

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. IPR2025-00943
U.S. Patent No. 11,597,402

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,597,402**

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I. INTRODUCTION

Petitioner Tesla, Inc. (“Petitioner”) requests *Inter Partes* Review of Claims 1, 3-4, 6, 8-11, 13-24 (collectively, the “Challenged Claims”) of USPN 11,597,402 (“the ’402 Patent”) assigned to Granite Vehicle Ventures LLC. ’402 Patent (Ex. 1001). The purportedly distinguishing feature of the Challenged Claims—determining a corrective action associated with a fault using a fault-remediation table—was well-known before the ’402 Patent. The Challenged Claims are obvious over the prior art and accordingly, IPR should be instituted.

II. DESCRIPTION OF THE ’402 PATENT

The ’402 Patent claims a self-driving vehicle (SDV) that receives sensor readings from a plurality of sensors, determines whether a fault has occurred based on the sensor readings, determines whether the fault exceeds a threshold for danger, determines a corrective action associated with the fault using a fault-remediation table, and implements the corrective action. ’402 Patent, 1:42-59, 8:13-46.

III. SUMMARY OF THE ’402 PATENT

A. The ’402 Patent’s Prosecution

During prosecution of the ’402 Patent, Examiner rejected the claims under § 102 in view of *Stenneth*. ’402 FH, 3314-3319. In response, Applicant argued *Stenneth* does not teach “whether a fault has occurred,” but instead only teaches “adjusting a confidence level” based on current external conditions the vehicle is facing. ’402 FH, 3401-3402. Additionally, Applicant argued *Stenneth* does not teach

a “‘fault-remediation table’ which allows for decisions based on the type of fault occurring.” *Id.*

B. Priority Date of the Challenged Claims

The ’402 Patent claims priority to USPN 9,566,986 filed September 25, 2015. ’402 Patent, (63). For purposes of this Petition only, Petitioner applies September 25, 2015, as the priority date for the Challenged Claims.

C. Level of Skill of a Person Having Ordinary Skill in the Art (“POSITA”)

A POSITA at the time of the ’402 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.

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

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

Petitioner certifies the ’402 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.

Proposed Grounds of Unpatentability	Exhibits
Ground 1: Claims 1 and 3 are obvious under § 103(a) over <i>Attard</i> and <i>Frazer</i> .	1004, 1005
Ground 2: Claim 4 is obvious under §103(a) over <i>Attard</i> and <i>Hampiholi</i> .	1004, 1007
Ground 3: Claim 6 is obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , <i>McNew</i> , and <i>Scofield</i> .	1004, 1007, 1006, 1022
Ground 4: Claim 8 is obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , <i>McNew</i> , <i>Scofield</i> , and <i>Grimm</i> .	1004, 1007, 1006, 1022, 1031
Ground 5: Claims 9-11 are obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , and <i>Grimm</i> .	1004, 1007, 1031
Ground 6: Claim 13 is obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , <i>Grimm</i> , and <i>Frazer</i> .	1004, 1007, 1031, 1005
Ground 7: Claim 14 is obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , <i>Grimm</i> , and <i>Dolgov</i> .	1004, 1007, 1031, 1032
Ground 8: Claims 15-16 and 18-20 are obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , and <i>McNew</i> .	1007, 1007, 1006
Ground 9: Claims 17, 21-22, and 24 are obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , <i>McNew</i> , and <i>Frazer</i> .	1004, 1007, 1006, 1005
Ground 10: Claim 23 is obvious under §103(a) over <i>Attard</i> , <i>Hampiholi</i> , <i>McNew</i> , <i>Frazer</i> , and <i>Zhu</i>	1004, 1007, 1006, 1005, 1033

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 '402 Patent are indefinite or additional terms need construction.

V. SHOWING OF ANALOGOUS, PRIOR ART

The prior art is analogous to the claimed invention of the '402 Patent. The prior art is from the same field of endeavor of the '402 patent, namely vehicles. '402 Patent, 1:26-27, 8:52-59; Attard, 1:15-24, 9:63-67; Frazer, 1:18-23, 21:20-22:22; McNew, 1:17-30, 3:5-52, FIG. 1; Hampiholi, [0050]-[0051], [0057]-[0058]; Grimm, 1:9-19, 2:57-59, 3:44-52, FIG. 1; Dolgov, 1:17-29, 3:5-16, FIG. 1; Zhu, [0002]-[0003], [0031]-[0032]; Scofield, 3:9-17, 5:7-13; Dec., 57-80.¹

The prior art is also reasonably pertinent to at least one problem facing the '402 Patent's inventors, namely at least one of:

(A) evaluating a computer's ability to autonomously operate a vehicle and determining actions to take when faults are detected; '402 Patent, 1:26-59, 8:13-18; Attard, 1:15-24, 2:28-54; McNew, 20:7-31, 4:3-5, 8:41-44; Dolgov, 1:51-60; Zhu, [0029]; Scofield, 1:55-60;

(B) autonomously controlling a device's operational mode; '402 Patent, 1:26-59, 3:17-24; Frazer, 19:23-25, 21:20-22:22, FIG. 6; Zhu, [0029];

¹ References to Dec. are to paragraphs of Ex. 1003, Declaration of Christopher Wilson.

(C) selecting appropriate corrective actions for a given driving situation; '402 *Patent*, 7:59-8:18, 9:13-37, 10:32-62; *McNew*, 20:7-31, 4:3-5, 8:41-44; *Frazer*, 19:23-25, 21:20-22:22, FIG. 6; *Grimm*, 4:57-5:4; *Zhu*, [0029];

(D) adjusting an operation of a vehicle based on driver competence; '402 *Patent*, 8:52-59; *Hampiholi*, [0001]-[0004], [0057]; *Scofield*, 6:31-51;

(E) adapting to weather conditions to increase vehicle safety; '402 *Patent*, 7:44-58, 13:63-14:20, 15:39-52; *Zhu*, [0024]-[0029]; and/or

(F) improving vehicle safety. '402 *Patent*, 9:13-19; *Dec.*, 57-80.

VI. GROUND 1: CLAIMS 1 AND 3 ARE OBVIOUS OVER *ATTARD* AND *FRAZER*

A. Claim 1

1. Claim 1(Pre)²

To the extent the preamble is limiting, *Attard* teaches *a computer program product* that manages fault handling in an autonomous vehicle (“*self-driving vehicle SDV*”) including controlling a driving mode by changing from an autonomous driving mode to a manual driving mode (or semi-autonomous driving mode) in response to a detected fault (“*controlling a driving mode of a self-driving vehicle*”). Further, *Attard* teaches *computer readable storage medium* such as non-volatile memory and programming code stored thereon that is *readable and executable by a processor*.

² See Claims Appendix for claim language.

a) *Attard* Teaches Controlling a Driving Mode

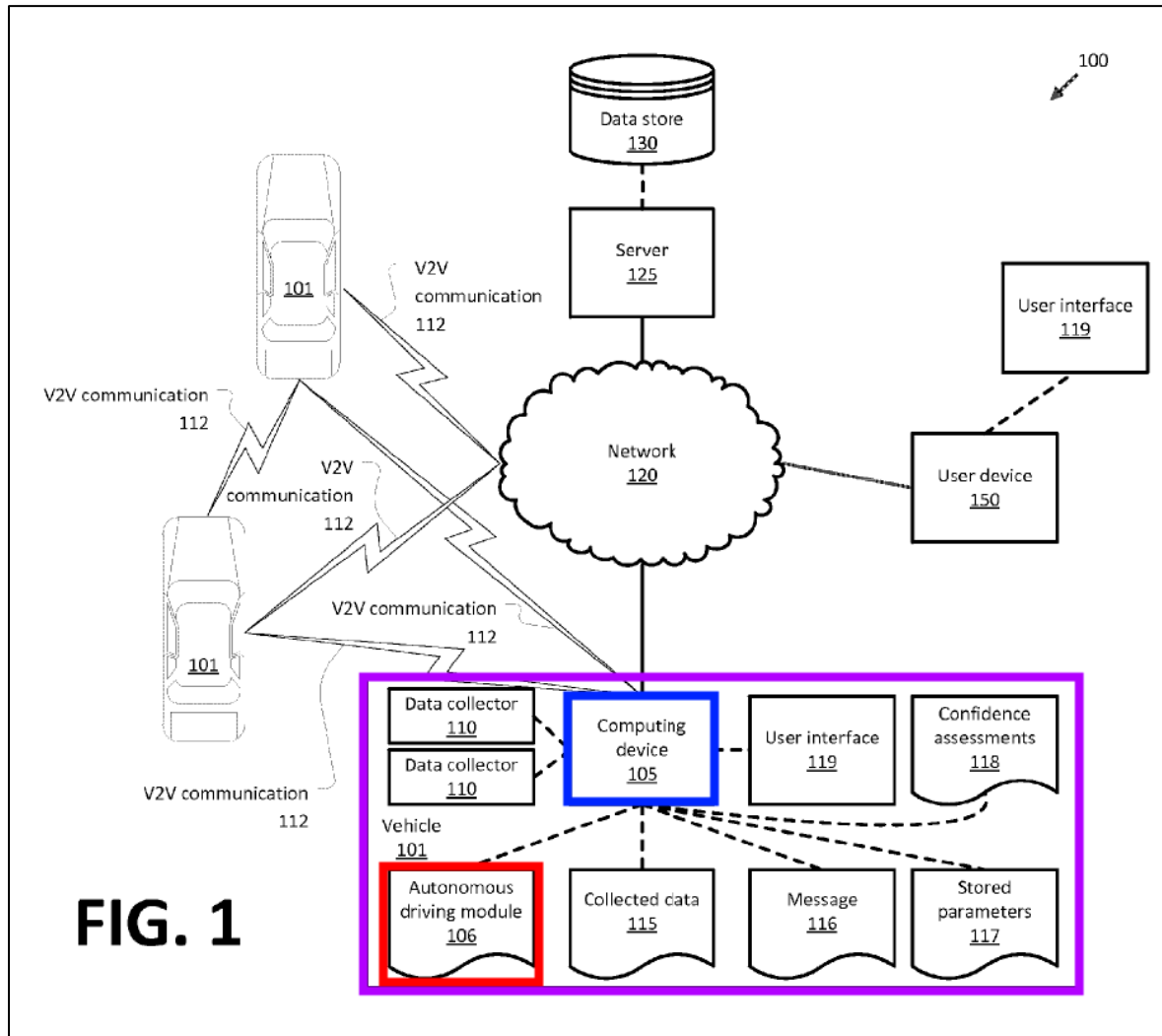
Attard's vehicle 101 is capable of driving autonomously. *Attard*, 1:15-52, 2:28-32, 9:63-67. A POSITA would have understood that a vehicle capable of driving autonomously is a self-driving vehicle (SDV). *Dec.*, 82. Vehicle 101 includes three driving modes: (1) an autonomous driving mode (in which autonomous driving module 106 of computer 105 controls vehicle 101's functions such as steering, braking, and speed), (2) a semi-autonomous mode (in which the driver/operator controls one or more of vehicle 101's functions and computer 105 controls one or more of vehicle 101's functions), and (3) a manual mode in which a human driver is in "complete" control of vehicle 101. *Attard*, 1:15-52, 1:62-2:9, 2:55-3:4, 3:22-27, 3:56-67, 7:39-46, 9:60-10:12, 10:36-41. Thus, a POSITA would have understood or found obvious that *Attard* teaches or renders obvious (1) an autonomous driving mode, (2) a semi-autonomous mode in which both driver and computer each control one or more vehicle functions, and (3) a manual mode in which a driver has "complete" manual control over vehicle functions including steering, braking, and speed. *Dec.*, 82.

Regarding *controlling a driving mode*, *Attard* teaches disabling autonomous mode (that is, transitioning from autonomous mode to either semi-autonomous mode or manual mode) in response to a detected fault. *Attard*, 1:62-65, 2:55-3:4, 3:5-13.

A POSITA would have recognized that *Attard's* computer 105 (including autonomous driving module 106) controlling vehicle 101 to transition from autonomous mode to either of semi-autonomous or manual modes would have been *controlling a driving mode. Dec.*, 83-84. A POSITA would have understood that when disabling vehicle 101's autonomous functions such as braking, steering, and acceleration, a human driver would have taken over managing such functions, as is done in a typical non-SDV (e.g., standard non-SDV car). *Id.* While *Attard* does not expressly use the phrase “manual *mode*,” a POSITA would have understood or found obvious that *Attard's* driving mode in which the driver takes “complete control” of the vehicle teaches a “manual mode.” *Id.*

b) *Attard's* Computer Program Product Comprises Non-Transitory Computer-Readable Memory and Processor

Attard's Fig. 1 below depicts vehicle 101 including computer 105 and autonomous driving module 106:



Attard, Fig. 1³, 1:41-52.

Attard teaches autonomous operations of vehicle 101 may be stored as a set of instructions in vehicle 101's memory *and executable by a processor* of computer 105. *Attard*, 2:27-32 ("Autonomous operations of the vehicle 101, including generation and evaluation of confidence assessments 118, may be performed in an

³ All annotations and emphases are added by Petitioner unless specified otherwise.

autonomous driving module 106, e.g., as a set of instructions stored in a memory of, and executable by a processor of, a computing device 105 in the vehicle 101.”), 3:15-22 (“In any case, the vehicle 101 generally includes a vehicle computer 105 that includes a processor and a memory, the memory including one or more forms of computer-readable media, and storing instructions executable by the processor for performing various operations, including as disclosed herein.”), 15:11-46 (teaching computer-executable instructions, processor, and computer-readable medium including non-volatile media). Thus, a POSITA would have understood or found obvious that *Attard* teaches a *computer program product* for vehicle 101 including for *controlling a driving mode* and that the computer program product comprises non-volatile memory and a processor for executing programming instructions. *Dec.*, 85-86.

