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Paper 12
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DENSO CORPORATION
Petitioner

v.

BEACON NAVIGATION GmbH
Patent Owner

Case IPR2013-00027
Patent 5,862,511

Before SCOTT R. BOALICK, GLENN J. PERRY, and
THOMAS L. GIANNETTI, *Administrative Patent Judges.*

PERRY, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Petitioner Denso Corporation ("Denso") requests *inter partes* review of claims 1-17 of US Patent 5,862,511 patent ("'511 patent") pursuant to 35 U.S.C. §§ 311 et seq. Patent Owner, Beacon Navigation GmbH ("Beacon"), submitted a patent owner preliminary response under 37 C.F.R. § 42.107(b) on January 21, 2013. Paper No. 11. We have jurisdiction under 35 U.S.C. § 314.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a) which provides as follows:

> THRESHOLD -- The Director may not authorize an *inter partes* review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

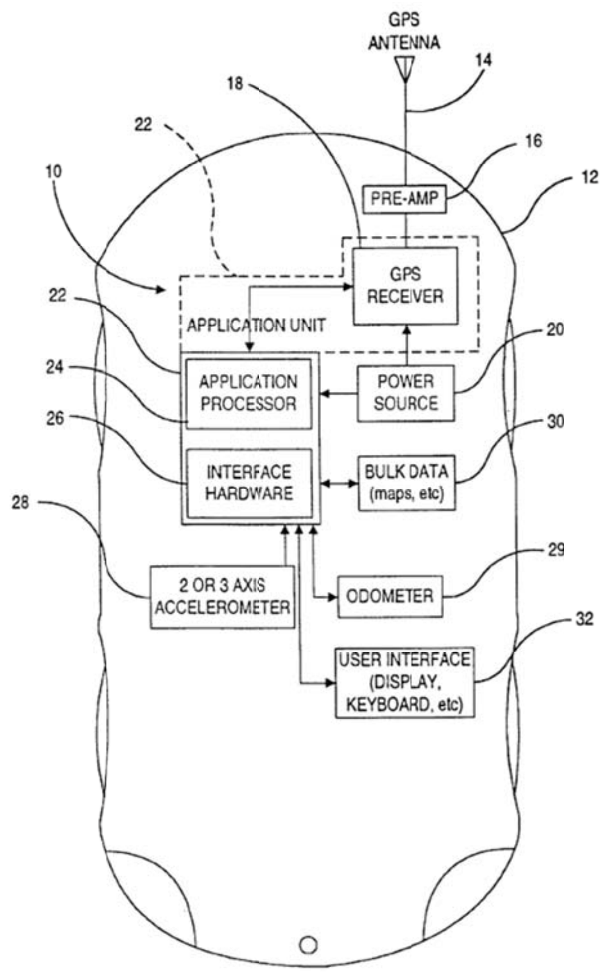
Petitioner challenges claims 1-9 and 13-16 as being anticipated (35 U.S.C. § 102). Petitioner also challenges claims 9-12 and 17 as being obvious (35 U.S.C. § 103). For the reasons that follow, the Petition is <u>denied</u>.

II. BACKGROUND

A. The '511 patent (Exhibit 1001)

The '511 patent describes a navigation system and method in which a GPS-derived velocity vector, including speed and heading components, is used for propagating a "previous position" to a "current position." If a GPS-derived velocity vector is not available, speed and heading information derived from an orthogonal axes accelerometer and other sensors, is used to propagate vehicle position. Because the GPS information is almost always available, less reliance on accelerometers is needed, thereby allowing the use of less expensive accelerometers. The accelerometers are repeatedly calibrated using the GPS-derived velocity data. *See* '511 patent, Abstract.

Figure 2a of the '511 patent, reproduced below, includes a block diagram of a vehicle navigation system according to the invention.



'511 patent Fig. 2a

GPS receiver 18 provides information about vehicle movement based on the reception of satellite signals via GPS antenna 14. Vehicle on-board sensors include a 2 or 3 axis accelerometer 28 and an optional odometer 29. A bulk data store 30 stores map information. A user interface 32 includes a display and keyboard. *See* '511 patent 5:25-49.

B. Illustrative Claims

Each of the independent claims of the '511 patent falls into at least one of the following categories: 1) those requiring utilizing map data to adjust the heading of a GPS-derived velocity vector used to propagate a previous position to a current position; and 2) those that require use of an orthogonal axes accelerometer to provide data for propagating a previous position to a current position.

