

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner,

v.

AUTONOMOUS DEVICES, LLC
Patent Owner

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,452,974**

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- d. [1.4] generating or receiving a third circumstance representation, wherein the third circumstance representation represents a third circumstance detected at least in part by the one or more sensors of the first device or at least in part by one or more sensors of a second device;17
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PETITIONER’S EXHIBIT LIST

Ex. 1001	U.S. Patent No. 10,452,974 (the “’974 patent”)
Ex. 1002	Declaration of Jason Janet, Ph.D.
Ex. 1003	Curriculum Vitae of Jason Janet, Ph.D.
Ex. 1004	U.S. Patent No. 9,604,359 (“Grotmol”)
Ex. 1005	U.S. Patent No. 8,639,644 (“Hickman”)
Ex. 1006	Service, Robert F., <i>Minds of Their Own</i> , Sci. Magazine. Oct. 10, 2014, 346(6206):182-183, available at, https://www.usna.edu/AcResearch/_files/documents/Science_Minds_of_Their_own_182.full1.pdf
Ex. 1007	Prosecution File History of U.S. Patent No. 10,452,974

I. MANDATORY NOTICES

A. Real Party-in-Interest

Tesla, Inc. is the sole real party-in-interest.

B. Related Matters

The '974 patent is the subject of a civil action, *Autonomous Devices LLC v. Tesla, Inc.*, No. 22-cv-1466 (MN) (D. Del.), filed November 7, 2022.

The '974 patent is a parent of U.S. Patent Application No. 16/540,972, filed on August 14, 2019, now U.S. Patent No. 11,238,344 ("the '344 patent"). Tesla has also filed a petition for *inter partes* review of the '344 patent.

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II. GROUNDS FOR STANDING

Petitioner certifies that the '974 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting *inter partes* review challenging the patent claims on the grounds identified in this Petition.

III. INTRODUCTION

The '974 patent claims a system for autonomous device operation in which: a memory stores circumstance representations (*e.g.*, pictures of the device's circumstances) correlated with instructions for operating a device where the instructions or circumstance representations are learned during operation of the device by a user; new circumstance representations are generated or received; instructions for operating the device are anticipated by determining a partial match between the new circumstance representations and the stored circumstance representations; and the correlated instructions are executed to autonomously operate the device.

Petitioner requests *inter partes* review based upon U.S. Patent No. 9,604,359 ("Grotmol") and U.S. Patent No. 8,639,644 ("Hickman"), neither of which were before the Examiner during prosecution. Grotmol, filed more than a year before the '974 patent, discloses the same approach to autonomous operation:

A robotic vehicle may utilize a camera and stores the sequence of images of a visual scene seen when following a trajectory during training in an ordered buffer. Motor commands associated with a given image may be stored. During autonomous operation,

an acquired image may be compared with one or more images from the training buffer in order to determine the most likely match.

Ex. 1004, Abstract. Grotmol further teaches that a robot’s “trained configuration may be stored” and “loaded to one or more other robots in order to provide learned behaviors.” Ex. 1004, 33:12-35.

Hickman—a reference cited in Grotmol—further discloses “shared robot knowledge bases for use with cloud computing systems,” in which the cloud computing system “collects data from a robot about an object the robot has encountered in its environment, and stores the received data in the shared robot knowledge base . . . sends instructions for interacting with an object to a robot . . . [and] sends instructions to a robot for executing an application based on information stored in the shared robot knowledge base.” Ex. 1005, Abstract.

Grotmol anticipates and/or renders obvious in combination with Hickman claims 1-20 of the ’974 patent. Petitioner respectfully requests that the Board institute review.

IV. STATUTORY GROUNDS FOR THE CHALLENGES

Ground 1	Anticipation of Claims 1-9 and 12-20 based on Grotmol
Ground 2	Obviousness of claims 10 and 11 based on Grotmol in view of the knowledge of a POSITA.

Ground 3	Obviousness of Claims 4 and 11 based on Grotmol in view of Hickman.
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V. LEVEL OF ORDINARY SKILL IN THE ART

A person having ordinary skill in the art (“POSITA”) relevant to the ’974 patent as of November 2, 2016—the earliest possible priority date of the ’974 patent—would have at least: (1) a bachelor’s degree in electrical engineering, computer engineering, computer science, systems engineering, or equivalent course work with two to three years of work experience in computer vision, image/video processing, and/or machine learning; or (2) a master’s degree in electrical engineering, computer engineering, computer science, systems engineering, or equivalent course work with a focus in computer vision, image/video processing, and/or machine learning. Decl. ¶¶ 40-42.

VI. CLAIM CONSTRUCTION

The Petition applies the ordinary and customary meaning of the claim terms. Where appropriate, Petitioner explains the meaning of claim terms in its analysis of how the prior art anticipates and/or renders obvious the challenged claims.

A. “means for generating or receiving”; “means for anticipating”; and “means for executing” (claim 19)

Claim 19 requires a “means for generating or receiving a third circumstance representation,” a “means for anticipating the first one or more instruction sets,” and

a “means for executing ... the first one or more instruction sets.” The ’974 patent specification describes that a corresponding structure for performing these claimed functions is one or more processor circuits. Ex. 1001, 16:63-17:29 (stating that the system includes “one or more processor circuits” that perform the functions of receiving object representations detected by a sensor, anticipating the first one or more instruction sets, and executing the first one or more instruction sets.); 17:40-18:8; claim 1 (requiring that one or more processor circuits perform the generating/receiving, anticipating, and executing steps). Dependent claim 20 of the ’974 patent confirms that a corresponding structure for these functions is one or more processor circuits. *Id.*, 174:48-59. Decl. ¶ 58.