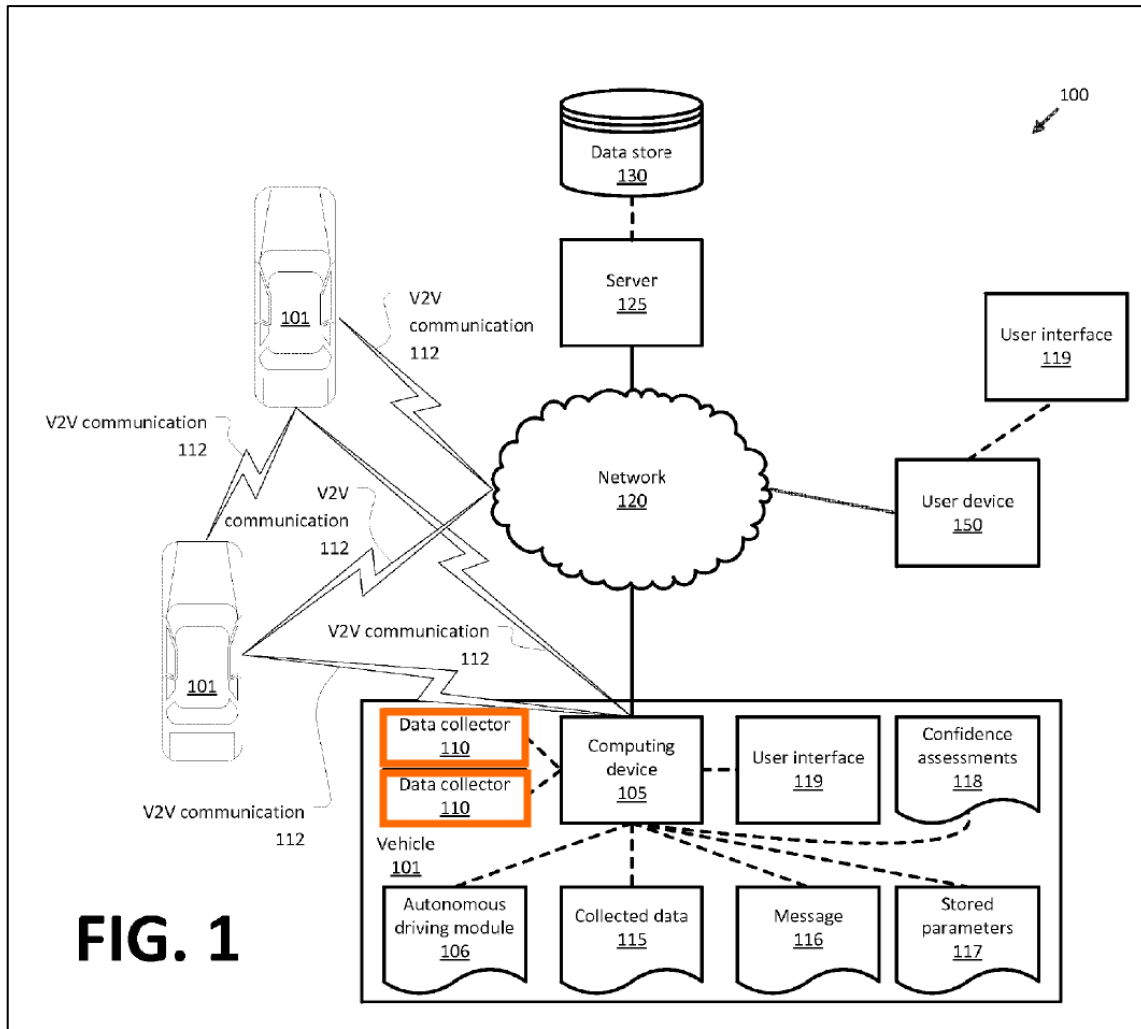
2. *Claim 1(a)*

a) *Attard’s System of Sensors and Sensor Readings*

Attard’s computer 105 receives collected data 115 (“*sensor readings*”) from a plurality of sensors 110 (“*system of sensors*,” also called data collectors 110 in *Attard*), which include cameras, Global Positioning System (GPS) equipment, sensors relating to vehicle speed or acceleration, RADAR, LIDAR, and sonar. *Attard*, 4:1-31, 1:50-52, 1:62-2:9, 4:65-5:3, 6:16-35, 9:51-56, 10:13-17. *Attard’s* sensors 110 transmit collected data 115 to computer 105. *Attard*, 3:45-55 (“computer

105 ... generally includes instructions for receiving data, e.g., collected data 115 from one or more data collectors 110”), 4:1-17 (“data collectors 110 to provide data directly to the computer 105.”), 4:32-45 (“A memory of the computer 105 generally stores collected data 115.”), 6:14-35, 10:13-17.

Collected data 115 may include “a variety of data collected in a vehicle 101 from data collectors 110.” *Attard*, 4:32-45. *Dec.*, 88. Additionally, *Attard* teaches collected data 115 includes not only data gathered by one or more collection devices 115, but also includes data derived from the sensor readings. Specifically, *Attard* teaches collected data 115 includes “any data that may be gathered by a collection device 110 and/or derived from such data.” *Attard*, 4:32-45. *Attard*’s sensors 110 are depicted below:



Attard, Fig. 1; *Dec.*, 88.

A POSITA would have understood or found obvious that *Attard*'s sensors 110 are a *system of sensors* because *Attard* teaches a plurality of such sensors and the sensors work together with vehicle 101 including computer 105 and autonomous driving module 106 to collect data 115. *Dec.*, 89; *Attard*, 4:1-17, 1:61-2:6. To the extent PO argues *Attard* does not expressly teach *sensor readings*, a POSITA would

have understood or found it obvious that *Attard's* cameras capture collected data 115, which are *sensor readings*. *Dec.*, 89.

b) *Attard's* Sensor Readings Describe a Current Operational State of an SDV

The '402 Patent describes that an “operational state” of a vehicle including states (e.g. presence/absence of snow tires), conditions (e.g., road conditions), and measured parameters (e.g., tire pressure, fluid volume) detected via its system of sensors. '402 *Patent*, 5:59-6:8; *Dec.*, 90-92. Operational states may, in some cases, indicate “anomalous” or “faulty” states, including failure of a particular system (e.g., an “all wheel traction system”) or a fault (e.g., a “faulty braking system.”). *Id.*

Attard teaches sensors which similarly “provide indicia related to collected data 115 pertaining to a particular vehicle 101 and/or vehicle 101 sub-system, environmental attribute, or condition,” where “an attribute or condition such as road conditions, weather conditions, braking capabilities, ability to detect a lane, ability to maintain a speed of the vehicle 101” are all taken into consideration and are related to collected data 115. *Attard*, 10:42-52. As described regarding Fig. 2, at block 210 the vehicle's sensors collect data, providing it to computer 105. *Attard*, 10:13-17, Figs. 1-2.

Because *Attard's* collected data 115 (*sensor readings*) detect conditions external to the vehicle (e.g., weather conditions, road attributes) and data internal to the vehicle (e.g., acceleration, speed) used to perform autonomous driving, *Attard's*

sensor readings describe a current operational state of a SDV, as claimed. Compare Attard, 1:61-2:6, 4:1-17, 6:4-13, 10:13-27 with '402 Patent, 5:59-6:8; Dec., 90-92.

3. Claim 1(b)

Attard teaches “faults” as recited in limitation 1(b) via its “confidence attribute sub-assessments 118” (also denoted as “ φ_i ” below). *Attard*, 7:39-46; *Dec.*, 95-101. As mapped below, when φ_i falls below $\varphi_{\min}$, *Attard*’s vehicle makes a first determination that *a fault has occurred*. Claim 1(c) addresses a second determination of whether the fault exceeds a threshold for danger.

a) '402 Patent’s Fault Description

As discussed regarding 1(a), the “operational state” of a vehicle, per the '402 Patent, may indicate that a fault has occurred, such as a “faulty braking system.” '402 Patent, 5:59-6:8. Though a fault is sensed, in some instances the fault may be tolerable, so long as a threshold for danger has not yet been exceeded (further described below regarding limitation 1(c)). *Id.*, 8:6-18, 9:13-17; *Dec.*, 94.

b) *Attard's* Fault Teachings

Attard teaches computer 105 and at least one processor performing its steps, and *Attard* teaches collecting sensor data 115 describing a current operational state of the vehicle. *See*, 1(Pre)-1(a).⁴

Attard uses collected sensor data 115 to produce confidence assessments 118⁵ indicating whether the vehicle “can and/or should be operated autonomously.” *Attard*, 5:54-6:3, 5:21-53, 6:14-35; *Dec.*, 96-101. When expressed as a vector, each confidence assessment (φ) comprises a plurality of sub-assessments φ_i , each φ_i related to a single sensor (e.g., camera) or a group of sensors (e.g., lane-tracking

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.

⁵ *Attard* uses element 118 to refer to both overall confidence assessment Φ and vector confidence assessments φ . *Attard*, 2:10-48, 5:54-6:44, 6:61-7:23, 7:39-46, 7:62-8:45. Each of Φ and φ will be further discussed regarding limitation 1(h), below. Hereinafter, element “118” is omitted, and each confidence assessment is referred to as its specific type (i.e., overall, vector, sub-assessment) for clarity.

system). *Attard* names φ_i “confidence attribute sub-assessments 118.”⁶ *Attard*, 7:39-46; *Dec.*, 96-98. Each of *Attard*’s vector components φ_i may indicate a potential fault within one sensor or a group of related sensors, if it is determined that the particular φ_i falls below a threshold. *Dec.*, 96-98 citing *Attard* 6:4-13, 7:39-46, 7:65-8:13.

Attard explains each sub-assessment φ_i is compared with threshold(s) specified by *Attard*’s parameter 117 corresponding to that particular sub-assessment. *Attard*, 5:21-65; *Dec.*, 98-99. That is, for each sub-assessment φ_i , an associated parameter 117 is stored comprising thresholds ($\varphi_{\min}$) for comparison with sub-assessment φ_i to determine when associated collected data 115 indicates a particular driving condition/attribute has become problematic (i.e., that *a fault has occurred*). *Attard*, 5:21-29, 6:4-13; *Dec.*, 98-99. Thus, each sub-assessment φ_i represents a potential fault. *Id.*

In one example, *Attard* describes a sub-assessment φ_1 representing optical lane-tracking confidence. *Attard*, 8:10-39; *Dec.*, 99. A POSITA would have understood this particular sub-assessment φ_1 would have been based on collected data 115 received from a component such as an external camera or infrared sensor

⁶ *Attard* refers to φ_i as “confidence attribute sub-assessment,” “vector component,” and other related phrasing. *Attard*, 7:65-8:4, 11:10-15. For clarity, Petitioner refers to φ_i as “sub-assessment” throughout.

used for lane tracking. *Id.* In any case, *Attard* explains sub-assessment ϕ_1 is compared to a threshold $\phi_{\min}$ (from an associated parameter 117), and if $\phi_1 < \phi_{\min}$, a message may be generated regarding the fault, where the urgency/severity of the fault may be indicated in the message. *Attard*, 8:10-39, 14:63-15:4, 1:65-2:9, 7:6-17; *Dec.*, 99-100. Thus, sub-assessment ϕ_i falling below threshold $\phi_{\min}$ determines a fault has occurred. *Id.*

As discussed below regarding limitation 1(c), this “fault” may, in some cases, be tolerable to *Attard*’s SDV, much like the method described by the ’402 Patent. For example, when a sub-assessment ϕ_i falls below a particular threshold, a low-urgency fault message may be presented such as “Notice,” “Caution,” or “Warning.” *Attard*, 8:10-25. Here, the fault may not yet have exceeded the threshold for “Danger,” which would warrant a message indicating higher urgency. *Id.*; *Dec.*, 100. In another example, a fault may indicate that one of multiple cameras has failed, but, due to redundancy, the vehicle may continue operating autonomously. *Attard*, 14:64-15:1; *Dec.*, 100.

4. Claim 1(c)

As discussed regarding limitation 1(b), *Attard* teaches determining a fault when a sub-assessment ϕ_i falls below a threshold $\phi_{\min}$, triggering message generation such as “Notice,” “Caution,” or “Warning.” *See*, 1(b) *citing Attard*, 8:10-25. As

further explained, *Attard* teaches computer 105 and at least one processor performing its steps. *See*, 1(Pre)-1(a).

Attard continues, explaining that a second determination is made, where if the confidence assessment φ_i component continues to fall below another threshold, a message for “Danger” is generated. *Attard*, 8:10-25; *Dec.*, 103. Thus, *Attard* teaches determining, by its processor(s), whether the fault (such as poor lane-tracking confidence or a weather condition) falls below a *threshold for danger*. *Id.*

Though *Attard*’s disclosure describes sub-assessment φ_i falling *below a threshold for danger*, a POSITA would have understood that *Attard* teaches surpassing, and thus “*exceeding*” the threshold for danger, as claimed. *Attard*, 8:10-25; *Dec.*, 104. Particularly, *Attard* expressly uses the word “exceed” to describe surpassing a threshold in the negative direction, i.e., the quantity “exceeds” a threshold by dropping below the threshold, though the value of the parameter is becoming smaller. *Dec.*, 104. A POSITA would also have had the skill and found it obvious to simply reprogram *Attard*’s scale, multiplying by -1, such that the *threshold for danger* was exceeded in the positive direction. *Id.*

a) Overall Confidence Assessment – Capital Φ

Attard’s process of determining if a sub-assessment φ_i exceeds a threshold for danger only occurs if overall confidence assessment Φ falls below a threshold $\Phi_{\min}$.

These two sub-steps of *Attard's* process, wherein Φ falls below $\Phi_{\min}$ AND ϕ_i falls below a threshold for danger, are collectively mapped as limitation 1(c).

Thus, *Attard's* overall confidence assessment Φ (mapped below as the *control processor confidence level*) is *determin[ed]* as part of the step of “determining, by the one or more processors, whether the fault exceeds a threshold for danger.”

5. *Claim 1(d)*

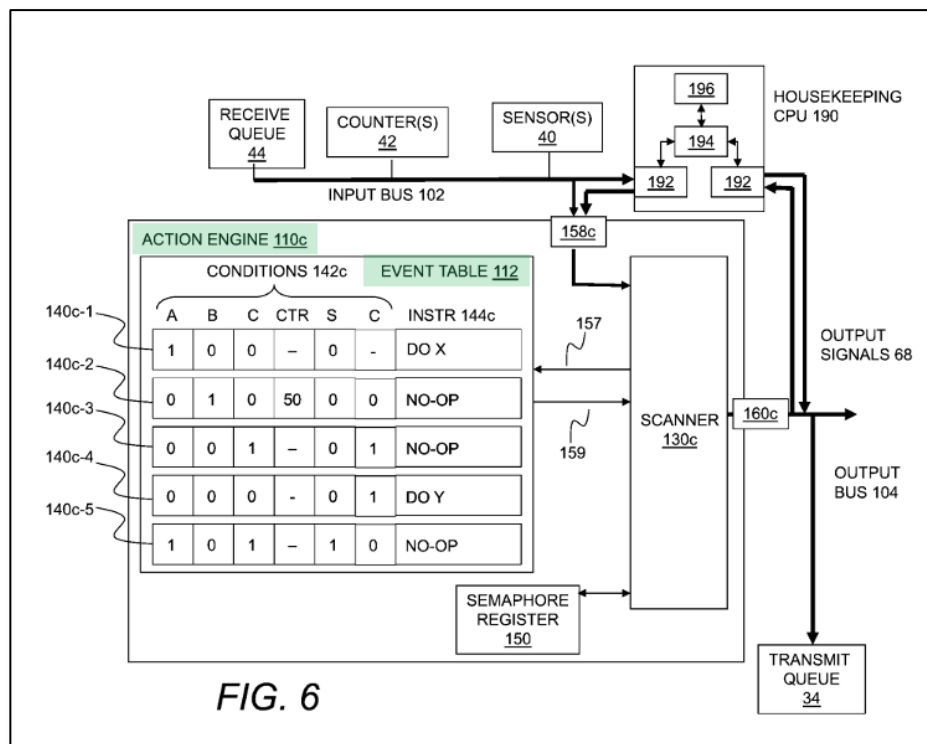
a) *Attard Teaches a Corrective Action Associated with a Fault*

Attard teaches a fault. *See*, 1(b). Further, *Attard* teaches taking one or more corrective actions based on the fault that occurs. *Attard*, 3:9-13 (including “ceasing one or more autonomous operations”), 14:63-15:4. For example, like the '402 Patent, corrective actions may include sending a message (e.g., “Caution” or “Danger”) or performing an action (e.g., slowing the vehicle to a stop) based on the fault. *Compare Attard*, 2:28-3:4, 3:9-13, 7:18-57, 8:10-39, 14:27-33 *with '402 Patent*, 8:23-28, 12:3-9. In one example, content of message 116 to be displayed “may be determined according to an identity of the component that has dropped below” (i.e., “exceeded”) the threshold. *Attard*, 8:1-13; *Dec.*, 107 (explaining “component” here refers to sub-assessment ϕ_i , and thus the message is related to the specific fault that has occurred). Additionally, a requested action (“RA”) may be included in the message, where the RA is a function of the vehicle “subsystem i” and sub-assessment ϕ_i . *Attard*, 8:36-38 (“A requested action (RA); in the example

above, $RA=f(i, \phi_i)$ is the phrase “Driver intervention.”). Thus, a POSITA would have recognized *Attard* teaches determining performing particular corrective actions in response to particular determined faults. *Dec.*, 107.

a) *Frazer* Teaches a 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 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 in event table register 140c are executed. *Frazer*, 22:6-22. *Frazer*’s event table 112 is depicted below:



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 '402 Patent. *See* '402 Patent, 8:29-46 ("fault-remediation table, where each row refers to a fault condition, a first column refers to a condition that gets manifested by that fault, and a second column that refers to the mode in which the vehicle should be driven when that condition is manifested.") *compared with Frazer*, 21:19-43, FIG. 6. *Dec.*, 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 action to be taken when the conditions are manifested ("DO X"); *Dec.*, 110-111.