Independent claims 1-4 and 15 belong to the first category. Claim 1, reproduced below (with paragraphing added), is illustrative.

> 1. An improved vehicle navigation system comprising:
>
> [a] a map database with map information, said vehicle navigation system derives a map heading from said map information; and
>
> [b] a GPS receiver which provides GPS velocity information including a heading,
>
> [c] said vehicle navigation system uses said velocity information to propagate a previous position to a current position and interrogates said map database to obtain said map heading information;
>
> [d] said vehicle navigation system updates said velocity information with said map heading for propagating said previous position to said current position if the difference between the heading of said velocity information and said map heading are within a threshold,
>
> [e] wherein said system rotates said velocity to align with said map heading and integrates the rotated velocity to obtain displacements;

[f] said system obtains said current position by applying said displacements to said previous position.

Per paragraph [d] of claim 1, GPS-derived velocity information is updated using map data. The updated GPS-derived velocity information is then used to propagate a previous position to a current position. As is evident from the references cited by Petitioner, there are ways other than as required by claim 1 to make use of map data in a process for determining a current position.

Independent claims 5-6, 8, 11-13, 15-16, and 17 belong to the second category, requiring the use of an orthogonal axes accelerometer to provide information for propagating a previous position to a current position. Claim 5, reproduced below (with paragraphing added), is illustrative.

5. An improved vehicle navigation system, comprising

[a] an orthogonal axes accelerometer which provides longitudinal and lateral acceleration information and

[b] a GPS receiver which provides GPS velocity information,

[c] said vehicle navigation system uses said lateral acceleration information to derive heading change;

[d] said vehicle navigation system uses said heading change to propagate a previous position to a current position:

[e] said vehicle navigation system uses said GPS velocity information to propagate said previous position to said current position if GPS velocity information is used;

> [f] said vehicle navigation system determines lateral and longitudinal calibration information from said GPS velocity information to calibrate said orthogonal axes accelerometer.

Illustrative claim 5 requires the use of an "orthogonal axes accelerometer" to obtain longitudinal and lateral acceleration information. Acceleration information is used to derive a heading change. GPS-derived velocity information is used to calibrate the orthogonal axes accelerometer. See ¶¶ [a] and [f].

C. Related Matters

Petitioner identifies 10 lawsuits involving the '511 patent. *See* Petition 1-2. In addition, there have been two requests to reexamine the patent. Reexamination 90/012,109 was requested Jan. 27, 2012 and has been concluded.[1] Claims 1 and 3 were confirmed as patentable over five references including the Kaise reference cited by Petitioner in this proceeding. Reexamination 90/012,743 was requested on Dec. 17, 2012 and granted Jan. 23, 2013. We stayed the 90/012,743 reexamination pending the outcome of this proceeding.[2]

D. Prior Art

Petitioner relies on the following prior art:

Odagawa	5,087,919	July 6, 1990	Ex. 1003
Klein	5,541,845	Aug. 2, 1994	Ex. 1004
Anderson	5,684,476	May 8, 1995	Ex. 1005

[1] Petitioner did not bring this reexamination to our attention in the Petition filed Oct. 18, 2012.
[2] *See* Order Paper No. 11.

Kaise	5,740,049	Dec. 4, 1995	Ex. 1006
Kato	5,796,613	Aug. 1, 1995	Ex. 1007
Koiwai	JP 2-83224	Mar. 30, 1990	Ex. 1009
Yoshinori	JP 1992-121618 (English translation)	April 22, 1992	Ex. 1011
Sewaki	JP 6-331369	May 24, 1993	Ex. 1013
Hoshino	JP H6-094366	May 6, 1994	Ex. 1015
Lipp	"Integrated GPS / Fiber Optic Gyro Land Navigation System"	April, 1994	Ex. 1016

E. Alleged Grounds for Unpatentability

Petitioner asserts that the following references anticipate claims as indicated under 35 U.S.C. § 102.

Odagawa: claims 1-4.

Klein: claims 1, 3, 5-9, 13-14 and 16.

Anderson: claims 1-8 and 15.

Kaise: claims 1 and 3.

Kato: claims 1, 3 and 8.

Koiwai: claims 1-4.