VII. OVERVIEW OF THE ’974 PATENT

The ’974 patent was filed on November 2, 2016 and does not claim priority to any earlier-filed application.

The ’974 patent relates to “devices, systems, methods, and/or applications for learning a device's operation in various circumstances, storing this knowledge in a knowledgebase (i.e. neural network, graph, sequences, etc.), and enabling autonomous operation of the device.” Ex. 1001, Abstract. The ’974 patent describes a method of automation comprising “learning a device’s circumstances including objects with various properties along with correlated instruction sets for operating the device, storing this knowledge in a knowledgebase ... and operating a device

autonomously.” Ex. 1001, 57:49-57. The ’974 patent refers to this approach as “device’s circumstances for autonomous device operation,” or “DCADO.” *Id.*, 57:49-63. Figure 32, copied below, illustrates this functionality.

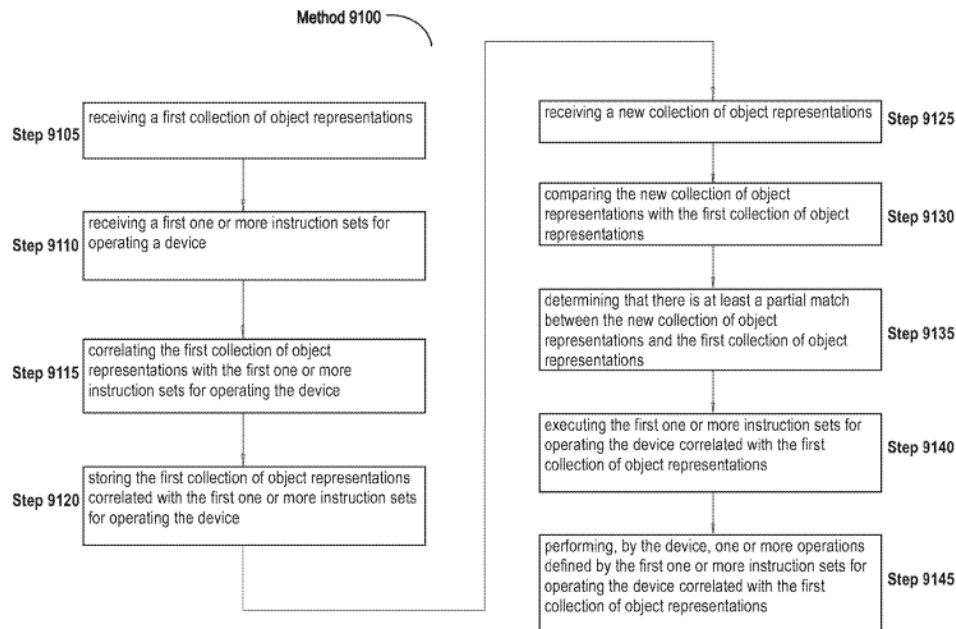


FIG. 32

Ex. 1001, Fig. 32

The ’974 patent further describes that the DCADO functionality can be implemented on a “Server 96 accessible over Network 95,” such that “[a]ny number of Devices 98 may connect to such remote DCADO Unit 100 and the remote DCADO Unit 100 may learn their operations in circumstances including objects with various properties. In turn, any number of Devices 98 can utilize the remote DCADO Unit 100 for autonomous operation in circumstances including objects with various properties.” Ex. 1001, 95:14-22.

During prosecution of the '974 patent, the claims were allowed over Schnittman (U.S. 2016/0167226). The inventor submitted a statement after allowance that the “training in Schnittman is different than the process recited in [the claims] because training in Schnittman does not include a user at least partially operating a device...and what is learned in the training in Schnittman is different than what is learned in the learning process recited by [the claims].” Ex. 1007 at 7/18/2019 Comments on Statement of Reasons for Allowance. As detailed below, Grotmol discloses training in which a user operates a robotic device, and what is learned during the training includes images (circumstance representations) correlated with motor commands (instruction sets) as claimed in the '344 patent.

VIII. OVERVIEW OF THE PRIOR ART

A. Grotmol

Grotmol is a U.S. patent filed on January 27, 2015, which issued on March 28, 2017. Grotmol is prior art under at least 35 U.S.C. §§ 102(a), (d).

Grotmol relates to “[a]n apparatus and methods for training and/or operating a robotic device to follow a trajectory.” Ex. 1004, Abstract. Grotmol describes that “conventional approaches” to training a robot entailed a user “first control[ing] the robot one time or multiple times to move along the desired path.” *Id.*, 1:62-67. That would constitute the “training of the robot,” and thereafter, the robot would perform the same navigation autonomously. *Id.*, 1:67-2:2. A “typical approach” was to store

the motor commands executed by a user during training then “simply replay them.” *Id.*, 2:3-5. Grotmol then describes its own approach, whereby user commands are associated with camera images captured during training, such that during “autonomous operation, an acquired image may be compared with one or more images from the training buffer” to determine how to control the robot. *Id.*, Abstract.

