UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner

v.

GRANITE VEHICLE VENTURES LLC,
Patent Owner

Inter Partes Review Case No. IPR2025-01035
U.S. Patent No. 12,037,004

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 12,037,004 (Claims 10-24, 27)

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I. INTRODUCTION

Petitioner Tesla, Inc. ("Petitioner") requests *Inter Partes* Review of Claims 10-24, 27 (collectively, the "Challenged Claims") of USPN 12,037,004 ("the '004 Patent") assigned to Granite Vehicle Ventures LLC. *'004 Patent* (Ex. 1001).

The Challenged Claims encompass a hotchpotch of features from prior-art self-driving vehicles (SDVs) including determining competence levels of the driver and the SDV—well-known techniques prior to the '004 Patent. Because the Challenged Claims recite numerous known features, Petitioner's proposed Grounds rely on combinations of multiple references. "The criterion [for obviousness], however, is not the number of references, but what they would have meant to a person of ordinary skill[.]" *In re Gorman*, 933 F.2d 982, 986 (Fed. Cir. 1991). The Challenged Claims are plainly obvious and should be canceled.

II. SUMMARY OF THE '004 PATENT

A. Priority Date of the Challenged Claims

The '004 Patent claims priority to USPN 9,566,986 filed on September 25, 2015. *'004 Patent*, (63). For purposes of this Petition only, Petitioner applies September 25, 2015, as the priority date for the Challenged Claims.

B. Level of Skill of a Person Having Ordinary Skill in the Art

A POSITA at the time of the '004 Patent would have had a bachelor's degree in computer engineering, computer science, electrical engineering, mechanical

engineering, physics, or a related field, with at least four years of experience in the field of vehicle telematics and safety systems, or a master's degree in the same fields with at least three years of experience in the field of vehicle telematics and safety systems. Additional education or experience might substitute for the above requirements.

III. REQUIREMENTS UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Petitioner certifies the '004 Patent is eligible for IPR.

B. Identification of Challenge Under 37 C.F.R. § 42.104(b)

Petitioner requests the Challenged Claims be found unpatentable on the following grounds.[1]

Proposed Grounds of Unpatentability	Exhibits
Ground 1: Claims 10-14 are obvious under §103(a) over *Hampiholi, Attard, McNew, Yamada, Gunderson, Grimm,* and *Frazer*	1007, 1004, 1006, 1046, 1012, 1031, 1005
Ground 2: Claim 15 is obvious under §103(a) over *Hampiholi, Attard, McNew, Gunderson, Grimm, Frazer, Duncan,* and *Engelman*	1007, 1004, 1006, 1012,

[1] All References qualify as prior art under §§ 102(a)(1) and/or 102(a)(2).

	1031, 1005, 1045, 1047
Ground 3: Claims 16-17 are obvious under §103(a) over *Hampiholi, Attard, McNew, Gunderson, Grimm, Frazer, Duncan, Engelman*, and *Strauss*	1007, 1004, 1006, 1012, 1031, 1005, 1045, 1047, 1048
Ground 4: Claims 18-20 are obvious under §103(a) over *Hampiholi, Attard, McNew, Gunderson, Grimm, Frazer, Duncan, Engelman*, *Strauss*, and *Sako*	1007, 1004, 1006, 1012, 1031, 1005, 1045, 1047, 1048, 1040
Ground 5: Claims 21-24, 27 are obvious under §103(a) over *Hampiholi, Attard, McNew, Gunderson, Grimm, Frazer, Duncan, Engelman*, *Strauss*, *Sako*, and *Hada*	1007, 1004, 1006, 1012, 1031, 1005, 1045, 1047, 1048, 1040, 1043

C. Claim Construction Under 37 C.F.R. § 42.104(b)(3)

In this proceeding, claims are interpreted under the same standard applied by Article III courts (i.e., the *Phillips* standard). 37 C.F.R. § 42.100(b); 83 Fed. Reg. 197 (Oct. 11, 2018); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (*en banc*). Petitioner applies the plain and ordinary meaning of all claim terms. Petitioner does not waive any argument in any litigation that claim terms in the '004 Patent are indefinite or additional terms need construction.

IV. SHOWING OF ANALOGOUS, PRIOR ART

The prior art is analogous to the claimed invention of the '004 Patent. The prior art is from the same field of endeavor of the '004 patent, namely vehicles. *'004 Patent*, 1:24-25, 8:50-57; *Attard*, 1:15-24, 9:63-67; *Frazer*, 1:19-23, 21:20-22:22; *McNew*, 1:17-30, 3:5-52, FIG. 1; *Hampiholi*, [0050]-[0051], [0057]-[0058]; *Gunderson*, [0002]-[0004], [0025]; *Sako,* 1:55-2:3, 9:63-67; *Hada,* 1:5-10; *Duncan,* [0023]; *Grimm*, 1:9-43*; Engelman*, [0004]*; Yamada*, 1:5-56; *Strauss*, 1:8-15. *Dec*., 59-60.[2]

The prior art is also reasonably pertinent to at least one problem facing the '004 Patent's inventors, namely at least one of:

[2] References to *Dec*. are to paragraphs of Ex. 1003, Declaration of Christopher Wilson.

(A) evaluating a computer's ability to autonomously operate a vehicle and determining actions to take when faults are detected; *'004 Patent*, 1:24-57, 8:11-16; *Attard*, 1:15-24, 2:28-54; *McNew*, 20:7-31, 4:3-5, 8:41-44; *Sako*, 34:15-35:21, *Grimm*, 3:44-62, *Engelman*, [0022];

(B) autonomously controlling a device's operational mode; *'004 Patent*, 1:24-57, 3:15-22; *Frazer*, 19:23-25, 21:20-22:22, FIG. 6; *Sako*, 1:24-57, 34:15-35:21, *Engleman*, [0004], [0022];

(C) selecting appropriate corrective actions for a given driving situation; *'004 Patent*, 7:57-8:16, 9:11-35, 10:30-60; *McNew*, 20:7-31, 4:3-5, 8:41-44; *Frazer*, 19:23-25, 21:20-22:22, FIG. 6; *Sako*, 34:15-35:21; *Grimm*, 5:65-6:4; *Strauss*, 5:67-6:4;

(D) adjusting an operation of a vehicle based on driver competence; *'004 Patent*, 8:50-58; *Hampiholi*, [0001]-[0004], [0057]; *Duncan*, [0007]-[0008];

(E) adapting to weather conditions to increase vehicle safety; *'004 Patent*, 7:42-56, 13:61-14:25, 15:33-50; *Grimm*, 1:31-44, 7:53-8:6, and/or

(F) improving vehicle safety. *'004 Patent*, 9:11-17; *Gunderson*, [0062]; *Grimm*, 1:9-19, 1:55-67; *Yamada*, 1:5-15; *Strauss*, 5:18-41; *Hada*, 1:5-36, 3:17-21, 3:55-61, 5:23-36; *Duncan*, [0007]-[0008]. *Dec*., 59-60.

V. GROUND 1: CLAIMS 10-14 ARE OBVIOUS OVER HAMPIHOLI, ATTARD, MCNEW, YAMADA, GUNDERSON, GRIMM, AND FRAZER

A. Claim 10

1. Claim 10(Pre): "A self-driving vehicle (SDV) comprising:"

Claim 10 is rendered obvious over a combined *Hampiholi-Attard self-driving vehicle* (SDV)[3], operating according to *Hampiholi's* disclosure and modified to incorporate *Attard's* self-driving modes, functions, features, and confidence assessments, as well as any hardware and software necessary to provide an operable SDV practicing the techniques taught by both *Hampiholi* and *Attard*.

The '004 Patent describes SDVs as vehicles "able to autonomously drive themselves through private and/or public spaces" and during some, but not all, weather conditions. *'004 Patent*, 1:29-31, 15:64-16:4, 28:38-40. *Hampiholi's* vehicle is capable of driving automatically. *Hampiholi*, [0057] (describing "**automatically** controlling the vehicle speed or braking" and "**automatically** bringing the vehicle to a complete stop"), [0073], [0076] ("**automatic** adjustment of engine operation"), Fig. 4; *Dec.,* 62-63. A POSITA would have understood that a vehicle capable of driving automatically in at least some scenarios is a self-driving vehicle (SDV) per the '004 Patent. *Dec*., 62-63. *Attard* teaches such an autonomous

[3] Herein Petitioner uses the "*Hampiholi-Attard* SDV" as shorthand to refer to the mapped combinations.

self-driving vehicle in which autonomous driving module 106 of computer 105 controls steering, braking, and speed. *Attard*, 1:15-65, 3:22-67, 7:39-46, 9:60-67-10:12, 10:36-41; *Dec.,* 64. Specifically, *Attard* teaches controlling a driving mode, transitioning from autonomous mode to either semi-autonomous mode or manual mode responsive to detecting a fault. *Id.*

The *Hampiholi-Attard* SDV would have desirably been capable of self-driving and implementing corrective actions when appropriate, whether due to detected reduced human competence (per *Hampiholi*) or due to detected reduced processor competence (per *Attard*). *Dec*., 62.

A POSITA would have appreciated that the resulting SDV would have thus furthered *Hampiholi's* stated goal of increasing driver, passenger, and bystander safety by controlling a driving mode of an SDV to respond to faults such as decreased driver competence (per *Hampiholi*) as well as hardware failures or weather conditions (per *Attard*). *Hampiholi*, [0002], [0017]; *Attard*, 1:41-2:9; *Dec*., 65. This modification would have been combining prior art elements according to known methods to yield the predictable result of an SDV. *Dec.,* 65. Further, the modification would have been use of a known technique of implementing hardware and/or software features in a vehicle, resulting in an SDV. *Dec.,* 65. A POSITA would have had a reasonable expectation of success because producing SDVs was known in the prior art, and a POSITA would not have had to personally bodily

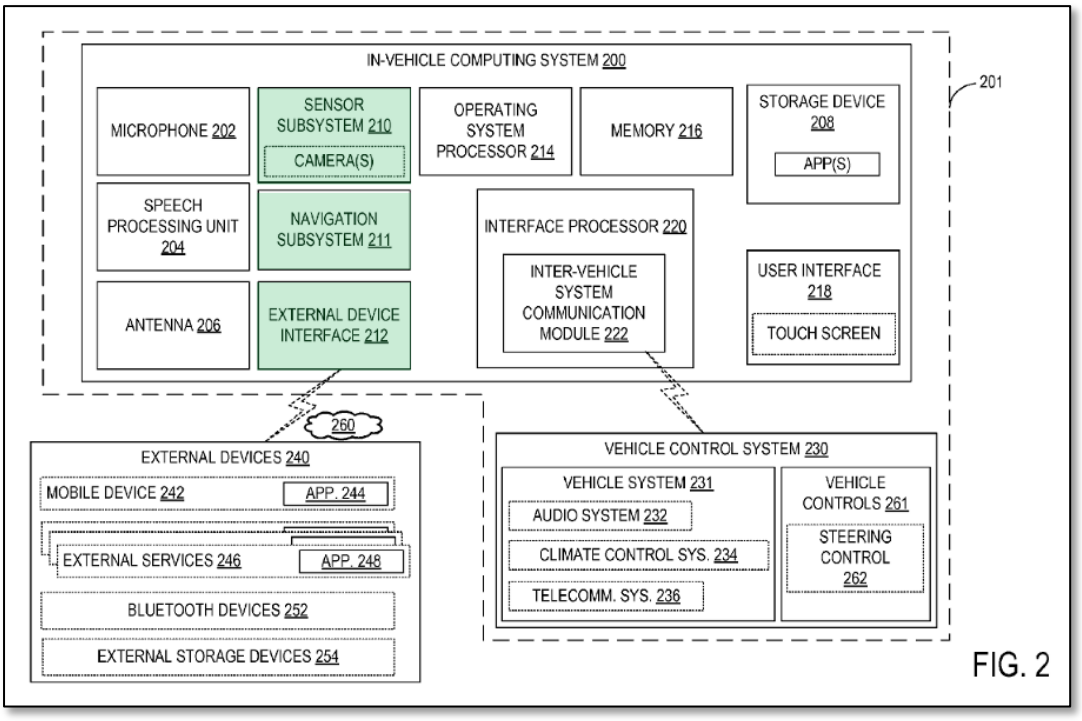
incorporate *Attard's* SDV into *Hampiholi's* vehicle. *Dec.,* 66. *See*, 10(c)[4] for additional motivation to modify *Hampiholi* per *Attard* to include features for self-driving functionality (*vehicle controls*). *Dec*., 62-66.

2. Claim 10(a): "a sensor system having a plurality of sensors, comprising:"

a) *Hampiholi's* Sensor System

Hampiholi teaches receiving inputs from a plurality of sensors in sensor subsystem 210, external device interface 212, and navigation subsystem 211 (collectively, a *sensor system*) including signals regarding gas pedal and brake inputs, temperatures, vehicle and engine speed, cameras, and the vehicle's location.

[4] Any citation to a claim limitation is to the limitation's mapping in this Petition, and such mapping is otherwise incorporated by reference in the section citing the limitation.

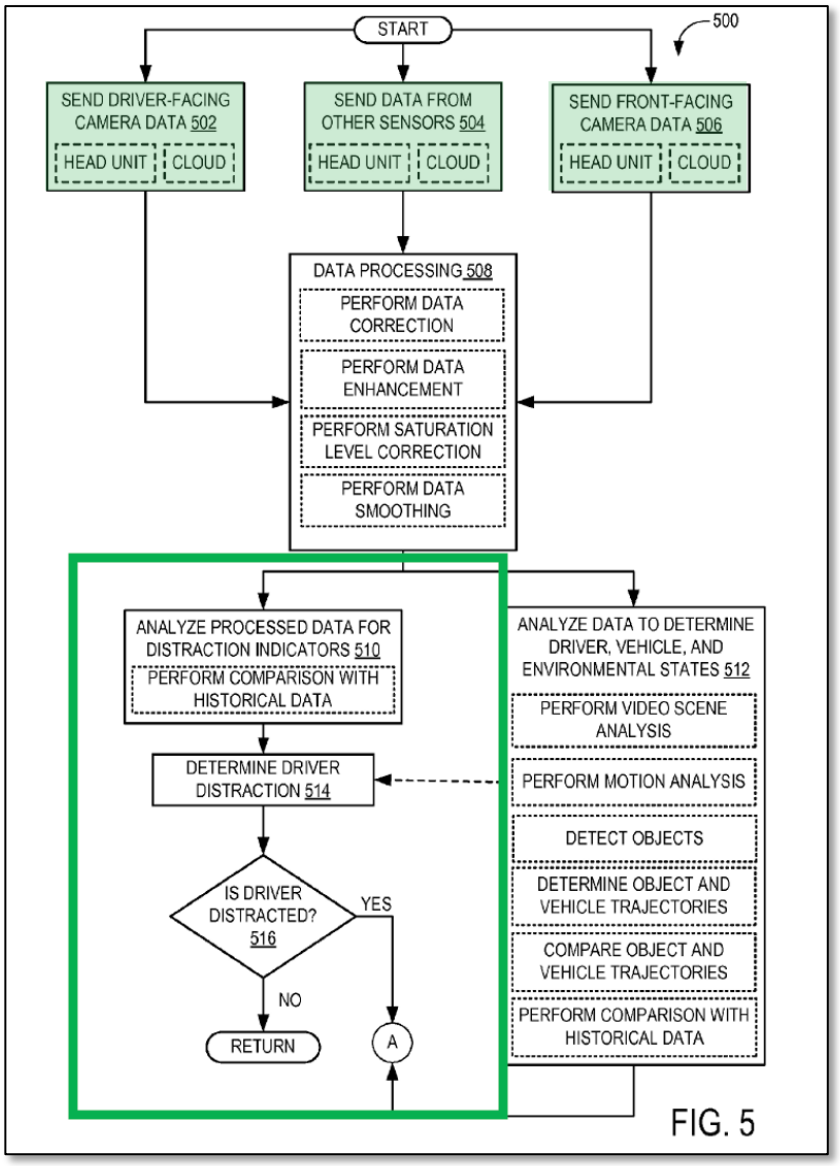


Hampiholi, Fig. 2[5], [0031], [0034], [0046]; *Dec*., 67-68. Specific sensors described by *Hampiholi* include interior (driver-facing) and exterior cameras, and thermometers.

3. Claim 10(a)(i): "a first camera"

Hampiholi teaches a driver-facing camera (*a first camera*). For example, mobile/wearable device 302 includes a driver-facing camera and communicates with the in-vehicle computing system. *Hampiholi*, [0004], [0005], [0035]-[0036], [0046], [0055], [0058]-[0059], [0061]-[0062], [0065].

[5] All annotations and emphases are added by Petitioner unless specified otherwise.



Hampiholi, FIG. 5. As discussed below, *Hampiholi* teaches using these sensor readings to determine *Hampiholi's* severity rank R, the mapped *competence level of the human driver* (HDCL) may include the driver's eyelid position as determined by the video from a driver facing-camera ([0062]). *See*, 10(g)(v).

4. Claim 10(a)(ii): "a second camera"

a) *Attard's* Second Camera

Attard teaches "[d]ata collectors 110 could also include sensors or the like for detecting conditions outside the vehicle" including "image capture devices", i.e., a *second camera*. *Attard*, 4:8-17, 14:63-67.

b) Motivation to Combine *Hampiholi-Attard*

A POSITA would have been motivated and found it obvious to include a second camera, per *Attard*, in the *Hampiholi-Attard* SDV to increase the total amount of data collected, resulting in a safer vehicle. *Dec.,* 71. A POSITA would have had a reasonable expectation of success (REOS) because *Hampiholi* already includes a camera and vehicles utilizing multiple cameras were well-known. *Id.* This modification would have been combining prior art elements according to known methods to yield the predictable result of an SDV having multiple cameras. *Id*. Further, this would have been use of known technique of an SDV with a camera to monitor the exterior of the SDV to improve the *Hampiholi-Attard* SDV in the same way as *Attard's*. *Id*. Additional motivation to combine *Hampiholi-Attard* is provided above. *See*, 10(Pre).

5. Claim 10(a)(iii): "a sensor configured to detect input from a steering wheel"

Attard teaches that the commanded steering input is measured. *Attard*, 7:8-11. A POSITA would have understood that when the steering is manual and the

command is from the steering wheel, this requires "a sensor configured to detect input from a steering wheel."

McNew teaches a "steering wheel grip sensor [that] can detect whether the driver's hands are in contact with the steering wheel," i.e., *a sensor configured to detect input from a steering wheel*. *McNew*, 4:15-18.

a) Motivation to Combine *Hampiholi-Attard-McNew*

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV further per *McNew* to yield the predictable result of the *Hampiholi-Attard* SDV operable to detect whether the driver's hands are on the vehicle. *Dec*., 72-78. This would have predictably improved *Hampiholi's* driver distraction system by providing another avenue by which to detect whether the driver is paying attention. Thus, a more accurate and/or a more flexible severity rank R would be computed. *Dec*., 75.

In fact, *Hampiholi* provides an express teaching, suggestion, and motivation by teaching the use of a camera for detecting whether "the driver may have taken his/her hands from the driving wheel." *Hampiholi*, [0065]. A POSITA would have recognized that adding a steering wheel grip sensor, per *McNew*, would have improved *Hampiholi's* detecting of the driver's hands being on the wheel. *Dec*., 76. For example, perhaps the driver's hands are near the steering wheel but outside the range of the camera, which is more focused on the driver's face and eyes. *Id*. This

modification would have been combining prior art elements according to known methods to yield the predictable result of a steering wheel sensor in an SDV. *Dec*., 76-77. Further, this use of a known technique of using a steering wheel sensor to determine if a driver's hands are on the steering wheel would have improved the *Hampiholi-Attard* SDV in the same way as *McNew's* SDV. *Id*.

Such a modification would have had a REOS (reasonable expectation of success) at least because *Hampiholi* expressly contemplates detecting the driver's hands on the wheels and because *Hampiholi's* vehicle already includes a wheel such that the modification is merely adding a sensor to detect input on the wheel, per *McNew*. *Dec*., 75-78. Adding a sensor would have been a straightforward modification to vehicle hardware and programming instructions within the skillset of a POSITA. *Id.*

6. Claim 10(a)(iv): "a GPS sensor"

The *Hampiholi-Attard* SDV includes *a GPS sensor*. *Hampiholi*, [0031] ("[L]ocation sensors such as Global Positioning System [GPS] sensors); *Attard*, 3:4-7.

7. Claim 10(a)(v): "a thermometer; and"

See, 10(a). *Hampiholi* teaches or renders obvious a thermometer. Namely, *Hampiholi* teaches an "inter vehicle system communication module 22 that outputs data "provided by individual information sources" including "**thermometers**."