Yoshinori: claims 1-9, 13-14 and 16.

Sewaki: claims 1-4.

Hoshino: claims 1-4.

Lipp: claims 5-8.

In addition, Petitioner asserts that the following references and combinations of references render obvious claims as indicated under 35 U.S.C. § 103.

Anderson (single reference): claims 10-11 and 17.

Anderson and Yoshinori: claim 12.

Lipp (single reference): claim 9

II. CLAIM CONSTRUCTION

Petitioner has not provided a proposed construction of claim terms. We therefore use the ordinary and customary meaning for all claim terms. In particular, we construe the claim phrase “orthogonal axes accelerometer” as a device that provides a measure of acceleration along at least two axes that are orthogonal to one another. An orthogonal axes accelerometer would not encompass a device that merely indicates positional/angular orientation, such as a gyroscope.

III. UNPATENTABILITY OF CLAIMS 1-17

Petitioner has raised 55 separate and distinct anticipation contentions under 35 U.S.C. § 102 and five obviousness contentions under 35 U.S.C. § 103, four of which are based on a single reference and one of which is based on a combination of references.

A. Odagawa (Ex. 1003)

Petitioner contends that Odagawa anticipates claims 1-4. The claim charts related to Odagawa appear at pages 16-18 of the Petition.

1. Claim 1

Claim 1, set forth above, essentially requires that a velocity vector, obtained from a GPS receiver, is used to propagate a previous position to obtain a current position. It further requires that the velocity vector be "updated" ("rotates") to align with a map heading obtained by "interrogating" a map database to obtain a map heading that aligns within a "threshold" of the velocity vector.

Odagawa Figures 2 and 3, and their accompanying specification text, describe how Odagawa uses map data to correct inaccurately determined position information provided by a GPS receiver. For example, Odagawa Figure 2 describes a manner of correcting a current position. It describes detecting direction in which a vehicle runs (step S1). Longitude and latitude differences are determined (step S3). From map data, positions are compared with road segments to determine which road segment the vehicle is likely on (steps S4-S6). A likely position on a road segment is selected as a "current position" and is established as the current longitude and latitude regardless of the imprecise position determined by the GPS receiver (steps S9-S11). The Odagawa Figure 3 embodiment describes correcting position in a different manner.

However, none of the portions of the portions of the Odagawa specification cited by Petitioner suggest correcting the GPS derived velocity vector by rotating it in accordance with map data or otherwise. Petitioner cites particularly to col. 6, lines 32-43 to support the alleged anticipation of the claim recitation "wherein said system rotates said velocity to align with said map heading." Yet, this section describes only how the closest road segment is selected in the flowchart of Figure 2. Petitioner has not provided persuasive evidence that a GPS velocity vector is updated based on map information. Correcting a GPS-derived position by reference to map data and known locations is not the same as correcting the heading portion of a velocity vector by rotating it and then using that corrected velocity vector to propagate (dead reckon) a previous position to a current position.

Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 1 to be anticipated by Odagawa.

2. Claim 2

Petitioner's claim charts for claim 2 point us to the same portions cited in support of its anticipation contention with respect to claim 1. Claim 2, like claim 1, requires the velocity information from a GPS receiver to be updated based on map heading and then using the updated velocity to propagate a "previous position" to a "current position." Thus, our analysis with respect to claim 1 applies to claim 2. Petitioner has not provided persuasive evidence that a GPS velocity vector is updated based on map information. As such, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 2 to be anticipated by Odagawa.

3. Claim 3

As with claims 1 and 2, independent method claim 3 requires "updating" the GPS-determined velocity based on a "map heading." As stated above, although Odagawa describes correcting "position" based on a nearest-fit road segment, Petitioner has not pointed to evidence demonstrating that a GPS-determined velocity is updated. Nor has Petitioner pointed to evidence showing that an updated velocity is used to propagate a "previous position" to a "current position." Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 3 to be anticipated by Odagawa.

4. Claim 4

As with claims 1-3, independent method claim 4 requires that a GPS-determined velocity be updated based on "map heading" information. Petitioner's claim chart does not point to any additional portion of Odagawa not previously reviewed and considered. In view of the requirements of claim 4 similar to those discussed above with respect to claims 1-3, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 4 to be anticipated by Odagawa.