ACTION ENGINE 110c						
CONDITIONS 142c						EVENT TABLE 112
A	B	C	CTR	S	C	INSTR 144c
1	0	0	-	0	-	DO X
0	1	0	50	0	0	NO-OP
0	0	1	-	0	1	NO-OP
0	0	0	-	0	1	DO Y
1	0	1	-	1	0	NO-OP

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., 111.

b) Motivation to Combine *Attard-Frazer*

A POSITA would have found it obvious and been motivated to modify *Attard*'s fault handling (including determining a corrective action, such as a "Danger" message) 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 *determining a corrective action associated with the fault using a fault-remediation table*. Dec., 112. 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. *Id.* 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.*, 112-113 . A POSITA would have specifically appreciated the if/then type of fault remediation data already present in *Attard's* vehicle 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.*, 113. 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.*, 114.

A POSITA would have recognized the usefulness of storing these associations in a table reduces latency, as *Frazer* expressly teaches. *Frazer*, 23:64-67; *Dec.*, 116. The proposed combination constitutes application of a known technique (*Frazer's* event tables) to a known method (*Attard's* fault handling method) ready for improvement to yield predictable results. Based on *Attard's* teachings that faults have associated actions (*see, e.g., Attard*, 2:1-6, 14:27-33, 14:63–15:4), 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. *Dec.*, 114-116.

A POSITA would have appreciated that modifying *Attard* per *Frazer* would have had a reasonable expectation of success (“REOS”). *Dec.*, 117-120. *Attard* and *Frazer* teach implementing programs and functions using programming instructions executed by a processor. *Attard*, 15:12-46 (teaching computer-executable instructions, processor, memory); *Frazer*, 21:20-51. *Dec.*, 117-120. Modifying *Attard* would have merely required straightforward changes to programming instructions. *Id.* Indeed, *Attard* already teaches computer hardware including a processor for executing instructions and memory that stores instructions. *Attard*, 2:28-41, 3:15-27, 4:32-45, 5:21-30, 5:54-57, 15:12-46 (teaching examples of memory).

Thus, a POSITA would have understood or found obvious that *Attard* already has the necessary computer hardware for implementing an event table, such as *Frazer’s*. *Dec.*, 119. Modifying *Attard* to utilize *Frazer’s* table would have been use of a known technique of using a fault-remediation table to group data such as faults, conditions that indicate the faults, and actions to take when the fault conditions are met, and this known technique would have improved *Attard’s* similar autonomous vehicle (including determining a corrective action in response to a fault) in the same way as *Frazer’s* autonomous vehicle. *Dec.*, 115-116. To the extent it is argued that

Attard's hardware is insufficient for this modification, a POSITA would have understood that it would have been straightforward to modify *Attard* to include additional memory or processing power as needed, and that this would have been a tradeoff to capture *Frazer's* advantages. *Id.*

Further, a POSITA would have recognized the ease of modifying *Attard's* computer 105 (or other memory of vehicle 101) to include an event table per *Frazer, Dec.*, 120. Both *Attard* and *Frazer* are similar in that they both describe detecting faults/events based on sensor data. *Compare Attard* 1:50-52, 12:53-62 with *Frazer*, 21:52-56, 22:31-47. 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 *Attard* per *Frazer's* teachings. *Id.*

6. Claim 1(e)

Attard-Frazer teaches determining a corrective action associated with the fault using a fault-remediation table. *See*, 1(d). Further, *Attard-Frazer's* SDV implements the corrective action(s) based on its fault-remediation table.

ACTION ENGINE 110c						
CONDITIONS 142c						EVENT TABLE 112
A	B	C	CTR	S	C	INSTR 144c
1	0	0	-	0	-	DO X
0	1	0	50	0	0	NO-OP
0	0	1	-	0	1	NO-OP
0	0	0	-	0	1	DO Y
1	0	1	-	1	0	NO-OP

Frazer, FIG. 6 (excerpt); *Dec.*, 121.

For example, *Attard* teaches that when Φ falls below $\Phi_{\min}$, computer 105 may *implement[] the corrective action*, such as sending a message or performing an action (e.g., presenting a “Danger” message to the driver and/or slowing the vehicle to a stop) where the action taken is based on the fault, i.e., when ϕ_i is below a $\phi_{\min}$. *Attard*, 1:62-2:6, 2:46-3:4, 8:10-39, 14:27-33, 14:63-15:4, *generally* 7:18-9:10, 11:26-12:22 (teaching details of messages 116, e.g., a corrective action). In *Attard-Frazer*, a suitable *corrective action* (instruction 144c) for a fault would have been determined using its fault-remediation table. *Dec.*, 122; *see*, 1(d). After selection, the corrective action would have been implemented by *Attard’s* vehicle 101. *Attard*, 14:63-64 (“[T]he nature of a fault may indicate an action **directed by the computer.**”); *Dec.*, 122.

In this manner, modifying *Attard* to use *Frazer's fault-remediation table* would have merely been providing a particular data storage arrangement (an event table) for selecting *Attard's* corrective action(s) to implement. *Dec.*, 123. Thus, when a condition of the event table is met (e.g., fault, such as a threshold exceeded), a corresponding *corrective action* is implemented in response to the particular fault. *Id.* A motivation to modify *Attard* per *Frazer's* teachings is provided above. *See*, 1(d).

B. Claim 3

1. Claim 3(Pre)

See, 1(Pre).

2. Claim 3(a)

As discussed above, *Attard* teaches vehicle 101 includes sensors 110 that perform *sensor readings*. *See*, 1(a). In particular, *Attard* teaches sensors 110 include *a GPS sensor* that sends GPS (global positioning system) sensor readings to computer 105. *Attard*, 4:4-11, 4:32-45, 6:4-13, 7:14-17, 10:42-52, 13:22-24, 13:56-58, 14:41-48; *Dec.*, 125. *See*, 1(a). Petitioner notes claim 3 requires nothing more than mere presence of GPS sensor readings.

3. Claim 3(b)

See, 1(a)-1(b). *Attard* teaches sensors to detect a vehicle state including internal and external (e.g., weather) conditions. In some cases, a fault is a result of a vehicle state. Specifically, *Attard* teaches sensors which similarly “provide indicia

related to collected data 115 pertaining to a particular vehicle 101 and/or vehicle 101 sub-system, environmental attribute, or condition[,]” where “an attribute or condition such as road conditions, weather conditions, braking capabilities, ability to detect a lane, ability to maintain a speed of the vehicle 101” are all taken into consideration and are related to collected data 115. *Attard*, 10:42-52. As described regarding Fig. 2, at block 210 the vehicle’s sensors collect data, providing it to computer 105. *Attard*, 10:13-17, Figs. 1-2. Each of *Attard*’s vector components ϕ_i may indicate a potential fault within one sensor or a group of related sensors, if it is determined that the particular ϕ_i falls below a threshold. *Dec.*, 126 citing *Attard* 6:4-13, 7:39-46, 7:65-8:13. *See*, 1(b).

Because *Attard*’s collected data 115 (*sensor readings*) detect conditions external to the vehicle (e.g., weather conditions, road attributes) and data internal to the vehicle (e.g., acceleration, speed) used to perform autonomous driving, *Attard*’s sensor readings describe *a vehicle state* of a SDV and a *fault comprises a vehicle state*. Compare *Attard*, 1:62-2:6, 4:1-17, 6:4-13, 10:13-27 with ’402 Patent, 5:59-6:8.

4. *Claim 3(c)*

Attard-Frazer teaches *determining a corrective action associated with the fault using a fault-remediation table*. *See*, 1(d). Further, *Attard* teaches weighted voting parameters to determine a corrective action. For example, *Attard* teaches

weighting determinations of collected data 115 from sensors 110 based on factors including precipitation, road conditions, and environmental conditions to generate confidence assessments about the ability of vehicle 101 to operate autonomously. *Attard*, 6:28-35. Each sensor determination that is weighted is *a weighted voting parameter*. *Dec.*, 128. Thus, *determining a corrective action associated with the fault using a fault-remediation table comprises a weighted voting parameter*. *Id.*

5. Claim 3(d)

Attard teaches various corrective actions. *See*, 1(d). Specifically, *Attard* teaches performing a “limp home” operation in response to a fault as well as determining a safe path for the vehicle to a “safe stopping point.” *Attard*, 2:46-54, 14:27-41. *Dec.*, 129.

VII. GROUND 2: CLAIM 4 IS OBVIOUS OVER ATTARD AND HAMPIHOLI

A. Claim 4

1. Claim 4(Pre)

See, 1(Pre).

2. Claim 4(a)

See, 1(a).

3. Claim 4(b)

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," as well as "navigation." *Attard*, 9:63-10:12, 14:13-48; *Dec.*, 132. A POSITA would have understood 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." *Id.*

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) and direction (steering mechanism and navigation). *Dec.*, 132-133 *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. A POSITA would have recognized each of these autonomous operations would have required control of the engine throttle, steering mechanism, and braking system as recited in 4(b). *Dec.*, 132-133.

Specifically, though *Attard* does not explicitly use the term "*engine throttle*," a POSITA would have recognized *Attard's* description of a vehicle autonomously controlling its speed to teach the claimed "*engine throttle*." *Id.*

4. Claim 4(c)

See, 1(Pre).

5. Claim 4(d)

See, 1(a).

6. Claim 4(e)

See, 1(Pre), 4(b).

7. Claim 4(f)

See, 1(a).

8. Claim 4(g)

See, 1(b).

9. Claim 4(h)

Attard teaches or renders obvious *determining ... whether a fault has occurred and determining whether the fault exceeds a threshold for danger. See*, 4(g). Further, *Attard* teaches *determining a competence level of the processor (CPCL), Φ .*

a) '402 Patent's CPCL

The '402 Patent characterizes a CPCL as “a competence level of the SDV control processor in controlling the SDV while the SDV experiences the current operational anomaly.” '402 *Patent*, 1:41-48, 10:9-15 (“Various approaches may be used to determine this control processor competence level.”), 10:32-52.

b) *Attard's* CPCL – Capital Φ

Attard's vehicle confidence assessments 118 are generated in two coexisting forms:

(1) φ , a **vector**, “where each value in the vector relates to an attribute [] of the vehicle [] and/or a surrounding environment...such as vehicle speed, braking performance, acceleration,...weather conditions, road conditions, etc. *Attard*, 6:4-13; *Dec.*, 141-143. *Attard* teaches determining a fault has occurred due to a particular sub-assessment φ_i falling below an associated threshold $\varphi_{\min}$, triggering message generation specific to the particular sub-assessment φ_i . *See*, 1(b).

(2) Φ , which may be “a **scalar** value, e.g., as a number [] in the range of 0 to 1. *Attard*, 5:54-6:3; *Dec.*, 141. *Attard's* Φ is mapped as the claimed *computer processor competence level* (CPCL) because it “indicates an overall confidence that the vehicle 101 can and/or should be operated autonomously.” *Attard*, 5:54-62, 1:44-50.

Though *Attard* does not provide detailed mathematical description regarding Φ , a POSITA would have known various approaches for its calculation. *Dec.*, 142. For example, as Mr. Wilson opines, a POSITA would have understood or found obvious techniques for converting *Attard's* **vector** confidence assessments φ directly to a **scalar** via a well-known mathematical method. *Id.* However, Petitioner notes claim 4 does not require any particular mathematical relationship between Φ and φ .

Any mathematical approach for calculating *Attard's* Φ would have satisfied claim 4, including approaches in which Φ is not directly calculated using ϕ whatsoever. *Id.*

10. Claim 4(i)

a) *Hampiholi's* Competence Level of a Human Driver

Hampiholi teaches a system and method of determining a competence level of a human driver in controlling its vehicle, as measured by the severity level of distraction the driver is experiencing. Examples given of distractions experienced by drivers include not looking at the road for upcoming turns, being distracted by music, handling (e.g., providing user input to) infotainment units, being sleepy or tired, and/or other driver states. *Hampiholi*, [0001]-[0004], [0050]. Specifically, *Hampiholi* teaches that a severity rank R is determined, measuring the distraction level of the driver.

For example, a low-level severity rank R may indicate a short-lived driver distraction while the vehicle is not in immediate danger of collision, while a medium-level severity rank R may include a more serious driver distraction, (e.g., droopy eyes indicating sleepiness) while the vehicle is in an otherwise safe environment (e.g., no objects within a trajectory/path of the vehicle, driving at a low speed), and a high-level severity rank R may include any driver distraction while an object in the vehicle's environment is on a colliding course with the vehicle. *Hampiholi*, [0057]; *Dec.*, 145. Exemplary severity ranks R are illustrated in Fig. 7

below, corresponding to detected human behaviors and road/vehicle conditions indicating the situation.

700

Distraction	Road/Vehicle Condition	Severity Rank (R)
Driver not looking ahead	Vehicle stopped at traffic signal	1
Parking light off	Vehicle parked in garage	1
Driver talking on the phone	Using hands free, freeway, no upcoming turns, medium speed	4
Parking light off	Vehicle parked on side of freeway	5
Driver not looking ahead	Vehicle not in reverse gear, high vehicle speed, upcoming turn within city limits	8
Driver talking on the phone	Not using hands free, upcoming turns within city limits, high speed	8

↑ Less Distracted/
Higher
Competence

 More Distracted/
Lower
Competence ↓

FIG. 7

Hampiholi, FIG. 7; *Dec.*, 145.

Hampiholi's severity rank R teaches a competence level of the human driver in controlling the SDV. *Dec.*, 146. For example, a driver that is paying more attention is more competent at taking control of the vehicle if a transition to manual mode is required. *Id.* Also, a driver paying more attention would allow for more possible corrective actions (e.g., transition to manual, disable one or more autonomous driving features, automatically slow to a stop) because a driver paying more attention

would allow for sufficient lead time to safely transition to manual mode or disable an autonomous driving feature. *Id.* If a driver is fatigued, asleep, or otherwise not paying sufficient attention (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) Motivation to Combine *Attard-Hampiholi*

A POSITA would have been motivated and found it obvious to combine *Attard's* SDV with the vehicle, methods, and supporting hardware disclosed by *Hampiholi* to result in a safer vehicle, able to account for unsafe driving situations arising from weather conditions (*e.g.*, wet/icy roads) or hardware faults, per *Attard*, and/or a reduction in driver competence due to distraction, per *Hampiholi. Dec.*, 147. 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 *Attard-Hampiholi* vehicle and would have improved *Attard's* and *Hampiholi's* similar vehicles in the same way. *Id.* While this modification may add additional complexity to *Attard's* vehicle, a POSITA would have been motivated to make such a tradeoff to achieve *Hampiholi's* benefits. *Id.*

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

human competence (per *Hampiholi*). *Dec.*, 148. A POSITA would have *Hampiholi*'s statement of increasing driver, passenger, and bystander safety as an express teaching, suggestion, or motivation to modify *Attard*'s SDV to adjust its driving mode to respond to faults such as hardware failures or weather conditions as well as decreased driver competence. *Hampiholi*, [0002], [0017]; *Dec.*, 148. Such a modification is merely the combination of known prior art elements (*Hampiholi*'s sensors and methods into *Attard*'s already-automated vehicle) according to known methods to yield predictable results of a car operable to autonomously perform corrective actions such as slowing to a stop or pulling over in response to driver incompetence as well as weather conditions and hardware faults. *Id.* A POSITA would have had a REOS for the combination at least because the *Attard* vehicle already included the processor, memory, and sensor infrastructure necessary to support *Hampiholi*'s methods, and modification would have at most merely required addition of well-known inward-facing cameras and software reprogramming techniques available to a POSITA. *Id.*

11. Claim 4(j)

The *Attard* combination teaches *the computer system is capable of determining a corrective action using the competence level of the processor*. See, 4(h). *Attard* modified by *Hampiholi* teaches *the computer system is capable of determining a corrective action using the competence level of the processor and the*

competence level of the human driver. As further discussed regarding 4(i), *Hampiholi* teaches determining *a competence level of a human driver* as measured by the severity level of distraction the driver is experiencing, such as not looking at the road for upcoming turns, being distracted by music, handling infotainment units, or being sleepy/tired. *See*, 4(i) *citing Hampiholi*, [0001]-[0004], [0050].