More specifically, Grotmol describes a “listen mode,” in which a robot observes a teacher’s commands in order to “learn an association.” *Id.*, 23:3-11. Grotmol also describes an “override mode,” in which a robot will operate autonomously until a teacher sends a command, in which case the robot will apply the teacher’s command and “try to remember it for the next time the same situation occurs.” *Id.*, 23:12-22. “During training, images (e.g., raw and/or pre-processed) may be stored in a memory buffer (training buffer),” along with “[m]otor commands issued by a trainer corresponding to time instances when the images are acquired.” *Id.*, 39:13-22. The robot may then switch—either manually or automatically—into an “autonomous mode,” in which the robot performs tasks autonomously based on what it has learned. *Id.*, 23:46-48, 24:1-16. “During autonomous operation, control process of the robot may be configured to compare a given (e.g., the most recent, current) image with one or more the images from the training buffer.” *Id.*, 39:23-28. “In some implementations, motor commands at a given time step may be obtained

by taking the stored motor commands from the training buffer that may correspond to the best matching stored image.” *Id.*, 43:5-9.

Grotmol further teaches that a robot’s “trained configuration may be stored” and “loaded to one or more other robots in order to provide learned behaviors.” Ex. 1004, 33:12-35.

B. Hickman

Hickman is a U.S. patent filed on May 4, 2012, which issued on January 28, 2014. Hickman is prior art under at least 35 U.S.C. §§ 102(a) and 102(d). Hickman is cited in Grotmol. Ex. 1004.002.

The disclosure of Hickman relates to “shared robot knowledge bases for use with cloud computing systems.” Ex. 1005, Abstract. Hickman teaches a method whereby “information in the shared robot knowledge bases is updated based on robot experiences so that any particular robot may benefit from prior experiences of other robots.” *Id.* One embodiment of Hickman’s shared robot knowledge base is illustrated in Figure 4, copied below. *Id.*, 25:3-27:26 (describing figure).

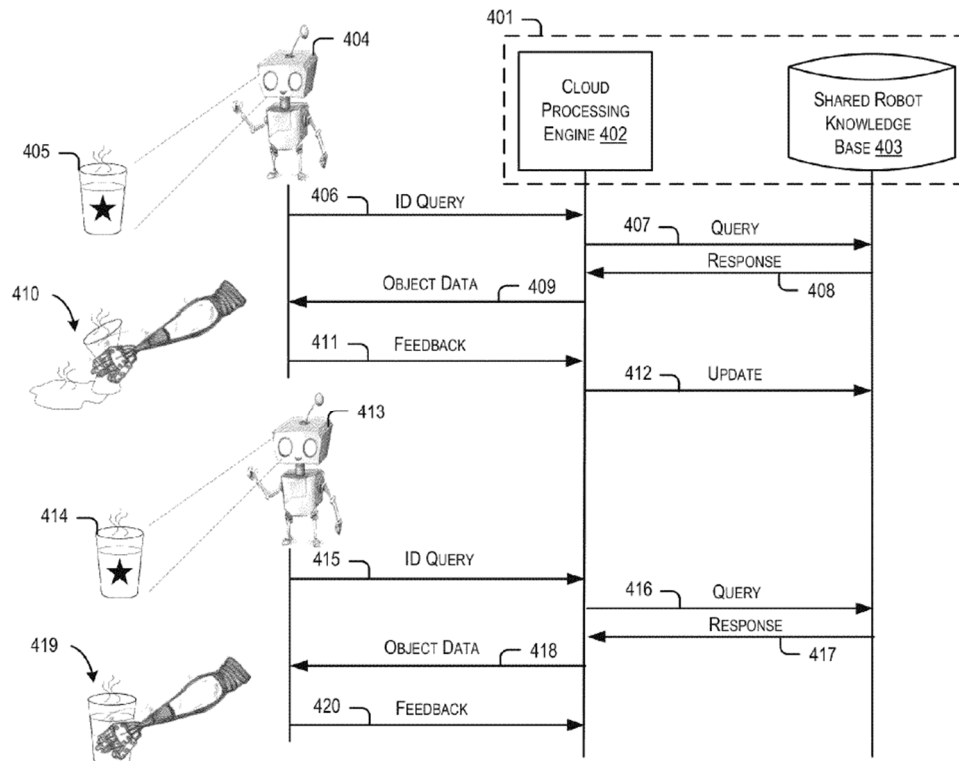


FIGURE 4

Ex. 1005, Fig. 4

As shown above, a first robot 404 encounters an object 405 and obtains image data associated with it. *Id.*, 25:14-26. The first robot attempts to grasp the object but crushes it (410). *Id.*, 26:38-56. “When an accident happens, a human can ‘coach’ the robot on how much force to use by, for example, manually controlling the robot’s hand.” *Id.* “The cloud processing system 402 can then update” with this new training. *Id.* Later, a second robot may encounter an object 414 with similar image data to object 405. *Id.*, 26:57-27:6. The second robot may attempt to grasp the new object—but with less force based on the updated training data from the first robot—and this time be successful. *Id.*, 26:66-27:26.

IX. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1

Grotmol anticipates claims 1-9 and 12-20.