Hampiholi, [0031], [0034] (ambient temperature, intake air temperature, climate control temperatures). *Dec*., 80. To the extent it is argued *Hampiholi* does not teach a thermometer, *Yamada* teaches such. *See*, 10(b)(ii).

8. Claim 10(a)(vi): "a speedometer"

Hampiholi teaches "inputs received by sensor subsystem 210 may include…vehicle speed," which a POSITA would have understood as teaching or rendering obvious *a speedometer*, which are present in all vehicles. To the extent it is argued *Hampiholi* does not teach a speedometer, *Yamada* teaches such. *See*, 10(b)(iii). *Dec*., 81.

9. Claim 10(b): "a display that is capable of displaying"

Hampiholi teaches a user interface 218 that "may include a graphical user interface presented on a touch screen," meeting the claimed *display*. *Hampiholi*, [0044]. A POSITA would have understood that a display such as *Hampiholi's* would have been capable of displaying sensor readings. *Dec*., 82.

To the extent it is argued that *Hampiholi* does not teach UI 218 *is capable of displaying* the GPS, thermometer, and speedometer readings required by 10(b)(i)-(iii); however, *Yamada* teaches such, and a POSITA would have found it obvious and been motivated to modify *Hampiholi* based on *Yamada* as discussed below for 10(b)(i)-10(b)(iii). *Dec*., 83.

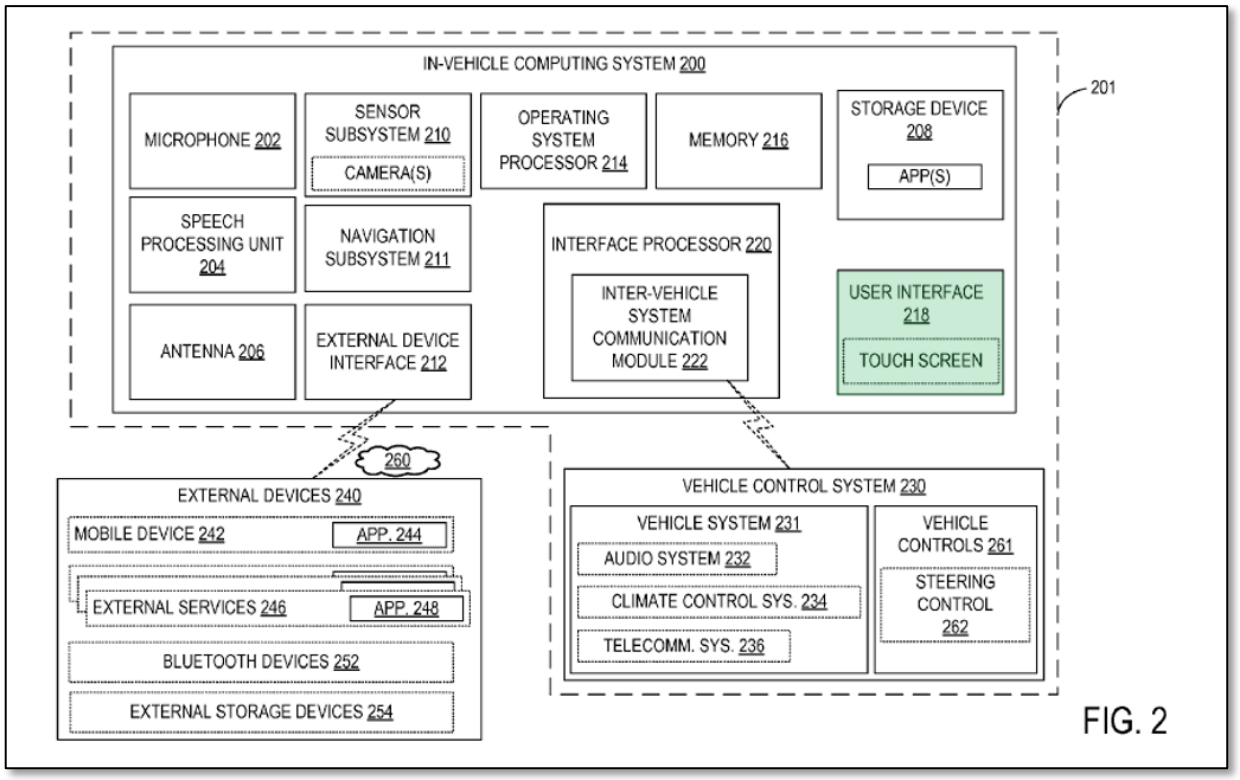


FIG. 2

Hampiholi, FIG. 2.

10. Claim 10(b)(i)-(iii): "displaying…" "a reading from the GPS sensor;" "a reading from the thermometer; and" "a reading from the speedometer;"

a) *Yamada's* readings from GPS sensor, thermometer, speedometer

Yamada teaches a display capable of displaying *a reading from a GPS sensor*. *Yamada*, 4:26-32, 8:30-53, 8:64-9:22, 5:4-8, 5:31-41, 1:28-35. *Yamada* teaches information sensors 72 including interior/exterior/engine temperature sensors (i.e., thermometers) may display a *reading from a thermometer* on a vehicle display. *Yamada*, 8:64-9:22. Similarly, *Yamada* teaches displaying *a reading from the*

speedometer. *Yamada*, 8:30-66, 5:4-8. A speedometer 302 and GPS navigation map are depicted in Fig. 3 below.

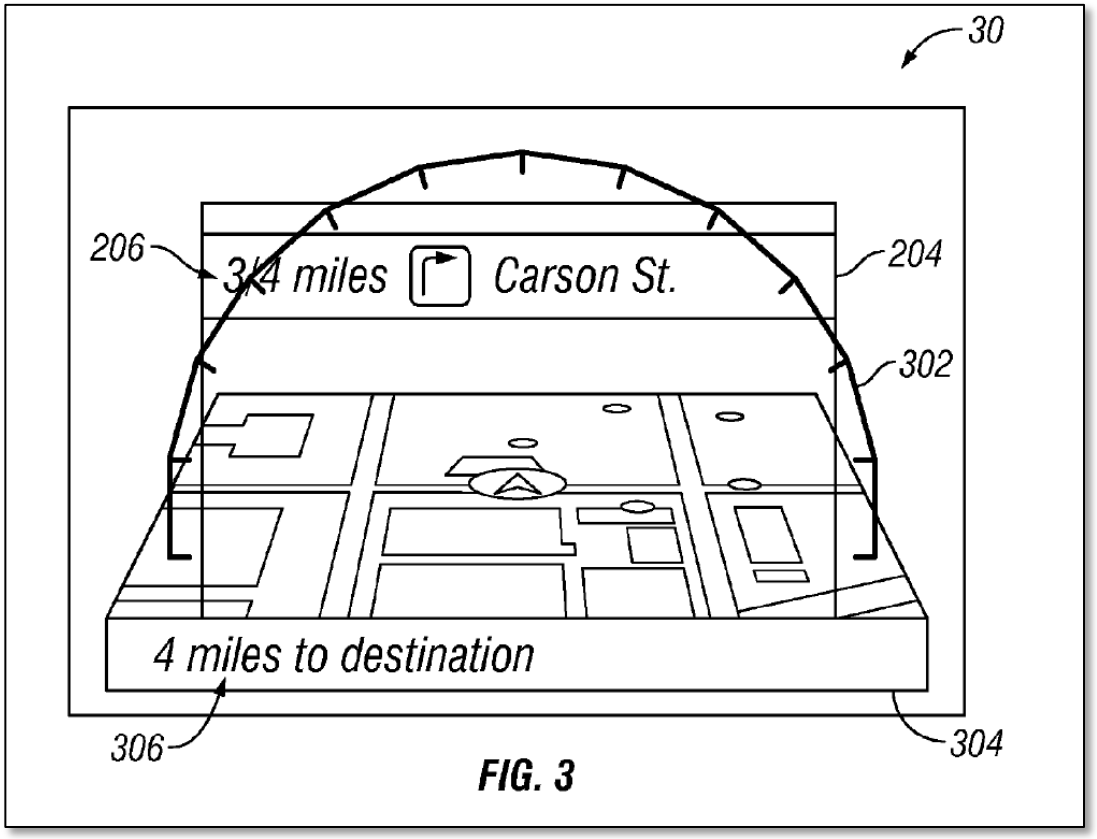


FIG. 3

Yamada, Fig. 3. While not depicted for Fig. 3, a POSITA would have understood that *Yamada's* display was capable of displaying temperature readings. *Dec*., 84.

b) Motivation to Combine *Hampiholi-Attard-McNew-Yamada*

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV to display readings from sensors including GPS sensor, thermometer, and speedometer per *Yamada's* teachings. *Dec*., 85-87. Displaying a reading from a GPS sensor would have aided the driver in navigation. *Dec*., 85-87.

Displaying thermometer readings would have informed a driver of interior and exterior vehicle temperature for climate control. *Id.* Informing a driver of engine temperature would have been advantageous for a user to monitor if an engine is overheating or too cold to effectively run the vehicle's heater. *Id*. Displaying a reading from a speedometer would have advantageously helped a driver know the vehicle's current speed and comply with traffic laws regarding speeding. *Id*. Modifying the *Hampiholi-Attard* SDV to utilize a display capable of displaying these sensor readings would have been combining prior art elements according to known methods to yield predictable results. *Dec*., 85-87. Further, this modification would have been use of *Yamada's* known technique to improve the similar *Hampiholi-Attard* SDV in the same way as *Yamada's* SDV. *Id.*

This modification would have had a reasonable expectation of success because displaying, GPS, temperature, and speedometer readings was well-known in the art prior to the '004 Patent. *Dec*., 85-87. Further, this modification would have had a REOS because *Hampiholi-Attard* already has the necessary hardware including sensors and a display, processor, and memory for storing programming instructions. *Dec*., 85-87. Only straightforward changes to programming instructions would have been required. *Dec*., 87. To the extent it is argued that the *Hampiholi-Attard* SDV's display would have needed to be replaced, such would have been a

simple substitution of one known display for another and would have obtained predictable results. *Dec*., 87.

11. Claim 10(c): "vehicle controls comprising: an engine throttle, a steering mechanism, and a braking system;"

As discussed above, the *Hampiholi-Attard* SDV is configured to automatically modify particular operations of the vehicle, including specifically autonomously controlling the vehicle speed and bringing the vehicle to a complete stop (per *Hampiholi*) and disabling one or more autonomous operations, such as in response to a fault (per *Attard*). *See*, 10(Pre), 15(d)(ii).

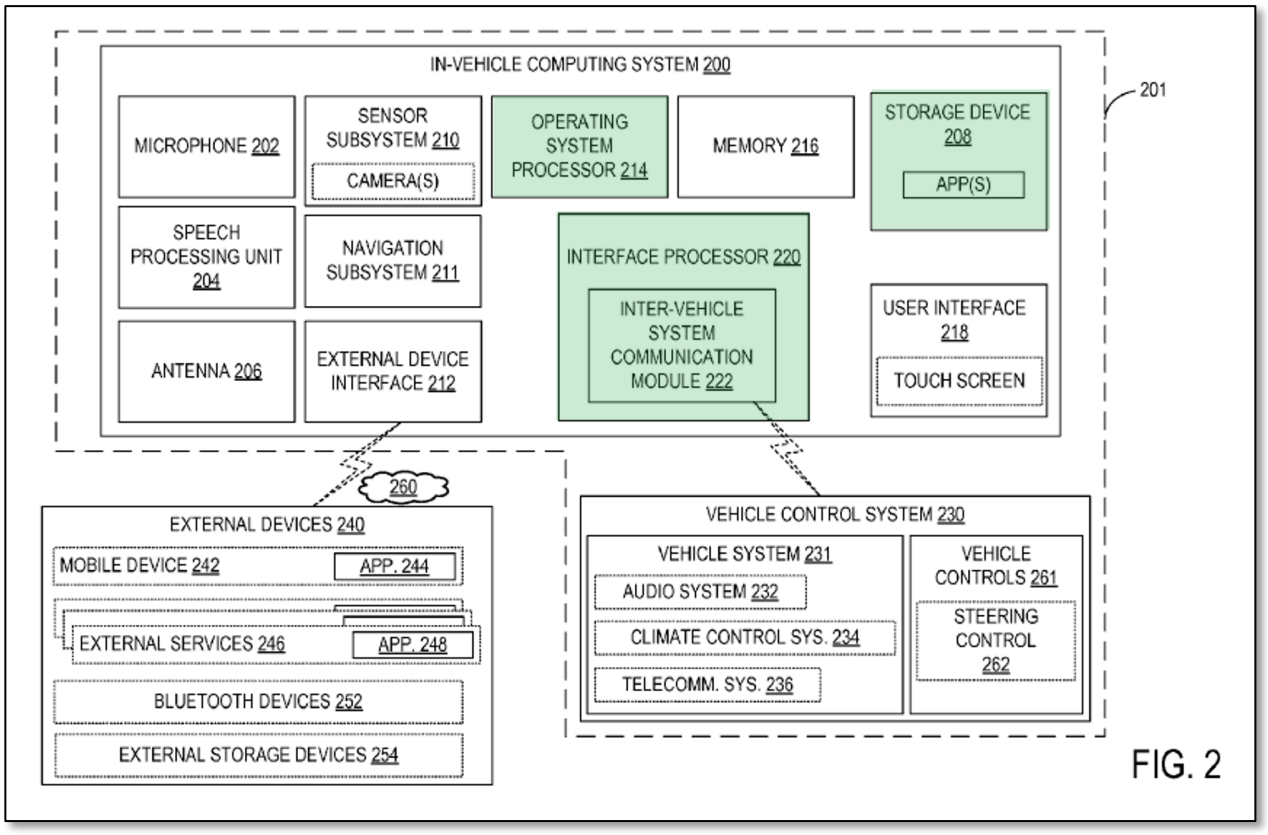
Attard teaches its vehicle is operated partially or completely autonomously by autonomous driving module 106 in its computer 105, including specifically the operation of the vehicle's "steering, braking, [and] speed." *Attard*, 9:63–10:12. A POSITA would have recognized or at least found obvious that controlling the vehicle's "steering" teaches controlling its "steering mechanism," controlling its "braking" teaches controlling its "braking system," and controlling its "speed" teaches controlling its "engine throttle." *Dec*., 88-89.

A POSITA would have understood or found obvious that because *Attard* teaches a vehicle operable in manual and autonomous modes and *Attard* defines an autonomous vehicle as being "operated wholly … without human intervention, i.e., … autonomous" and its vehicle computer making "decisions concerning vehicle speed, course, etc.," that *Attard's* vehicle would have included autonomous control

of vehicle controls performing these functions, including changing the vehicle's speed (*engine throttle* and *braking system*) and direction (*steering mechanism*). *Dec*., 90 *citing Attard*, 1:15-24. In specific examples, *Attard's* vehicle may take autonomous actions such as a "slow to a stop," "pull over and stop," or "limp home" operation. *Attard*, 2:46-54. *Dec*., 91. A POSITA would have recognized each of these autonomous operations would have required control of the *engine throttle*, *steering mechanism*, and *braking system*. *Dec*., 88-91.

12. Claim 10(d): "a non-transitory computer readable storage medium comprising"

Hampiholi's Fig. 2 below depicts vehicle 201 including vehicle storage device 208 including "instructions executable by processors 214 and 220 in non-volatile form:"



Hampiholi, Fig. 2, [0029], [0032].

Hampiholi teaches storage device 208 may store instructions and/or code that, when executed by a processor (e.g., operating system processor 214 and/or interface processor 220), controls the in-vehicle computing system 200 to perform one or more actions. *Hampiholi*, [0032]. These instructions would have included those taught by both *Hampiholi* and *Attard* in the *Hampiholi-Attard* SDV, including specifically the instructions for "controlling a driving mode" according to *Attard's* disclosure. *Hampiholi*, [0003], [0032]; *Attard*, 3:22-27, 3:56-67, 9:60-10:12. *Dec*., 92-93. Thus, a POSITA would have understood or found obvious *Hampiholi's*

storage device 208 is *a non-transitory computer readable storage medium*. *Dec*., 92-93.

13. Claim 10(d)(i): "a first plurality of weights, and the first plurality of weights comprising first active learning data from a first cohort of other SDVs:"

a) *Gunderson's* Teachings

Gunderson teaches vehicle 10 and event capture device 20 (e.g., camera) determining driver behaviors. *Gunderson*, [0030]. Further, *Gunderson* teaches event detector 30 in combination with event capture devices 20 "identifies an event and stores certain audio and video data along with related information about the event." *Gunderson*, [0032]. Data regarding event 150 is stored locally until being provided to evaluation server 50. *Gunderson*, [0040]-[0045]. Evaluation server 50 includes insight module 270, which aggregates event data into a database and correlates the data to identify trends in driving behavior that relate to risk factors and generates a driver rating/score for a driver. *Gunderson*, [0056], [0059].

Insight module 270 includes individual module 400 and group module 410.

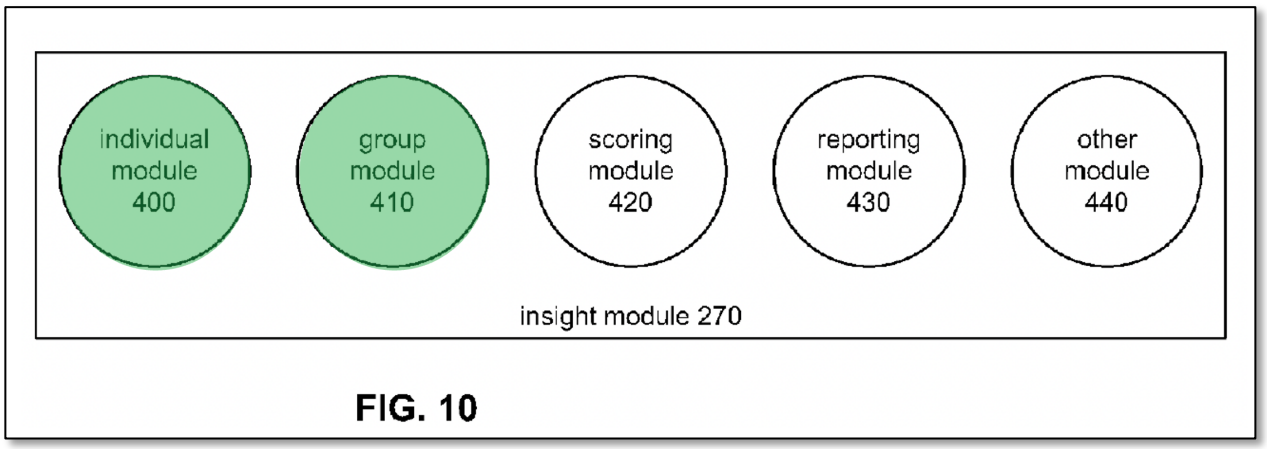


FIG. 10

Gunderson, Fig. 10, [0060]. Individual module 400 analyzes event data for an individual, and scoring module 420 applies scoring regarding risk factors (e.g., changing lanes without signaling). *Gunderson*, [0061]. Group module 410 analyzes event data for a group of drivers and "assign[s] relative weights to the risk factors depending on their prevalence to the group as a whole." *Gunderson*, [0062]. For example, a tendency of not utilizing a turn signal before changing lanes appears in only one driver out of ten, reducing that tendency by 90 percent when applied to the group. *Id.* Additionally, *Gunderson's* scoring module 420 uses data from the individual and group modules (including the weights) to derive a score for the individual. *Gunderson*, [0063]. Thus, *Gunderson's* weights applied to risk factors are *a first plurality of weights*. *Dec*., 94-95. Furthermore, A POSITA would have understood or found obvious that weighting driver behaviors in this way teaches *weights comprising active learning data from a first cohort* (*Gunderson's* group of drivers) *of other SDVs*. *Dec*., 94-95.

b) Motivation to Combine *Gunderson*

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV per *Gunderson's* weight teachings. This modification would have improved the *Hampiholi-Attard* SDV to advantageously use more accurate/flexible information when computing *Hampiholi's* severity rank R. *Dec*., 96-98. For example, *Gunderson* teaches negative tendencies may be relatively

uncommon among drivers, and the *weights* may be set to learn from such behaviors. *Dec*., 96-98. Thus, driver behaviors trends among a group of drivers can be identified to accurately weight such trends. *Dec*., 96-98. Accordingly, modifying the *Hampiholi-Attard* SDV in this way would have enabled, for example, assigning a higher weight to certain distraction indicators that are more prevalent based on data from other drivers and a lower weight to those distraction indicators that are less prevalent among drivers. *Hampiholi*, [0062]-[0063], FIG. 5; *Dec*., 96-98. This modification would have been use of a known technique that would have improved *Hampiholi-Attard's* similar vehicle in the same way as *Gunderson's* vehicle. *Dec*., 96-98.