As also discussed with respect to 4(h), *Attard* teaches sending a message 116 when Φ is below $\Phi_{\min}$. *See*, 4(h); *Attard*, 7:62-65. *Attard* teaches or renders obvious that $\Phi_{\min}$ is “a threshold provided by the parameter 117.” *Attard*, 5:62-65, 10:53-11:4; *Dec.*, 150-151. Parameter 117 is “associated with a particular vehicle 101 operator” and “may be determined in a variety of ways, e.g., according to operator age, level of driving experience, etc.” *Attard*, 5:33-37. Thus, *Attard* itself envisions parameter 117 accounts for the driver’s ability to operate the vehicle. *Dec.*, 150-151.

A POSITA would have been motivated and found it obvious to modify *Attard*’s computer system such that $\Phi_{\min}$ is substituted with *Hampiholi*’s severity rank R or is based on severity rank R (HDCL). *Dec.*, 152. Thus, in the *Attard-Hampiholi* combination, *Attard*’s Φ (CPCL) is either compared directly to *Hampiholi*’s severity rank R (HDCL), i.e., the modification is a simple substitution, or *Attard*’s parameter 117, which is used to determine $\Phi_{\min}$, is modified to be based on severity rank R, where the modification is use of a known technique. *Id.* Because *Attard* teaches determining to send message 116 when Φ is below $\Phi_{\min}$, and in the

combination, $\Phi_{\min}$ is substituted or modified using *Hampiholi's* severity rank R, the *Attard-Hampiholi* combination teaches or renders obvious *determining a corrective action using the competence level of the processor and the competence level of the human driver. Dec., 153.*

a) Motivation to Combine *Attard-Hampiholi*

A POSITA would have been motivated and found it obvious to modify *Attard's* $\Phi_{\min}$ based on *Hampiholi's* HDCL (severity rank R) teachings such that *Attard's* determination of sending a message 116, which *determin[es] a corrective action, us[es] the competence level of the processor and the competence level of the human driver. Dec., 154.* *Attard* provides a teaching, suggestion, or motivation to do so by teaching that parameter 117 (used to determine $\Phi_{\min}$) is “associated with a particular vehicle 101 operator.” *Attard*, 5:33-37, 10:53-11:4; *Dec.*, 155. However, *Attard* does not expressly teach using a parameter such as *Hampiholi's* severity rank R. Thus, a POSITA would have found it obvious to use or substitute other driver-related information, i.e., *Hampiholi's* severity rank R, into $\Phi_{\min}$ to provide a safer and/or more accurate method by which to determine the recommendation resulting from *Attard's* message 116. *Dec.*, 156. For example, a POSITA would have found it obvious that a driving-experience-related parameter 117 for a less-experienced driver would have a lower associated threshold ($\Phi_{\min}$) to reduce the likelihood Φ is below $\Phi_{\min}$ so vehicle 101 is more likely to be driven autonomously. *Dec.*, 155. Thus,

based on these teachings, a POSITA would have found it obvious to include *Hampiholi's* driver-related parameter (severity rank R) to increase the safety of *Attard's* vehicle 101 by ensuring the driver is prepared for the handover. *Id.* This is at least because accounting for the driver's state was well-known in handover processes. *Dec.*, 156 (*citing Scofield, Caveney*).

This modification would have required only straightforward programming changes to *Attard's* computer 105 to determine $\Phi_{\min}$ based on the determined HDCL (per *Hampiholi*), thus combining known techniques according to known programming methods, yielding the predictable result of an SDV using both an HDCL and CPCL in *determining a corrective action*. *Dec.*, 157. *Hampiholi's* severity rank R, like *Attard's* Φ , is taught as being a scalar value. *Hampiholi*, [0066], FIG. 7; *Attard*, 5:66-6:3. Adding (or substituting) an additional scalar for comparison against *Attard's* Φ would have been within the skill of a POSITA and would have used hardware already present in the combination, leading to a REOS. *Dec.*, 157. A POSITA would have appreciated that there would have been an increase in the accuracy and appropriateness of the corrective action determined when additional information (the driver's distraction level) is accounted for in the process of *determining a corrective action*. *Id.* Particularly, the diversity of the type of information being considered (driver's distraction level as opposed to more abstract

data, e.g., driver's age) would have led a POSITA to appreciate the desirability of combining *Hampiholi's* HDCL. *Id.*

Thus, the *Attard-Hampiholi* vehicle would have a computer system capable of using *Attard's* CPCL and *Hampiholi's* HDCL to determine a corrective action, as claimed.

12. Claim 4(k)

See, 1(d)-1(e). *Attard* teaches a computer system capable of implementing corrective actions such as ceasing autonomous operations. *Attard*, 13:45-49, 2:46-54.

13. Claim 4(l)

See, 1(d)-1(e). *Attard* teaches issuing an alert indicating a corrective action. *Attard's* message 116 is an *alert indicating a corrective action*. *Dec.*, 161. For example, *Attard* teaches messages indicating “immediate manual control is recommended” for reasons such as “mechanical,” “environmental or weather conditions,” and “traffic conditions.” *Attard*, 2:61-3:4. Further, these messages can be formed with a “requested action” such as a “driver intervention.” *Attard*, 8:36-37.

As discussed above, *Attard* teaches implementing corrective action(s). *See*, 1(d), 4(l). Petitioner notes a fault-remediation table is not recited in Claims 4 or 6, so *Frazer's* teachings are not utilized here.

VIII. GROUND 3: CLAIM 6 IS OBVIOUS OVER *ATTARD*, *HAMPIHOLI*, *MCNEW*, AND *SCOFIELD*

A. Claim 6

1. Claim 6(Pre)

See, 4(Pre) (*Attard-Hampiholi* SDV).

2. Claim 6(a)

McNew teaches “managing vehicle control states of a semi-autonomous vehicle while simultaneously managing a driver state of a driver, which can include driver steering interaction[.]” *McNew*, 1:16-19; *Dec.*, 164. *McNew*’s driver states include “steering states such as DRIVER_IS_STEERING, HANDS_ON, and HANDS_FREE” and are determined using a “steering wheel grip **sensor**.” *McNew*, 4:6-18. Each of these states are *a physical state of a human driver* because they track the driver’s physical interaction with a steering wheel. *Dec.*, 164.

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

A POSITA would have found it obvious and been motivated to modify *Attard-Hampiholi* with *McNew*’s teachings of steering wheel sensors to monitor a physical state of the human driver. *Dec.*, 165. Such a modification would have improved *Attard*’s fault handling system to make decisions based on additional information, such as the current state of the driver as taught by *McNew*. *Id.* While *Attard* teaches determining how to handle faults in SDVs, *Attard* does not teach driver-related faults. *Dec.*, 166. While *Hampiholi* teaches driver-related faults, *Hampiholi* does not

expressly teach a fault related to input from a steering mechanism sensor, which is required by Claim 6(b). A POSITA would have understood that driver-related faults still need to be considered in SDVs and, as such, would have been motivated to turn to references teaching such, e.g., *McNew*. *Id.* For example, *McNew* teaches monitoring driver-related faults such as whether a driver's hands are on the steering wheel. *McNew*, 4:6-29, 3:26-52, 5:4-15.

Such a combination is merely the combination of known prior art elements according to known methods to yield predictable results, i.e., the combination of *McNew*'s detection of driver steering state with *Attard*'s fault handling system to yield the predictable result of *Attard*'s fault handling system to take a corrective action further based on a detected physical state of the driver. *Dec.*, 167. A POSITA would have had a REOS at least because monitoring driver state was well-known in the art before the '402 Patent and further because such would have required only straightforward changes to the *Attard*'s software, e.g., to detect driver input via a steering mechanism state. *Id.*

3. *Claim 6(b)*

McNew teaches monitoring a driver's behavior and level of attention and also monitoring input from a steering mechanism sensor. *McNew*, 4:6-29 (“A **steering wheel grip sensor** can detect whether the driver's hands are in contact with the steering wheel...”), 7:61-64 (“A steering wheel torque sensor 220 can detect if the

driver is actively steering the vehicle...”). A motivation to modify *Attard-Hampiholi* per *McNew* is discussed above and incorporated by reference herein. *See*, 6(a).

4. Claim 6(c)

a) Scofield’s Teachings

Scofield teaches “notifying a driver to assume manual vehicle control” of an autonomous vehicle using “driving condition data.” *Scofield*, 3:9-22. The driving condition data “may correspond to an aggregation of vehicle sensor data from one or more vehicles while the one or more vehicles” were traveling a road segment. *Scofield*, 3:22-30, 3:12-22 (describing autonomous vehicles sending sensor data to a remote communication device); *Dec.*, 169. Because the driving condition data is data from other autonomous vehicles, it is *active learning data including information from other SDVs*.

The driving condition data, along with vehicle sensor data, is “evaluated to determine a driving condition of the expressway onramp road segment that is to be traveled by the vehicle,” and “responsive to determining that the driving condition exceeds a complexity threshold for autonomous driving decision making functionality, a driver alert to assume manual vehicle control may be generated.” *Scofield*, 3:53-56, 4:4-7, FIG. 1 (steps 106 and 108); *Dec.*, 170. Because the driving condition is evaluated against “a complexity threshold for autonomous driving decision making,” it is a *competence level of the processor*. *Dec.*, 171. Therefore,

because *Scofield* teaches the driving condition (*competence level of the processor*) is based on the driving condition data (*active learning data*), *Scofield* teaches 6(e).

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

A POSITA would have found it obvious and been motivated to modify *Attard's* Φ computation (*competence level of the processor*) with *Scofield's* teachings of determining whether to autonomously operate based on data from other vehicles, i.e., based on *active learning data*. *Dec.*, 173. This would have predictably improved *Attard's* Φ computation to account for information from other vehicles, which may not be available to *Attard's* vehicle's sensors 110 but would still be useful in determining a recommendation to cease autonomous operations. *Id.*

Such a combination is merely the combination of known prior art elements (*Attard's* Φ and *Scofield's* driving condition based on *active learning data*) according to known methods to yield predictable results where the only difference between prior art and claimed invention is lack of the combination of the known elements in a single reference. *Dec.*, 174. When combined, each element would perform the same function separately as when combined, with *Scofield's* driving condition determination being used to augment *Attard's* Φ computation to determine whether self-driving should be carried out based further on data from other vehicles. *Id.*

A POSITA would have recognized the results of the combination to be predictable because both *Attard* and *Scofield*'s CPCL computations are directed to determining whether to operate an SDV in autonomous or manual mode. Given *Attard* already teaches V2V methods, modifying *Attard* with *Scofield*'s *active learning data* teachings would have yielded predictable results and a REOS. Such a use of a known technique would have improved *Attard* and *Scofield*'s similar vehicles and computer program products in the same way. *Dec.*, 175.

Further still, *Attard* contemplates incorporating weather reports and other data from a server 125 into its confidence assessment calculations (*Attard*, 6:61-7:5); however, *Attard* does not teach the server 125 can receive the weather data from other vehicles. *Scofield* teaches such (*see, e.g., Scofield*, 3:17-22), and for this additional reason there would have been a REOS. Lastly, *Attard* and *Scofield* both teach implementing their methods in computer programs. *Attard*, 15:12-46; *Scofield*, 7:1-25, 8:5-17. Thus, modifying *Attard-Hampiholi-McNew* per *Scofield* would have required only straightforward modifications to programming instructions, which was well-within the skillset of a POSITA.

5. Claim 6(d)

See 4(i).

6. Claim 6(e)

As discussed above, *Attard* teaches implementing corrective action(s). *See*, 1(d). Petitioner notes a fault-remediation table is not recited in Claims 4 or 6, so *Frazer's* teachings are not utilized here.

a) *Attard* Teaches Alerting a Human Driver to Take Over Immediately

Attard teaches *corrective action[s]* including providing a message to a human driver including audio and/or visual alerts. *See*, 1(d). *Attard* also teaches the alerts can include an “urgency” component, for example, indicating a need for the driver to take over manual control immediately. For example, *Attard* teaches messages 116 (“e.g., an alert”) can “convey a level of urgency or importance to a vehicle 101 operator, e.g., by using prosody techniques to include emotional content in a voice alert, a visual avatar having an appearance tailored to a level of urgency, etc.” *Attard*, 2:28-46. In particular, *Attard* teaches alerting the driver with a high level of urgency to take over manual control immediately. *Attard*, 2:55-61, 2:62-3:4, 7:39-61, *Dec.*, 180.

To the extent it is argued that *Attard* merely warns the driver but does not actually transfer driver controls to manual control, *McNew* teaches it.

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

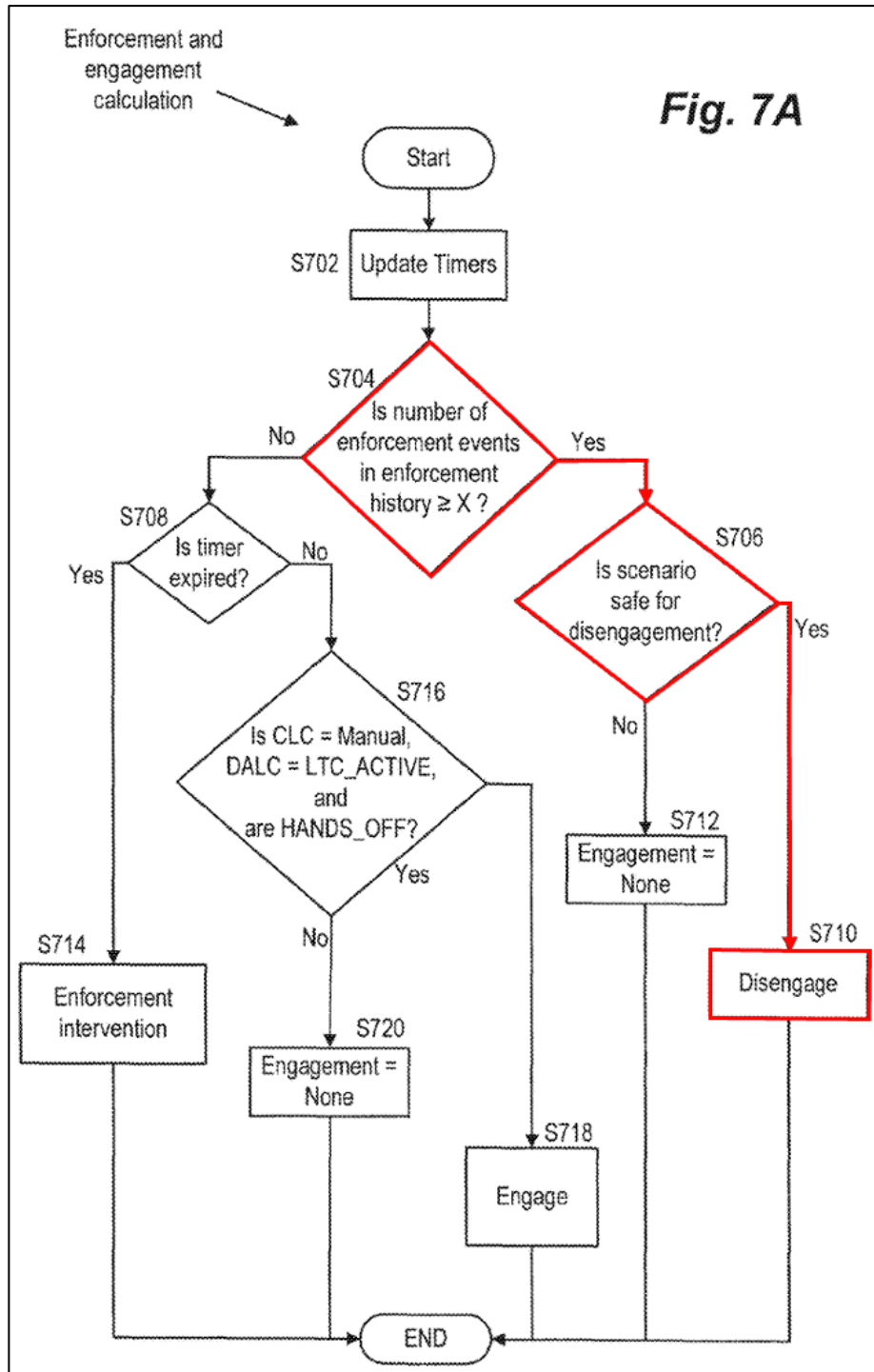
McNew teaches managing vehicle control states of a semi-autonomous vehicle (e.g., semi-autonomous, manual) while also managing a driver state (e.g., whether

the driver is paying attention to the road). *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. To enhance safety of the semi-autonomous driving system, *McNew* teaches monitoring driver states such as driver attention and taking actions such as warning the driver or reducing vehicle speed if the driver is not paying sufficient attention. *McNew*, 1:17-30, 1:59-65, 6:15-28.

