest elapsed time routes between various origin and destination combinations.” Ex. 1007, 1:13–17. Peterson enables vehicle tracking and management, ensuring that “routing is up to the minute, dynamic, constantly keeping track of the current traffic and recalculating the user’s route considering all changes.” *Id.* at 1:17–22.

Peterson teaches performing route-calculations at a central computer. *Id.* at 9:64–10:8 (“The central computer calculates the least time route based on giving weight to sensor data in the near horizon and historical in the far horizon.”). Peterson also estimates route travel times using current travel times for the beginning portion of the route and statistical travel times for the remaining portion of the trip. *Id.* Peterson describes that “[g]enerally, the most accurate predictor of elapsed time now is the sensed velocities; two hours from now the probability based most accurate velocity is one hundred percent historical patterns.” *Id.*

3. *Matsumoto (Ex. 1020)*

Matsumoto relates to a “course searching apparatus for a vehicle, which is capable of searching an optimal course connecting [] two points

preset on a road map by using the road map data.” Ex. 1020, 1:10–13. Matsumoto describes using a hierarchical set of maps arranged in different levels, or layers, of detail to search for an optimal course from a start point to a target point. *Id.* at Abst., 2:66–67, 4:35–45. Matsumoto also describes searching algorithms to determine the optimal course “using a plurality of traveling cost-related parameters such as distance, mean required travelling time and road width and the number of turns of the course.” *Id.* at 4:12–24. Matsumoto discloses the capability of changing weight coefficients of the cost-related parameters for the function to be suitable for each searching area’s condition. *Id.* at 2:46–56.

4. Discussion

Petitioner argues that each of the limitations of claims 1 and 3 is found in the proposed combination of Xu, Matsumoto, and Peterson. Pet. 44–71. To support its arguments, Petitioner identifies the relevant passages in the cited references that purportedly meet the corresponding claim limitation, and explains the significance of each passage with respect to the corresponding claim limitation. *Id.* Petitioner also provides an articulated reasoning with rational underpinning to support its conclusion of obviousness. *Id.* We have reviewed the information provided by the parties and are persuaded, based on the final record, that Petitioner has proven by a preponderance of the evidence that claims 1 and 3 would have been obviousness based on the combination of Xu, Matsumoto, and Peterson.

a. Uncontested Limitations

We previously instructed Patent Owner that “any arguments for patentability not raised in the [Patent Owner Response] will be deemed waived.” Paper 8, 7; *see also* 37 C.F.R. § 42.23(a) (“Any material fact not

specifically denied may be considered admitted.”); *In re NuVasive, Inc.*, 842 F.3d 1376, 1379–82 (Fed. Cir. 2016) (holding patent owner waived an argument addressed in the preliminary response by not raising the same argument in the patent owner response). Additionally, the Board’s Patent Trial Practice Guide states that the Patent Owner Response “should identify all the involved claims that are believed to be patentable and state the basis for that belief.” Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012).

With the complete trial record before us, we note that we have reviewed arguments and evidence advanced by Petitioner to support its unpatentability contentions where Patent Owner chose not to address certain limitations in its Patent Owner Response. In this regard, the record now contains persuasive arguments and evidence presented by Petitioner, many of which are unrebutted, regarding the manner in which the asserted prior art teaches corresponding limitations of claims 1 and 3 against which that prior art is asserted. Based on the preponderance of the evidence before us, we conclude that the prior art identified by Petitioner teaches or suggests all uncontested limitations of claims 1 and 3. Below, we discuss a few of the uncontested limitations followed by a detailed analysis of the contested limitations.