Furthermore, a POSITA would have been motivated and found it obvious to store *Gunderson's* weights in *Hampiholi's* storage device 208 (*non-transitory computer readable storage medium*). A POSITA would have thus been motivated and found it obvious to apply *Gunderson's* teachings of weighting driver behaviors to *Hampiholi's* similar system that evaluates driver behaviors to compute severity rank R. *Dec*., 96-98.

Modifying the *Hampiholi-Attard* SDV per *Gunderson* would have had a REOS. *Hampiholi-Attard* already includes hardware necessary to perform *Gunderson's* steps, including *Hampiholi's* sensors, processor, memory, and programming instructions. *Hampiholi,* [0032]. Because *Hampiholi* already accounts

for historical information in determining driver distractedness, a POSITA would have had a reasonable expectation of success in the modification. *Hampiholi*, [0062-0063]. Thus, modifying the *Hampiholi-Attard* SDV per *Gunderson* would have required only straightforward changes to programming instructions well-within the skillset of POSITA. *Dec*., 96-98. Modifying the *Hampiholi-Attard* SDV, e.g., to store *weights* per *Gunderson* would have been a straightforward modification well within the skillset of a POSITA. *Dec*., 96-98.

14. Claim 10(e): "the non-transitory computer readable storage medium comprises"

See, 10(d).

15. Claim 10(e)(i): "a second plurality of weights, and the second plurality of weights comprising second active learning data from the first cohort of other SDVs;"

a) *Grimm's* Weights

Grimm teaches "crowd-sourced data from vehicles to determine traffic conditions and events." *Grimm*, 1:9-10, 3:44-52 (disclosing autonomous vehicle systems). *Dec*., 100-103. Vehicles determine "threats" that are communicated to a server 170. *Grimm*, 5:41-46; *Dec*., 100-103. Per *Grimm*, "threats or hazardous conditions may only be determined by evaluating multiple parameters" such as "determining that a particular surrounding vehicle is driving in a dangerous manner." *Grimm*, 5:56-59. *Grimm* teaches computing a "threat level TL_i of a particular vehicle i" by the following equation:

$$TL_i = \sum_{j=1}^{m} w_j p_j^i$$

where "w_j is a weighting value associated with a specific property j, and p_j^i is the property (such as braking, acceleration, or speed) for the vehicle i." *Grimm*, 5:59-65; *Dec*., 101-103. Property p_j^i is a function of vehicle parameters, obtainable from *Grimm's* vehicle dynamics module, object detection module, system status module, and V2V communications module. *Grimm*, 5:65-6:4, 2:57-3:52 (discussing the modules). *Dec*., 101-103. The properties can be "of multiple vehicles." *Grimm*, 6:18-30, 4:46-50 (disclosing vehicles communicating braking data). The weights w_j in the threat level equation teach *a second plurality of weights*. Further, because these weights are derived from different properties reported from the other vehicles, the weights *compris[e] second active learning data from the first cohort of other SDVs*. A POSITA would have understood or found obvious to modify the *Hampiholi-Attard* SDV such that *Gunderson's* and *Grimm's weights* are from the same (*first*) *cohort of other SDVs*, thereby advantageously leveraging data/weights from the same set of vehicles for the decision-making process. *Dec*., 101-103.

b) Motivation to Combine with *Grimm*

Per Claim 10(g)(iv) and 10(g)(vi), the *second plurality of weights* are used with *a second plurality of inputs* to obtain *a second weighted voting result*, which is in turn used to *autonomously maintain a buffer of space*.

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV per *Grimm's* teachings of a *second plurality of weights* and to store those weights in memory. *Dec*., 104-106. This would have combined prior art elements according to known methods to yield the predictable result of the *Hampiholi-Attard* SDV storing *Grimm's* weights in memory for computing the *second weighted voting result*. *Id.* This use of a known technique would have improved the *Hampiholi-Attard* SDV in the same way as *Grimm. Dec*., 104-106. A motivation to combine *Grimm's* teachings of *a second weighted voting result* based on the *second plurality of weights* is discussed below with respect to Claim 10(g)(vi). *See*, 10(g)(vi).

Modifying the *Hampiholi-Attard* SDV per *Grimm* would have had a REOS. *Hampiholi-Attard* already includes hardware necessary to perform *Grimm's* steps, including *Hampiholi's* sensors, processor, memory, and programming instructions. *Hampiholi,* [0032]; *Dec*., 104-106. Thus, modifying the *Hampiholi-Attard* SDV per *Grimm* would have required only straightforward changes to programming instructions well-within the skillset of POSITA. *Dec*., 104-106.

16. Claim 10(f): "the non-transitory computer readable storage medium comprises a fault remediation table comprising a first quota, a second quota, a first corrective action, and a second corrective action;"

a) *Frazer's* Fault Remediation Table

Frazer teaches action engine 110c including event table 112 for use with autonomous or semi-autonomous vehicles. *Frazer*, 21:20-32. Event table 112 includes registers (rows 140c-1, 140c-2, etc.) containing particular sets of conditions 142c and an instruction/action 144c (*a corrective action*) to be taken when conditions are met. *Frazer*, 21:20-22:22. In more detail, *Frazer* teaches conditions of a "dynamic environment" monitored by sensors. *Frazer*, 21:52-56. If input signals match a given condition 142c stored in event table register 140c, corresponding action(s) 144c stored in event table register 140c are executed. *Frazer*, 22:6-22. *Frazer's* event table 112 is depicted below, including *a first corrective action* and *a second corrective action*:

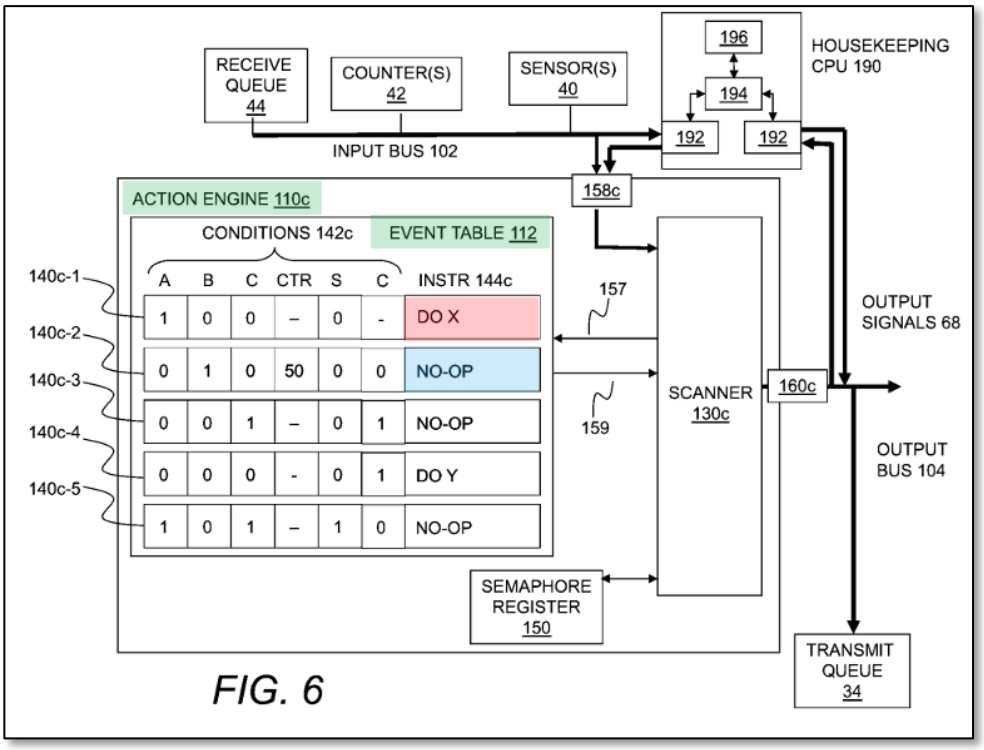
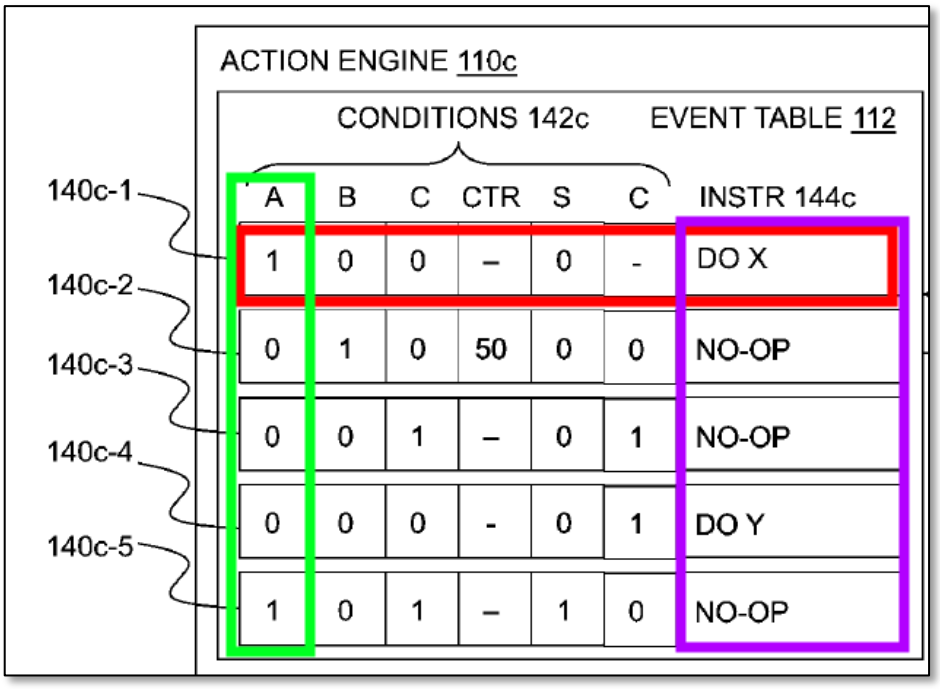


FIG. 6

Frazer, FIG. 6, 21:19-43.

A POSITA would have recognized *Frazer's* event table 112 mirrors the description of a fault-remediation table in the '004 Patent. *See*, *'004 Patent*, 8:27-44 *compared with Frazer*, 21:19-43, FIG. 6. *Dec*., 107-110. In particular, *Frazer's* rows 140c represent fault conditions, a first column 142c refers to a condition manifested by that fault, and a second column 144c refers to the *corrective action* to be taken when the conditions are manifested ("DO X"); *Dec*., 107-110.



Frazer, FIG. 6 (excerpt).

Therefore, because *Frazer's* event table 112 includes faults 140c specified by conditions 142c and actions 144c that are triggered when conditions are met, *Frazer's* event table 112 teaches *a fault-remediation table*. *Dec*., 107-110.

Frazer further teaches event table 112 "can be implemented in any suitable type of memory, including but not limited to computer readable storage media such as a volatile or non-volatile memory…" *Frazer*, 22:43-51.

b) Motivation to Combine with *Frazer*

A POSITA would have found it obvious and been motivated to modify *Hampiholi-Attard's* fault handling (including determining a corrective action, such as visual/audio warnings) with *Frazer's* teachings of organizing faults, conditions, and action(s) to take for each fault in an event table (i.e., *fault-remediation table*),

which would have resulted in *Hampiholi's* memory comprising *a fault remediation table comprising…a first corrective action, and a second corrective action*. *Dec*., 111-117. A POSITA would have found it obvious and been motivated to determine which corrective action to take using *Frazer's* event table to enable easy access and quick determination of actions to take in response to detected faults. *Dec*., 111-117. A POSITA would have recognized formatting data into a table was a well-known and widely-used method of efficiently organizing data for retrieval, reference, and potential modification. *Dec*., 111-117. A POSITA would have specifically appreciated the if/then type of fault remediation data already present in *Hampiholi-Attard's* SDV would have been particularly apt for organizing into a table, concisely and efficiently cross-referencing an array of detectable conditions to quickly determine appropriate responses, improving the safety of the vehicle while reducing its memory requirements compared to an otherwise unorganized list of fault responses. *Dec*., 111-117.

Based on *Hampiholi's* teachings that faults have associated actions (*see, e.g., Hampiholi*, [0056]-[0057]), a POSITA would have looked to other references that describe specific ways to associate faults with actions and to store such information in computer memory, e.g., *Frazer*. A POSITA would have understood *Frazer* provides an express teaching, suggestion, and motivation for the combination, stating its action engine "exhibits a significantly low latency with respect to

processing information relating to respective states of the dynamic environment and taking actions in response to same." *Frazer*, 23:64-67; *Dec*., 111-117. A POSITA would have recognized the usefulness of storing these associations at least to reduce latency as expressly taught by *Frazer*. *Frazer*, 23:64-67; *Dec*., 111-117. The proposed combination constitutes application of a known technique (using event tables to organize data, such as *Frazer* teaches) to a known method (*Hampiholi-Attard's* fault handling method) ready for improvement to yield predictable results. *Dec*., 111-117. Further, this use of *Frazer's* known technique would have improved *Hampiholi-Attard's* similar SDV in the same way as *Frazer's*, including because *Frazer* expressly teaches this event table is for use in an autonomous or semi-autonomous vehicle. *Dec*., 111-117.

A POSITA would have appreciated that modifying *Hampiholi-Attard* per *Frazer* would have had a REOS. *Dec*., 111-117. *Hampiholi, Attard,* and *Frazer* teach implementing programs and functions using programming instructions executed by a processor. *Hampiholi,* [0032], *Attard*, 15:12-46; *Frazer*, 21:20-50. *Dec*., 111-117. Modifying *Hampiholi-Attard* would have merely required straightforward changes to programming instructions. *Dec*., 111-117. Indeed, *Hampiholi* already teaches computer hardware including a processor for executing instructions and memory that stores instructions. *Attard*, [0032] (teaching examples of memory).

Thus, a POSITA would have understood or found obvious that *Hampiholi-Attard* already has the necessary computer hardware for implementing an event table, such as *Frazer's*. *Dec*., 111-117. To the extent it is argued that *Hampiholi-Attard's* hardware is insufficient for this modification, a POSITA would have understood that it would have been straightforward to modify the vehicle to include additional memory or processing power as needed, and that this would have been a tradeoff to capture *Frazer's* advantages. *Dec*., 111-117.

Further, a POSITA would have recognized the ease of modifying *Hampiholi-Attard's* computer and memory to include an event table per *Frazer*. *Dec*., 111-117. *Hampiholi, Attard,* and *Frazer* are similar in that they each describe detecting faults/events based on sensor data. *Compare Hampiholi,* [0031], [0034], [0046] *with Attard* 1:50-52, 12:53-62 *with Frazer*, 21:52-56, 22:31-47. Thus, there would have been a REOS in modifying *Hampiholi-Attard* to utilize a fault-remediation table such as taught by *Frazer*. *Dec*., 111-117. Additionally, both *Frazer* and *Attard* teach applying their systems and methods to an autonomous or semi-autonomous vehicle, such that a POSITA would have had a REOS when modifying *Hampiholi-Attard* per *Frazer's* teachings. *Dec*., 111-117.

c) *Hampiholi's* First and Second Quotas

Frazer's event table 112 does not expressly teach *first and second quotas*; however, a POSITA would have found it obvious to store *Hampiholi's* thresholds

(*quotas*) in *Frazer's* event table 112. *Hampiholi* teaches determining whether a severity ranking R falls within a severity rank range to determine a corrective action to take. *Hampiholi*, [0056]-[0057]. The upper and lower bounds of each severity rank range are thresholds/*quotas*. *Dec*., 118-122. Two exemplary *quotas* are shown below, where when R is above the first *quota* (i.e., *better than*, or the value of R is less than the 1st range), nothing happens and when R is below the first *quota*, a corrective action is taken, e.g., based on whether R is below the second quota.

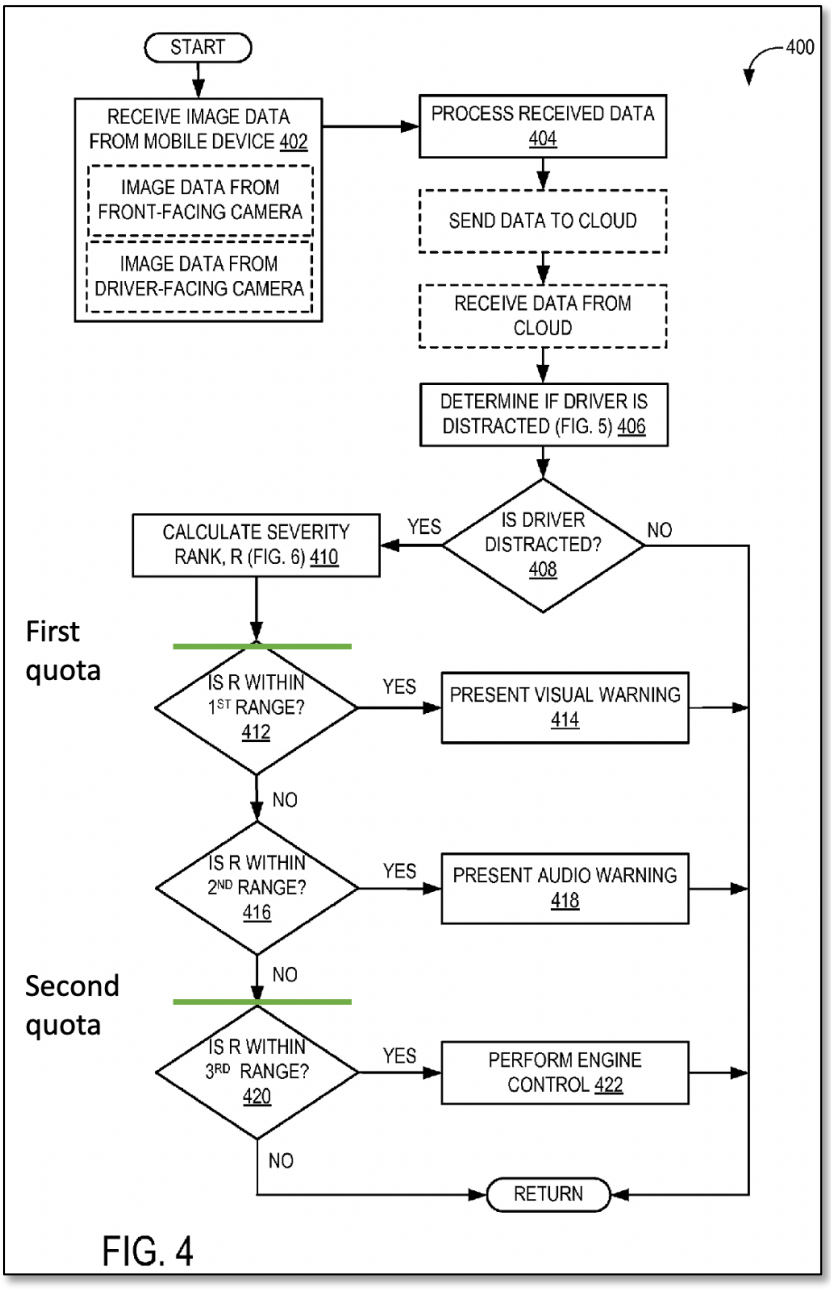


FIG. 4

Hampiholi, FIG. 4.