In one example, if a driver continues ignoring warnings, *McNew* teaches disengaging the semi-autonomous⁷ driving system as long as the current driving scenario is "safe enough." *McNew*, 20:7-31, 4:3-5, 8:41-44. Specifically, *McNew*'s system determines if the semi-autonomous mode should be disengaged due to a factor such as driver inattention (Step S704), determines if it is safe enough to

⁷ *McNew* refers to its system as both "semi-autonomous" and "semi-automatic." *McNew*, 1:7-13, 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* uses these terms synonymously. *Dec.*, 183. "Semi-autonomous" is used herein for simplicity.

disengage the semi-autonomous mode (Step S706), and disengages the semi-automatic driving system by “shutting down the semi-automatic driving system...[where] the LTC system transitions through the CO-STEER and **MANUAL** settings before being turned off[.]” (Step S710). *Id.* Fig. 7A below depicts **Steps 704, 706, and 710** where the end result is disengaging the vehicle’s semi-autonomous system and transferring the driver controls to manual control:



McNew, Fig. 7A; Dec., 183.

c) Motivation to Combine *Attard-Hampiholi-Scofield-McNew*

A POSITA would have been motivated and found it obvious to include transferring driver controls to manual control as a corrective action in *Attard* in response to particular faults per *McNew's* teachings. *Dec.*, 184. Indeed, a POSITA would have been motivated at least because *Attard* includes a specific suggestion to do so, i.e., via *Attard's* repeated disclosures of recommending transferring driver controls to manual. *See, e.g., Attard*, 2:55-3:4. Modifying *Attard-Hampiholi-Scofield* in this way would have simply been use of a known technique of taking a particular corrective action (e.g., transition from autonomous/semi-autonomous mode to manual control) in response to a fault and would have improved *Attard-Hampiholi-Scofield's* similar autonomous/semi-autonomous vehicle in the same way as *McNew's*. *Dec.*, 185. Further, modifying *Attard-Hampiholi-Scofield* per *McNew's* teachings would thus have allowed *Attard-Hampiholi-Scofield-McNew's* vehicle to advantageously both (1) alert a driver of a need to transition from autonomous/semi-autonomous mode to manual mode and (2) actually perform the transition to manual mode. *Dec.*, 186. Another advantage provided by the combination would have been the increased safety and security provided by alerting the driver to assume control in situations in which the computer deems itself to be insufficiently competent at self-driving. *Dec.*, 187.

A POSITA would have been motivated and found it obvious to include transferring driver controls to manual control as a possible corrective action for numerous reasons. *Id.* For example, if one or more sensors needed to perform autonomous driving experience a fault but the vehicle is otherwise safe to drive, transitioning from autonomous/semi-autonomous mode to manual mode would have allowed a driver to continue to drive to their destination. *Id.* Similarly, even if no hardware fault exists, but if adverse weather or road conditions are severe enough to prevent continuing driving in autonomous mode safely, alerting the driver and transitioning to manual mode would have allowed the human driver to take over and continue driving to the destination. *Id.*

A POSITA would have understood that modifying *Attard-Hampiholi-Scofield* to include a corrective action such as transferring driver controls to manual control would have had a REOS. *Dec.*, 188. Modifying *Attard-Hampiholi-Scofield* per *McNew's* teachings would have required only straightforward changes to programming instructions. *Id.* Indeed, *McNew* teaches implementing its system in computer program instructions, making the modification to *Attard-Hampiholi-Scofield* straightforward. *Id.* For example, the straightforward changes would have included modifying *Attard's* corrective actions to include transferring driver controls to manual control as a corrective action. *Id.* Additionally, *Attard* expressly contemplates transition to manual control and teaches vehicle 101 is manually

drivable, such that a POSITA would not have had to modify vehicle 101 to be able to drive using manual control. *Attard*, 2:55-3:4; *Dec.*, 188.

7. ***Claim 6(f)***

See 6(e).

IX. GROUND 4: CLAIM 8 IS OBVIOUS OVER *ATTARD*, *HAMPIHOLI*, *MCNEW*, *SCOFIELD*, AND *GRIMM*

A. Claim 8

1. ***Claim 8(Pre)***

See 4(Pre).

2. ***Claim 8(a)***

See 6(a).

3. ***Claim 8(b)***

See 6(b).

4. ***Claim 8(c)***

Scofield teaches determining the competence level of the processor based on active learning data including information from other SDVs. *See*, 6(c). Per 4(j), the *corrective action is determined using the competence level of the processor* such that a CPCL that *us[es] weighted voting...based on active learning data* (i.e., *Attard's* Φ modified by *Scofield*) teaches *determining a corrective action using weighted voting*. *Dec.*, 193. The *Attard-Scofield* Φ does not use *weighted voting*; however, *Grimm* teaches such *weighted voting...based on active learning data*.

a) Grimm's Weighted Voting

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.*, 194. Vehicles determine “threats” that are communicated to a server 170. *Grimm*, 5:41-46; *Dec.*, 195. 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:

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

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.*, 195. Property p_j^i is a function of vehicle parameters. *Grimm*, 5:65-6:4. *Dec.*, 195. Thus, *Grimm*'s threat level equation, which weights vehicle properties, teaches *weighted voting*.

b) Grimm's Active Learning Data

Grimm teaches the threat level equation “could be used to calculate a threat level of a location on a roadway, based on properties of **multiple vehicles** (such as how many vehicles are braking unexpectedly on a freeway).” *Grimm*, 6:18-30, 4:46-50 (describing vehicles communicating braking data). Thus, *Grimm* teaches using

data from other vehicles to compute the threat level equation, i.e., in its *weighted voting*. *Grimm* teaches weighting voting data from other vehicles, teaching this limitation or rendering it obvious. *Dec.*, 197 (comparing *Grimm* to '402 Patent, 9:7-12). *Grimm* teaches a *weighted voting parameter*, i.e., the $w_j p_j^i$ parameter, where the property p_j^i is the property of another vehicle such that this parameter is *determined based on active learning data including information from other SDVs*. *Dec.*, 194-195.

A POSITA would have found it obvious to implement this weighted voting technique to enable the modified *Attard* vehicle to attribute relatively more importance to very critical data from other SDVs (such as a large crowd in an upcoming crosswalk) than the amount of importance attributed to other available data that is less relevant to safe operation of the vehicle, such as minor potholes, dips, or bumps in the road. *Compare Scofield*, 1:40-60 with *Attard*, 4: 8-17. Thus, in the combined vehicle, the *computer system determines corrective actions* (per *Attard*) *using weighted voting* (per *Grimm*), wherein a *weighted parameter is determined on active learning data from other SDVs* (such as the number of objects within an upcoming stretch of road, per *Scofield* and *Grimm*).

c) Motivation to Combine *Attard-Hampiholi-Scofield-Grimm*

A POSITA would have been motivated and found it obvious to modify *Attard's* Φ computation further per *Grimm's* teachings of weighting inputs (properties p) to determine whether to take an action, thereby yielding the predictable result of Φ being computed by weighting the various inputs (e.g., sensor determinations). *Dec.*, 199. So modified, *Attard's* step of *determining the corrective action using the competence level of the processor*, which involves computing Φ , would include *weighted voting*, i.e., by weighting the sensor determinations used to compute Φ , per *Grimm*, which is also expressly envisioned by *Attard*. *Attard*, 6:28-35; *Dec.*, 199.

As mentioned, *Attard* provides an express teaching, suggestion, and motivation for combining with *Grimm* by teaching “weighting various determinations” for computing Φ . *Attard*, 6:28-35; *Dec.*, 200. Using the known technique of weighted voting would have improved *Attard-Hampiholi-Scofield's* similar system in the same way as *Grimm's*. *Id.* That is, by providing a more accurate and/or granular determination to be made by weighting variables. *Id.*

A POSITA would have had a REOS at least because (a) weighting inputs was well-known prior to the '402 Patent, and (b) modifying *Attard* would have required

only straightforward programming modifications to multiply *Attard's* determinations by weights, per *Grimm's* teachings. *Dec.*, 201.

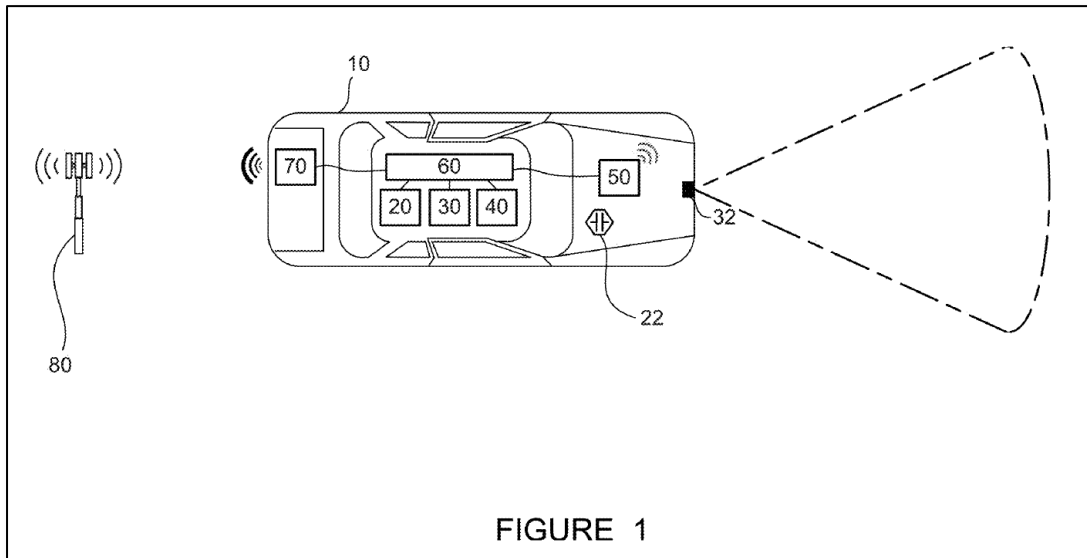
Furthermore, a POSITA would have been motivated and found it obvious to modify *Attard-Hampiholi-Scofield* per *Grimm* to utilize *active learning data* from other vehicles to receive more accurate weather reports, traffic reports, or other information for a vehicle traveling down a roadway. *Grimm*, 4:53-56, 10:44-65; *Dec.*, 202. *Grimm* teaches several advantages including more “accurate, timely and relevant safety-related advisories—thereby avoiding dangerous situations[.]” *Grimm*, 10:52-56. *Dec.*, 202 (opining this was well-known and *Grimm* also teaching such).

Modifying *Attard-Hampiholi* per *Grimm* to gather *active learning data* regarding traffic conditions from other vehicles would have been use of *Grimm's* known technique and would have improved the *Attard-Hampiholi-Scofield* system in the same way as *Grimm's* system. *Dec.*, 203. Indeed, modifying *Attard's* server 125 functionality per *Grimm's* teachings or simply substituting *Grimm's* server 170 and its functionality for *Attard's* server 125 would have obtained predictable results of more accurate traffic reporting. *Id.*

A POSITA would have had a REOS when making this modification. Indeed, *Attard* teaches natively receiving weather and traffic information from server 125 and *Attard's* vehicle 101 already has sensors 110 to capture weather- and traffic-related data. *Attard*, 3:45-55, 9:11-58, 10:28-52, 2:10-27, 2:55-3:4, 4:32-45, 6:4-13,

6:61-7:5; *see*, 1(a). Thus, the modification would have merely required straightforward changes to programming instructions of the vehicle and potentially adding additional sensors to capture additional weather-related or traffic-related data. *Dec.*, 204. Combining prior art sensors with a vehicle according to known methods would have yielded predictable results. *Id.* To the extent *Attard's* server 125 would also need to be modified, such would have been straightforward. *Id.* Either *Attard's* server functionality would have been replaced/modified to include *Grimm's* server functionality or a simple substitution of using *Grimm's* server 170 instead of *Attard's* server 125 would have obtained the predictable results of *Grimm's* functionality. *Attard*, 6:61-7:5, 9:11-39; *Dec.*, 204.

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:



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

As discussed above, *Attard-Hampiholi-Scofield* also teaches similar vehicle-based computing system with processor and program instructions stored in memory. *See*, 1(Pre), 1(a), 1(d), 6(c). Thus, modifying *Attard-Hampiholi-Scofield*'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.*, 205.

5. Claim 8(d)

See, 6(d).

6. Claim 8(e)

Attard's description of a vehicle autonomously controlling its speed teaches the claimed “corrective action comprises using the engine throttle.” *See*, 4(b).

**X. GROUND 5: CLAIMS 9-11 ARE OBVIOUS OVER *ATTARD*,
HAMPIHOLI, AND *GRIMM***

A. Claim 9

1. Claim 9(*Pre*)

See, 1(*pre*).

2. Claim 9(*a*)

See, 4(*i*). *Hampiholi*'s severity rank R describes a competence level of the human driver in controlling the *Attard-Hampiholi* SDV because it indicates how distracted the driver is, i.e., their *competence in controlling* the vehicle. *Dec.*, 210.

3. Claim 9(*b*)

See, 1(*a*), 4(*b*), 4(*i*), 4(*j*).

4. Claim 9(*c*)

See, 4(*h*).

5. Claim 9(*d*)

See, 1(*e*), 4(*j*).

6. Claim 9(*e*)

See, 1(*e*), 4(*j*).

7. Claim 9(*e*)(*i*)

As discussed above, *Attard* teaches or renders obvious an SDV currently *traveling on a roadway*, taking *sensor readings*, and sending said sensor readings to computer 105. *See*, 1(*a*). *Attard* teaches determining based on sensor readings whether a fault has occurred. *See*, 1(*b*).