1. Claim 1

- a. **[1.1] A method implemented using a computing system that includes one or more processor circuits, the method comprising:**

To the extent the preamble is limiting, Grotmol discloses a method implemented using a “self-contained robotic apparatus” (system) that includes “*one or more physical processors.*”¹ Ex. 1004, 3:27-30; *see also id.*, 2:14-18, 7:30-42; Decl. ¶¶ 65-66. Grotmol discloses “[a] method of determining a control signal for a robot, ... being performed by a special purpose computing platform having one or more processors . . .” *Id.*, claim 1. Grotmol defines “processor” as follows:

As used herein, the terms “processor”, “microprocessor” and “digital processor” are meant generally to include all types of digital processing devices including, without limitation, digital signal processors (DSPs), reduced instruction set computers (RISC), general-purpose (CISC) processors, microprocessors, gate arrays (e.g., field programmable gate arrays (FPGAs)), PLDs, reconfigurable computer fabrics (RCFs), array processors, secure microprocessors, and application-specific integrated circuits (ASICs). Such digital processors may be contained on a single unitary IC die, or distributed across multiple components.

Id., 8:5-15.

¹ All emphasis added, unless otherwise noted.

- b. [1.2] accessing a memory that stores at least a knowledgebase that includes: a first correlation including a first circumstance representation correlated with a first one or more instruction sets for operating a first device and a second correlation including a second circumstance representation correlated with a second one or more instruction sets for operating the first device, wherein the first circumstance representation represents a first circumstance detected at least in part by one or more sensors of the first device and the second circumstance representation represents a second circumstance detected at least in part by the one or more sensors of the first device,

Grotmol discloses limitation [1.2]. Decl. ¶¶ 67-73.

Grotmol discloses a “memory component may be configured to store training sets,” where “[a] given training set may comprise an instance of the video frame, an instance of the binary signal, and an instance of a motor control indication configured to cause the robot to execute an action.” Ex. 1004, 3:27-39; Abstract (“[R]obotic vehicle may utilize a camera and stores the sequence of images of a visual scene seen when following a trajectory during training in an ordered buffer. Motor commands associated with a given image may be stored.”); *see also id.*, 3:31-39, 8:66-9:3, 10:23-26, 38:36-58, 39:13-22. Thus, Grotmol discloses a memory that

stores a knowledgebase² including multiple correlations (training sets), where each correlation includes a “circumstance representation”³ (image of scene from a robot vehicle’s operation) correlated with an “instruction set[] for operating a first device”⁴ (motor control indication configured to cause the robot to execute an action).

The images in Grotmol are “associated with” or “correspond to”—*i.e.*, are correlated with⁵—motor control indications issued around the same time. Decl. ¶ 68. Grotmol describes training behaviors in a robotic device by “learning of

² The ’974 patent states that a “[k]nowledgebase 530 may be or include *any data structure or arrangement* capable of storing the knowledge of a devices’s operation in circumstances including objects with various properties.” Ex. 1001, 102:8-12.

³ The ’974 patent specification does not define or even contain the term “circumstance representation.” The phrase “collection of object representations,” is described generally as “one or more representations of objects detected by the sensor at a time.” Ex. 1001, 3:31-33. The “sensor” that detects the object representations may include a “[c]amera ... for capturing one or more pictures” or a “motion picture camera that can capture streams of pictures.” *Id.*, 69:45-56.

⁴ The ’974 patent describes that “an instruction set may be used or executed by a logic circuit ... [or] actuator in operating a device” Ex. 1001, 152:1-7. An instruction set can be “received from a processor, application program, logic circuit, and/or other processing element,” “from memory [], hard drive, or any other storage element or repository,” or “over a network such as Internet, local area network, wireless network, and/or other network.” *Id.*, 152:10-29. “In general, an instruction set can be received by any element of the system.” *Id.*, 152:33-34. “Instruction Set 526 may include one or more instructions or commands of a high-level programming language such as Java or SQL... and/or *any other language or construct.*” *Id.*, 93:27-32.

⁵ The ’974 patent describes that a device may “correlate a Collection of Object Respresentations 525 with one or more *temporally corresponding* Instruction Sets”). *Id.*, 99:11-14.

associations between sensory context . . . and a respective action . . . during training.” Ex. 1004, 33:59-62; Abstract (“Motor commands *associated with* a given image may be stored.”). This association may be based on the timing of the images and the motor commands. *Id.*, 39:17-19 (“Motor commands issued by a trainer *corresponding to* time instances when the images are acquired may be stored.”); 43:5-9 (“[M]otor commands at a given time step may be obtained by taking the stored motor commands from the training buffer that may *correspond to* the best matching stored image.”).

Grotmol discloses that circumstance representations (images) represent circumstances detected by a sensor of the first device. Specifically, Grotmol discloses the video frame instances are detected by a “sensor component” of the robotic vehicle. *Id.*, 3:31-33 (“The first sensor component may be configured to provide a signal conveying a video frame comprising a plurality of pixels.”); Abstract (“A robotic vehical may utilize a camera and stores the sequence of images of a visual scene seen when following a trajectory during training in an ordered buffer.”). As depicted in Figure 8 of Grotmol, the “memory” of Grotmol is connected to the “sensory” functionality through the “processing” functionality. *See* Ex. 1004, 9:1-3 (“[T]he output provided by the sensor component 166 may comprise a stream of pixel values associated with one or more digital images.”). Both Grotmol and the ’974 patent disclose that digital images may come from, for example, a CCD image

sensor in the form of color encoded pixels. *Compare* Ex. 1001, 69:67-70:5, 112:24-32 *with* Ex. 1004, 9:8-22. Grotmol further discloses that these pixels are used for object (or circumstance) recognition. Ex. 1004, 8:66-9:3 (“In one or more implementations, such as object recognition, and/or obstacle avoidance, the output provided by the sensor component 166 may comprise a stream of pixel values associated with one or more digital images.”).