Hampiholi's quotas are conditions that, when met, cause an action (e.g., visual and/or audio warning, or engine control) to be carried out. Thus, *Hampiholi's quotas* are analogous to the conditions 142c taught by *Frazer*. *Compare Hampiholi*, [0057] *with Frazer*, 21:33-64. *Dec*., 118-122. As such, a POSITA would have found it

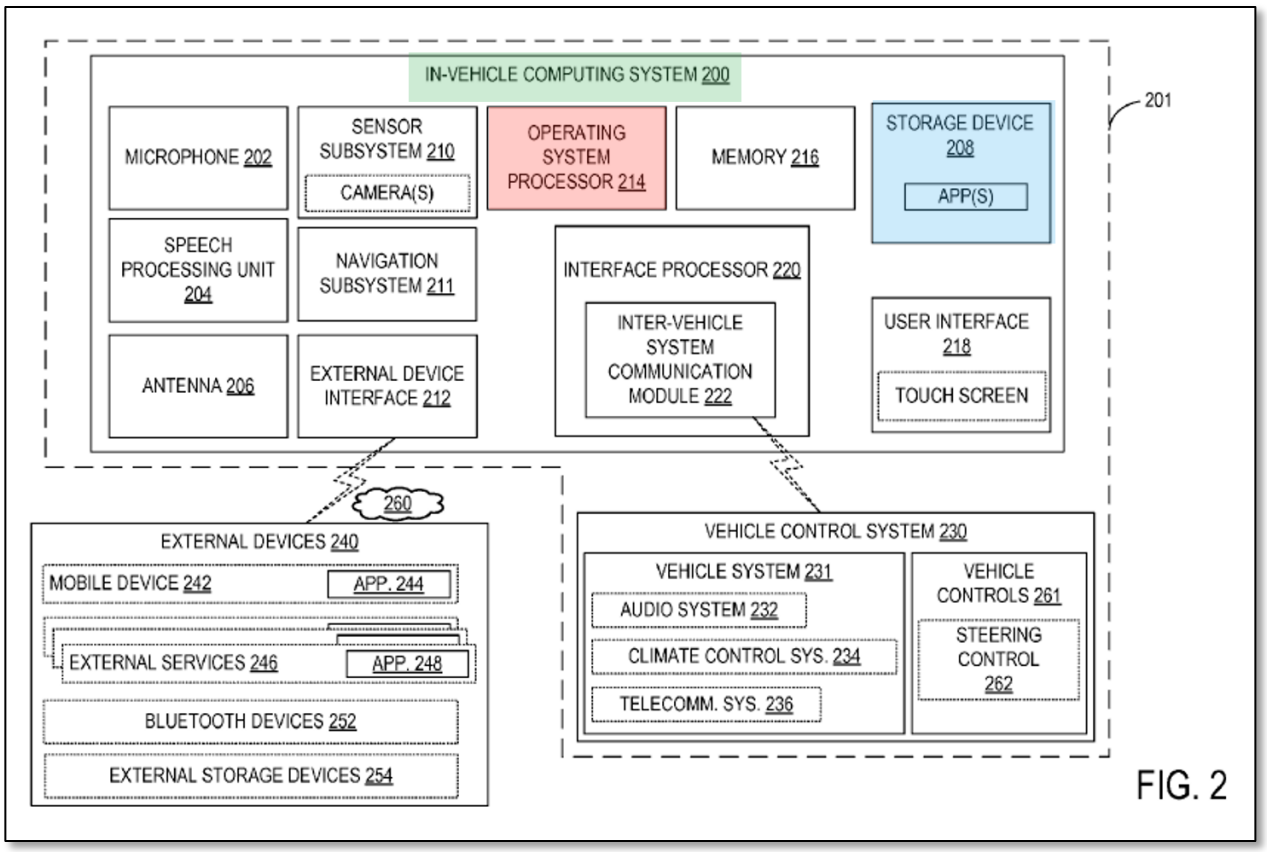
obvious and been motivated to modify the *Hampiholi-Attard* SDV to store *Hampiholi's quotas* in the event table 112 such that, when met, actions 144c are executed. *Dec*., 118-122.

Modifying the *Hampiholi-Attard* SDV in such a way is merely the combination of known prior art elements according to known methods to yield predictable results. *Dec*., 118-122. *Hampiholi* teaches severity ranges having thresholds (*quotas*) that, when met, cause a corrective action to be taken. *Hampiholi*, [0057]. *Frazer* teaches an event table 112 usable in vehicles that stores the relationship between conditions and actions to take when the conditions are met. *Frazer*, 22:20-51. A POSITA would have had a REOS in making this modification for the reasons stated above. *See,* V.A.16.b.

17. Claim 10(g): "a computer system comprising a processor coupled to the non-transitory computer readable storage medium and program code, the program code readable and executable by the processor, wherein the computer system is capable of performing operations comprising:"

Hampiholi's vehicle includes an in-vehicle computing system 200 (*a computer system*) that comprises an operating system processor 214 (*a processor*) that is coupled to storage device 208 (*non-transitory computer readable storage medium*). The storage device 208 stores *program code* that is *readable and executable by* the processor 214. *Hampiholi*, [0032] ("Non-transitory storage devices, such as non-volatile storage device 208…may store instructions and/or

code that, when executed by a processor (e.g., operating system processor 214 and/or interface processor 220), controls the in-vehicle computing system 200 to perform one or more of the actions described in the disclosure.") A POSITA would have understood the processor 214 to be coupled to the storage device 208 because *Hampiholi* teaches the processor 214 executes instructions stored in device 208. *Dec*., 123. The in-vehicle computing system 200 (*computer system*) is capable of performing the operations recited in the subsequent Claim 10(g) limitations or is modified to be capable of performing the claimed operations.



Hampiholi, FIG. 2, [0032], [0072], [0089].

18. Claim 10(g)(i): "receiving a first plurality of inputs comprising readings from the first camera and the sensor configured to detect input from the steering wheel;"

See, 10(a), 10(a)(i), 10(a)(iii). The *Hampiholi-Attard* SDV *receiv[es] a first plurality of inputs* when the *first camera and the sensor configured to detect input from the steering wheel* collect data (driver data).

19. Claim 10(g)(ii): "receiving a second plurality of inputs comprising readings from the second camera and the speedometer;"

See, 10(a), 10(a)(ii), 10(a)(vi). The *Hampiholi-Attard* SDV *receiv[es] a second plurality of inputs* when the *second camera and the speedometer* collect data (vehicle data).

20. Claim 10(g)(iii): "determining a first weighted voting result comprising multiplying a first input from among the first plurality of inputs by a weight from among the first plurality of weights;"

Per 10(g)(v), the *first weighted voting result* is used to *determin[e] a competence level of a human driver* (HDCL). *Hampiholi* teaches computing a severity rank R, which is mapped to the HDCL. *Hampiholi* modified by *Gunderson* teaches 10(g)(iii). In the combination, *Hampiholi's* severity rank R computation is modified, per *Gunderson*, such that *Hampiholi's first input* (e.g., a camera reading) is *multipl[ied]…by a weight from among the first plurality of weights* (per *Gunderson*). A motivation to combine the *Hampiholi-Attard* SDV with *Gunderson* is above. *See*, 10(d)(i). Further, a POSITA would have been motivated and found it

obvious to modify *Hampiholi* such that inputs for computing R are *weight[ed]*, thereby providing greater accuracy/flexibility in determining the driver's distraction level. *Dec*., 126.

21. Claim 10(g)(iv): "determining a second weighted voting result comprising multiplying a second input from among the second plurality of inputs by a weight from among the second plurality of weights;"

Per 10(g)(vi), *the second weighted voting result* is used to *autonomously maintain[] a buffer of space from other vehicles* (*see* 10(g)(vi)). *Grimm* teaches a threat level equation where properties are multiplied by weights.

$$TL_i = \sum_{j=1}^{m} w_j p_j^i$$

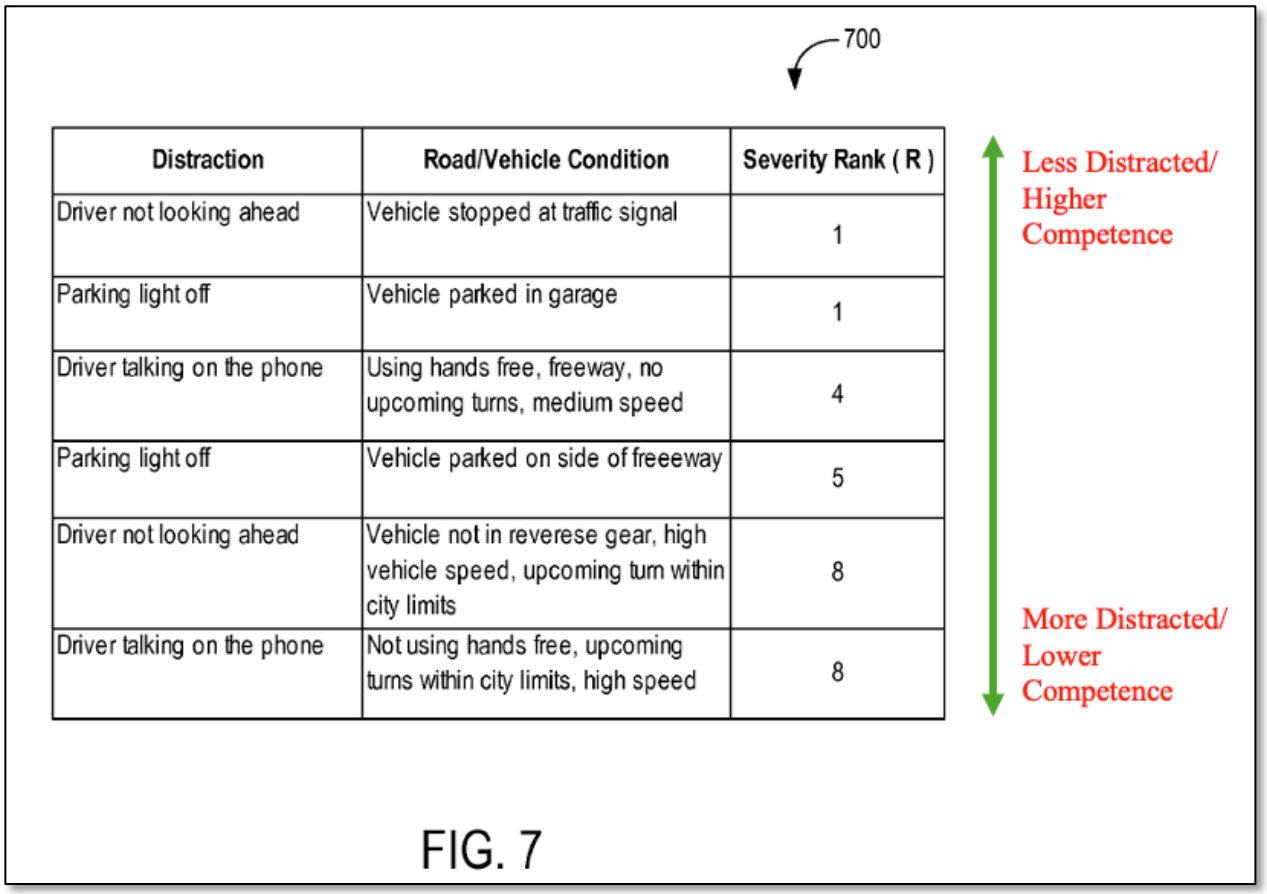
Grimm, 5:59-65. The *result* of the threat level equation is *a second weighted voting result* where *a second input* p_j^i is multiplied by *a weight* w_j. *Dec*., 127. Motivations to combine and reasons for reasonable expectation of success in the combination are set forth above and below. *See,* 10(e)(i), 10(g)(vi).

22. Claim 10(g)(v): "determining a competence level of a human driver using the first weighted voting result;"

a) *Hampiholi's* HDCL

Hampiholi teaches determining *a competence level of a human driver* via severity rank R. Driver distractions include not looking at the road and being sleepy/tired. *Hampiholi,* [0001]-[0004], [0050].

A low-level R includes short-lived driver distraction while the vehicle is not in immediate danger; a medium-level R includes a more serious driver distraction while the vehicle is in an otherwise safe environment; and a high-level R includes any driver distraction while collision risk is high. *Hampiholi,* [0057]; *Dec.,* 128-130. Fig. 7 depicts exemplary severity ranks R corresponding to detected human behaviors and road/vehicle conditions.



Hampiholi, FIG. 7.

Hampiholi's severity rank R teaches *a competence level of the human driver.* For example, a driver paying more attention is more competent at taking control of the vehicle if a transition to manual mode is required. *Dec*., 128-132. A driver paying

more attention allows for more possible corrective actions (e.g., transition to manual, disabling autonomous driving feature(s), automatically slowing to a stop) by allowing sufficient lead time to safely transition to manual mode or disable autonomous driving feature(s). *Dec*., 128-132. If a driver is fatigued, asleep, or otherwise inattentive (lower competence level), transitioning to manual mode would be more dangerous, and corrective actions may be limited to automatically slowing/stopping the vehicle. *Id.*

b) Using the first weighted voting result

As discussed in 10(g)(iii), *Hampiholi* is modified per *Gunderson* such that severity rank R is determined by weighting *Hampiholi's inputs*. *See*, 10(g)(iii). Thus, the *Hampiholi-Attard* SDV modified by *Gunderson* teaches determining a HDCL (*Hampiholi's* severity rank R) *using the first weighted voting result*.

23. Claim 10(g)(vi): "autonomously maintaining a buffer of space from other vehicles around the SDV using the vehicle controls and the second weighted voting result;"

a) *Attard's* Teachings

Attard teaches its vehicle autonomously "maintain[s] a distance from other vehicles," i.e., *a buffer of space from other vehicles around the SDV using the vehicle controls*. *Attard*, 1:65-2:6; *see*, 10(c) (vehicle controls). A motivation to combine *Hampiholi-Attard* is above. *See,* Section V.A.1.

b) Motivation to Combine *Grimm's* second weighted voting result

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV to *autonomously maintain[] a buffer of space* using *Grimm's second weighted voting result*, advantageously improving the autonomous driving of the SDV. *Dec*., 134-140. Specifically, such would have enabled the *Hampiholi-Attard* SDV to "maintain a distance from other vehicles" based on the data from those vehicles, which is incorporated into *Grimm's* threat level equation (*second weighted voting result*). That is, the higher the threat level of *Grimm*, the greater the buffer space the *Hampiholi-Attard* SDV would maintain. *Attard*, 1:65-2:6; *Dec*., 134-140. A POSITA would have found it obvious to implement this weighted voting technique to enable the *Hampiholi-Attard* SDV to, for example, attribute relatively more importance to very critical data from other SDVs, such as their braking, than the amount of importance attributed to other available SDV data that is less relevant to safe operation of the vehicle. *Id.*

Grimm teaches the result of the threat level equation can result in a "warning report [] indicative of a vehicle exhibiting severely dangerous driving behavior" to be communicated to vehicles. *Grimm*, 6:11-17. This report can result in the vehicle taking action such as braking and evasive steering. *Grimm*, 4:60-5:4. Further, *Grimm* explicitly teaches several advantages including improved vehicle safety. *Grimm*, 10:52-56. Thus, *Grimm* provides an express teaching, suggestion, and motivation

for modifying with *Hampiholi-Attard* by improving vehicle safety and taking automatic actions based on the second weighted voting result to *maintain a buffer of space*, i.e., to avoid a collision. *Dec*., 134-140.

Modifying *Hampiholi-Attard* per *Grimm* to have use *weighted voting* in autonomous driving would have been use of *Grimm's* known technique and would have improved the *Hampiholi-Attard* SDV in the same way as *Grimm's* system. *Dec*., 134-140. Indeed, modifying, e.g., *Hampiholi-Attard's* Φ computation per *Grimm's* teachings would have obtained predictable results of safer autonomous driving by incorporating data from other vehicles that is weighted. *Id*.

A POSITA would have had a REOS when making this modification. Indeed, *Hampiholi-Attard* teaches natively obtaining data of nearby vehicles. *Hampiholi*, [0058], [0064]. Thus, the modification would have merely required straightforward changes to programming instructions of the vehicle and potentially adding additional sensors traffic-related data. *Dec*., 134-140. Combining prior art sensors with a vehicle according to known methods would have yielded predictable results. *Id*.

Further underscoring the REOS, *Grimm* teaches a processor and memory with program instructions stored in memory. *Grimm*, 3:44-4:12, 11:33-39, 13:24-27. *Grimm's* vehicle 10 including processor and memory as part of one or more of vehicle dynamics module 20, object detection module 30, system status module 40, V2V communications module 50, and/or data collection module 60:

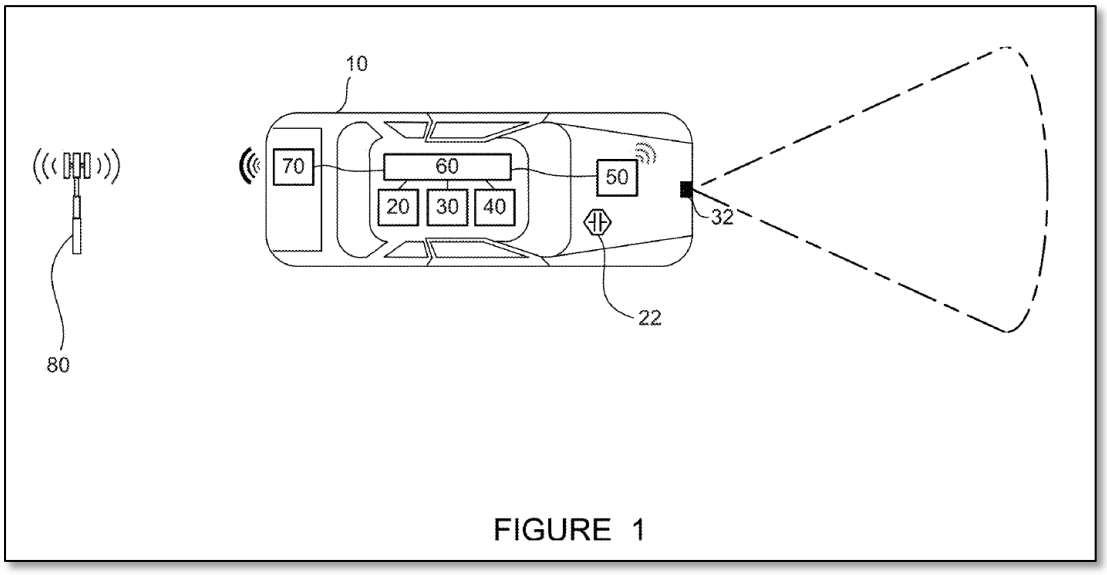


FIGURE 1

Grimm, Fig. 1, 3:63-4:12.

As discussed above, *Hampiholi-Attard* also teaches similar vehicle-based computing system with processor and program instructions stored in memory. *See*, 10(Pre), 10(d), 10(g). Thus, modifying *Hampiholi-Attard's* functionality per *Grimm* would have required only straightforward changes to programming instructions that would have been well-within the skillset of a POSITA. *Dec*., 134-140. Further reasons for a reasonable expectation of success are set forth in 10(e)(i) and 10(g)(iv).

24. Claim 10(g)(vii): "determining that a first fault has occurred when the competence level of the human driver is below the first quota; and"

When R is below the *first quota* (i.e., exceeds the first quota), then it is determined that *a first fault has occurred* because a corrective action is taken. The yellow range below indicates R values below the *first quota*. *Id*.

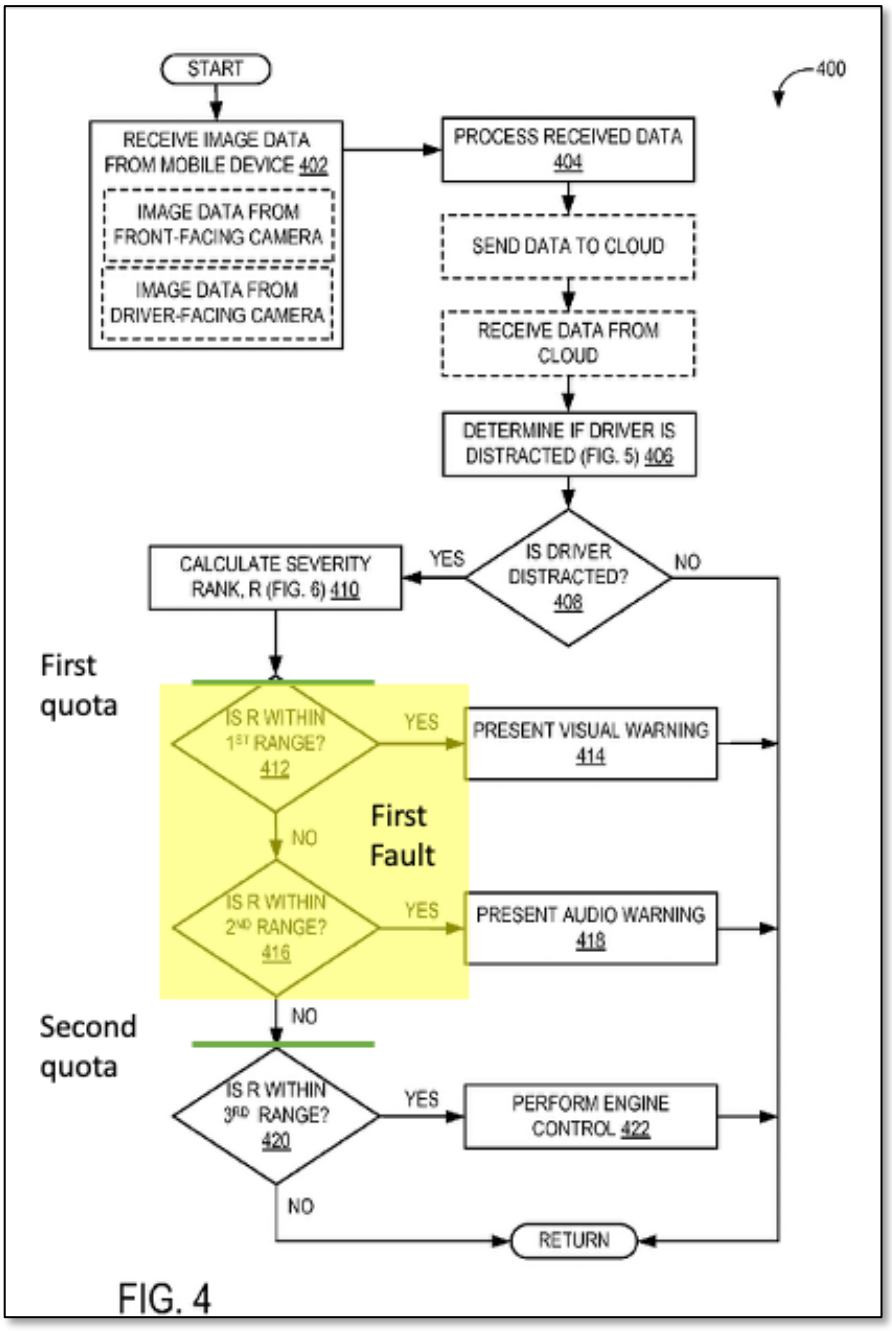


FIG. 4

Hampiholi, FIG. 4, [0056]-[0057].