Further, *Attard* teaches or renders obvious the *sensor readings comprise information about a current weather condition of a roadway on which vehicle 101 (“the SDV”) is currently traveling*. In particular, *Attard* teaches various weather conditions (e.g., ice, snow, rain) may cause a fault. *Attard*, 2:10-21, 2:61-3:4, 4:1-17, 4:32-56 (“collected data 115 could include data 115 concerning ... detection of road attributes such as those mentioned above, weather conditions, etc.”), 6:4-13 (“weather conditions, road conditions”), 6:61-7:5, 7:51-57, 10:42-52; *Dec.*, 216.

In one example, *Attard* teaches weather conditions may cause a fault by lowering a confidence assessment below a threshold even if there is no problem with a sensor 110 (that is, the fault is not due to hardware malfunction). That is, the fault comprises an effect of the current weather condition itself. *Attard*, 7:14-17 (“Note that lower confidence assessments 118 may or may not reflect a hardware fault; for example, environmental conditions (e.g., wet or icy roads) may lower a related confidence assessment 118 even though no hardware failure is implied.”); *Dec.*, 217-218. Thus, *Attard* teaches a particular sub-assessment ϕ_i corresponding to a weather condition on the roadway on which the SDV is traveling (wet or icy roads) that may result in a fault, and particularly a fault that may “exceeds a threshold for danger.”

8. Claim 9(e)(ii)

See, 1(b), 1(c), 1(d).

9. Claim 9(e)(iii)

As discussed above, *Attard* teaches vehicle 101 includes sensors 110 that perform *sensor readings*. See 1(a). In particular, *Attard* teaches sensors 110 include *a GPS sensor* that sends GPS (global positioning system) sensor readings to computer 105. *Attard*, 4:4-11, 4:32-45, 6:4-13, 7:14-17, 10:42-52, 13:22-24, 13:56-58, 14:41-48; *Dec.*, 220. See 1(a). Petitioner notes claim 9(e)(iii) requires nothing more than mere presence of GPS sensor readings.

10. Claim 9(e)(iv)

a) '402 Patent's Weighted Voting

The '402 Patent describes weighted voting with inputs and where an “input’s weight (w) is the number of ‘votes’ associated with the input.” ’402 *Patent*, 8:60-9:3.⁸

b) *Attard*'s Weighting Teachings

Attard teaches determining a *competence level of the processor* Φ . See, 1(c), 4(h). *Attard* also teaches weighting sensor determinations for computing Φ , i.e., *weighted voting*. For example, *Attard* teaches weighting determinations of collected data 115 from sensors 110 based on factors including precipitation, road conditions, and environmental conditions to generate confidence assessments about the ability

⁸ While the '402 Patent also describes a quota is sometimes utilized in a weighted voting system, “quota” is not recited in Claim 9. ’402 *Patent*, 8:60-9:3, Claim 9.

of vehicle 101 to operate autonomously. *Attard*, 6:28-35. To the extent *Attard* does not teach *weighted voting*, *Grimm* teaches such.

c) *Grimm's Teachings*

As discussed in 8(c), *Grimm* teaches computing a “threat level TL_i of a particular vehicle i ” by:

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

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.*, 225. Thus, *Grimm's* threat level equation, which weights vehicle properties, teaches *weighted voting*.

d) *Motivation to Combine Attard-Hampiholi-Grimm*

See Claim 8(c) for a motivation to combine *Attard-Hampiholi-Grimm*, which is hereby incorporated by reference. *Dec.*, 226-229. So modified, *Attard's* step of *determining whether the fault exceeds the threshold for danger*, which involves comparing ϕ_i to $\phi_{\min}$, would include *weighted voting*, i.e., by weighting the sensor determinations used to compute ϕ_i , per *Grimm*, which is also expressly envisioned by *Attard*. *Attard*, 6:28-35; *Dec.*, 226. Alternatively, or additionally, it would have been obvious to modify *Attard's* Φ computation to weight the sensor determinations used to compute Φ , per *Grimm*. *Dec.*, 227. *Attard's* Φ computation triggers the

comparison of φ_i to $\varphi_{\min}$ such that using *weighted voting* in Φ also teaches Claim 9(e)(iv) because the act of comparing φ_i to $\varphi_{\min}$ involves first computing Φ and comparing it to $\Phi_{\min}$.

A POSITA would have had a REOS for the reasons discussed at 8(c); *Dec.*, 229.

11. Claim 9(e)(v)

Attard teaches vehicle-to-vehicle communications and receiving weather data from server 125. *Attard*, 2:41-61, 6:61-7:5, 9:11-39. *Grimm* teaches a *weighted voting parameter comprises active learning data...including information from other SDVs*.

a) Grimm's Active Learning Data

As discussed in 8(c), *Grimm* teaches *active learning data*. See, 8(c), 9(e)(iv). *Grimm's active learning data* is used to compute the threat level equation, i.e., in its *weighted voting system*. *Grimm* teaches a *weighted voting parameter*, i.e., the $w_j p_j^i$ parameter, where the property p_j^i is the property of another vehicle such that this parameter *comprises active learning data including information from other SDVs*. *Dec.*, 231-232.

b) Motivation to Combine Attard-Hampiholi-Grimm

See 8(c), 9(e)(iv) for a motivation to combine *Attard-Hampiholi-Grimm* and reasons for why the modification would have had a REOS. *Dec.*, 233-236.

B. Claim 10

1. Claim 10(Pre)

See, 9(Pre).

2. Claim 10(a)

Grimm teaches “[t]ransient hazardous driving conditions may be caused by weather conditions...and may include poor visibility[.]” *Grimm*, 7:53-63.

3. Claim 10(b)

Grimm teaches obtaining data from other vehicles (*active learning data*) to determine the reduced visibility (*a fault*). Specifically, “[a]t box 210, data is collected from many participative sensing vehicles...If reduced visibility or wet/icy road conditions also exist in the heavy traffic area...advisories of the braking activity ahead may well be warranted for vehicles approaching the braking zone.” *Grimm*, 6:33-49, 7:58-63 (disclosing transient hazardous driving conditions including “poor visibility”).

a) Motivation to Combine *Grimm* and *Attard*

A motivation to combine *Attard* with *Grimm* is set forth above and incorporated herein. *See*, 8(c), 9(e)(iv)-(v). While *Attard* teaches weather conditions, *Attard* does not expressly teach a weather condition of *reduced visibility*. A POSITA would have been motivated and found it obvious to modify *Attard*’s teachings with *Grimm*’s teachings that a weather condition is reduced visibility. *Dec.*, 240. A POSITA would have found it obvious to modify *Attard*’s system to include any

number of weather conditions, including reduced visibility, to improve the safety of *Attard's* system. *Id.*

Such a combination is merely the application of a known technique (*Grimm's* visibility determination using information from other vehicles) to a known method (*Attard's* fault detection method) ready for improvement to yield predictable results. *Dec.*, 241. *Attard* teaches a base method upon which the claimed invention could be seen as an improvement, i.e., the inclusion of poor visibility as a fault that is detected by other SDVs. *Grimm* teaches this improvement. A POSITA would have recognized that modifying *Attard* with *Grimm* would have yielded predictable results and been met with a REOS. *Id.* *Attard* already includes the infrastructure that *Grimm* relies on to determine the poor visibility. For example, both *Attard* and *Grimm* include a server (server 125 in *Attard* and server 170 in *Grimm*) that transmit weather information to vehicles. *Attard*, 6:62-65; *Grimm*, 1:47-67. Further, both *Attard* and *Grimm* are configured for V2V communications. *Attard*, 4:46-5:13, FIG. 1; *Grimm*, 3:44-52.

C. Claim 11

1. Claim 11(Pre)

See, 9(Pre).

2. Claim 11(a)

See, 3(a).

3. **Claim 11(b)**

See, 9(e)(iv).

4. **Claim 11(c)**

See, 9(e)(v).

XI. GROUND 6: CLAIM 13 IS OBVIOUS OVER ATTARD, HAMPIHOLI, GRIMM, AND FRAZER

A. Claim 13

1. **Claim 13(Pre)**

See, 9(Pre).

2. **Claim 13(a)**

See, 3(a).

3. **Claim 13(b)**

Per Claim 9(e)(ii), *determining a corrective action* comprises *determining whether the fault exceeds a threshold for danger*. Further, per Claim 9(e)(iv)-(v), *determining whether the fault exceeds a threshold for danger* comprises *weighted voting*, and a *weighted voting parameter* comprises *active learning data...including information from other SDVs*. In the Claim 9 mapping, *Attard* in view of *Grimm* teaches limitations 9(e)(ii) and 9(e)(iv)-(v). *See*, 9. Because (1) the step of *determining a corrective action* includes *determining whether the fault exceeds a threshold for danger*; (2) *determining whether the fault exceeds a threshold for danger* comprises *weighted voting*, and (3) a *weighted voting parameter* includes *active learning data*, then *determining the corrective action* comprises using *active*

learning data, i.e., the *active learning data* of the *weighted voting parameter*.

Therefore, the *Attard-Hampiholi-Grimm* combination teaches or renders obvious Claim 13(b) for the reasons set forth above with respect to Claim 9. *Dec.*, 248-249.

4. Claim 13(c)

Frazer teaches a fault-remediation table, which is stored in memory. A POSITA would have understood or found obvious that a fault-remediation table is a type of database that is queried for a “proper action to take.” *Dec.*, 250.

XII. GROUND 7: CLAIM 14 IS OBVIOUS OVER ATTARD, HAMPIHOLI, GRIMM, AND DOLGOV

A. Claim 14

1. Claim 14(Pre)

See, 9(Pre).

2. Claim 14(a)

a) Attard’s Teachings

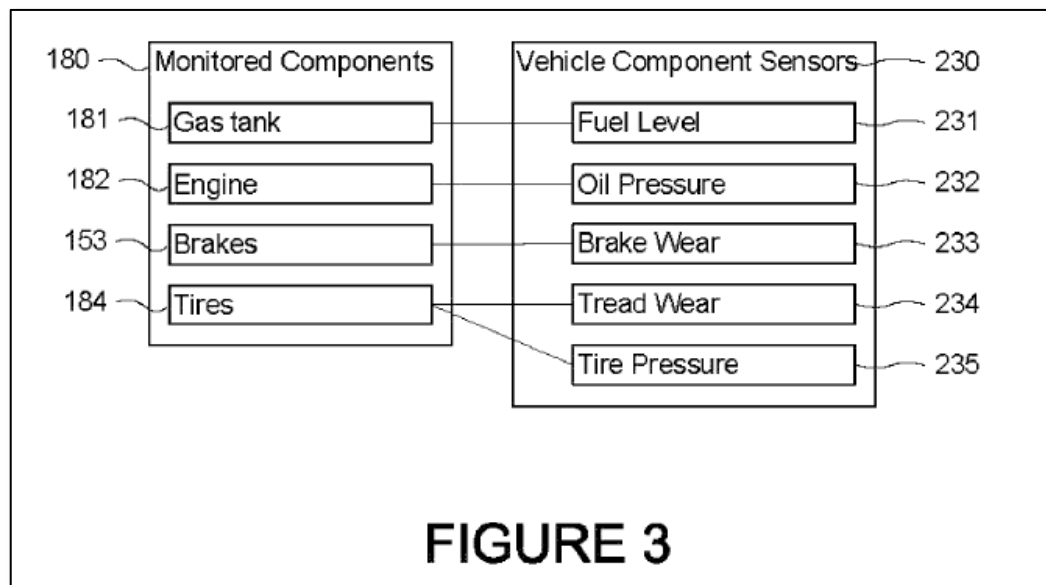
Attard teaches a reading from a GPS sensor. *See*, 3(a). *Attard* further teaches sensors 110 includes a *radar sensor* for maintaining a distance from another vehicle. *Attard*, 1:65-2:6, 4:8-17, 4:67-5:3; *Dec.*, 252. Petitioner notes claim 14 requires nothing more than mere presence of GPS and radar sensor readings.

b) The ’402 Patent’s Sensors

The ’402 Patent describes sensors such as sensors 153 that detect “tire tread” and a “faulty braking system.” ’402 Patent, 5:59-6:8. *Dolgov* teaches such sensors.

c) ***Dolgov's Teachings***

Dolgov teaches “autonomously moving a vehicle...wherein sensors detect whether a component is damaged and a processor maneuvers the vehicle differently based on the presence of damage and in order to mitigate further damage to the component.” *Dolgov*, 2:65-3:3. *Dolgov's* sensors include “vehicle component sensors 230 [that] provide information about the physical characteristics of the vehicle components” such as “brake wear sensor 233 [that] may monitor the amount of wear on brakes” and “tread wear sensors 234 [that] may monitor the treads of the tires.” *Dolgov*, 4:39-50; *Dec.*, 254.



Dolgov, FIG. 3.

Thus, because *Dolgov's* sensors 230, like the '402 Patent, include tire tread and brake wear sensors, *Dolgov* teaches *vehicle maintenance sensors*. *Dec.*, 255. A motivation to combine *Attard-Dolgov* is set forth below in 14(b).

3. Claim 14(b)

Dolgov's sensors 230 “detect wear and other types of damage” such as “excessive wear” on the brakes 153. *Dolgov*, 8:22-35. A POSITA would have understood excessive brake wear to be *a maintenance fault*. *Dec.*, 256.

a) Motivation to Combine *Attard-Dolgov*

A POSITA would have found it obvious and been motivated to modify *Attard* based on *Dolgov's* teachings of *vehicle maintenance sensors* to detect *a maintenance fault*. Such a combination is merely the combination of known prior art elements according to known methods to yield the predictable results of *Attard's* fault handling system further detecting vehicle maintenance faults. *Dec.*, 257. A POSITA would have appreciated the additional safety benefits provided by modifying *Attard* to also detect maintenance-related faults as such faults are a concern for all vehicles, including SDVs. *Id.* Additionally, *Attard* provides a teaching, suggestion, and motivation to do so by providing the “actuation layer” that “execute[s] commanded vehicle 101 operations.” *Attard*, 2:15-24. Further, *Attard* teaches sensors for conditions/faults internal to the vehicle (*see*, 1(a)), such that modifying *Attard* would merely be combining prior art elements according to known methods to yield the predictable result of determining a fault that comprises a maintenance fault. *Dec.*, 257.

Further, such a modification is merely the use of known technique (*Dolgov's* teachings of sensors 230 to detect maintenance faults) to improve similar products (*Attard's* computer program product and vehicle) in the same way. *Dec.*, 258. There would have been a REOS at least because such maintenance sensors were well known in the art. *Id.* It would have been a straightforward modification to add such vehicle maintenance sensors to *Attard's* vehicle 101 along with any straightforward modifications to programming instructions. *Id.* In fact, *Attard* expressly contemplates assessing the braking capability of vehicle 101. *Attard*, 6:4-9, 10:44-52. Thus, a POSITA would have expected a REOS in modifying *Attard*. *Dec.*, 258.

4. Claim 14(c)

See, 3(d).

XIII. GROUND 8: CLAIMS 15-16, 18-20 ARE OBVIOUS OVER ATTARD, HAMPIHOLI, AND MCNEW

A. Claim 15

1. Claim 15(Pre)

See, 1(Pre).

2. Claim 15(a)

See, 4(i).

3. Claim 15(b)

See, 1(a), 3(a) (*GPS*), 14(a) (*radar*).

4. Claim 15(c)

See, 1(b).