Grotmol further discloses accessing the training sets stored in the memory component to perform autonomous operation. *Id.*, Abstract (“During autonomous operation, an acquired image may be compared with one or more images from the training buffer in order to determine the most likely match.”); 39:23-28 (“During autonomous operation, control process of the robot may be configured to compare a given (e.g., the most recent, current) image with *one or more* the images from the training buffer.”).

Accordingly, Grotmol discloses accessing a memory that stores the claimed knowledgebase. Decl. ¶¶ 67-73.

- c. **[1.3] and wherein at least a portion of the first correlation and at least a portion of the second correlation are learned in a learning process that includes operating the first device at least partially by a user;**

Grotmol discloses limitation [1.3]. Decl. ¶ 74.

Grotmol discloses that a human (“user”⁶) can operate the robot during a training process and “[t]rained behaviors of the robotic device may be configured based on *learning* of associations between sensory context (e.g., presence of an obstacle in front of the robotic vehicle) and a respective action (e.g., right turn) during training.” Ex. 1004, 33:59-62. In both the “listen mode” and “override mode,” Grotmol teaches that the robot will listen to commands sent by a trainer (user) “and try to remember it for the next time the same situation occurs.” *Id.*, 23:3-29; 24:55-25:5 (“While training a particular behavior, the *user* may concentrate on a particular behavior and may not show any examples of other behaviors thus making a prediction task for the classifier substantially easier (e.g., less computationally intensive).”); 34:50-55 (“In some implementations of supervised training of robots, control instructions (also referred to as corrections) produced by the *trainer* (e.g., human) may be combined with control instructions produced by the robot controller instructions (predictions).”). Grotmol describes this training as a learning process. *E.g., id.*, 24:17-20 (“Apparatus and methods for hierarchical *learning* are disclosed herein, in accordance with one or more implementations. In *supervised learning*, a user may train simple tasks by demonstrating example tasks to the system.”); claim 12 (reciting “one or more physical processors configured to operate a random k-

⁶ “User 50 (also referred to simply as user or other suitable name or reference) comprises a human user or non-human user.” Ex. 1001, 68:22-24.

nearest neighbors *learning process*”). Accordingly, Grotmol discloses a first correlation and a second correlation are learned during a learning process in which a user operates the first device. Decl. ¶ 74.

d. **[1.4] generating or receiving a third circumstance representation, wherein the third circumstance representation represents a third circumstance detected at least in part by the one or more sensors of the first device or at least in part by one or more sensors of a second device;**

Grotmol discloses limitation [1.4]. Decl. ¶¶ 75-77.

Grotmol discloses that its processor or a feature of an application running thereon receives additional digital pictures from the camera over time. Ex. 1004, 38:36-39 (“In some implementations, the robot may comprise a robotic vehicle (e.g., 160 in FIG.1) comprising a camera (e.g., 166). The robot may comprise a controller configured to store a *sequence of images* obtained during training phase.”); 39:23-28 (“During autonomous operation, control process of the robot may be configured to compare a given (e.g., the most recent, current) image with *one or more* the images from the training buffer.”). In Grotmol, “the most recent, current” image corresponds to the claimed “third circumstance representation” and it is compared to the stored images in the training buffer (the claimed first and second circumstance representations). Decl. ¶¶ 75-76. Furthermore, Grotmol discloses that the “most recent, current” image (*i.e.*, third circumstance representation) can be detected by a camera of the robot that was used during the training mode (*i.e.*, first device), or it

can be detected by the camera of a different robot (*i.e.*, second device). Decl. ¶ 76; *see also* Ex. 1004, 33:27-32 (“The trained configuration may be stored. A saved configuration may be loaded into *the robot being trained* thereby providing one or more trained behaviors to the robot. In some implementations, the trained configuration may be loaded to *one or more other robots* in order to provide learned behaviors.”).

Accordingly, Grotmol discloses generating or receiving a third circumstance representation detected by a sensor of the first device or a second device. Decl. ¶¶ 75-77.

- e. **[1.5] anticipating the first one or more instruction sets for operating the first device learned in the learning process based on at least partial match between the third circumstance representation and the first circumstance representation; and:**

Grotmol discloses limitation [1.5]. Decl. ¶¶ 78-79.

Grotmol discloses that “motor commands at a given time step may be obtained by taking the stored motor commands from the training buffer that may correspond to the *best matching* stored image.” Ex. 1004, 43:5-9. Grotmol discloses that the matching step may comprise calculating a similarity measure between a current image and a stored image, then determining whether that similarity measure breaches a threshold (*i.e.*, “at least partial match between the third circumstance representation and the first circumstance representation”).

The method may comprise, based on the comparison, determining a *similarity measure* for a given training set of the plurality of training feature sets. The similarity measure may characterize similarity between features of the subset and features of the given training set. The method may comprise, responsive to the similarity measure *breaching a threshold*, selecting one or more training sets from the plurality of training sets. The method may comprise determining one or more potential control signals for the robot.

Id., 2:30-38; *see also id.*, 39:13-41, 40:64-41:18. As used in Grotmol, “the term feature may be used to describe one or more integer or floating point values characterizing the input, e.g., the presence or absence of an edge, corner, shape, texture, color, object, at particular locations in the image, *values of pixels in an image*, patches of color texture, brightness in the image, and/or in the image as a whole” *Id.*, 28:19-24. As used in Grotmol, a “training set” may comprise “an instance of the video frame, an instance of the binary signal, and an instance of a motor control indication configured to cause the robot to execute an action.” *Id.*, 3:35-39.