Petitioner’s analysis demonstrates where each limitation of claims 1 and 3 is found in the Xu, Matsumoto, and Peterson combination. Pet. 44–71. For example, regarding “a wireless communications system for communicating with client vehicles, and a computer system operatively connected to the communications system,” Petitioner asserts that the disclosure in Xu regarding “a communication sub-system in each device and

the traffic service center for communicating the vehicle position data from the vehicle to the traffic service center” satisfies this limitation. Pet. 51 (quoting Ex. 1006, 17:9–16) (emphasis omitted). Petitioner argues persuasively that Xu’s disclosure of a “traffic forecast [that] is based on projections from normal traffic conditions retrieved from archived data adjusted by factors related to real-time situations” teaches “performing a hierarchically computed route search based on current and statistical section data” as required by claim 1. Pet. 52 (quoting Ex. 1006, Abst.) (emphasis omitted). Petitioner also relies on Xu’s disclosure of “a route planning system which computes optimal routes between a departure and a destination point based on road traffic forecasts and current road condition information.” *Id.* at 52–53 (quoting Ex. 1006, 3:66–4:2) (emphasis omitted).

Petitioner notes that “Xu does not expressly disclose a top-down hierarchical search in which fastest classifications of roads are searched first followed by intermediate layers and slowest rated roads last,” but Petitioner contends “Matsumoto discloses precisely such a route determination process.” Pet. 53. Petitioner argues persuasively that “Matsumoto describes calculating ‘a least-costing travelling course between two points’ in which ‘a coarsely illustrated road map of higher hierarchy’ (e.g., a ‘highway’ map) is ‘first searched’ prior to ‘local roads.’” *Id.* (quoting Ex. 1020, 4:12–42). Petitioner then relies on Matsumoto’s description of further searching second and third hierarchy layers containing distinct road types. *Id.* As argued by Petitioner, Matsumoto also describes “changing weight coefficients” for “cost-related variable parameters” for various road segments as part of the route calculation process and the “cost-related

parameters” applied to the road segments include “mean required travelling time.” *Id.* (quoting Ex. 1020, 2:46–57, 4:12–24).

The limitations that Patent Owner contests in the Patent Owner Response are addressed below.

b. Contested Limitations

Traffic Jam Limitation

As noted above, Claim 1 requires, in pertinent part, the traffic jam limitation. Ex. 1001, 19:66–20:2. Petitioner argues that this limitation is satisfied by the disclosure in Xu of a traffic service center that uses the road position of all vehicles to provide real-time road traffic conditions (Pet. 43–44, 58–59, (citing Ex. 1006, 6:50–60, 1:6–12)) and further that received traffic data is used to identify congestion on a link or road (*id.* (citing Ex. 1006, 12:66–13:6)). Petitioner contends that Xu teaches the “traffic jam limitation” because Xu discloses how congestion on a link can be determined from traffic volume and unusual congestion may be used to adjust the traffic forecast. *Id.* Petitioner also contends that traffic volume, and thus congestion, are determined using the road positions of all vehicles, specifically relying on Xu’s disclosure: “The traffic service center 60 *uses the road positions of all vehicles* 20 and the information obtained from the external party data sources to provide real-time road traffic conditions.” *Id.* at 59 (citing Ex. 1006, 6:50–55) (referred to as “the Xu sentence”).

Further, Petitioner’s expert explains that a person of ordinary skill in the art would have understood that Xu’s traffic service center 60 performs the process of comparing the current traffic status with the normal traffic condition, and the data used to adjust the next traffic forecast provides real

time traffic jam identification at various locations of the individual roads.
Ex. 1003 ¶ 157 (citing Ex. 1006, 1:6–16, 12:66–13:6).

Patent Owner argues that “Xu does not disclose or suggest” the traffic jam limitation. PO Resp. 16 (emphasis omitted). Xu, in Patent Owner’s view, collects position data in real-time, and uses the gathered position data for future forecasting and not identification of traffic jam conditions in real-time. *Id.* at 17–18. Patent Owner asserts that one passage in Xu (referred to as the “Xu sentence”) is the only citation that “can be stretched to suggest that data collected from vehicles may be used for traffic forecasting (if indeed that is what the passage is suggesting at all).” *Id.* at 17. The crux of Patent Owner’s argument is that the Xu sentence

fails to disclose *how* it actually would “use[]” the static positions of the vehicle for real-time traffic determination – if indeed the “road positions” are intended to be part of the determination of real-time road traffic conditions at all, rather than merely a statement of the geographic locus to be used for each vehicle’s report.

Id. (citing Ex. 2003 ¶¶ 26–27) (emphasis added).