5. Claim 15(d)

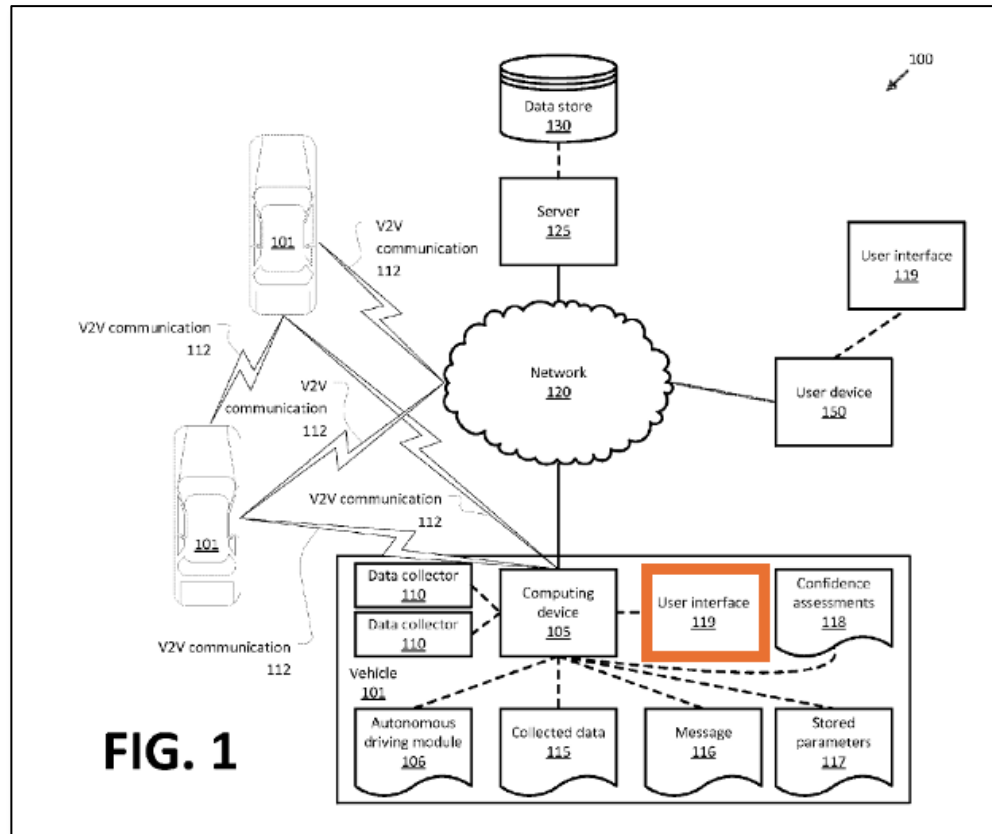
See, 1(d).

6. Claim 15(e)

Attard-Hampiholi in further view of *McNew* teaches *sending a control signal to a control system of the SDV corresponding to the corrective action*. As previously discussed, *Attard* teaches *corrective action[s]* such as “an action or actions to take concerning vehicle 101 operations” and/or message 116, which is sent when Φ is below $\Phi_{\min}$. *See*, 1(d)-(e); *Attard*, 7:62-63, 3:5-3:13, 13:33-49, 14:63-15:4; *Dec.*, 265.

a) Attard’s Control System

Per Claim 16, *the control system comprises an engine throttle, a steering mechanism, a display, and a braking system*. *Attard* teaches such; namely, *Attard’s* vehicle 101 includes *engine throttle, a steering mechanism, and a braking system*. *See*, 4(b); *Attard*, 9:63-10:2; *Dec.*, 266. *Attard* further teaches *a display*, i.e., user interface 119, which “may include a graphical user interface (GUI) or the like that may display alerts, messages, etc.” *Attard*, 7:33-38, 3:49-55 (describing the interface as including an HMI).



Attard, FIG. 1. Therefore, *Attard* teaches the claimed *control system*.

Attard further teaches that computer 105 instructs interface 119 to formulate message 116. *Attard*, 7:22-23 (“[T]he computer 105 may include instructions for providing a message 116, e.g., an alert, via the affective interface 119”). *Attard* does not expressly teach computer 105 *sending a control signal to the interface 119 (control system)*. However, *McNew* teaches such.

b) *McNew’s Control Signal*

McNew teaches “processing circuitry can send **control signals** to a HMI [human-machine interface] 226 to display requests or warnings to the driver.” *McNew*, 6:63-66, 5:4-43 (discussing the HMI). Further, *McNew* teaches the semi-

autonomous mode manager (SAMM) “implements enforcement actions...to force the driver to comply with previously issued warnings,” and [i]f the driver has not complied with the predetermined number of warnings...the SAMM can issue **control signals** to shut off the semi-automatic driving system.” 5:62-64, 6:20-24, FIG. 1; *Dec.*, 268. Thus, like *Attard*, *McNew* teaches taking an action (sending messages and/or shutting off the semi-automatic system) in response to a fault (the driver not responding to the warning) where such actions are initiated by *sending a control signal*. *McNew*, 6:20-24, 8:7-14 (speed enforcement control signals), 20:21-31, 20:55-62, 7:55-62, 23:64-67; *Dec.*, 268.

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

A POSITA would have found it obvious and been motivated to modify *Attard*’s fault handling system with *McNew*’s teachings of sending a control signal corresponding to a corrective action. *Dec.*, 269. So modified, *Attard*’s vehicle 101 and its computer 105 would have sent *a control signal* to user interface 119 (*control system*) *corresponding to the corrective action* (e.g., corresponding to message 116). *Id.*

Such a modification is merely an implementation detail and the combination of known prior art elements according to known methods to yield predictable results, i.e., the predictable result of *Attard*’s computer 105 signaling interface 119 to send message 116. *Dec.*, 270. Separately, *Attard*’s fault handling system and *McNew*’s

control signaling teachings would work the same as when combined. *Id.* This use of a known technique of sending a signal to an electronic system to cause an action to be taken would have improved *Attard* and *McNew's* similar vehicle systems in the same way. *Id.*

There would have been a REOS in making the combination at least because generating a control signal indicative of an action was well known in the art. *Dec.*, 271. More specifically, it was well known to send a *control signal* to a display (e.g., GUI, HMI) to cause the display to render a message or alert. *Id.* Further still, such a change would have only required a simple, straightforward modification to *Attard* such that computer 105 *send[s] a control signal* to interface 119 when computer 105 determines a message 116 is to be sent, i.e., when Φ is below $\Phi_{\min}$. *Attard*, 7:62-63; *Dec.*, 271. A POSITA would have understood that this modification would have required merely straightforward changes to programming instructions since hardware such as *Attard's* processor and memory would already have been capable of transmitting/receiving electronic signals, e.g., wirelessly and/or via a bus or other wired connection. *Dec.*, 271.

B. Claim 16:

See, 15(e).

C. Claim 18

1. Claim 18(Pre)

See, 15(Pre).

2. Claim 18(a)

Attard teaches sensors 110 determine road conditions. *Attard*, 4:42-56 (“For example, collected data 115 could include data 115 concerning a vehicle 101 speed, acceleration, braking, **detection of road attributes such as those mentioned above, weather conditions**, etc.”), 4:11-17 (detecting potholes, bumps, etc.). A POSITA would have understood *Attard*’s disclosures of detecting road attributes using sensors 110 on vehicle 101 to teach *determining a current condition of a roadway* that the vehicle 101 is driving on. *Attard*’s condition of the road is a *current condition* because it is being detected by *Attard*’s SDV, which is traveling on the roadway. *Dec.*, 274.

3. Claim 18(b)

Attard’s Φ is a competence level of a control processor. *See*, 4(h). Φ incorporates the road/weather conditions. *Attard*, 6:4-13 (describing Φ as including vector values related to weather and road conditions.) Accordingly, because (a) *Attard*’s Φ incorporates the road/weather conditions and (b) *Attard*’s Φ “indicates an overall confidence that the vehicle 101 can and/or should be operated autonomously,” *determining Attard*’s CPCL, Φ , *determin[es] whether the control*

processor is competent to control the SDV while the SDV encounters the current condition of the roadway. Dec., 275.

D. Claim 19

Attard teaches Claim 19. *See*, 18(a); *Attard*, 2:10-12, 4:42-45, 6:4-13, 7:14-17 (wet and icy roads), 7:51-57; *Dec.*, 276.

E. Claim 20

See, 16, Claim 4(b).

XIV. GROUND 9: CLAIMS 17, 21-22, 24 ARE OBVIOUS OVER *ATTARD*, *HAMPIHOLI*, *MCNEW*, AND *FRAZER*

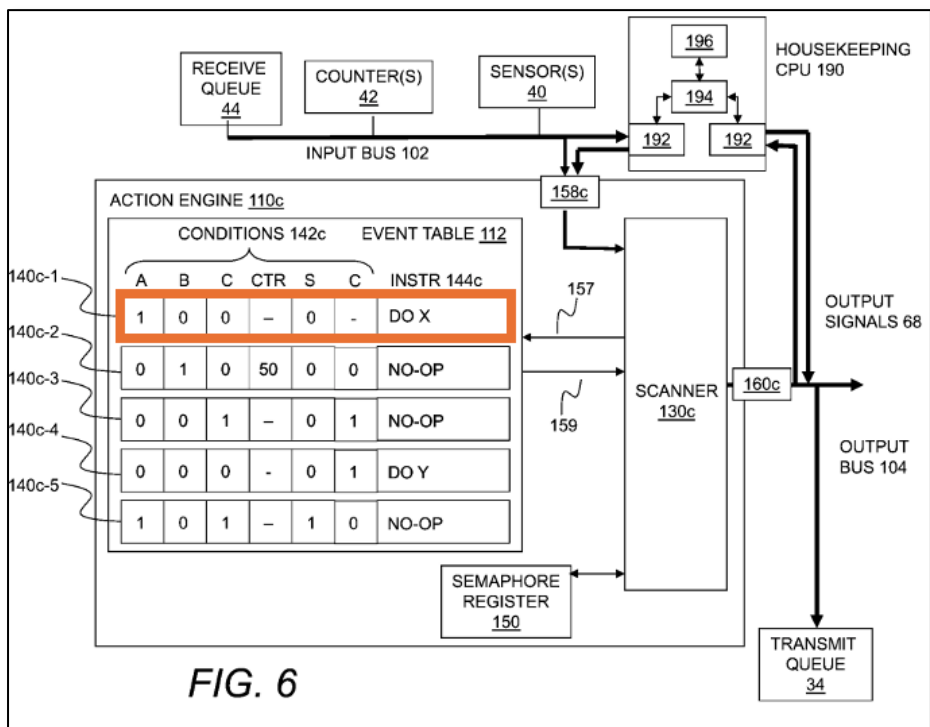
A. Claim 17

1. Claim 17(Pre)

See, 15(Pre).

2. Claim 17(a)

Attard-Hampiholi-McNew in view of *Frazer* teaches 17(a). *See*, 1(d). *Attard*, modified by *Frazer*, uses *Frazer's* event table 112 (*fault remediation table*) to structure the correlation between *Attard's* faults and the corrective actions to take in response to the faults. *See*, 1(d). Therefore, the *Attard-Frazer* combination *determin[es] a corrective action by looking up an entry in a fault remediation table* (e.g., the register 140c-1 in *Frazer's* table 112 corresponding to the fault or the instruction 144c itself). *Dec.*, 279 (citing *Frazer*, 22:9-15).



Frazer, FIG. 6 (depicting an illustrative *entry*).

3. Claim 17(b)

See, 15(e). *Attard* modified by *McNew's* control signal teachings teaches sending to a display (*Attard's* interface 119) an alert (message 116) that corresponds to the entry (the action/instruction in Frazer's fault-remediation table). *Dec.*, 280.

B. Claim 21

See, Claim 17.

C. Claim 22

See, Claim 19.

D. Claim 24

Petitioner notes the term *the weather condition of the roadway* lacks antecedent basis. Regardless, Attard teaches a *weather condition of the roadway* that is an *icy roadway*, thereby teaching Claim 24. Attard, 7:14-17 (“[E]nvironmental conditions (e.g., wet or **icy roads**) may lower a related confidence assessment 118 even though no hardware failure is implied.”).

XV. GROUND 10: CLAIM 23 IS OBVIOUS OVER ATTARD, HAMPIHOLI, MCNEW, FRAZER, AND ZHU

A. Claim 23

1. Attard’s Teachings

As discussed with respect to Claim 1(a) and 9(e)(i), respectively, Attard teaches a *sensor reading from a camera and determining the weather condition of the roadway*. Attard teaches sensors 110 “detect[] conditions outside the vehicle” such as “cameras or other image capture devices...to detect road attributes.” Attard, 4:8-17. Attard also teaches data 115 can relate to “weather conditions.” Attard, 4:39-45.

While Attard does not provide an express teaching that the camera sensors 110 *determine the weather of the roadway*, a POSITA would have found it obvious that Attard teaches such based on Attard’s teachings of using camera sensors 110 to detect external conditions and the fact that it was well known in the art before the

'402 Patent to use camera sensors to determine weather conditions on the roadway.

Dec., 285. To the extent it is argued *Attard* does not teach such, *Zhu* does.

2. *Zhu's Teachings*

Zhu teaches an autonomous vehicle that includes “a camera and may receive image data collected for the environment of the vehicle.” *Zhu*, [0117]. Per *Zhu*, “it may be possible to identify rain in the images as well.” *Id.*, [0118] (disclosing fog as being visible in the images). Therefore, *Zhu* teaches *determining the weather condition of the roadway* (e.g., rain or fog) *comprises receiving sensor reading from a camera*. *Dec.*, 286.

3. *Motivation to Combine Attard-Hampiholi-McNew-Frazer with Zhu.*

A POSITA would have been motivated and found it obvious to modify the *Attard-Hampiholi-McNew-Frazer* combination further with *Zhu's* teachings of identifying rain/fog via images captured by a camera. *Dec.*, 287. *Attard* teaches both cameras and determining weather conditions using sensor data. *Attard*, 4:8-17, 4:42-45. However, *Attard* does not expressly teach which sensors are used to determine the weather data. *Zhu*, however, expressly teaches the use of camera sensors for determining weather conditions in an autonomous vehicle. *Zhu*, [0117]-[0118]. Thus, at least *Attard* provides an express motivation to incorporate *Zhu's* teachings because *Attard* teaches determining weather conditions but lacks the specificity on how to do so. *Dec.*, 287.

Because the *Attard* SDV includes cameras, a POSITA would have had a REOS combining *Zhu*'s teachings of using autonomous vehicle cameras to determine weather conditions. *Dec.*, 288. Additionally, such a modification would have required only straightforward changes to programming instructions. *Id.* *Zhu* teaches implementing its system in computer program instructions, making the modification straightforward. *Zhu*, [0058], [0074]; *Dec.*, 288. These changes would have involved, e.g., modifying the *Attard* software instructions to detect rain/fog from images, per *Zhu. Id.*

XVI. DISCRETIONARY DENIAL

Pursuant to the Board's Interim Process Concerning Institution of AIA Proceedings dated March 26, 2025, Petitioner reserves all rights to respond to any discretionary denial issues raised by Patent Owner.

XVII. CONCLUSION

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

Respectfully submitted,

ERISE IP, P.A.