Both Grotmol and the '974 patent disclose that determining a “partial match” may comprise pixel-wise difference analysis between two digital pictures. *Compare* Ex. 1001, 66:24-28 (discussing “matching”), 73:21-54 (discussing object detection and recognition by “comparing regions of pixels”) *with* Ex. 1004, 3:13-15 (“The first input type may comprise a digital image comprising a plurality of pixel values.”), 41:8-17 (“A similarity metric . . . may be determined by performing pixel-wise

difference between the overlapping regions (e.g., the frames 2020, 2040 in FIG. 20B) of the given image and the matching image.”).

Accordingly, Grotmol discloses anticipating an instruction set for operating the first device learned in the learning process based on a partial match between the third circumstance representation and the first circumstance representation. Decl. ¶¶ 78-79.

- f. **[1.6] at least in response to the anticipating, executing the first one or more instruction sets for operating the first device learned in the learning process, wherein the first device or the second device autonomously performs one or more operations defined by the first one or more instruction sets for operating the first device learned in the learning process.**

Grotmol discloses limitation [1.6]. Decl. ¶¶ 80-82.

As described above for limitation [1.5], Grotmol discloses anticipating the learned instruction sets for operating the device by comparing a new image with a stored image at least by matching portions of the images and determining whether those matching portions exceed a threshold number. Decl. ¶¶ 78-79. Grotmol further discloses “executing the first one or more instruction sets for operating the first device learned in the learning process” in response to the “anticipating.” Grotmol describes that after it is determined that the similarity measure between the new image and image from the training set breaches a threshold, one or more potential control signals corresponding to the image from the training set that were obtained

during a training operation of the robot (the instruction sets correlated with the first digital picture) are determined and executed.

The method may comprise, responsive to the similarity measure breaching a threshold, selecting one or more training sets from the plurality of training sets. The method may comprise determining one or more potential control signals for the robot. Individual ones of the one or more potential control signals may be associated with a corresponding training set of the plurality of training sets. . . . In some implementations, the control signal may be configured *to cause the robot to execute the action*.

Ex. 1004, 2:34-41, 3:12-13; *see also id.*, 43:4-11 (“In some implementations, motor commands at a given time step may be obtained by taking the stored motor commands from the training buffer that may correspond to the best matching stored image.”).

Grotmol discloses that the robot (first device) autonomously performs the operations defined by the first instruction set for operating the device. Ex. 1004, 34:56-62 (“In some implementations, the trainer may be provided with the control of the robot during training. Upon completion of the training, the robot may be configured to operate autonomously.”); Abstract (“During autonomous operation, an acquired image may be compared with one or more images from the training buffer in order to determine the most likely match.”); 43:4-11 (“In some implementations, motor commands at a given time step may be obtained by taking the stored motor commands from the training buffer that may correspond to the best matching stored image.”). Grotmol further discloses that training sets for performing

autonomous operation may be loaded into the robot used for training (*i.e.*, first device), or may be loaded into another robot (*i.e.*, second device), and therefore, discloses that a first device or a second device autonomously performs the operations defined by the instructions stored in the training set. *Id.*, 33:21-32.

Accordingly, Grotmol discloses executing the instruction set for operating the first device learned in the learning process, where the first device or the second device autonomously performs an operation defined by the instruction set. Decl. ¶¶ 80-82.

2. Claim 2

Grotmol discloses claim 2 that depends from claim 1 and requires “the knowledgebase further includes: a first knowledge cell and a second knowledge cell, and wherein the first knowledge cell includes the first correlation and the second knowledge cell includes the second correlation.” Decl. ¶¶ 83-87.

The '974 patent describes that a “knowledge cell” may “compris[e] the first collection of object representations correlated with the first one or more instruction sets for operating the device.” Ex. 1001, 7:21-27. “Knowledge Cell 800 comprises the functionality for storing one or more Collections of Object Representations 525 correlated with any Instruction Sets 526 and/or Extra Info 527. Knowledge Cell 800 includes knowledge (*i.e.* unit of knowledge, etc.) of how Device 98 operated in a circumstance including objects with various properties.” Ex. 1001, 98:19-24. “Once

created or generated, Knowledge Cells 800 can be used in/as neurons, nodes, vertices, or other elements in any of the data structures or arrangements (i.e. neural networks, graphs, sequences, etc.) used for storing the knowledge of Device's 98 operation in circumstances including objects with various properties, thereby facilitating learning functionalities herein." Ex. 1001, 98:24-31. "Knowledge Cell 800 may include any data structure or arrangement that can facilitate such storing." Ex. 1001, 98:52-54.

The '974 patent further describes that "[k]nowledge cells may be connected, interrelated, or interlinked into knowledge structures using statistical, artificial intelligence, machine learning, and/or other models or techniques." Ex. 1001, 153:66-154:2. "In some embodiments, Knowledge Structuring Unit 520 may correlate a Collection of Object Representations 525 with one or more temporally corresponding Instruction Sets 526 and/or Extra Info 527." *Id.*, 99:11-14.