Patent Owner also understands the following passage of Xu as teaching that road positions and other sources are utilized in long-term forecasts, and only external data is used for real-time determinations:

An external party interface 64 is provided to connect the external party data sources 70 to receive real-time information about weather or road conditions. The real-time information is processed by an external party data integrator 65 for incorporation into real-time traffic forecasts. The traffic forecasts are computed by a traffic forecaster 68 using the collected vehicle position data for *normal* road conditions.

Id. at 18 (quoting Ex. 1006, 8:23–30). Taken together, Patent Owner argues that the Xu sentence and this passage teach that vehicle position is used “only for longer-term / normal / average conditions” and not to calculate immediate congestion. *Id.* (citing Ex. 2003 ¶ 28). Patent Owner contends that other passages in Xu regarding measurements from vehicles teach using this data in calculating average travel time for the link, at a specific time and day, and using this average to predict travel time for the link. *Id.* at 18–19 (citing Ex. 1006, 4:56–5:16). Patent Owner further contends that “[c]urrent traffic conditions in Xu are simply not determined based upon data from vehicles.” *Id.* at 20. As to the passage in Xu stating that “the traffic service center receives a plurality of traffic data indicating that the link is experiencing an unusual congestion” (Ex. 1006, 13:2–4), Patent Owner argues that this passage “does not at all tie to the positions of the vehicles determined by GPS (as opposed to the data from ‘third-party sources’). Nothing in Xu in any way indicates that the real-time data so received at the traffic center comes from the vehicles.” PO Resp. 20 (citing Ex. 2003 ¶ 29).

Petitioner, in its Reply, takes the position that Xu discloses the traffic jam limitation under both the plain meaning of the term “traffic jam” and also adopting Patent Owner’s more narrow interpretation. Pet. Reply 9, n.1. Petitioner supports its position with the testimony of Dr. Braasch that “Xu clearly discloses identifying real-time traffic jam conditions under both the proposed narrow constructions and the plain and ordinary meaning of the term ‘traffic jam,’” because “Xu discloses that its system identifies ‘unusual congestion, by comparing the current traffic status with the normal traffic condition.’” Ex. 1023 ¶ 25 (quoting Ex. 1006, 12:66–13:6). We find Dr. Braasch’s testimony in this regard to be credible, and agree with this

position. As such, our analysis below is not dependent on the scope of the term “traffic jam” addressed above – the limitation is taught by Xu in view of our interpretation of “traffic jam,” but also would be taught under either party’s proposed construction.

Petitioner in Reply also argues that the Xu sentence clearly establishes that vehicle data based on GPS providing road positions of all vehicles is used “to provide real-time road traffic conditions,” as stated in Xu. Pet. Reply 9 (quoting Ex. 1006, 6:50–55) (emphasis omitted). Furthermore, Petitioner contends that Patent Owner’s arguments are inconsistent with the disclosure of Xu. *Id.* In this regard, Petitioner directs us to other passages in Xu that, when taken with the Xu sentence, support its position. *Id.* at 10–13. For example, Petitioner notes that the abstract of Xu states “[i]n-vehicle devices . . . transmit the time-related vehicle locations to a traffic service center’ and that ‘[t]he traffic service center collects the data from all equipped vehicles . . . [to] process the data and provide a real-time traffic forecasts [sic].’” Pet. Reply 10 (quoting Ex. 1006, Abst.) (emphasis omitted).

As further support, Petitioner points to the passage in Xu that teaches how the “communication system ‘forwards road traffic data reported from all vehicles 20 . . . to the traffic service center’ and that this data is used to provide ‘an optimum travel route based on real-time traffic conditions.’” *Id.* (quoting Ex. 1006, 7:37–52) (emphasis omitted). Petitioner argues that external party data is incorporated into real-time traffic forecasts, not the sole basis for real-time traffic forecasts. *Id.* at 10–11 (quoting Ex. 1006, 8:23–30) (emphasis omitted). Petitioner argues that Xu uses vehicle time delay information to “calculate both historic and real-time travel time

estimates.” *Id.* at 11–12 (citing Ex. 1006, Abst., 6:50–60, 7:32–53) (emphasis omitted). We find Petitioner’s contentions persuasive on the final record before us for the reasons set forth below.