BY: /s/ Jennifer C. Bailey
Jennifer C. Bailey, Reg. No. 52,583
jennifer.bailey@eriseip.com
7015 College Boulevard, Suite 700
Overland Park, Kansas 66211
(913) 777-5600 Telephone

IPR2025-00943

U.S. Patent No. 11,597,402

(913) 777-5601 Facsimile

COUNSEL FOR PETITIONER

XVIII. 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 '402 Patent is presently the subject of the following patent infringement lawsuit: filed against Petitioner entitled *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

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

Lead Counsel	Back-Up Counsel
Jennifer C. Bailey (Reg. No. 52,583) jennifer.bailey@eriseip.com PTAB@eriseip.com <u>Postal and Hand-Delivery Address:</u> ERISE IP, P.A. 7015 College Blvd., Suite 700 Overland Park, Kansas 66211 Telephone: (913) 777-5600 Fax: (913) 777-5601	Adam M. Sandwell (Reg. No. 72,484) adam.sandwell@eriseip.com Kevin J. Rongish (Reg. No. 78,716) kevin.rongish @eriseip.com Justin Grimes (Reg. No. 81,059) justin.grimes@eriseip.com <u>Postal and Hand-Delivery Address:</u> ERISE IP, P.A. 7015 College Blvd., Suite 700 Overland Park, Kansas 66211 Telephone: (913) 777-5600 Fax: (913) 777-5601
	Ashraf Fawzy, (Reg. No. 67,914) afawzy@tesla.com Tesla, Inc. 1 Tesla Road Austin, Texas 78725 Tel: 202-905-9221

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. 11,597,402 for Claims 1, 3-4, 6, 8-11, and 13-24

Claim Designation	Claim Language
Claim 1(Pre)	A computer program product for controlling a driving mode of a self-driving vehicle (SDV), the computer program product comprising a non-transitory computer readable storage medium having program code embodied therewith, the program code readable and executable by a processor to perform a method comprising:
Claim 1(a)	receiving sensor readings from a system of sensors, wherein the sensor readings describe a current operational state of a SDV;
Claim 1(b)	determining based on the sensor readings, by one or more processors, whether a fault has occurred;
Claim 1(c)	determining, by the one or more processors, whether the fault exceeds a threshold for danger;
Claim 1(d)	determining a corrective action associated with the fault using a fault-remediation table;
Claim 1(e)	the SDV implementing the corrective action.
Claim 3(Pre)	The computer program product of claim 1, wherein:
Claim 3(a)	the sensor readings comprise a reading from a GPS sensor;
Claim 3(b)	the fault comprises a vehicle state;
Claim 3(c)	determining a corrective action associated with the fault using a fault-remediation table comprises a weighted voting parameter;
Claim 3(d)	the corrective action comprises re-routing the SDV.
Claim 4(Pre)	A self-driving vehicle (SDV) comprising:
Claim 4(a)	a sensor system comprising a plurality of sensors;
Claim 4(b)	vehicle controls comprising: engine throttle, steering mechanism, and braking system;
Claim 4(c)	a computer system comprising a processor coupled to a non-transitory computer readable storage medium containing program code, the program code readable and executable by a processor;
Claim 4(d)	the computer system is capable of receiving a sensor reading from the system of sensors;
Claim 4(e)	the computer system is capable of operating the vehicle controls;

Claim Designation	Claim Language
Claim 4(f)	the computer system is capable of determining the operational state of the self-driving vehicle (SDV);
Claim 4(g)	the computer system is capable of determining a vehicle fault;
Claim 4(h)	the computer system is capable of determining a competence level of the processor;
Claim 4(i)	the computer system is capable of determining competence level of a human driver;
Claim 4(j)	the computer system is capable of determining a corrective action using the competence level of the processor and the competence level of the human driver;
Claim 4(k)	the computer system is capable of implementing the corrective action; and
Claim 4(l)	the computer system is capable of issuing an alert indicating the corrective action.
Claim 6(Pre)	The SDV of claim 4, further comprising:
Claim 6(a)	the sensor system comprises sensors that detect a physical state of the human driver;
Claim 6(b)	the sensor readings comprise an input from a steering mechanism sensor;
Claim 6(c)	the computer system determines the competence level of the processor using active learning data, said active learning data including information from other SDVs;
Claim 6(d)	the computer system determines the competence level of the human driver using the sensor readings;
Claim 6(e)	the corrective action is to transfer vehicle controls to the human driver;
Claim 6(f)	the alert indicates take over immediately.
Claim 8(Pre)	The SDV of claim 4, further comprising:
Claim 8(a)	the sensor system comprises sensors that detect a physical state of the human driver;
Claim 8(b)	the sensor readings comprise an input from a steering mechanism sensor;
Claim 8(c)	the computer system determines the corrective action using weighted voting, wherein a weighted voting parameter is determined based on active learning data, said active learning data including information from other SDVs;

Claim Designation	Claim Language
Claim 8(d)	the computer system determines the competence level of the human driver using the sensor readings;
Claim 8(e)	the corrective action comprises the computer system using the engine throttle.
Claim 9(Pre)	A computer program product for controlling a driving mode of a self-driving vehicle (SDV), the computer program product comprising a non-transitory computer readable storage medium having program code embodied therewith, the program code readable and executable by a processor to perform a method comprising:
Claim 9(a)	determining a competence level of a human driver, wherein the competence level describes a competence level of the human driver in controlling the SDV;
Claim 9(b)	receiving sensor readings from a system of sensors about the competence level of the human driver, wherein the SDV is operable to provide autonomous control of driver controls comprising: engine throttle, steering mechanism, braking system, and navigation;
Claim 9(c)	determining a competence level of a processor;
Claim 9(d)	determining a corrective action;
Claim 9(e)	the SDV implementing the corrective action wherein:
Claim 9(e)(i)	the sensor readings comprise information about a current weather condition of a roadway on which the SDV is currently traveling;
Claim 9(e)(ii)	determining a corrective action comprises determining whether a fault has occurred and whether the fault exceeds a threshold for danger;
Claim 9(e)(iii)	the sensor readings comprise a reading from a GPS sensor;
Claim 9(e)(iv)	determining whether the fault exceeds the threshold for danger comprises weighted voting;
Claim 9(e)(v)	a weighted voting parameter comprises active learning data, said active learning data including information from other SDVs.
Claim 10(Pre)	The computer program product of claim 9, wherein:
Claim 10(a)	the current weather condition comprises reduced visibility of the roadway;

Claim Designation	Claim Language
Claim 10(b)	the processor determines whether a fault has occurred using active learning data, said active learning data including information from other SDVs.
Claim 11(Pre)	The computer program product of claim 9, wherein:
Claim 11(a)	the sensor readings comprise a reading from a GPS sensor;
Claim 11(b)	determining whether the fault exceeds the threshold for danger comprises weighted voting;
Claim 11(c)	a weighted voting parameter comprises active learning data, said active learning data including information from other SDVs.
Claim 13(Pre)	The computer program product of claim 9, wherein:
Claim 13(a)	the sensor readings comprise a reading from a GPS sensor;
Claim 13(b)	determining the corrective action comprises using active learning data, said active learning data including information from other SDVs;
Claim 13(c)	the corrective action comprises querying a database for the proper action to take.
Claim 14(Pre)	The computer program product of claim 9, wherein:
Claim 14(a)	the sensor readings comprise a reading from a GPS sensor, a reading from a radar sensor, and a reading from a vehicle maintenance sensor;
Claim 14(b)	the fault comprises a maintenance fault;
Claim 14(c)	the corrective action comprises re-routing the SDV.
Claim 15(Pre)	A computer program product for controlling a driving mode of a self-driving vehicle (SDV), the computer program product comprising a non-transitory computer readable storage medium having program code embodied therewith, the program code readable and executable by a processor to perform a method comprising:
Claim 15(a)	determining a competence level of a human driver using information about a human driver's control of the SDV;
Claim 15(b)	receiving a sensor reading from a system of sensors, wherein the system of sensors comprises a GPS sensor, a radar sensor, and a camera;
Claim 15(c)	determining a vehicle fault using the sensor reading;
Claim 15(d)	determining a corrective action;

Claim Designation	Claim Language
Claim 15(e)	sending a control signal to a control system of the SDV corresponding to the corrective action.
Claim 16	The computer program product of claim 15, wherein the control system comprises: an engine throttle, a steering mechanism, a display, and a braking system.
Claim 17(Pre)	The computer program product of claim 15,
Claim 17(a)	wherein determining a corrective action comprises looking up an entry in a fault remediation table and
Claim 17(b)	wherein sending a control signal comprises sending to a display an alert that corresponds to the entry.
Claim 18(Pre)	The computer program product of claim 15 further comprising:
Claim 18(a)	determining a current condition of a roadway;
Claim 18(b)	determining a competence level of a control processor, wherein determining the competence level of the control processor comprises determining whether the control processor is competent to control the SDV while the SDV encounters the current condition of the roadway.
Claim 19	The computer program product of claim 18, wherein determining the current condition of the roadway comprises determining a weather condition of the roadway.
Claim 20	The computer program product of claim 18, wherein the control system comprises: an engine throttle, a steering mechanism, a display, and a braking system.
Claim 21	The computer program product of claim 18 wherein determining a corrective action comprises looking up an entry in a fault remediation table and wherein sending a control signal comprises sending to a display an alert that corresponds to the entry.
Claim 22	The computer program product of claim 21, wherein determining the current condition of the roadway comprises determining a weather condition of the roadway.
Claim 23	The computer program product of claim 22, wherein determining the weather condition of the roadway comprises receiving a sensor reading from a camera.

Claim Designation	Claim Language
Claim 24	The computer program product of claim 21, wherein the weather condition of the roadway is selected from the group consisting of: rain, snow, sleet, hail, fog, smoke, wet roadway, icy roadway, reduced visibility, temperature exceeding a predetermined threshold, temperature below a predetermined threshold.

APPENDIX OF EXHIBITS

Exhibit 1001	U.S. Patent No. 11,597,402 (“ <i>The ’402 Patent</i> ”)
Exhibit 1002	File History of the ’402 Patent
Exhibit 1003	Declaration of Christopher Wilson
Exhibit 1004	U.S. Patent No. 9,406,177 (“ <i>Attard</i> ”)
Exhibit 1005	U.S. Patent No. 9,494,926 (“ <i>Frazer</i> ”)
Exhibit 1006	U.S. Patent No. 10,377,303 (“ <i>McNew</i> ”)
Exhibit 1007	U.S. Patent Application Publication No. 2016/0267335 (“ <i>Hampiholi</i> ”)
Exhibit 1008	U.S. Patent No. 9,063,543 (“ <i>An</i> ”)
Exhibit 1009	Intentionally Left Blank
Exhibit 1010	Intentionally Left Blank
Exhibit 1011	Intentionally Left Blank
Exhibit 1012	Intentionally Left Blank
Exhibit 1013	U.S. Patent Application Publication No. 2007/0219720 (“ <i>Trepagnier</i> ”)
Exhibit 1014	Gereon Meyer and Sven Beiker. <i>Road Vehicle Automation</i> . Springer. 2014. (“ <i>Meyer</i> ”)
Exhibit 1015	Jeff Wit et al. “Autonomous Ground Vehicle Path Tracking.” <i>Journal of Robotic Systems</i> 21(8), 439-449 (2004). (“ <i>Wit</i> ”)
Exhibit 1016	Keshav Bimbraw. “Autonomous Cars: Past, Present and Future.” <i>Proceedings of the 12th International Conference on Informatics in Control, Automation and Robotics (ICINCO-2015)</i> , pages 191-198, July 21-23, 2015. (“ <i>Bimbraw</i> ”)
Exhibit 1017	Xavier Mosquet et al. <i>Revolution in the Driver’s Seat</i> . The Boston Consulting Group. April 2015. (“ <i>Mosquet</i> ”)
Exhibit 1018	Steven E. Muldoon et al. “10.3: Vehicle Fault Diagnostics Using a Sensor Fusion Approach.” IEEE 2002. (“ <i>Muldoon</i> ”)
Exhibit 1019	U.S. Patent No. 8,825,258 (“ <i>Cullinane</i> ”)
Exhibit 1020	U.S. Patent No. 9,798,323 (“ <i>Tsimhoni-323</i> ”)
Exhibit 1021	U.S. Patent No. 9,884,631 (“ <i>James</i> ”)
Exhibit 1022	U.S. Patent No. 11,040,725 (“ <i>Scofield</i> ”)
Exhibit 1023	U.S. Patent No. 9,483,059 (“ <i>Caveney</i> ”)
Exhibit 1024	U.S. Patent No. 9,365,213 (“ <i>Stenneth</i> ”)
Exhibit 1025	International Publication No. WO 2006/047297 (“ <i>Allard</i> ”)
Exhibit 1026	Rajesh Rajamani et al. “A Complete Fault Diagnostic System for Automated Vehicles Operating in a Platoon.” <i>IEEE Transactions</i>

	on Control Systems Technology, Vol 9, No. 4, July 2001. (“ <i>Rajamani</i> ”)
Exhibit 1027	U.S. Patent Application Publication No. 2013/0063336 (“ <i>Sugimoto</i> ”)
Exhibit 1028	Matthew McNaughton et al. “Motion Planning for Autonomous Driving with a Conformal Spatiotemporal Lattice.” 2011 IEEE International Conference on Robotics and Automation. May 9-13, 2011, Shanghai, China. (“ <i>McNaughton</i> ”)
Exhibit 1029	A. de la Escalera. “Traffic sign recognition and analysis for intelligent vehicles.” Image and Vision Computing 21 (2003) 247-258. (“ <i>Escalera</i> ”)
Exhibit 1030	“Surface Vehicle Information Report J3016.” SAE International. January 2014. (“ <i>J3016</i> ”)
Exhibit 1031	U.S. Patent No. 9,430,944 (“ <i>Grimm</i> ”)
Exhibit 1032	U.S. Patent No. 8,874,305 (“ <i>Dolgov</i> ”)
Exhibit 1033	U.S. Patent Application Publication No. 2014/0336935 (“ <i>Zhu</i> ”)
Exhibit 1034	U.S. Patent No. 8,378,849 (“ <i>Chandra</i> ”)
Exhibit 1035	U.S. Patent No. 5,779,593 (“ <i>Takada</i> ”)
Exhibit 1036	Intentionally Left Blank.
Exhibit 1037	Harding, J., Powell, G., R., Yoon, R., Fikentscher, J., Doyle, C., Sade, D., Lukuc, M., Simons, J., & Wang, J. (2014, August). “Vehicle-to-vehicle communications: Readiness of V2V technology for application.” (Report No. DOT HS 812 014). Washington, DC: National Highway Traffic Safety Administration. (“ <i>Harding</i> ”).
Exhibit 1038	U.S. Patent No. 9,950,740 (“ <i>Sato</i> ”)
Exhibit 1039	Dannheim, C., Icking, C., Mäder, M., & Sallis, P. (2014, May). Weather detection in vehicles by means of camera and LIDAR systems. In <i>2014 Sixth International Conference on Computational Intelligence, Communication Systems and Networks</i> (pp. 186-191). IEEE. (“ <i>Dannheim</i> ”)

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 13,898 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: May 5, 2025

ERISE IP, P.A.

BY: /s/ Jennifer C. Bailey
Jennifer C. Bailey, Reg. No. 52,583
jennifer.bailey@eriseip.com
7015 College Blvd., Suite 700
Overland Park, KS 66211
P: (913) 777-5600
F: (913) 777-5601

COUNSEL FOR PETITIONER

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

Pursuant to 37 C.F.R. § 42.6(e) and 37 C.F.R. § 42.105(b), the undersigned certifies that on May 5, 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 '402 Patent:

KINNEY & LANGE, P.A.
333 S. 7TH ST., SUITE 2700
MINNEAPOLIS, MN 55402-2438

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

Andrea Leigh Fair (andrea@millerfairhenry.com)
Claire Abernathy Henry (claire@millerfairhenry.com)
Blaine Andrew Larson (blarson@hpcllp.com)
Kyle Ruvolo (kruvolo@hpcllp.com)
Leslie V Payne (lpayne@hpcllp.com)
Lily Rebecca Glick (lglick@hpcllp.com)
Alden Harris (aharris@hpcllp.com)

Respectfully submitted,

ERISE IP, P.A.

BY: /s/ Jennifer C. Bailey
Jennifer C. Bailey, Reg. No. 52,583
jennifer.bailey@eriseip.com
7015 College Blvd., Suite 700
Overland Park, KS 66211
P: (913) 777-5600
F: (913) 777-5601

COUNSEL FOR PETITIONER