Grotmol discloses the claimed "knowledgebase" that comprises "a first knowledge cell" and a "second knowledge cell." Decl. ¶¶ 83-87. For example, Grotmol describes storing sequences of images and the corresponding instruction sets (*i.e.*, a sequence of knowledge cells). Ex. 1004, Abstract ("Motor commands associated with a given image may be stored."); *see also id.*, 38:21-42. Grotmol further discloses that its training data is stored as a "sequence" and may be stored in "an ordered buffer in a non-volatile memory." Ex. 1004, 38:39-42. An ordered buffer

is a region of memory that is allocated for storing data in a specific order or sequence. Decl. ¶ 84. Grotmol describes that the training buffer may be ordered according to when the images were acquired. *See* Ex. 1004, 39:65-40:4; Decl. ¶ 86; *see also* Ex. 1004, 39:17-19 (“Motor commands issued by a trainer corresponding to time instances when the images are acquired may be stored.”). The training data stored in memory in a sequence corresponds to the claimed “knowledge cells.”

Furthermore, as explained with respect to limitations [1.2] and [1.3] of claim 1, Grotmol discloses that multiple images may be acquired during a training process, with images respectively stored in association with corresponding motor commands issued at the time the image was acquired. Decl. ¶¶ 67-74. Thus, Grotmol discloses first, second, third, etc. knowledge cells, where each knowledge cell includes the correlation. Decl. ¶¶ 83-87.

3. Claim 3

Grotmol discloses claim 3 that depends from claim 1 and requires “wherein the learning process includes: creating, inserting, deleting, modifying, or manipulating an element of the first correlation, or creating, inserting, deleting, modifying, or manipulating an element of the second correlation.” Decl. ¶¶ 88-90.

As described above with respect to claim 1, Grotmol discloses a learning process that includes operating the first device at least partially by a user. *See supra* limitation [1.3]. As part of this learning process, Grotmol discloses various

manipulations of “element[s]”⁷ of the first or second correlations (training sets). Decl. ¶¶ 74, 88-89. For example, Grotmol discloses creating new video frames that are inserted into training sets. Ex. 1004, Abstract (“A robotic vehicle may utilize a camera and stores the sequence of images of a visual scene seen when following a trajectory during training in an ordered buffer. Motor commands associated with a given image may be stored.”); *see also* 3:31-39, 39:13-28. Grotmol also discloses insertion of user specified instructions into the training sets that modify existing instruction sets. *Id.*, 34:50-55 (“In some implementations of supervised training of robots, control instructions (also referred to as corrections) produced by the trainer (e.g., human) may be combined with control instructions produced by the robot controller instructions (predictions).”).

Accordingly, Grotmol discloses that the learning process includes creating and inserting an element of the first and second correlations. Decl. ¶¶ 88-90.

4. Claim 4

- a. **[4.1] The method of claim 1, wherein the learning process includes: generating or receiving the first circumstance representation, and generating or receiving the second circumstance representation; and,**

Grotmol discloses limitation [4.1]. Decl. ¶ 91.

⁷ Petitioner understands that the plain meaning of “an element” of the first or second correlations includes a “circumstance representation” or “one or more instruction sets for operating a first device.” *See supra* limitation [1.2].

As described above for limitations [1.2] and [1.3], Grotmol discloses a learning process that results in a memory storing multiple correlations (training sets), where each correlation includes a “circumstance representation” (image of scene from a robot vehicle’s operation) correlated with an “instruction set[] for operating a first device” (motor control indication configured to cause the robot to execute an action). Decl. ¶¶ 67-74. The images are generated by a camera during a training process and are received by the memory. Ex. 1004, Abstract (“A robotic vehical may utilize a camera and stores the sequence of images of a visual scene seen when following a trajectory during training in an ordered buffer.”); *see also* 3:31-39, 8:66-9:3, 10:23-26, 38:36-58, 39:13-22.

b. [4.2] obtaining or receiving the first one or more instruction sets for operating the first device, and obtaining or receiving the second one or more instruction sets for operating the first device,

Grotmol discloses limitation [4.2]. Decl. ¶ 92.

As described above for limitations [1.2] and [1.3], Grotmol discloses a learning process in which multiple correlations (training sets) are stored in memory, where each correlation includes a “circumstance representation” (image of scene from a robot vehicle’s operation) correlated with an “instruction set[] for operating a first device” (motor control indication configured to cause the robot to execute an action). Decl. ¶¶ 67-77. The motor commands are issued by a trainer and are received by the memory during the training process. Ex. 1004, 39:13-22 (“Motor commands

issued by a trainer corresponding to time instances when the images are acquired may be stored”); *see also* Abstract, 3:36-39.

- c. **[4.3] and wherein the knowledgebase further includes a fourth correlation including a fourth circumstance representation correlated with a fourth one or more instruction sets for operating the second device, and wherein the fourth circumstance representation represents a fourth circumstance detected at least in part by the one or more sensors of the second device, and wherein at least a portion of the fourth correlation is learned in another learning process that includes: generating or receiving the fourth circumstance representation; and obtaining or receiving the fourth one or more instruction sets for operating the second device.**

Grotmol discloses limitation [4.3]. Decl. ¶¶ 93-94.

As described above with respect to limitations [1.2] and [1.3] of claim 1, Grotmol discloses that multiple images may be acquired, with images respectively stored in association with corresponding motor commands issued at the time the image was acquired. *See e.g.*, Ex. 1004, 3:31-39, 16:4-12, 24:17-23, 24:49-55. Accordingly, Grotmol discloses first, second, third, fourth, etc. correlations, where each correlation includes a circumstance representation correlated with an instruction for operating the robotic device. Decl. ¶¶ 67-74.