25. Claim 10(g)(viii): "taking the first corrective action when the first fault has occurred."

Hampiholi teaches the first corrective action (present visual warning and present audio warning) is *taken when the first fault occur[s]*.

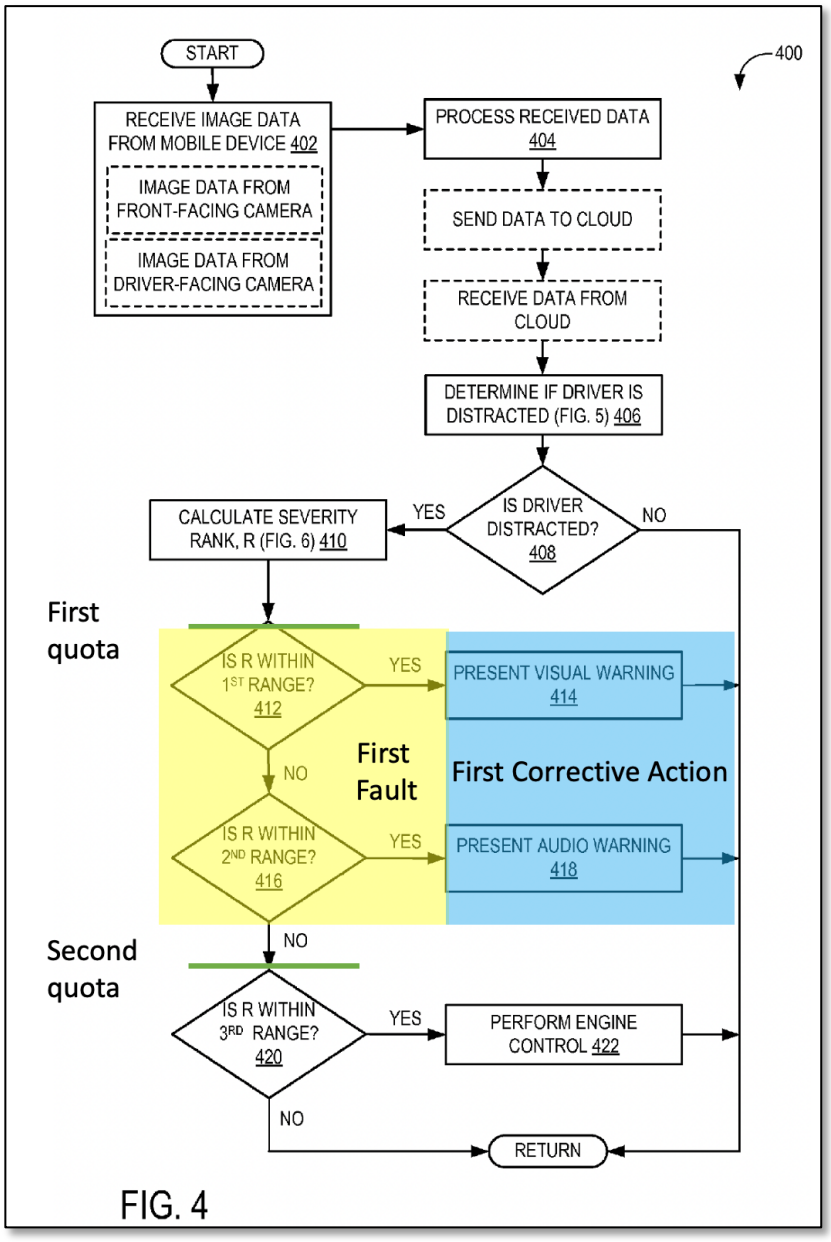


FIG. 4

Hampiholi, FIG. 4.

While *Hampiholi* depicts the visual and audio warnings as occurring when R is in different ranges, a POSITA would have been motivated and found it obvious to combine both warnings as a single corrective action to be taken when R is below the first quota. *Dec.*, 142-144. Regarding this modification, whether (1) *Hampiholi* initially presents a visual warning when R is within a 1st range and then subsequently

presents both a visual and audio warning when R is within a 2nd range, or (2) both the 1st and 2nd ranges are combined into a single range such that a visual warning and audio warning are presented when R is within said particular range, either would have satisfied the claim. *Dec*., 142-144.

This modification would have advantageously improved the *Hampiholi-Attard* SDV by providing warnings of different modalities, improving the chances of obtaining the driver's attention so that the driver can correct their distractedness. *Id*. Furthermore, *Hampiholi* expressly teaches that "[a]ny suitable action may be mapped to any suitable severity ranking," thereby motivating the modification. *Hampiholi*, [0066]. Further still, *Hampiholi* expressly contemplates presenting a "combination of an audio and a visual alert" as a corrective action. *Hampiholi*, [0070]. Therefore, *Hampiholi* has an express teaching, suggestion, or motivation to perform both an audio and visual warning as a corrective action. Thus, a POSITA would have had a reasonable expectation of success in modifying the *Hampiholi-Attard* SDV (to the extent such a modification is required) because of *Hampiholi's* express teaching, suggestion, and motivation of presenting a combined audio and visual alert. *Dec*., 142-144.

B. Claim 11[6]

1. Claim 11(a)

The *Hampiholi-Attard* SDV includes a computer system capable of performing operations including those claimed at 11(b)-11(d).

2. Claim 11(b)

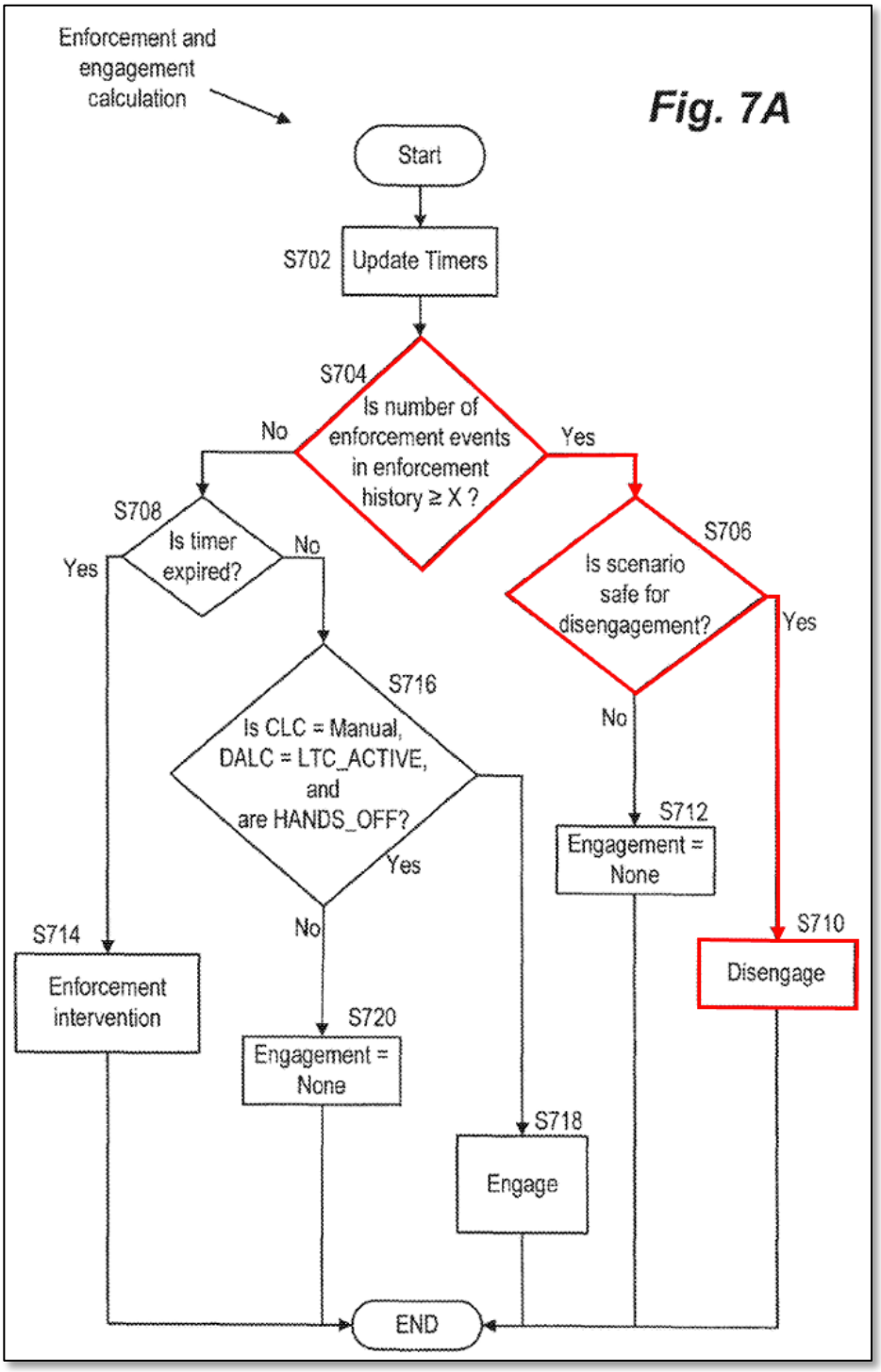
a) *McNew's* Teachings

Hampiholi teaches a first fault of the HDCL being below a first quota. *See*, 10(g)(vii). *Hampiholi* does not teach recording a number of times the first fault has occurred. *McNew*, like *Hampiholi*, teaches faults related to driver distraction, which relate to a driver not responding to a warning. *McNew*, 3:15-21. *McNew* further teaches logging the number of times the driver does not respond. *McNew*, 19:57-20:25. Thus, a POSITA would have found it obvious and been motivated to combine *McNew's* teachings of tracking the number of times a fault has occurred with *Hampiholi's* first fault teachings of severity rank R being below a quota. *Dec*., 146-150.

Specifically, *McNew* teaches "generat[ing] warnings and/or requests to prompt the driver to interact with the steering wheel and/or pay attention to the road, and enforc[ing] driver attention or steering interaction when the driver is not responding to the warnings." *McNew*, 3:15-21. Each warning is an "enforcement

[6] *See* Claims Appendix for claim language.

event" and, when "the number of enforcement events is greater than or equal to" a threshold, a corrective action of shutting down semi-autonomous driving occurs. *McNew*, 19:57-20:25, 6:9-28.



McNew, FIG. 7A.

The enforcement event is a *first fault* because it is an event where the driver does not respond to a warning. *Dec*., 148. Therefore, because *McNew* logs the number of enforcement events, *McNew* teaches *recording a number of times the first fault has occurred*. *Id*.

b) Motivation to Combine with *McNew*

A POSITA would have found it obvious and been motivated to modify the *Hampiholi-Attard* SDV further with *McNew's* teachings of *recording a number of times the first fault has occurred*. Such a modification is merely the combination of known elements according to known methods to yield predictable results. *Dec*., 149. This modification would have been use of a known technique that would have improved the *Hampiholi-Attard* SDV in the same way as *McNew*. *Id*. A POSITA would have recognized the safety benefits of further modifying the *Hampiholi-Attard* SDV to address situations where "the driver may be purposely ignoring the semi-automatic driving system." *McNew*, 6:15-20. Per Mr. Wilson, it was well known that level 3 and below SDVs required driver supervision. *Dec*., 149. Further motivations are provided with respect to 10(a)(iii).

There would have been a REOS because the modification merely would have required a straightforward software/programming change to record the number of times the HDCL drops below the first threshold. *Dec*., 150. For example, *McNew*

teaches such a straightforward modification, i.e., a "log of enforcement events…that can be stored in memory." *McNew*, 19:62-65. It would have straightforward and well-within the skillset of a POSITA to modify *Hampiholi-Attard* to log the enforcement events in, e.g., *Hampiholi's* storage device 208. *Dec*., 150.

3. Claim 11(c)

a) *McNew's* Teachings

McNew teaches "determin[ing] that the driver is abusing the system by purposely ignoring warnings and requests from the SAMM [semi-autonomous mode manager]." *McNew*, 20:7-9, FIG. 7A. Determining the driver is ignoring warnings is analogous to *determining* an HDCL because it relates to the driver's inattention. *Dec*., 151. Thus, the *Hampiholi-Attard* SDV modified by *McNew* teaches or renders obvious 11(c) because determining the driver is ignoring warnings includes logging the number of enforcement events and comparing the number to a threshold (*determining that a second fault has occurred when the number of times the first fault has occurred exceeds the second quota*). *Id*. When the number of times exceeds a second threshold, it is determined a second fault has occurred. *Id*.

b) Motivation To Combine with *McNew*

A POSITA would have found it obvious and been motivated to modify *Hampiholi-Attard's* warning system with *McNew's* teachings of using the number of times a driver has not responded to an alert to determine *Hampiholi's* severity rank R, i.e., the HDCL. *Dec*., 152.

A POSITA would have been motivated to modify *Hampiholi-Attard* in this manner at least because of the safety benefit such a modification would provide. *Dec*., 153. As discussed in the Claim 10 mapping, *Hampiholi's* severity rank R is used to determine an appropriate action to take, including sending an alert and escalating to performing automatic control of the vehicle. *See,* Claim 10; *Hampiholi*, [0057]. While *Hampiholi* considers driver's historical information in computing R, *Hampiholi* does not track how the driver has responded to prior warnings. *Dec*., 153. *McNew*, however, recognizes that historical information is beneficial for ensuring the vehicle is safely driven. Thus, such a combination is merely the application of a known technique to a known method ready for improvement to yield predictable results. *Id*. This use of a known technique would have improved the *Hampiholi-Attard* SDV in the same way as *McNew*. *Id*. A POSITA would have had a REOS for the modification as discussed in 11(b).

4. Claim 11(d)

See, 10(f)-(g), 11(c). When a second fault occurs, a corrective action is taken. Examples of corrective actions are mapped for Claim 12. *See*, 12.

C. Claim 12

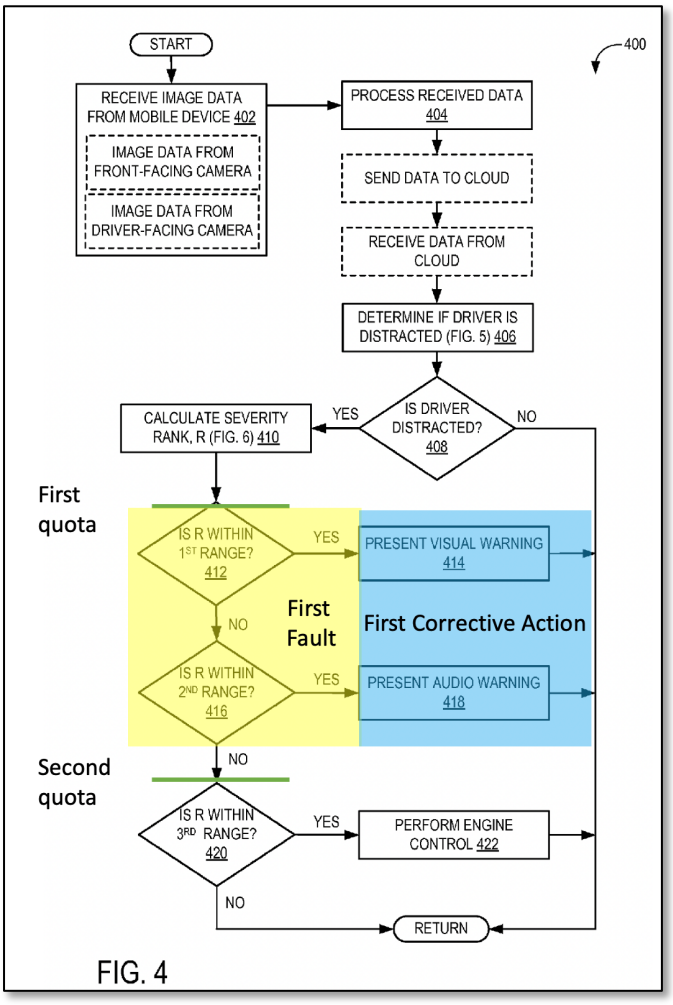
1. Claim 12(a)

See, 11, 12(b)-12(c).

2. Claim 12(b)

a) *Hampiholi-Attard's* Corrective Actions

Hampiholi-Attard teaches faults based on R's value in relation to various thresholds/quotas. *See,* 10(f)-(g). Further, *Hampiholi* teaches taking corrective actions based on faults. *See*, 10(f)-(g) *citing Hampiholi*, Fig. 4, [0056]-[0057]. Specifically, *Hampiholi's* corrective actions associated with the first fault are sounding a warning sound 418 and presenting a visual warning 414.



Hampiholi, Fig. 4, [0056]-[0057].

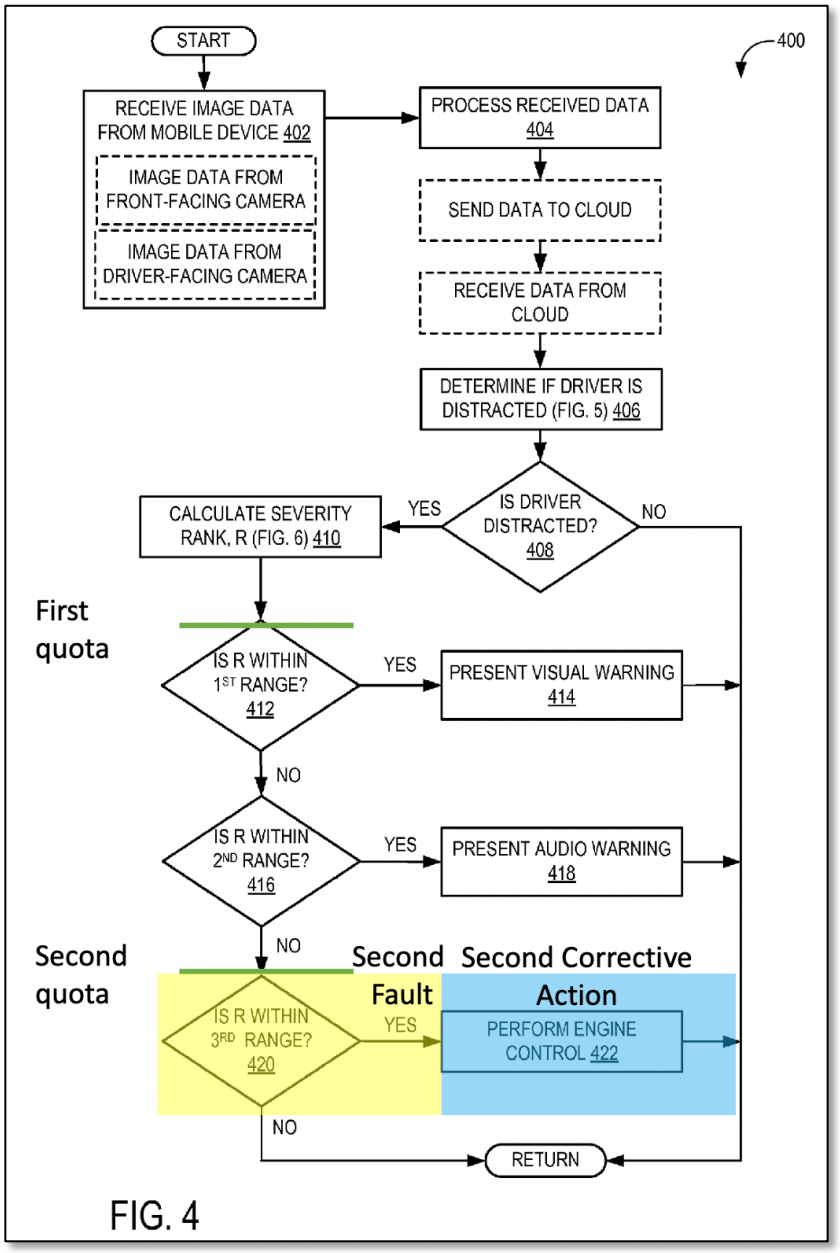
Hampiholi teaches *a display screen* for displaying visual warning 414. *Hampiholi*, [0020]-[0021], [0044], FIG. 1. Further, *Attard* teaches that displayed alerts may be "icons." *Attard*, 7:33-38. Thus, in the *Hampiholi-Attard* SDV, a first fault triggers a *first corrective action comprising sounding a warning sound and displaying an icon on a display screen. Dec.,* 156-158.

b) Motivation to Combine *Hampiholi-Attard*

A POSITA would have been motivated and found it obvious to modify *Hampiholi's* visual warning to include *Attard's* display icon and further to both display the icon and sound a warning, advantageously increasing the likelihood of obtaining the driver's attention. *Dec.,* 159. A driver would have quickly understood warning icons. *Id*. Further, icons conserve space on the display screen relative to purely-textual warnings and are language-independent, motivating the combination to a POSITA. *Id*. The combination is the use of a known technique would have improved *Hampiholi* in the same way as *Attard*. *Id*. The combination would have had a REOS because *Hampiholi* already teaches a display screen presenting visual warnings, as well as computer hardware and programming instructions. *Dec.,* 160. Similarly, *Attard* teaches an autonomous vehicle and computer hardware and programming instructions, such that modifying *Hampiholi* would have required only modifying programming instructions and/or a display to display an icon per *Attard*. *Id*.