First, the record does not persuade us that Xu only uses information from third party, or other external, sources to identify current traffic conditions. Petitioner’s analysis considers Xu as a whole; however, Patent Owner’s argument narrowly focuses on one example described in Xu, and fails to consider Xu as a whole, from the perspective of an ordinarily skilled artisan. A prior art reference must be considered for everything it teaches by way of technology and is not limited to the particular example it is describing. *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985). Furthermore, in an obviousness analysis, we must consider the combination of references, as a whole, in light of the general knowledge of an ordinarily skilled artisan. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

One stated objective of Xu is to create “a method for collecting dynamic traffic data using equipment installed in vehicles” as opposed to just relying on the prior art “methods for collecting traffic data” such as “sensing systems” that “are installed along highways,” using “[v]ideo cameras” or “pulsed laser range image technology.” Ex. 1006, 3:23–48. Given that a purpose of Xu was to use dynamic traffic data obtained from GPS receivers installed in vehicles, we are persuaded by Petitioner that one of ordinary skill in the art, in considering Xu as a whole, would understand Xu as providing a basis for using that same dynamic traffic data for determination of real time traffic conditions. *Id.*; *see also id.* at 2:63–67, 4:17–22; Ex. 1023 ¶¶ 19–25. For example, Xu explains how current traffic

conditions may impact traffic forecasts and “the [TSC] receives a *plurality of traffic data* indicating that the link is experiencing an unusual congestion, by comparing the current traffic status with the normal traffic condition.”

Ex. 1006, 12:66–13:6 (emphasis added); Ex. 1023 ¶ 19.

Based on the final record, Petitioner provides sufficient arguments and credible evidence to support a finding that the “plurality of traffic data” would include dynamic vehicle position data and that “time delays” are determined by comparing the current traffic status as determined by vehicle position with the normal traffic condition. Ex. 1006, 13:2–5 (“comparing the current traffic status with the normal traffic condition”); Ex. 1003 ¶¶ 157–59; Ex. 1023 ¶¶ 19–21. For example, we credit the testimony of Dr. Braasch that vehicle position data would be a source of real time traffic conditions indicative of unusual congestion. See Ex. Ex. 1023 ¶¶ 19–21; Ex. 1006, 12:66–13:6. We are also persuaded by Petitioner’s argument that Xu’s “communication system ‘forwards road traffic data reported from all vehicles 20 . . . to the traffic service center’ and that this data is used to provide ‘an optimum travel route based on real-time traffic conditions.’” Pet. Reply 10 (citing Ex. 1006, 7:37–52; 8:26–36; 12:66–13:6). Also persuasive is the cross-examination testimony of Dr. Kurzhanskiy that “one of the plurality of traffic data that could be being [sic] used to detect unusual congestion is vehicle probe position data.” *Id.* (quoting Ex. 1030, 82:19–83:7) (also agreeing “that Xu discloses that vehicle position data is a form of traffic data that the system collects”). For these reasons, the record persuades us that Xu discloses the traffic jam limitation.

Predicted Road Section Coefficients Limitation

Petitioner relies on Xu’s disclosure that “traffic conditions may be weighted in a plurality of ways” such as by adjusting the link travel times for road segments using various different weighting factors as teaching “applying predicted road section coefficients corresponding to each route section,” as required by claim 1. Pet. 55 (quoting Ex. 1006, 12:54–65). As argued by Petitioner, Matsumoto also describes “changing weight coefficients” for “cost-related variable parameters” for various road segments as part of the route calculation process and the “cost-related parameters” applied to the road segments include “mean required travelling time.” *Id.* (quoting Ex. 1020, 2:46–57, 4:12–24).