B. Klein (Ex. 1004)

Petitioner contends that Klein anticipates claims 1, 3, 5-9, 13-14 and 16. The claim charts related to this reference appear at pages 19-24 of the Petition.

1. Claim 1

Claim 1, as described above with respect to Odagawa, essentially requires that a velocity vector, obtained from a GPS receiver, is used to propagate a previous position to obtain a current position. It further requires that the velocity vector be "updated" ("rotates") to align with a map heading obtained by "interrogating" a map database to obtain a map heading that aligns within a "threshold" of the velocity vector.

Klein recognizes a problem often encountered with the use of "dead reckoning" in that vehicle heading "drifts" with the passage of time. Klein 7:18-21. Klein therefore combines "dead-reckoning (DR)" and "snap-to-route (SR)" techniques to provide periodic recalibration of the heading or direction cosine coordinates. Klein 7:21-23. It does so by "adjusting the estimated heading coordinates by the local direction cosines of the path segment PN at the snap-to-route location of the perpendicular footer PiN." *See* Klein 7:24-25. Thus, a position determined by DR (integrating a velocity heading over time from a previous position) is not accepted. Rather, the SR computation of position is substituted for the DR-determined position, which may have drifted. Then, DR resumes from the corrected position.

However, claim 1 requires

> …said vehicle navigation system updates said velocity information with said map heading for propagating said previous position to said current position if the difference between the heading of said velocity information and said map heading are within a threshold,
>
> wherein said system rotates said velocity to align with said map heading and integrates the rotated velocity to obtain displacements;

To meet the limitations of claim 1, the velocity vector heading must be corrected by reference to map data before that velocity vector is used to propagate a previous position to a current position. First propagating a previous position to a current position and then correcting that current position by reference to map data does not meet the terms of the claim. We therefore conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 1 to be anticipated by Klein.

2. Claim 3

Claim 3 also requires rotating the velocity vector based on correction provided by map data. The updated velocity vector is used to dead reckon to a next position. Thus, our analysis, supra, with respect to claim 1 applies also to claim 3. We therefore conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 3 to be anticipated by Klein.

3. Claim 5

Unlike previously discussed claims, claim 5 does not require that GPS velocity information be used to propagate a previous position to a current position. However, claim 5 requires an "orthogonal axes accelerometer" which provides longitudinal and lateral acceleration information." Petitioner points to Klein col. 7 ll. 2-18 as disclosing this claim feature. We have reviewed the portion of Klein cited and find no mention of an "orthogonal axes accelerometer." The cited passage describes a "second alternative" for dead reckoning that uses an on-board "magnetometer" or other device that senses the present "direction" that a vehicle is traveling. It also mentions use of a separate "speedometer" or other velocity monitor that determines vehicle speed. No persuasive evidence is presented that equates these disclosed devices to an "orthogonal axes accelerometer" which would provide an indication of acceleration along at least two different axes that are orthogonal to one another.

Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 5 to be anticipated by Klein.

4. Claim 6

Claim 6 requires that calibration information from GPS velocity information be used to calibrate an orthogonal axes accelerometer. For this recitation Petitioner's claim chart (at Pet. 21) refers us to "disclosures cited in response to Claim 5[g]." The claim chart entry for Claim 5[g] in turn refers us to col. 7, ll. 2-34 of Klein. We have reviewed col. 7, ll. 2-34, which describes a "second alternative" for dead reckoning vehicle position. The purpose for such dead reckoning is to determine a starting point for placing the vehicle on the assigned route so that it can be "snapped" to the route. The velocities described in the referred-to passage are velocities from *sensors*, not GPS-derived as recited in the claim. Thus, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 6 to be anticipated by Klein.

5. Claim 7

Claim 7 depends from claim 6 and further requires "wherein said system uses said longitudinal acceleration information and said heading change to propagate a previous position to a current position if said GPS velocity information is not used." Petitioner cites no additional passages in support of its argument with respect to claim 7. As in our analysis with respect to claim 6, supra, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 6 to be anticipated by Klein.

6. Claim 8.

Claim 8 requires calibrating an orthogonal axes accelerometer from GPS velocity data. Petitioner's claim chart refers us to claim 5[g], which, in turn, points to col. 7 ll. 2-34. As stated with respect to claim 6, col. 7, ll. 2-34 describes a "second alternative" for dead reckoning vehicle position. The purpose for such dead reckoning is to determine a starting point for placing the vehicle on the assigned route so that it can be "snapped" to the route. The velocities described in the referred-to passage are velocities from sensors, not a GPS-derived velocity vector. Thus, Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 8 to be anticipated by Klein.