3. Claim 12(c)

Hampiholi's corrective action associated with the *second fault* is performing engine control.



Hampiholi, Fig. 4, [0056]-[0057]. As seen in Fig. 4, when severity rank R is below the first and second quotas (e.g., block 420 – "Is R within 3rd range? – YES") it is

determined that a *second fault has occurred*, and a second corrective action is taken (perform engine control 422). *Dec*., 161. *Hampiholi* specifically describes engine control operations "include automatically controlling the vehicle speed or braking…" teaching *decreasing a speed of the SDV. Hampiholi,*[0057].

a) *McNew* Teaches Transferring Driver Controls to Manual Control

McNew teaches managing vehicle control states of a semi-autonomous vehicle *McNew*, 1:17-21. *McNew's* vehicle has a semi-autonomous mode manager (SAMM) to manage the control states, including control states of a lane trace control (LTC) system. *McNew*, 3:15-21. The LTC system includes several states, including MANUAL (LTC system is on and sensing, but the driver is in control) and OFF (LTC system is off). *McNew*, 3:59-4:5. *McNew* teaches monitoring driver states (e.g., attention) and taking actions if the driver is not paying attention, enhancing vehicle/driver safety. *McNew*, 1:17-30, 1:59-65, 6:15-28.

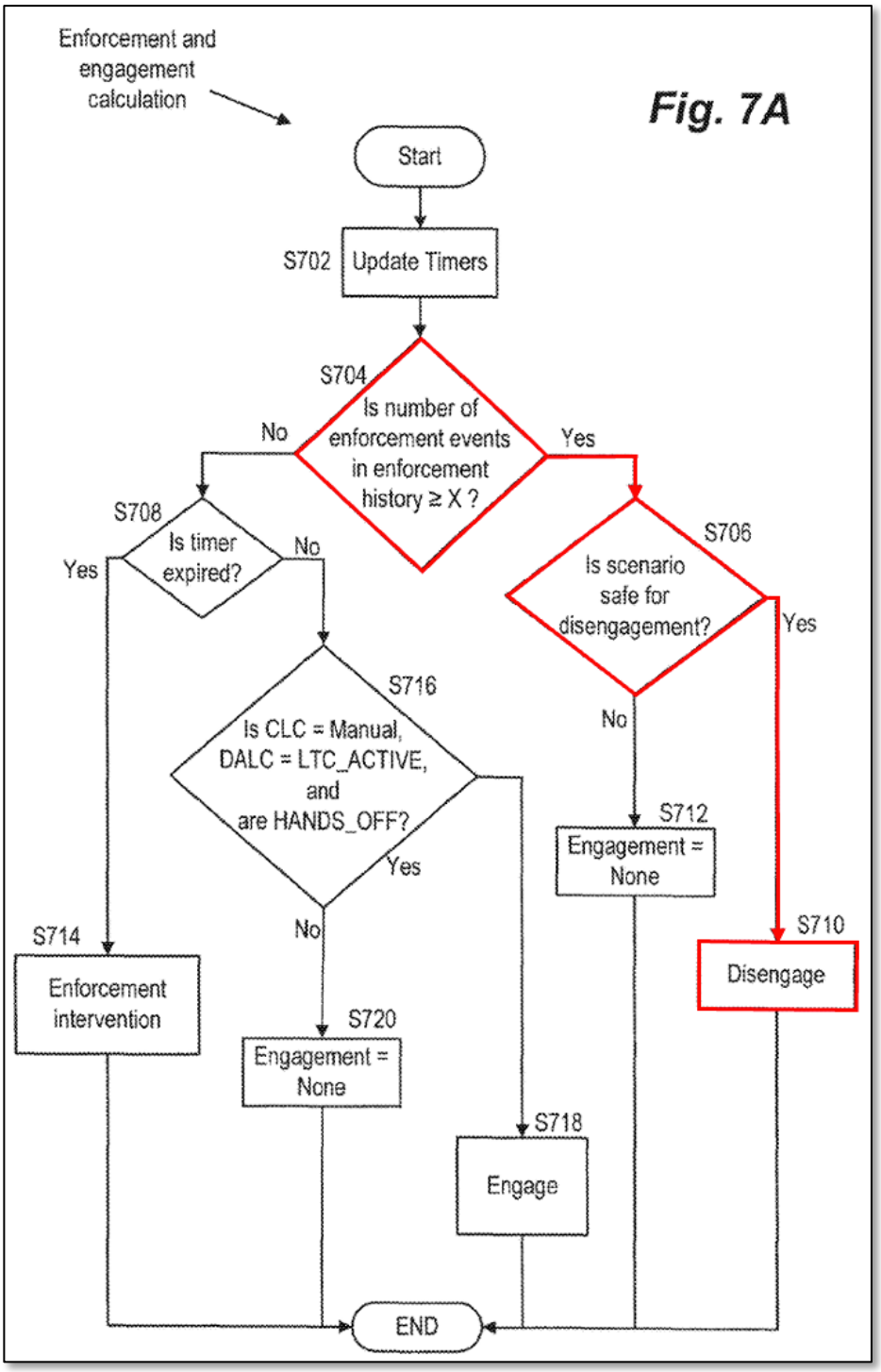
If a driver continues ignoring warnings, *McNew* teaches disengaging the semi-autonomous[7] driving system if the current driving scenario is "safe enough."

[7] *McNew* refers to its system as both "semi-autonomous" and "semi-automatic." *McNew*, 1:7-17, 1:59-65, 6:15-28 (referring to both "semi-autonomous" and "semi-automatic" driving system), 20:7-31. A POSITA would have recognized *McNew*

McNew, 20:7-31, 4:3-5, 8:41-44; *Dec*., 163 (discussing steps S704, S706, S710).

Fig. 7A below depicts Steps S704, S706, and S710, resulting in disengaging the vehicle's semi-autonomous system and transferring the driver controls to manual control:

uses these terms synonymously. *Dec*., 163. "Semi-autonomous" is used herein for simplicity.



McNew, Fig. 7A; *Dec.*, 163.

b) Motivation to Combine *Hampiholi-Attard-Frazer-McNew*

A POSITA would have been motivated and found it obvious to include decreasing a speed and transferring driver controls to manual control as a corrective action in the *Hampiholi-Attard* SDV's event table responsive to the second fault per *McNew*. *Dec*., 164. A POSITA would have been motivated because *Attard* includes a specific suggestion to do so, repeatedly disclosing recommending transferring driver controls to manual. *Attard*, 2:55–3:4. Modifying the *Hampiholi-Attard* SDV in this way would have been use of a known technique of taking particular corrective action(s) (e.g., transition to manual control) responsive to fault(s) and would have improved the *Hampiholi-Attard* similar SDV in the same way as *McNew's*. *Dec*., 165-167. Further, modifying the *Hampiholi-Attard* SDV per *McNew* would have allowed the SDV to advantageously alert a driver of a need to transition to manual mode and perform the transition to manual mode. *Id*.

A POSITA would have understood that modifying the *Hampiholi-Attard* SDV to include transferring driver controls to manual control would have had a REOS. *Dec*., 168. This modification would have required only straightforward changes to programming instructions. *Id*. Indeed, *McNew* teaches implementing its system in computer program instructions, and *Hampiholi-Attard's* SDV includes a manual (non-autonomous) control mode. *Id.*

D. Claim 13

1. Claim 13(a)

The *Hampiholi-Attard* SDV includes a computer system capable of performing operations including those claimed at 13.

2. Claim 13(b)

a) *McNew's* Teachings

McNew teaches "determin[ing] whether the timers that monitor how long it takes for the driver to respond to steering or attention requests have expired." *McNew*, 20:42-44. As discussed, *McNew* teaches a *fault* that is an attention/steering warning. *See,* 11(b). Therefore, *McNew's* disclosure of a timer that tracks the response time to this warning teaches recording a duration of time a fault has occurred. That is, a POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV per *McNew's* teachings to *record[] a duration of time during which the first fault* (*Hampiholi's* R being below the first quota) *has occurred*, teaching or rendering obvious 13(b). *Dec*., 170.

b) Motivation to Combine with *McNew*

See, 11(b). Here, a POSITA would have been motivated to record a duration of time during which a first fault has occurred in addition to a number of times the first fault has occurred for the same reasons discussed above, and this modification would have had a REOS for the same reasons as above. *See,* 11(b). *Dec*., 171.

3. Claim 13(c)

a) *McNew's* Teachings

McNew teaches "implement[ing] an enforcement intervention" when "one or more timers has expired due to the driver not complying with a warning." *McNew*, 20:55-59, FIG. 7A. Determining the driver is ignoring warnings is analogous to determining an HDCL. *Dec*., 172. Thus, the *Hampiholi-Attard* SDV modified by *McNew* teaches or renders obvious 13(c) because determining the driver is ignoring warnings includes tracking the length of time the driver has ignored the warning (*duration of time during which the first fault has occurred exceeds the second quota*). *Id*.

b) Motivation To Combine with *McNew*

See, 11(c).

4. Claim 13(d)

See, 12(c).

E. Claim 14

1. Claim 14(a)

See, 12(a).

2. Claim 14(b)

See, 12(b).

3. Claim 14(c)

See, 12(c).

VI. GROUND 2: CLAIM 15 IS OBVIOUS OVER HAMPIHOLI, ATTARD, MCNEW, GUNDERSON, GRIMM, FRAZER, DUNCAN, AND ENGELMAN

A. Claim 15

1. Claim 15(Pre): "A self-driving vehicle (SDV) comprising:"

See, 10(Pre).

2. Claim 15(a): "a sensor system having a plurality of sensors, comprising:"

See, 10(a).

3. Claim 15(a)(i): "a first camera;"

See, 10(a)(i).

4. Claim 15(a)(ii): "a second camera;"

See, 10(a)(ii).

5. Claim 15(a)(iii): "a sensor configured to detect input from a steering wheel;"

See, 10(a)(iii).

6. Claim 15(a)(iv): "a GPS sensor; and"

See, 10(a)(iv).

7. Claim 15(a)(v): "a speedometer;"

See, 10(a)(vi).

8. Claim 15(b): "vehicle controls comprising: an engine throttle, a steering mechanism, a turn signal, and a braking system;"

The *Hampiholi-Attard* SDV teaches *vehicle controls comprising: an engine throttle, a steering mechanism* and *a braking system*. *See*, 10(c). *Hampiholi* further

teaches *a turn signal*, disclosing that "steering wheel controls 262" of vehicle 201 include "turn signal controls." *Hampiholi*, [0041], FIG. 2.

9. Claim 15(c): "a non-transitory computer readable storage medium comprising:"

See, 10(d).

10. Claim 15(c)(i): "a first plurality of weights;"

See, 10(d)(i).

11. Claim 15(c)(ii): "a second plurality of weights; and"

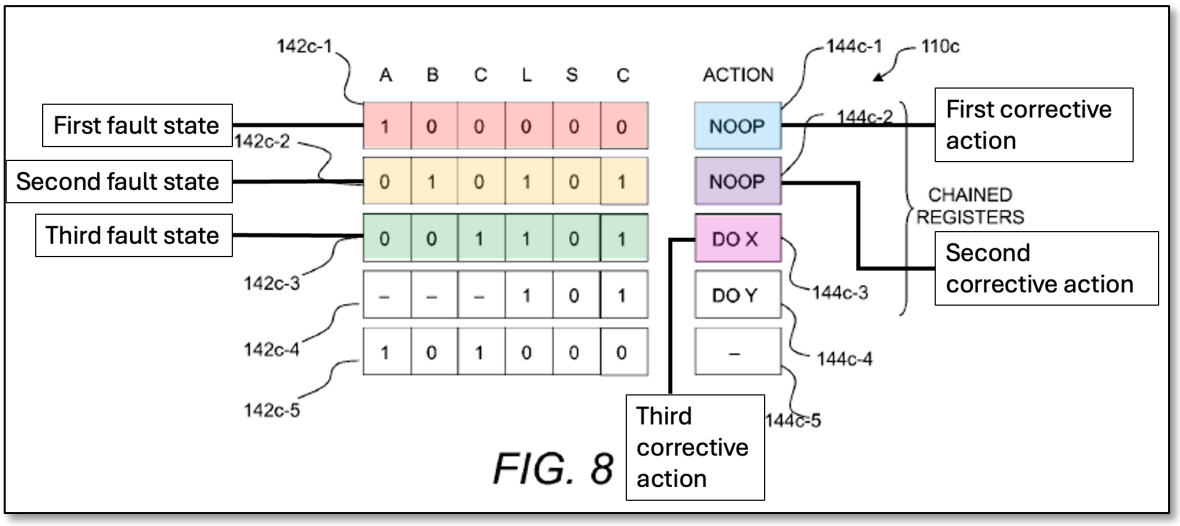
See, 10(d)(ii).

12. Claim 15(c)(iii): "a fault remediation table comprising:"

See, 10(f).

13. Claim 15(c)(iii)(1)-(6): "a first fault state; a first corrective action associated with the first fault state; a second fault state; a second corrective action associated with the second fault state; a third fault state; and a third corrective action associated with the third fault state;"

Frazer's event table 112 (*fault remediation table*) includes *a first fault state*, *a second fault state, and a third fault state* i.e., *conditions* 142c-1, 142c-2, and 142c-3, which cause "one or more actions 144c to be carried out if the state input matches the condition(s) 144c." *Frazer*, 22:6-9, 21:33-43; *Dec*., 190. When the conditions 142c-1, 142c-2, 142c-3 are met, a "corresponding" (*associated*) *first, second, and third corrective action* are taken. *Frazer*, 21:33-43, 22:6-9.



Frazer, FIG. 8; *Dec*., 190.

14. Claim 15(d): "a computer system comprising a processor coupled to the non-transitory computer readable storage medium and program code, the program code readable and executable by the processor, wherein the computer system is capable of:"

See, 10(g).

15. Claim 15(d)(i): "receiving a sensor reading from the system of sensors;"

Hampiholi teaches *receiving a sensor reading from the system of sensors*. *See,* 15(a); *Hampiholi*, FIG. 2, [0031], [0034], [0046].

16. Claim 15(d)(ii): "operating the vehicle controls;"

As discussed above, the *Hampiholi-Attard* SDV is configured to automatically modify particular operations of the vehicle, including specifically autonomously controlling the vehicle speed and bringing the vehicle to a complete

stop (per *Hampiholi*) and disabling one or more autonomous operations, such as in response to a fault (per *Attard*). *See*, 10(Pre).

Attard teaches its vehicle is operated partially or completely autonomously by autonomous driving module 106 in its computer 105. *Attard*, 9:63-10:12, 14:13-48. A POSITA would have understood or found obvious that because *Attard* teaches a vehicle operable in manual and autonomous modes and *Attard* defines an autonomous vehicle as being "operated wholly … without human intervention, i.e., … autonomous" and its vehicle computer making "decisions concerning vehicle speed, course, etc.," that *Attard's* vehicle would have *operating the vehicle controls*, including changing the vehicle's speed (engine throttle and braking) and direction (steering mechanism and navigation). *Dec.,* 195 (*citing Attard*, 1:15-24). Additionally, a POSITA would have found it obvious for *Attard* to control *the turn signal* at least because *Attard* teaches "module 106 could control when a vehicle 101 changes lanes," which a POSITA would have found obvious to involve controlling the *turn signal* as required by law to signal the vehicle's intention to other drivers/SDVs on the roadway. *Attard*, 10:7-8; *Dec*., 195.

In additional examples, *Attard's* vehicle may take autonomous actions such as a "slow to a stop," "pull over and stop," or "limp home" operation. *Attard*, 2:46-54. A POSITA would have recognized each of these autonomous operations would

have required control of the *engine throttle*, *steering mechanism*, *braking system*, and/or *turn signal* as recited in 15(b).

a) Motivation to Combine

See, 10(Pre). A POSITA would have incorporated *Attard's* teachings regarding autonomous control of the driver controls listed in 15(b) in the *Hampiholi-Attard* vehicle to provide an SDV operable to provide additional convenience and safety afforded by *Attard's* autonomous features in *Hampiholi's* vehicle that is already intended to increase the safety of the driver. *Dec.,* 196-197. Such a modification is merely the combination of known prior art elements (*Attard's* sensors and controlling functions) according to known methods to yield predictable results of a car operable to autonomously perform corrective actions such as "slow to a stop," "pull over and stop," and/or "limp home" operations. *Id.* Further, these modifications would have been use of a known technique of applying various vehicle hardware and software to allow for additional self-driving functionality in the *Hampiholi-Attard* vehicle and would have improved *Hampiholi* and *Attard's* similar vehicles in the same way. *Id.* While this modification may add additional complexity to *Hampiholi's* vehicle, a POSITA would have been motivated to make such a tradeoff to achieve *Attard's* benefits. *Id*.

A POSITA would have had a REOS for the combination at least because *Hampiholi* already includes an engine throttle, steering mechanism, and braking

system, as well as a processor and memory necessary for performing automatic functions; *Attard* is merely used to teach autonomous control of these driver controls. *Dec.,* 198. Methods of autonomously controlling each of the recited driver controls were known, and the predictable result would have been an SDV better-suited to respond to unsafe driving situations, including driver distraction as taught by *Hampiholi. Id.*

17. Claim 15(d)(iii): "receiving a first plurality of inputs, comprising readings from the first camera and the sensor configured to detect input from the steering wheel;"

See, 10(g)(i).

18. Claim 15(d)(iv): "receiving a second plurality of inputs, comprising readings from the second camera;"

See, 10(g)(ii).