Patent Owner contends that “[t]he proposed combination of Xu, Matsumoto, and/or Peterson does not teach the Hierarchical Limitation for at least two separate reasons.” PO Resp. 22. For the first reason, Patent Owner argues that “the proposed combination does not disclose or suggest ‘applying predicted road section coefficients,’ but rather, at most, would apply only static coefficients—and static coefficients are not ‘predicted.’” *Id.* Patent Owner’s arguments are primarily based on a claim construction position for “predicted road section coefficients” that we declined to adopt. *See supra*; *see also* PO Resp. 23 (“For coefficients to be “predicted,” by definition, these coefficients must be dynamic / variable, and must estimate something in the future.”). As such, we find Patent Owner’s contentions below, which are based on the predicted coefficients being “dynamic / variable,” not persuasive.

Patent Owner contends that “[n]othing in Xu, Matsumoto, and/or Peterson, or any combination thereof, discloses or suggests applying

predicted road section coefficients as claimed.” *Id.* According to Patent Owner, “Matsumoto discloses an optimization based on a cost function applied without variation to all road segments in each road classification, wherein the cost function consists entirely of static rather than predicted data.” *Id.* Because “Matsumoto’s cost factors are all differently weighted combinations of ‘distance, mean required travelling time and road width and the number of turns of the course,’” Patent Owner contends that “the factors are static, historical quantities known and stored in advance of route planning.” *Id.* at 24 (arguing distance “is also a constant” and that “mean travelling time” and “mean required travelling time” are pre-stored values). We have also considered Patent Owner observations on the cross-examination of Dr. Braasch. Paper 22, 1–4.

Petitioner responds that “even if it were true that Matsumoto’s ‘mean required travelling time’ coefficients were ‘static, historical quantities known and stored in advance of route planning,’” the claim limitation would still be taught because “Matsumoto’s mean required traveling time” is still “used to predict the time required to traverse road segments during Matsumoto’s route planning calculation.” Pet. Reply 15; Ex. 1020, 4:12–24. Petitioner contends that “Makor’s expert confirmed that Matsumoto’s suggested teaching is precisely how the preferred embodiment of the ’783 patent works,” because “when ‘the database is fully populated with the **historical** statistical travel times . . . [the system can] **predict** what will happen an hour from now, just by looking at [the] database.’” *Id.* (quoting Ex. 1028, 36:11–37:13); *see also* 34:7–12 (agreeing that statistical travel times that are based on historic traffic data are used to **predict** the amount of

time required to traverse particular road sections when planning a route);
Tr. 6:21–7:19.

Petitioner notes that although “Matsumoto does not *expressly* identify the mean required travelling time as a “coefficient,” an obviousness analysis “is not an *ipsissimis verbis* test,” and “[t]he evidence shows that Matsumoto’s mean required travelling times are recognizably used as coefficients because they are multiplicative factors used in calculating a fastest route.” Pet. Reply 16 (citing Ex. 1023 ¶ 29 (a coefficient is “[a]ny number that multiplies some other number or variable”)).

Based on the final trial record before us, we find Petitioner’s contentions persuasive. As discussed above, predicted road section coefficients are *coefficients associated with road sections in a route search* that can also be applied to specific route sections as claimed. The combination of Xu and Matsumoto teaches these claim requirements. Matsumoto’s mean required traveling time is a multiplicative factor, or coefficient that is directly associated with an identified road section and further is used to determine cost of traveling a road section for a future planned route. See Ex. 1020, 4:12–24. Matsumoto describes determining an optimal course using a plurality of traveling cost-related parameters such as distance and mean required traveling time. *Id.* The algorithm is executed between a start point and a target point by changing weight coefficients of the cost-related parameters. *Id.* at 4:25–33; Fig. 9. Matsumoto’s mean required traveling time is similar to the statistical travel times of the ’783 patent in that they both represent the current amount of time required to traverse a road segment and are used to predict future travel times during route planning. See Ex. 1023 ¶ 28; Ex. 1028, 28:15–19; 30:5–9; 34:7–12.

Accordingly, Petitioner has presented persuasive evidence demonstrating how the combination of Xu and Matsumoto teaches the predicted road section coefficients.