7. Claim 9

Claim 9 depends from claim 8 and further requires "updating scale factors for said orthogonal axes accelerometer using said lateral and longitudinal calibration information." Petitioner does not point to any portions of Klein not already reviewed. Thus, Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 9 to be anticipated by Klein.

8. Claim 13

Claim 13 requires that calibration information from GPS velocity information be used to calibrate an orthogonal axes accelerometer. Petitioner's claim chart (at Pet. 21) refers us to previously considered portions of Klein. As previously concluded, Petitioner has not provided persuasive evidence that Klein teaches calibrating an orthogonal axes accelerometer using GPS-determined velocity. Thus, Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 13 to be anticipated by Klein.

9. Claim 14

Claim 14 depends from claim 13 and further requires "wherein said system determines heading change using said longitudinal acceleration information." Petitioner's claim charts do not point to any portion of Klein not already considered. Thus, Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 14 to be anticipated by Klein.

10. Claim 16

Claim 16 requires that calibration information from GPS velocity information be used to calibrate an orthogonal axes accelerometer. Petitioner's claim chart (at Pet. 21) refers us to previously considered portions of Klein. As previously concluded, Petitioner has not provided persuasive evidence that Klein teaches calibrating an orthogonal axes accelerometer using GPS-determined velocity. Thus, Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 16 to be anticipated by Klein.

C. Anderson (Ex. 1005)

Petitioner contends that Anderson anticipates claims 1-8 and 15 and renders claims 10-11 and 17 obvious. The claim charts related to this reference appear at pages 25-33 of the Petition.

1. Claims 1- 4 and 15

Claims 1-4 and 15 each require that a heading determined from a GPS velocity vector is corrected by consulting a map database. Once corrected, the corrected GPS velocity vector is used to propagate a previous position to a current position (dead reckoning using the corrected heading). Anderson does not describe correcting the heading portion of a velocity vector at all, much less using the corrected velocity vector to propagate a previous position to a current position. To the contrary, Anderson corrects "position" (rather than the heading portion of a velocity vector) by reference to known locations. Furthermore, as to claim 15, Anderson does not teach the use of an orthogonal axes accelerometer, as discussed with respect to claims 5-8 below. Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 1-4 and 15 to be anticipated by Anderson.

2. Claims 5-8

Claims 5-8 require that longitude and latitude information be derived from a GPS receiver and used to calibrate an orthogonal axes accelerometer. Anderson does not teach the use of an orthogonal axes accelerometer. Instead, Anderson uses a "flux compass" to determine heading and a GPS receiver and radar to determine speed. Because there is no orthogonal axes accelerometer disclosed in Anderson, much less such a device that is calibrated in the manner required by the claims, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 5-8 to be anticipated by Anderson.

3. Claims 10 -11 and 17

Petitioner asserts that claim 10 is rendered obvious by Anderson (page 6 item 10); that claim 11 is rendered obvious by Anderson (see page 6, item 11); and that claim 17 is rendered obvious by Anderson (see page 6, item 17). However, Petitioner's claim chart at pages 25-33 does not address claims 10-11 or 17. Instead of a detailed analysis as required by the rules, Petitioner provides a "catch all" statement on pages 10-11 and in other portions of the Petition that to the extent that any claim element is not found in the references that it would be predictable and obvious to one of ordinary skill in the area of navigation systems. *See, e.g.*, Pet. 10.

The Petitioner must carry the burden of establishing a reason for unpatentability sufficient to meet the threshold for instituting a trial. That has not been done with respect to claims 10-11 and 17. Due to the lack of a detailed presentation of evidence, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 10-11 and 17 to be obvious in view of Anderson.

D. Kaise (Ex. 1006)

Petitioner contends that Kaise anticipates claims 1 and 3. The claim charts related to this reference appear at pages 33- 35 of the Petition. Petitioner's claim chart refers to various potions of Klein (Ex. 1004) rather than to portions of Kaise (Ex. 1006). Thus, there is a failure to identify any evidence as to Kaise. Despite Petitioner's oversight, we have reviewed Kaise and determined that it does not describe updating a velocity vector "heading" based on map data prior to the use of that heading in propagating a previous position to a current position. Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 1 and 3 to be anticipated by Kaise.