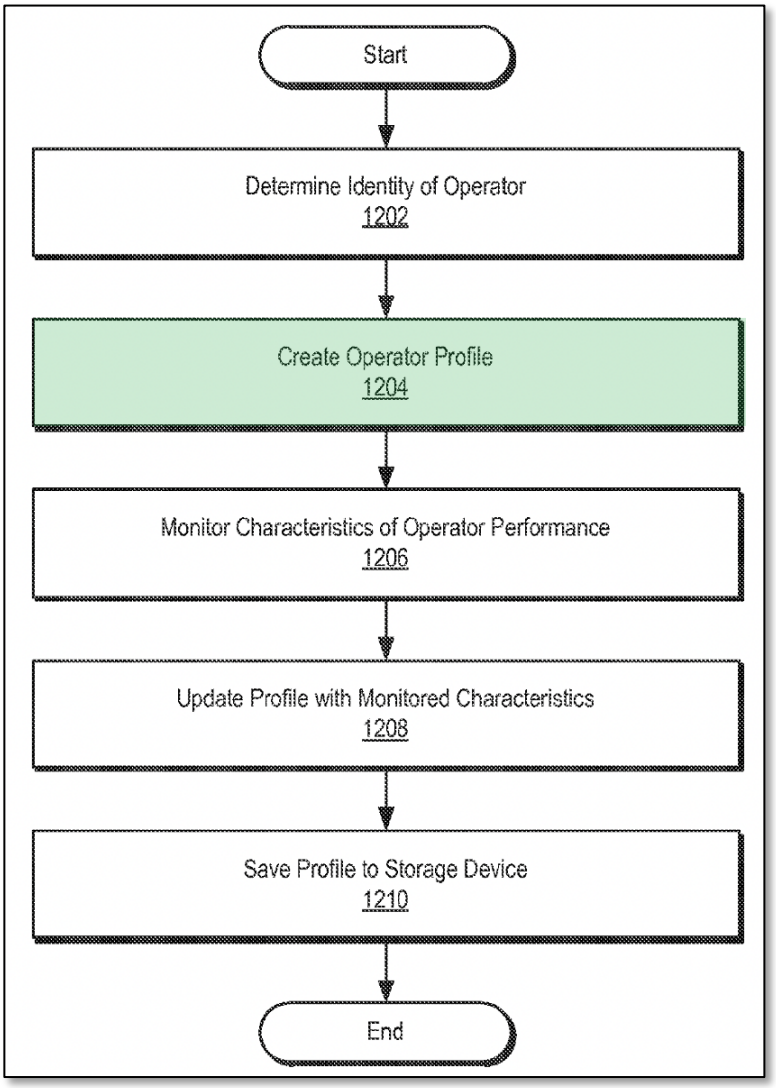
19. Claim 15(d)(v): "generating a human driver profile;"

Attard teaches generating and storing a human driver profile including parameters relating to the driver, including biometric data and the driver's "age, level of driving experience." *Attard*, 5:30-42. To the extent *Attard* does not teach *generating a human driver profile*, *Duncan* teaches such.

a) *Duncan's* Teachings

Duncan teaches an autonomous vehicle with "a monitoring unit configured to determine a characteristic of performance of an operator" including "historical characteristic[s] of operator performance," such as attentiveness. *Duncan*, [0007],

[0049], [0052]. Additionally, *Duncan* teaches creating an "operator profile [that] may include one or more historical characteristics of operator performance." *Duncan*, [0100]-[0101]. *Duncan's* creation of an operator profile teaches *generating a human driver profile*. *Dec*., 202.



Duncan, FIG. 12.

b) Motivation To Combine with *Duncan*

A POSITA would have found it obvious and been motivated to modify *Hampiholi-Attard* per *Duncan* to *generat[e] a human driver profile*. Such a modification is merely the combination of known prior art elements (*Hampiholi's* driver distraction system with *Duncan's* operator profile) according to known methods to yield the predictable result of the *Hampiholi-Attard* SDV generating a driver profile to store *Hampiholi's* historical data used for computing severity rank R. *Dec*., 203.

Hampiholi already teaches using historical driver data, such as eyelid position, head movement, and pulse data, to determine severity rank R. *Hampiholi*, [0062]-[0063]; *Dec*., 204. *Duncan*, meanwhile, teaches the operator profile can be based on attentiveness. *Duncan*, [0101]. Thus, it would have been obvious to modify *Hampiholi* per *Duncan's* teachings to generate a human driver profile based on, e.g., the driver's eyelid position, head movement, and pulse data. *Dec*., 204. Such a modification would have predictably improved the *Hampiholi-Attard* SDV by providing it with easily retrievable data from which *Hampiholi* would access the historical data used to compute severity rank R. *Dec*., 205. Additionally, each of *Hampiholi*, *Attard*, and *Duncan* teach executing their methods in software, and it would have only required a straightforward software change to the *Hampiholi-Attard*

SDV to generate a profile, per *Duncan*. *Hampiholi*, [0032]; *Attard*, 15:12-46; *Duncan*, [0054]-[0056], [0062]; *Dec*., 204.

Further, such a modification would have improved the *Hampiholi-Attard* SDV by tracking driver competence levels temporally and allowing for said driver profile data to be stored and retrieved. *Dec*., 205. This modification would have been use of a known technique that would have improved the *Hampiholi-Attard* SDV in the same way as *Duncan*. *Id.*

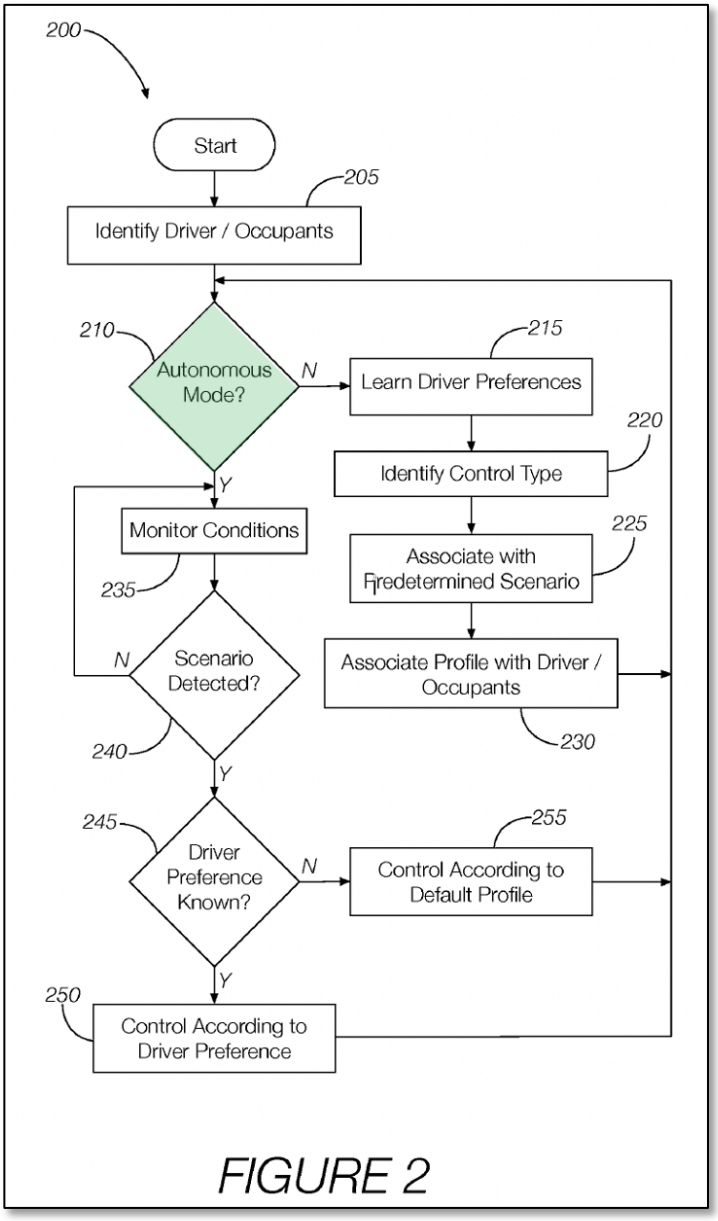
20. Claim 15(d)(vi): "generating a control processor profile;"

Per 16(c), *generating a control processor profile comprises determining whether the computer system is currently operating in a first autonomous mode, a second autonomous mode, or a manual mode*. *Attard* teaches that the vehicle can be "operated partially or completely autonomously" or under manual control. A POSITA would have understood that the "profile" (e.g. what is computer-controlled) must be known to the computer so that the driver and computer can effectively coexist. *Dec*., 206. To the extent not taught by *Attard*, *Engelman* teaches such.

a) *Engelman's* Teachings

Engelman teaches a "vehicle includes at least one autonomous driving sensor configured to monitor at least one condition while the vehicle is operating in an autonomous mode." *Engleman*, [0004]. An exemplary process 200 includes

"determin[ing] whether the vehicle 120 is operating in the autonomous mode" or "in the non-autonomous mode." *Engleman*, [0022].



Engelman, FIG. 2. *Engelman* additionally teaches a processing device 115 of the vehicle learns preferences and associates these preferences "to one or more profile controls, such as a longitudinal profile control, a lateral profile control, and a route

profile control." *Engelman*, [0012]; *Dec*., 207. Thus, because *Engelman* teaches determining whether the vehicle is in autonomous or manual mode, which per 16(c), satisfies *generating a control processor profile*, *Engelman* teaches 15(d)(vi). *Dec*., 207-208.

b) Motivation to Combine with *Engelman*

A POSITA would have found it obvious and been motivated to combine *Engelman's* teachings with the *Hampiholi-Attard* SDV, yielding the predictable result of *generating a control process profile* that indicates which driving mode the *Hampiholi-Attard* SDV is in. *Dec*., 209. Modifying the *Hampiholi-Attard* SDV in this way is merely the combination of known prior art elements according to known methods to yield predictable results. *Id*. The *Hampiholi-Attard* SDV teaches three driving/control modes: full autonomous, semi-autonomous, and manual mode. *Attard*, 1:44-49, 2:55-58. It would have been obvious to modify the *Hampiholi-Attard* SDV to determine which mode it is in at least to ensure *Attard's* module 106 is aware of which autonomous driving features it does (or does not) have permission to use. *Dec*., 209. This use of a known technique would have improved the *Hampiholi-Attard* SDV in the same way as *Engelman. Id*. There would have been a REOS in modifying the *Hampiholi-Attard* SDV in this way at least because such would have required only straightforward software/programming changes to

monitor and/or store the current driving mode of the SDV in memory, e.g., in *Hampiholi's* in storage 208. *Id*.

21. Claim 15(d)(vii): "taking the first corrective action when the first fault state has occurred;"

See, 10(g)(viii).

22. Claim 15(d)(viii): "taking the second corrective action when the second fault state has occurred; and"

See, 10(g)(viii), 15(c)(iii)(3)-(4). In the *Hampiholi-Attard* SDV, the *second corrective action* is taken *when the second fault state has occurred*, i.e., when conditions 142c-2 are met. *Dec*., 211.

23. Claim 15(d)(ix): "taking the third corrective action when the third fault state has occurred."

See, 10(g)(viii), 15(c)(iii)(5)-(6). In the *Hampiholi-Attard* SDV, the *third corrective action* is taken *when the third fault state has occurred*, i.e., when conditions 142c-3 are met. *Dec*., 212.

VII. GROUND 3: CLAIMS 16-17 ARE OBVIOUS OVER HAMPIHOLI, ATTARD, MCNEW, GUNDERSON, GRIMM, FRAZER, DUNCAN, ENGELMAN, AND STRAUSS

A. Claim 16

1. Claim 16(a)

See, 15(d). The *computer system* of the *Hampiholi-Attard* SDV is *further capable* of performing limitations 16(b)-(c).

2. Claim 16(b

Duncan's operator profile (*human driver profile*) is *generat[ed] using a human driver competence level* because the profile is based on "a monitored [driver] performance" such as "speed, attentiveness, and/or the like," which indicate *a human driver competence level*. *Duncan*, [0101]. *See*, 15(d)(v).

3. Claim 16(c)

See, 15(d)(vi).

4. Claim 16(d)

See, 10(g)(vi). *Attard's* full autonomous mode is *the first autonomous mode* that *autonomously maintain[s] a buffer of space from other vehicles*. *Attard*, 1:44-50, 1:65-2:6.

5. Claim 16(e)[8]

Attard teaches a second autonomous mode, i.e., the semi-autonomous mode. *Attard*, 1:44-48. *Attard* does not detail which autonomous features are controlled in the semi-autonomous mode. *Dec*., 217.

a) *Strauss's* Teachings

Strauss teaches an autonomous system for lateral and longitudinal control of a vehicle in which autonomous control of the "accelerator pedal" (*engine throttle*)

[8] Petitioner treats "*breaking*" as a typographical error of "braking." *'004 Patent*, 6:4-5 ("failure of an antilock breaking system in the SDV."), 12:59-60.

and "brake pedal" (*braking system*) are provided. *Strauss*, 1:27-36, 6:37-53, 8:31-39. Per *Strauss*, a "lane change can be recommended to the vehicle operator…whereupon the vehicle operator can agree to an autonomous lane change…by **activating the vehicle turn signal**." *Strauss*, 5:67-6:4.

b) Motivation to Combine with *Strauss*

A POSITA would have found it obvious and been motivated to modify the *Hampiholi-Attard* SDV with *Strauss's* teachings of an autonomous driving system in which a driver uses the turn signal to control lane changes. *Dec*., 219. Such a modification is merely the combination of known prior art elements according to known methods to yield the predictable results of the *Hampiholi-Attard* SDV driving semi-autonomously but changing lanes upon confirmation from the driver. *Id.* This modification constitutes use of a known technique: an autonomous driving system which autonomously controls engine throttle and braking system while a human driver controls a turn signal that would have improved the similar *Hampiholi-Attard* SDV in the same way as *Strauss*. *Id*. A POSITA would have had a REOS in modifying the *Hampiholi-Attard* SDV further based on *Strauss's* teachings at least because street-legal cars include turn signals, and the modification would have required only straightforward changes to programming instructions for the *Hampiholi-Attard* SDV to thus require turn signal input prior to changing lanes. *Dec*., 220. A POSITA would have appreciated the benefits of such a modification

that would have provided the driver with more comfort in using the autonomous driving features, which was a known problem at the time of the '004 Patent. *Id*.

6. Claim 16(f)

Attard teaches the driver can "take complete control of the vehicle," teaching 16(f). A motivation to combine *Hampiholi-Attard* is above. *See,* 10(Pre).

B. Claim 17

1. Claim 17(a)-(b)

See 15(c)(i), 10(d)(i), 10(e)(i) for *Gunderson's* teachings of *the first plurality of weights* and *Grimm's* teachings of *the second plurality of weights*.

a) *Grimm's* First and Second Cohorts

Grimm teaches a vehicle 110 receives weather data from a server 170, which in turn receives data from vehicles 120, 130 (e.g., *active learning data*), thereby forming *a first cohort of other SDVs*. *Grimm*, 4:33-49; *Dec*., 223-224. *Grimm* further teaches vehicle 110 receives weather data (e.g., *active learning data*) via V2V communications, such that the vehicles sending V2V data to vehicle 110 form *a second cohort of other SDVs*. *Grimm*, 3:44-52. Thus, the *Hampiholi-Attard* SDV further modified by *Gunderson* (*first plurality of weights*) and *Grimm* (*second plurality of weights*, *first/second cohorts*) renders obvious 17(a)-(b).

b) Motivation to Combine with *Grimm*

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV further with *Grimm's* teachings of receiving *active learning*

data from *first* and *second cohorts* of vehicles. A POSITA would have appreciated the benefits of receiving active learning data from multiple groups of other vehicles and via various communication means (V2V and V2I) to increase the data available to determine how to safely operate the *Hampiholi-Attard* SDV. *Dec*., 225. Such a modification is merely the application of *Grimm's* known technique of a vehicle polling data from multiple vehicle groups for decision making purposes according to known methods to yield the predictable results of the *Hampiholi-Attard* SDV obtaining *Gunderson's weights* and *Grimm's* weights from *first* and *second cohorts*. *Id*. Further motivations to combine *Hampiholi-Attard* with *Grimm* are above. *See* 10(e)(i).

A POSITA would have had a REOS in the modification for the reasons set forth above. *See*, 10(e)(i), 10(g)(vi). Further underscoring the REOS, the *Hampiholi-Attard* SDV is already configured for V2V and server communications, thus leading to a straightforward modification. *Hampiholi*, [0026], [0032]; *Attard*, 4:57-6:20; *Dec*., 226.

2. Claim 17(c)

See, 15(d), 10(g).

3. Claim 17(d)

See, 10(g)(iii).

4. Claim 17(e)

See, 10(g)(iv).

VIII. GROUND 4: CLAIMS 18-20 ARE OBVIOUS OVER HAMPIHOLI, ATTARD, MCNEW, GUNDERSON, GRIMM, FRAZER, DUNCAN, ENGELMAN, STRAUSS, AND SAKO

A. Claim 18

1. Claim 18(a)

See, 15(d), 10(g).

2. Claim 18(b)

See, 13(b). *McNew* further teaches a "steering timer monitors how long it takes a driver to put hands on the steering wheel." *McNew*, 19:46-51. A motivation to combine is above. *See*, 13(b).

3. Claim 18(c)

See, 13(c).

4. Claim 18(d)

See, 12(b).

5. Claim 18(e)

McNew's teachings of monitoring the time it takes a driver to put hands on wheel renders obvious 18(e). *See*, 18(b). Namely, a POSITA would have been motivated and found it obvious to include any multiple thresholds tracking the length of time the driver has their hands off the wheel. *Dec*., 234. Further, *McNew* expressly envisions multiple timers. *McNew*, 20:46-59 ("…one **or more** timer**s** ha[ve] expired…"); *Dec*., 234. A POSITA would have appreciated benefits of adding

multiple timers to the *Hampiholi-Attard* SDV, enabling escalating levels of alerts/warnings to be communicated to the driver. *Dec.,* 234.

Including a *second threshold* in the *Hampiholi-Attard* SDV would have had a REOS because it would have required a straightforward software modification to program a second time threshold. *Dec*., 235. For example, *McNew* already teaches a 20 second timer, and it would have been within the skillset of a POSITA to further modify the *Hampiholi-Attard* SDV to add, e.g., a 10 second timer. *Id.* A second timer would additionally have had a REOS and been obvious because it merely required a second application of the first timer technique expressly described, using hardware and memory already present. *Id.*

6. Claim 18(f)

See, 12(c).

7. Claim 18(g)

As discussed, the *Hampiholi-Attard* SDV determines *Attard's* Φ, taking corrective actions when necessary, including controlling whether or not to drive autonomously. *See*, 17(e), 10(g)(iv), 10(g)(vi). Claims 18(f) and 19 require taking the action of transferring control to manual when computer is in the second autonomous mode and the vehicle is on a public street.

a) *Sako's* Teachings

As mapped, *Sako* teaches when an SDV moves "from the highway to a general road, it is possible to switch the driving mode to the manual driving mode." *Sako*, 34:63-35:21. *Sako* teaches determining what roadway type an SDV is on using GPS readings. *Sako*, 34:62-35:21 (teaching detecting a public "highway" *first roadway type* vs "a general road" *second roadway type*); *Dec*., 238. The *Hampiholi-Attard* SDV already includes GPS, processor, and memory. *See*, Claim 15.

b) Motivation to Combine with *Sako*

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV to transfer from semi-autonomous (*second autonomous mode*) to manual when the vehicle exits a public highway onto a general (public) street, per *Sako*. A POSITA would have recognized the SDV would have most safely operated autonomously on a public highway, where infrastructure is better and where roads and driver behavior are the most predictable, and thus would have been motivated to cause the SDV to take *Sako's* corrective action of discontinuing autonomous driving (switching to manual) when moving to a public street from a highway. *Dec.,* 239. This modification combines prior art elements (*Attard's* semi-autonomous mode and *Sako's* functionality) according to known methods to yield predictable results of an SDV transferring to manual mode when exiting a public highway. *Id.* This use of a known technique would have improved *Hampiholi-Attard*

in the same way as *Sako*. *Dec.,* 240. Further, because the hardware/software necessary (including GPS and a map) was already present in *Hampiholi-Attard*, these modifications would have required only straightforward modifications to programming instructions of the *Hampiholi-Attard* SDV, which would have been well-within the skillset of a POSITA and would have had a REOS. *Id.*

c) Using the second weighted voting result

See, 10(g)(vi).

8. Claim 18(h)

See, 18(g) describing a "general road" *second roadway type*. A POSITA would have been motivated and found it obvious to combine *Sako's* teachings of determining to switch from autonomous mode to manual when on a general road (*determining that the third fault state has occurred*) at least because *Attard* expressly teaches that road conditions can cause a switch to manual by causing Φ to fall below Φ_{min}. *Attard*, 10:47-52; *Dec*., 242-243.

9. Claim 18(i)

See, 12(c).

B. Claim 19

1. Claim 19(a)

See, 18(g).

2. Claim 19(b)

See, 18(g). A POSITA would have understood a "general road" teaches or renders obvious *a public street*. *Dec.,* 246.

C. Claim 20

1. Claim 20(a)

See, 17(a).

2. Claim 20(b)

See, 17(b).

3. Claim 20(c)

See, 15(d), 10(g).

4. Claim 20(d)

See, 17(d)

5. Claim 20(e)

See, 17(e).