Patent Owner's second reason against the combination of Xu with Matsumoto and Peterson is that "the Petition has failed to support the combination of these references in line with the applicable legal standards, and the combination suffers from impermissible hindsight." PO Resp. 22. We have considered this argument but also find it unpersuasive. Patent Owner argues that "[e]ven assuming, *arguendo*, that one could substitute Xu's travel time estimates into Matsumoto's mean required travelling time, this substitution would alter the principle of operation of Matsumoto." *Id.* at 28. According to Patent Owner, "Xu's travel time estimate represents the entire cost function that it applies for purposes of optimization," and "[m]aking it a part of Matsumoto's calculation renders Matsumoto's other factors and their coefficients redundant." *Id.*

We find Patent Owner's contentions unpersuasive because Petitioner provides a persuasive rationale why a person of ordinary skill in the art would have calculated a route using a multi-layer hierarchical map database, as suggested by Matsumoto, in the navigation system disclosed by Xu. Pet. 47–50. For example, Petitioner contends incorporating a top-down hierarchical route calculation routine (as suggested by Matsumoto) into Xu's system allows the combined system to efficiently determine an optimal course. *Id.* at 48 (quoting Ex. 1020, 5:16–20). Petitioner also "provides an additional reason that would have prompted a POSITA to calculate Matsumoto's mean required travelling times using the technique described in Xu (specifically, lack of details on how Matsumoto's mean required

travelling times are determined).” Pet. Reply 17. We are also not persuaded by Patent Owner’s attorney argument that the proposed combination would render Matsumoto’s other factors and their coefficients redundant (PO Resp. 28) because Petitioner persuasively establishes that “Matsumoto’s mean required travelling times and Xu’s average travel times represent the same information and that a POSITA would have predictably used Xu’s technique for calculating average travel times to achieve Matsumoto’s suggestion for mean require travelling times.” *Id.* (citing Ex. 1003 ¶ 133).

Petitioner also provides persuasive rationale for combining Peterson with Xu and Matsumoto. Petitioner relies on Peterson for its disclosure of server side performance of route calculations such that “[t]he central processor then calculates the route segment or combination of route segments providing a shortest elapsed time route between each origin-destination combination and transmits that information to the respective users.” Pet. 45 (quoting Ex. 1007, 1:13–22, 3:34–50, 4:24–43, 9:64–10:10). Petitioner proposes several rationales for modifying Xu’s system to perform its route calculation server-side rather than at in-vehicle computers. *Id.* at 46, 57–60. For example, Petitioner contends a person of ordinary skill in the art “would have been prompted to modify Xu to perform server-side route calculation (as suggested by Peterson) because performing these calculations server-side would reduce the amount of computing power required at the in-vehicle computers.” *Id.* at 57–58 (citing Ex. 1003 ¶ 135). Further, Petitioner contends “the prior art recognized a finite number of locations at which such calculations could be performed in a traffic system (either server-side or at in-vehicle computers), and a POSITA would have

understood the benefits for each of these two predictable options—including the benefits described above.” *Id.* at 59.

c. Summary

For the foregoing reasons, we are persuaded by Petitioner’s arguments and evidence and find that Xu teaches the traffic jam limitation and the combination of Xu and Matsumoto teaches the predicted road section coefficients limitation. As discussed above, we are also persuaded by Petitioner’s contentions and find that the combination of Xu, Matsumoto, and Peterson, in light of the knowledge of one of ordinary skill in the art, teaches the remaining limitations as recited in claims 1 and 3. We further find that Petitioner has presented valid reasons to modify Xu with Matsumoto and Peterson supported by rational underpinnings as explained immediately above. Based on the preponderance of the evidence before us, we conclude that the prior art identified by Petitioner teaches all the limitations of claims 1 and 3, as well as each claim as a whole.

III. CONCLUSION

Petitioner has not demonstrated by a preponderance of the evidence that claims 1 and 3 of the ’783 patent are unpatentable under 35 U.S.C. § 103 based on TravTek and Seda. Petitioner has demonstrated by a preponderance of the evidence that claims 1 and 3 of the ’783 patent are unpatentable under 35 U.S.C. § 103 based on Xu, Matsumoto, and Peterson.

IV. ORDER

Accordingly, it is:

ORDERED that claims 1 and 3 of the ’783 patent are unpatentable;
and

FURTHER ORDERED that because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

Case IPR2017-00815

Patent 6,480,783 B1

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