Petitioner's "Summary" of grounds indicates that claim 4 is anticipated by Kaise. However, no argument is presented in support of this contention. Due to the lack of adequate supporting evidence presented, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 4 to be anticipated by Kaise.

E. Kato (Ex. 1007)

Petitioner contends that Kato anticipates claims 1, 3 and 8. The claim charts related to this reference appear at pages 35-37 of the Petition.

Kato describes a navigation system for a vehicle that includes "present position calculating means." *See* Title. The system includes a distance sensor that outputs "pulses" in proportion to the rotation of a wheel. *See* Abstract. A GPS receiver calculates vehicle speed. A "distance correction coefficient calculating unit" calculates GPS traveling distance from GPS speed and from a time difference between two points. *Id*. It further calculates a "distance correction coefficient" from the GPS-determined distance and the pulse difference between two points. *Id*. A present position-calculating unit calculates present position based on a corrected distance correction coefficient. *Id*.

Kato describes a scheme by which errors in speed and heading are determined by calculations based on the pulses from a distance sensor wheel and a time difference between two points. If it is determined that there is an intolerable potential error in a GPS-derived speed and heading, this data is discarded in favor of sensor data. Once presumed accurate heading and distance data are determined, vehicle position is plotted on a map based on pre-stored map data. Kato states (at 13:18-21) that "by making a comparison with road bearing in map information, more accurate map matching becomes possible. Accordingly, the reliability of the navigation system can be improved." However, Kato does not describe how map data might be consulted in order to correct a GPS-derived velocity vector for dead reckoning from a previous position to a current position as in the claims. Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 1-3 to be anticipated by Kato.

With regard to claim 8, there is no description in Kato of an "orthogonal axes accelerometer." A "heading sensor" as referenced in Figs. 1, 9 and 10 is described as a "geomagnetic sensor." The "distance sensor" is described as one that generates pulses from a wheel. Thus, no orthogonal axes accelerometer is described. We therefore conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 8 to be anticipated by Kato.

F. Koiwai (Ex. 1009, English translation)

Petitioner contends that Koiwai anticipates claims 1-4. The claim charts related to this reference appear at pages 37-40 of the Petition.

While it is true, as Petitioner suggests, that Kowai Fig. 2 demonstrates correcting a course based on map data, essential features of claims 1-4 are missing.

We have reviewed Koiwai and find no description related to obtaining a velocity vector from a GPS, much less correcting that velocity vector by reference to a map and then integrating the corrected velocity vector to propagate a previous position to a current position. Therefore we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 1-4 to be anticipated by Koiwai.

G. Yoshinori (Ex. 1011, English translation)

Petitioner contends that Yoshinori anticipates claims 1-9, 13-14 and 16. Their claim charts related to this reference appear at pages 40-47 of the Petition. We have reviewed the English translation of Yoshinori (Japanese) set forth as Exhibit 1011. We refer to the page numbers listed at the bottom of the Exhibit pages, beginning with page 107.

1. Claims 1-4

Yoshinori describes obtaining a "velocity vector" from a GPS. *See* Yoshinori page 107. Yoshinori also describes "map matching." The described map matching (see Fig. 3) is carried out to determine whether or not a vehicle is traveling on a mapped road. If it can identify a road it may correct an erroneously determined position. None of the Petitioner-cited portions of Yoshinori suggest altering a GPS-determined velocity vector and then using that altered vector to project a previous position to a current position. Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 1-4 to be anticipated by Yoshinori.

2. Claims 5-9 and 13

Claims 5-9 and 13 all require an "orthogonal axes accelerometer." We find no description in Yoshinori of such a device. Yoshinori describes a "gyro" that provides bearing information. The only "calibration" described by Yoshinori is the use of a multiplicative factor based on "slip rate" (e.g. tire slippage) that makes a speed sensor less accurate. Thus, Petitioner is not likely to prevail as to claim 5.

Regarding claim 6, Yoshinori does not describe determining a heading change based on lateral acceleration. Yoshinori Fig. 2 suggests that the heading is determined by the GPS velocity vector in one instance and by a "geomagnetic sensor" in another instance. A gyro provides angular positional information. Petitioner does not point to any description in the reference of acceleration, much less "lateral acceleration" being used to change a heading.