IX. GROUND 5: CLAIMS 21-24 AND 27 ARE OBVIOUS OVER HAMPIHOLI, ATTARD, MCNEW, GUNDERSON, GRIMM, FRAZER, DUNCAN, ENGELMAN, STRAUSS, SAKO, AND HADA

A. Claim 21

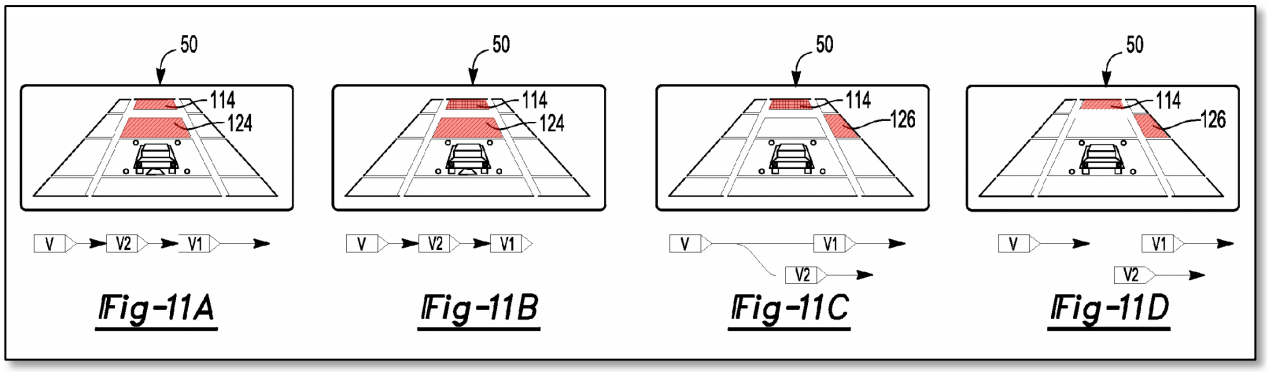
1. Claim 21(a)

Hampiholi teaches a *display* – user interface 218. *See,* 10(b).

a) *Hada's* Teachings

Hada teaches displaying proximity sensor information and/or collision warning information on a single display screen of a vehicle. *Hada*, 1:5-9. *Hada* teaches a display showing a grid for lane markings and illuminating at least one grid section as a function of the location of external objects. *Hada*, 1:41-2:34.

For example, *Hada* depicts the location of the user's vehicle (V) and the positions of other nearby vehicles (V1, V2). The hatched lines in the grid indicate the position of the other vehicles.



Hada, Figs. 11A-11D, 5:4-10, 6:28-35, 7:8-26.

b) Motivation to Combine with *Hada*

A POSITA would have been motivated and found it obvious to modify the *Hampiholi-Attard* SDV to display the position of nearby vehicles per *Hada*. *Dec*., 255. *Hada* teaches displaying sensor readings, such as those indicating nearby vehicles, advantageously improves vehicle safety, thereby motivating the combination. *Hada*, 1:5-36, 3:17-21, 3:55-61, 5:23-36; *Dec*., 255. This modification

would have been use of a known technique of displaying the position of nearby vehicles to improve the *Hampiholi-Attard* SDV in the same way as *Hada*. *Dec*., 255.

A POSITA would have had a REOS modifying the *Hampiholi-Attard* SDV because *Hampiholi* already includes sensors and a display. *Dec*., 256. Thus, a POSITA would have understood modifying the *Hampiholi-Attard* SDV would have merely required straightforward changes to programming instructions. *Id*.

2. Claim 21(b)

See, 15(d), 10(g).

3. Claim 21(c)

Grimm teaches *second weighted voting* via its threat level equation. *See*, 10(g)(iv). *Grimm's* threat level equation incorporates properties of *another vehicle*, that are obtained from a V2V module 50, which "collect[s] significant amounts of data from nearby vehicles, particularly including position, velocity and acceleration data–as is needed for "smart highway" or autonomous vehicle systems." *Grimm*, 5:59-6:4, 3:44-52. The position of the vehicle relative to the SDV is computed by differencing to the SDVs position (*see Grimm*, 3:3-5), as was well known in the art. A motivation to combine the *Hampiholi-Attard* SDV with *Grimm* is above. *See*, 10(g)(iv).

4. Claim 21(d)

See, 10(g)(vi).

B. Claim 22

1. Claim 22(a)

See, 15(d), 10(g).

2. Claim 22(b)

See, 18(b).

3. Claim 22(c)

See, 18(c).

4. Claim 22(d)

See, 18(d).

5. Claim 22(e)

See, 18(e).

C. Claim 23

1. Claim 23(a)

See, 15(d), 10(g).

2. Claim 23(b)

See, 16(c).

3. Claim 23(c)

See, 16(c), 10(g)(vi).

4. Claim 23(d)

See, 16(d).

5. Claim 23(e)

See, 16(e).

6. Claim 23(f)

See, 12(c).

D. Claim 24

1. Claim 24(a)

See, 15(d), 10(g).

2. Claim 24(b)

Duncan teaches *generating a human driver profile using active learning data from a current driver of the SDV*. *See,* 15(d)(v).

3. Claim 24(c)

The *Hampiholi-Attard* SDV would have been modified per *Frazer* to include *a third fault state* (e.g., a severity rank R in *Hampiholi's* 3rd range). *Hampiholi*, FIG. 4, [0057]. *See*, 15(c)(iii)(1-6). *Duncan* teaches generating a human driver profile including driver behaviors. *See*, 24(b). Thus, in the modified *Hampiholi-Attard* SDV, *determining that the third fault state has occurred* would have been done *using the human driver profile*.

A POSITA would have been motivated to modify *Hampiholi-Attard* SDV per *Frazer* and *Duncan* such that the fault-remediation table would have included a third fault state based on the human driver profile, where the human driver profile is used to determine *Hampiholi's* severity rank R. *Dec*., 273-275. This modification would have been use of a known technique and would have improved *Hampiholi-Attard* SDV in the same way as *Frazer* and *Duncan*. This modification would have had a

REOS because modifying *Hampiholi-Attard* would have required only straightforward modifications to programming instructions. *Dec*., 276.

4. Claim 24(d)

The *Hampiholi-Attard* SDV disables the first autonomous mode as a corrective action. *See*, 12(c). Likewise, instead of being a *second corrective action* for 12(c), here the corrective action would have been a *third corrective action* in response to a third fault state. *See*, 24(c).

E. Claim 27

1. Claim 27(a)

See, 15(d), 10(g).

2. Claim 27(b)

See, 15(c)(iii), 15(d)(ix) mapping "third fault state." Further, *Attard* specifically teaches the fault being a current weather of the roadway on which the SDV is currently travelling, *e.g.* wet or icy roads. *Attard*, 7:14-17.

3. Claim 27(c)

See, 12(c).

X. CONCLUSION

For the foregoing reasons, Petitioner respectfully requests *inter partes* review of the Challenged Claims.

Respectfully submitted,

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COUNSEL FOR PETITIONER

XI. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(A)(1)

A. Real Party-In-Interest

Petitioner is the real party-in-interest. 37 C.F.R. § 42.8(b)(1).

B. Related Matters

The '004 Patent is presently the subject of a patent infringement lawsuit filed against Petitioner: *Granite Vehicle Ventures LLC v. Tesla, Inc.*, 2:24-cv-01007, No. 1 (E.D. Tex.) Dec. 6, 2024.

C. Lead and Back-Up Counsel

Petitioners provide the following designation and service information for lead and back-up counsel. 37 C.F.R. § 42.8(b)(3) and (b)(4).

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D. 37 C.F.R. § 42.8(b)(4) – Service Information

Please address all correspondence to the lead and back-up counsel as shown above. Petitioner consents to electronic service by e-mail at the e-mail addresses provided above.

CLAIM LISTING APPENDIX
U.S. Patent No. 12,037,004 for Claims 10-24, 27

Claim Designation	Claim Language
Claim 10(Pre)	A self-driving vehicle (SDV) comprising:
Claim 10(a)	a sensor system having a plurality of sensors, comprising:
Claim 10(a)(i)	a first camera;
Claim 10(a)(ii)	a second camera;
Claim 10(a)(iii)	a sensor configured to detect input from a steering wheel;
Claim 10(a)(iv)	a GPS sensor;
Claim 10(a)(v)	a thermometer; and
Claim 10(a)(vi)	a speedometer;
Claim 10(b)	a display that is capable of displaying:
Claim 10(b)(i)	a reading from the GPS sensor;
Claim 10(b)(ii)	a reading from the thermometer; and
Claim 10(b)(iii)	a reading from the speedometer;
Claim 10(c)	vehicle controls comprising: an engine throttle, a steering mechanism, and a braking system;
Claim 10(d)	a non-transitory computer readable storage medium comprising
Claim 10(d)(i)	a first plurality of weights, and the first plurality of weights comprising first active learning data from a first cohort of other SDVs:
Claim 10(e)	the non-transitory computer readable storage medium comprises
Claim 10(e)(i)	a second plurality of weights, and the second plurality of weights comprising second active learning data from the first cohort of other SDVs;
Claim 10(f)	the non-transitory computer readable storage medium comprises a fault remediation table comprising a first quota, a second quota, a first corrective action, and a second corrective action;
Claim 10(g)	a computer system comprising a processor coupled to the non-transitory computer readable storage medium and program code, the program code readable and executable by the processor, wherein the computer system is capable of performing operations comprising:

Claim Designation	Claim Language
Claim 10(g)(i)	receiving a first plurality of inputs comprising readings from the first camera and the sensor configured to detect input from the steering wheel;
Claim 10(g)(ii)	receiving a second plurality of inputs comprising readings from the second camera and the speedometer;
Claim 10(g)(iii)	determining a first weighted voting result comprising multiplying a first input from among the first plurality of inputs by a weight from among the first plurality of weights;
Claim 10(g)(iv)	determining a second weighted voting result comprising multiplying a second input from among the second plurality of inputs by a weight from among the second plurality of weights;
Claim 10(g)(v)	determining a competence level of a human driver using the first weighted voting result;
Claim 10(g)(vi)	autonomously maintaining a buffer of space from other vehicles around the SDV using the vehicle controls and the second weighted voting result;
Claim 10(g)(vii)	determining that a first fault has occurred when the competence level of the human driver is below the first quota; and
Claim 10(g)(viii)	taking the first corrective action when the first fault has occurred.
Claim 11(a)	The SDV of claim 10, further comprising: the computer system is further capable of performing operations comprising:
Claim 11(b)	recording a number of times the first fault has occurred;
Claim 11(c)	determining that a second fault has occurred when the number of times the first fault has occurred exceeds the second quota; and
Claim 11(d)	taking the second corrective action when the second fault has occurred.
Claim 12(a)	The SDV of claim 11, further comprising: the computer system is further capable of performing operations comprising:
Claim 12(b)	taking the first corrective action comprising sounding a warning sound and displaying an icon on a display screen; and
Claim 12(c)	taking the second corrective action comprising decreasing a speed of the SDV and transferring driver controls to manual control.
Claim 13(a)	The SDV of claim 10, further comprising: the computer system is further capable of performing operations comprising:

Claim Designation	Claim Language
Claim 13(b)	recording a duration of time during which the first fault has occurred;
Claim 13(c)	determining that a second fault has occurred when the duration of time during which the first fault has occurred exceeds the second quota; and
Claim 13(d)	taking the second corrective action when the second fault has occurred.
Claim 14(a)	The SDV of claim 13, further comprising: the computer system is further capable of performing operations comprising:
Claim 14(b)	taking the first corrective action comprising sounding a warning sound and displaying an icon on a display screen; and
Claim 14(c)	taking the second corrective action comprising decreasing a speed of the SDV and transferring driver controls to manual control.
Claim 15(Pre)	A self-driving vehicle (SDV) comprising:
Claim 15(a)	a sensor system having a plurality of sensors, comprising:
Claim 15(a)(i)	a first camera;
Claim 15(a)(ii)	a second camera;
Claim 15(a)(iii)	a sensor configured to detect input from a steering wheel;
Claim 15(a)(iv)	a GPS sensor; and
Claim 15(a)(v)	a speedometer;
Claim 15(b)	vehicle controls comprising: an engine throttle, a steering mechanism, a turn signal, and a braking system;
Claim 15(c)	a non-transitory computer readable storage medium comprising:
Claim 15(c)(i)	a first plurality of weights;
Claim 15(c)(i)	a second plurality of weights; and
Claim 15(c)(iii)	a fault remediation table comprising:
Claim 15(c)(iii)(1)	a first fault state;
Claim 15(c)(iii)(2)	a first corrective action associated with the first fault state;
Claim 15(c)(iii)(3)	a second fault state;
Claim 15(c)(iii)(4)	a second corrective action associated with the second fault state;

Claim Designation	Claim Language
Claim 15(c)(iii)(5)	a third fault state; and
Claim 15(c)(iii)(6)	a third corrective action associated with the third fault state;
Claim 15(d)	a computer system comprising a processor coupled to the non-transitory computer readable storage medium and program code, the program code readable and executable by the processor, wherein the computer system is capable of:
Claim 15(d)(i)	receiving a sensor reading from the system of sensors;
Claim 15(d)(ii)	operating the vehicle controls;
Claim 15(d)(iii)	receiving a first plurality of inputs, comprising readings from the first camera and the sensor configured to detect input from the steering wheel;
Claim 15(d)(iv)	receiving a second plurality of inputs, comprising readings from the second camera;
Claim 15(d)(v)	generating a human driver profile;
Claim 15(d)(vi)	generating a control processor profile;
Claim 15(d)(vii)	taking the first corrective action when the first fault state has occurred;
Claim 15(d)(viii)	taking the second corrective action when the second fault state has occurred; and
Claim 15(d)(ix)	taking the third corrective action when the third fault state has occurred.
Claim 16(a)	The SDV of claim 15, further comprising: the computer system is further capable of:
Claim 16(b)	generating the human driver profile comprising using a human driver competence level;
Claim 16(c)	generating the control processor profile comprising determining whether the computer system is currently operating in a first autonomous mode, a second autonomous mode, or a manual mode;
Claim 16(d)	while operating in the first autonomous mode, autonomously maintaining a buffer of space from other vehicles around the SDV using the vehicle controls, without requiring the human driver to control the vehicle controls;

Claim Designation	Claim Language
Claim 16(e)	while operating in the second autonomous mode, autonomously controlling the engine throttle and the breaking system while the human driver controls the turn signal; and
Claim 16(f)	while operating in the manual mode, allowing the human driver to control the vehicle controls.
Claim 17(a)	The SDV of claim 16, further comprising: the first plurality of weights comprises first active learning data from a first cohort of other SDVs;
Claim 17(b)	the second plurality of weights comprises second active learning data from a second cohort of other SDVs;
Claim 17(c)	the computer system is further capable of:
Claim 17(d)	generating a first weighted voting result comprising multiplying an input from among the first plurality of inputs by a weight from among the first plurality of weights; and
Claim 17(e)	generating a second weighted voting result comprising multiplying an input from among the second plurality of inputs by a weight from among the second plurality of weights.
Claim 18(a)	The SDV of claim 17, further comprising: the computer system is further capable of:
Claim 18(b)	determining a length of time during which the sensor configured to detect input from the steering wheel has not detected an input from the human driver;
Claim 18(c)	determining that the first fault state has occurred when the length of time exceeds a first threshold;
Claim 18(d)	taking the first corrective action comprising sounding a warning sound and displaying an image on a display screen;
Claim 18(e)	determining that the second fault state has occurred when the length of time exceeds a second threshold;
Claim 18(f)	taking the second corrective action comprising switching to the manual mode;
Claim 18(g)	determining, using the second weighted voting result, whether the SDV is currently traveling on a first roadway type or a second roadway type;
Claim 18(h)	determining that the third fault state has occurred when the computer system is operating in the second autonomous mode and the SDV is currently traveling on the second roadway type; and

Claim Designation	Claim Language
Claim 18(i)	taking the third corrective action comprising switching to the manual mode.
Claim 19(a)	The SDV of claim 18, further comprising: the first roadway type comprises a public highway; and
Claim 19(b)	the second roadway type comprises a public street.
Claim 20(a)	The SDV of claim 15, further comprising: the first plurality of weights comprises first active learning data from a first cohort of other SDVs;
Claim 20(b)	the second plurality of weights comprises second active learning data from a second cohort of other SDVs;
Claim 20(c)	the computer system is further capable of:
Claim 20(d)	generating a first weighted voting result comprising multiplying an input from among the first plurality of inputs by a weight from among the first plurality of weights; and
Claim 20(e)	generating a second weighted voting result comprising multiplying an input from among the second plurality of inputs by a weight from among the second plurality of weights.
Claim 21(a)	The SDV of claim 20, further comprising: a display that is capable of displaying a position of another vehicle relative to the SDV;
Claim 21(b)	the computer system is further capable of:
Claim 21(c)	determining the position of another vehicle relative to the SDV using the second weighted voting result; and
Claim 21(d)	autonomously maintaining a buffer of space from other vehicles around the SDV using the vehicle controls and the second weighted voting result.
Claim 22(a)	The SDV of claim 21, further comprising: the computer system is further capable of:
Claim 22(b)	determining a length of time during which the sensor configured to detect input from a steering wheel has not detected input from the human driver;
Claim 22(c)	determining that the first fault state has occurred when the length of time exceeds a first threshold;
Claim 22(d)	taking the first corrective action comprising sounding a warning sound and displaying an alert on a display screen; and

Claim Designation	Claim Language
Claim 22(e)	determining that the second fault state has occurred when a number of times the first fault state has occurred exceeds a second threshold.
Claim 23(a)	The SDV of claim 22, further comprising: the computer system is further capable of:
Claim 23(b)	determining, using the control processor profile, whether the computer system is currently operating in a first autonomous mode, a second autonomous mode, or a manual mode;
Claim 23(c)	while operating in the first autonomous mode, autonomously maintaining a buffer of space from other vehicles around the SDV using the vehicle controls and the second weighted voting result, without requiring the human driver to control the vehicle controls;
Claim 23(d)	while operating in the second autonomous mode, autonomously controlling the engine throttle and the breaking system while the human driver controls the turn signal;
Claim 23(e)	while operating in the manual mode, allowing the human driver to control the vehicle controls; and
Claim 23(f)	taking the second corrective action comprising the computer system switching from the first autonomous mode to the manual mode.
Claim 24(a)	The SDV of claim 23, further comprising: the computer system is further capable of:
Claim 24(b)	generating the human driver profile comprises using active learning data from a current human driver of the SDV;
Claim 24(c)	determining that the third fault state has occurred using the human driver profile; and
Claim 24(d)	taking the third corrective action comprising disabling the first autonomous mode.
Claim 27(a)	The SDV of claim 23, further comprising: the computer system is further capable of:
Claim 27(b)	determining the third fault state has occurred comprising determining a current weather condition of a roadway on which the SDV is currently traveling; and
Claim 27(c)	taking the third corrective action comprising switching from the first autonomous mode to the manual mode.

APPENDIX OF EXHIBITS

Exhibit 1001	U.S. Patent No. 12,037,004 ("*the '004 Patent*")
Exhibit 1002	File History for U.S. Patent No. 12,037,004
Exhibit 1003	Declaration of Christopher Wilson
Exhibit 1004	U.S. Patent No. 9,406,177 to Attard et al. ("*Attard*")
Exhibit 1005	U.S. Patent No. 9,494,926 to Frazer et al. ("*Frazer*")
Exhibit 1006	U.S. Patent No. 10,377,303 to McNew et al. ("*McNew*")
Exhibit 1007	U.S. Patent Application Publication No. 2016/0267335 to Hampiholi ("*Hampiholi*")
Exhibit 1008	U.S. Patent No. 9,063,543 to An et al. ("*An*")
Exhibit 1009	Intentionally Left Blank
Exhibit 1010	Intentionally Left Blank
Exhibit 1011	Intentionally Left Blank
Exhibit 1012	U.S. Patent Application Publication No. 2007/0268158 to Gunderson et al. ("*Gunderson*")
Exhibit 1013	U.S. Patent Application Publication No. 2007/0219720 ("*Trepagnier*")
Exhibit 1014	Gereon Meyer and Sven Beiker. *Road Vehicle Automation*. Springer. 2014. ("*Meyer*")
Exhibit 1015	Jeff Wit et al. "Autonomous Ground Vehicle Path Tracking." Journal of Robotic Systems 21(8), 439-449 (2004). ("*Wit*")
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Exhibit 1057	Mercedes S-Class Operator's Manual ("*Mercedes S-Class Manual*")
Exhibit 1058	Disclosure of Asserted Claims *Granite Vehicle Ventures LLC v. Tesla, Inc.*, 2:24-cv-01007, No. 1 (E.D. Tex.)

CERTIFICATION OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. § 42.24 that the foregoing Petition for *Inter Partes* Review, excluding any table of contents, mandatory notices under 37 C.F.R. § 42.8, certificates of service or word count, or appendix of exhibits, contains 13,420 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: May 28, 2025

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CERTIFICATE OF SERVICE ON PATENT OWNER
UNDER 37 C.F.R. § 42.105

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(b), the undersigned certifies that on May 28, 2025, a complete and entire copy of this Petition for *Inter Partes* Review and Exhibits were provided via Federal Express to the Patent Owner by serving the correspondence address of record for the '004 Patent:

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Further, a courtesy copy of this Petition for *Inter Partes* Review was sent via email to Patent Owner's litigation counsel:

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