Claim 7 depends from claim 6 and further requires "wherein said system uses said longitudinal acceleration information and said heading change to propagate a previous position to a current position if said GPS velocity information is not used." Petitioner has not cited to any portion of Yoshinori teaching this limitation as well.

Similarly, there is no teaching in Yoshinori related to an orthogonal axes accelerometer. Thus, the limitation relating to such a device is not met. Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 5-9 and 13 to be anticipated by Yoshinori.

3. Claim 14

Claim 14 depends from claim 13 and further requires determining a heading change using longitudinal acceleration information. We conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 14 to be anticipated by Yoshinori for the same reasons stated as to 13.

4. Claim 16

Claim 16 also requires an orthogonal axes accelerometer, which is not described by Yoshinori. Furthermore, Yoshinori includes no teaching related to determining a heading change using lateral acceleration information. Thus we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 16 to be anticipated by Yoshinori.

H. Sewaki (Ex. 1013, English translation)

Petitioner contends that Sewaki anticipates claims 1-4. The claim charts related to this reference appear at pages 47-50 of the Petition. Petitioner's claim charts point to Sewaki paragraphs [0001], [0002], [0006], [0014], [0016], [0017], [0020] and [0021]. We have reviewed Sewaki, paying particularly close attention to the cited paragraphs. In paragraph [0001] Sewaki describes "a travel bearing computation system, specifically, a travel bearing computation system of a navigation system that adds a three-dimensional positioning function by GPS (Global Positioning System) to an autonomic navigation method using a distance sensor and an angle sensor."

Sewaki describes a problem to be solved in paragraph [0002]. According to Sewacki, map matching processing or induction course search processing are carried out based on the road layer. It is known to determine vehicle position using GPS and by using "distance" and "angle" sensor mounted on a vehicle. Measurement of vehicle position by the "autonomic navigation method" is low cost, but is incapable of highly-accurate measurement of position. The GPS determines position more accurately, but the required radio waves are often blocked by buildings, tunnels and the like. Thus, Sewaki explains a solution that uses an "autonomic navigation method" aided by the addition of vehicle sensors including "distance" and "angle" sensors.

Paragraph [0003] describes how signals from the distance and angle sensors are used to determine a change in vehicle position. Sewacki describes the use of a baseline bearing ("offset angle") to determine actual travel bearing of a vehicle from a starting point. However, using autonomic navigation, errors accumulate and the computed vehicle position no longer corresponds to the road being traveled as shown on map data. *See* [0006]. Map matching is used to correct these accumulated errors. GPS is used to correct vehicle position when a GPS position is available. *See* paragraph [0009].

Paragraph [0012] explains the Sewaki arrangement for solving the problem. It describes that instead of continuously using the bearing measured by the angle sensor, adjusted by offset angle, bearing data derived by GPS and previously stored are substituted for the routinely computed bearing and offset provided by the autonomic navigation method when map matching is not available. "By doing so, the offset angle can be accurately revised without using old bearing data preceding a preset period of time from the current time, with the result being that the absolute travel bearing of the vehicle can be accurately computed." Paragraph [0013]. Autonomic navigation proceeds with a corrected bearing. The vehicle speed is integrated along the corrected bearing to determine a current position. The speed component integrated, albeit using a GPS-corrected bearing, is from the vehicle speed sensor, not a speed component derived from the GPS. Thus, the Sewaki solution does not meet the limitations of claims 1-4, which require that the

GPS derived velocity vector be integrated to project a previous position to a current position.

Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 1-4 to be anticipated by Sewaki.

I. Hoshino (Ex. 1015, English translation)

Petitioner contends that Hoshino anticipates claims 1-4. Their claim charts related to this reference appear at pages 50-53 of the Petition.

Hoshino describes "a navigation device mounted to a traveling body, such as an automobile, and particularly to a technique for automatically correcting measured values of gyroscope, sensors such as an earth magnetism sensor, and vehicle speed sensor used for inertial navigation in a navigation device." *See* paragraph [0001]. Hoshino also describes that it was known to use GPS for determining a current location and that it was also known to use "inertial navigation" for finding a current location by integrating advancing azimuth and moving distance. *See* paragraph [0002]. Furthermore, paragraph [0003] states it was known to use these two different techniques together. Hoshino notes the problem of inertial guidance, namely that integrating speed from a vehicle speed sensor and bearing from a gyroscope, magnetism senor, etc. accumulate errors over time. Thus position determined without correction becomes more inaccurate over time. *See* paragraph [0005].

There are various ways to cope with this accumulating error as already noted with respect to previously discussed references noted by Petitioner. The Hoshino approach is to correct measured values (of vehicle sensors) using GPS (referred to in the English translation Exhibit 1015 as “wave navigation”). *See* Exhibit 1015 paragraph [0006].

As described in Hoshino paragraph [0032] a “locator 16” displays a calculated location using a map on a display 18. The vehicle driver then confirms current location. This is the only description of how map data is used to “correct” a location that may have been determined with some inaccuracy. There is no description related to updating a GPS-determined velocity vector which is then used to project a current position from a previous position. Thus we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 1-4 to be anticipated by Hoshino.

J. Lipp (Ex. 1016)

Petitioner contends that Lipp anticipates claims 5-8 and renders claim 9 obvious. Their claim charts related to this reference appear at pages 53-56 of the Petition.

1. Claims 5-8

Claims 5-8 require calibrating an “orthogonal axes accelerometer” using GPS velocity-derived lateral and longitudinal calibration information. Petitioner’s claim chart points us to Lipp page 448 as describing this claim feature. Page 448 describes that during GPS-aided dead reckoning navigation, data delivered from a GPS receiver are compared and integrated in a Kalman filter. This comparison results in an update of position, heading angle, and “odometer calibration data.” There is no convincing evidence cited to suggest that an odometer, which provides a measure of distance traveled, is the equivalent of an orthogonal axes accelerometer as required by claims 5-8. Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claims 5-8 to be anticipated by Lipp.

2. Claim 9

Petitioner asserts that claim 9 is rendered obvious by Lipp (single reference) because "calibration inherently requires updating information stored in the accelerometers, and scale factors are a well-known method to store calibration information that one skilled in the art would think to use." As stated with respect to claims 5-8, Lipp does not describe the use of an orthogonal axes accelerometer that is calibrated using lateral and longitudinal calibration information. Thus, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 9 to be obvious in view of Lipp alone.

K. Combination of Anderson and Yoshinori – claim 12

Neither Anderson nor Yoshinori explicitly describes an "orthogonal axes accelerometer." Anderson describes a "flux compass 12" for determining direction and a "radar gun 24" for determining speed. *See* Anderson Fig. 1. Anderson describes the potential use of "accelerometers" as an "optional supplement" at column 11 lines 24-25. Yoshinori describes a "gyro 8" for providing "angle information," a "geomagnetic sensor 7" for providing directional information and a "vehicle wheel speed sensor 5" for providing speed information. *See* Yoshinori Fig. 1. To bridge the gap from these descriptions in Anderson and Yoshinori, Petitioner proffers the declaration of William Michalson. Ex. 1021. Dr. Michalson states at page 46 of his declaration that "This element is an obvious modification of the cited reference. The reference discloses an orthogonal axes accelerometer having longitudinal and lateral acceleration information. *See* Anderson at c. 11 ll. 21–25; JP App. No. H4- 121618 at 8. One of ordinary skill in the art would know that accelerometers inherently have offsets, that offsets must be compensated or 'zeroed,' and that methods are available in the art to zero the accelerometer. One of skill in the art would have a strong motivation to combine these known references and techniques, and knowledge of how to do so, in order to achieve their anticipated results." Because Dr. Michalson has cited to two different references (Anderson and Yoshinori), it is not clear to which he refers. However, there is no persuasive evidence presented that either the structures of Anderson or the structures of Yoshinori suggest an "orthogonal axes accelerometer." Furthermore, no persuasive evidence has been presented that either Anderson or Yoshinori "updates said GPS velocity information with heading before propagating said previous position to a current position" as required by claim 12.

For at least these reasons, we conclude that Petitioner has not demonstrated a reasonable likelihood that it will prevail in proving the subject matter of claim 12 to be obvious in view of Anderson and Yoshinori.

IV. SUMMARY

We have not identified any of Petitioner's proposed reasons for unpatentability on which Petitioner will likely prevail. Petitioner has failed to demonstrate a reasonable likelihood of prevailing on its assertions as to any of the challenged claims.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is denied as to all challenged claims.

FURTHER ORDERED that no *inter partes* review is instituted.

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