Grotmol also discloses that the training sets and training configurations from a robot (which include the instruction sets for operating first device) can be “stored” or “saved.” Ex. 1004, 33:12-58 (discussing saved training configurations). The saved

training configuration may then be “loaded into the robot being trained thereby providing one or more trained behaviors to the robot.” *Id.*, 33:27-30. Further, the “trained configuration may be loaded to one or more *other robots* in order to provide learned behaviors.” *Id.*, 33:30-32. Thus, Grotmol discloses that the memory component of a first robot can store the claimed first and second correlations as well as a fourth correlation learned in another learning process involving the operation of a second robot—*i.e.*, a circumstance detected by the sensor of a second robot correlated with instructions for operating that second robot. Decl. ¶¶ 93-94.

5. Claim 5

Grotmol discloses claim 5 which depends from claim 1 and requires that anticipating based on a partial match between the first and third circumstance representations includes “determining that a number of at least partially matching portions of the third circumstance representation and portions of the first circumstance representation exceeds a threshold number, or determining that a percentage of at least partially matching portions of the third circumstance representation and portions of the first circumstance representation exceeds a threshold percentage.” Decl. ¶ 95.

As described above, Grotmol discloses limitation [1.5] that requires anticipating an instruction set for operating the first device based on a partial match between a third circumstance representation and a first circumstance representation.

See e.g., Ex. 1004, 43:5-9 (“In some implementations, motor commands at a given time step may be obtained by taking the stored motor commands from the training buffer that may correspond to the best matching stored image.”); Decl. ¶¶ 78-79. Grotmol discloses that the control process for autonomous operation may involve comparing a current image (*i.e.*, third circumstance representation) with an image from the training buffer (*i.e.*, first circumstance representation), and further discloses that determining a control signal for operation of the robot may involve computing a similarity measure for a given training set and another training set, and determining whether that similarity measure exceeds a threshold. Ex. 1004, 3:13-15; 3:35-58, 4:30-39, 39:23-41, 41:8-17, 43:5-9. Thus, Grotmol discloses determining that a number of at least partially matching portions of the third circumstance representation and portions of the first circumstance representation exceeds a threshold number. Decl. ¶ 95.

6. Claim 6

Grotmol discloses claim 6 that depends from claim 1 and requires “wherein the at least the portion of the first correlation and the at least the portion of the second correlation are learned in the learning process while the user operates the first device, and wherein the one or more operations defined by the first one or more instruction sets for operating the first device learned in the learning process correspond to the

user's methodology of operating the first device learned in the learning process.” Decl. ¶¶ 96-97.

As described above with respect to limitations [1.2] and [1.3], the first and second correlations are learned during a training process that involves a user operating the robotic vehicle. *See e.g.*, Ex. 1004, Abstract (“A robotic vehicle may utilize a camera and stores the sequence of images of a visual scene seen when following a trajectory during training in an ordered buffer. Motor commands associated with a given image may be stored.”); *see also* 3:27-39, 8:66-9:3, 10:23-26, 38:36-58, 39:13-22; Decl. ¶¶ 67-74. The operations learned during the training process correspond to the user’s methodology of operating the robotic vehicle. Ex. 1004, 33:21-24 (“Training of the robot’s controller may be based on the user observing [the] robot’s actions and sending one or more target control commands to the robot via the training handset.”); *see also* 12:16-17, 23:3-11, 24:17-23, 34:50-59, 39:17-19.

Accordingly, Grotmol discloses that portions of the first and second correlation are learned in a learning process while a user operates the first device, and the learned instructions correspond to the user’s methodology of operating the device. Decl. ¶¶ 96-97.

7. Claim 7

- a. [7.1] The method of claim 1, wherein the knowledgebase further includes a fourth correlation including a fourth circumstance representation correlated with a fourth one or more instruction sets for operating: the first device, the second device, or a third device,

Grotmol discloses limitation [7.1]. Decl. ¶¶ 98-99.

As described above with respect to limitations [1.2] and [1.3], Grotmol discloses that multiple images may be acquired, with images respectively stored in association with corresponding motor commands issued at the time the image was acquired. Accordingly, Grotmol discloses first, second, third, fourth, etc. correlations, where each correlation includes a circumstance representation correlated with an instruction for operating the robotic device. Decl. ¶¶ 67-74.

Grotmol discloses that the training sets and training configurations from a first robot (which include the instruction sets for operating first device) can be “stored” or “saved.” Ex. 1004, 33:12-58 (discussing saved training configurations). The saved training configuration may then be “loaded into the robot being trained thereby providing one or more trained behaviors to the robot.” *Id.*, 33:27-30. Further, the “trained configuration may be loaded to one or more *other robots* in order to provide learned behaviors.” *Id.*, 33:30-32. Thus, Grotmol discloses a second and third device (“one or more other robots”) that can autonomously perform one or more operations defined by one or more instruction sets for operating the first device training

configuration from first robot (*e.g.*, training sets with circumstance representations correlated to instruction sets) that is loaded into a second or third other robots to “provide learned behaviors.” Decl. ¶¶ 98-99.

b. **[7.2] and wherein a first connection is generated to connect the first correlation with the second correlation, and wherein a second connection is generated to connect the second correlation with the fourth correlation.**

Grotmol discloses limitation [7.2]. Decl. ¶¶ 100-101.

The '974 patent describes that “[k]nowledge cells [*containing correlations (see supra claim 2)*] may be *connected*, interrelated, or interlinked into knowledge structures using statistical, artificial intelligence, machine learning, and/or other models or techniques.” Ex. 1001, 153:66-154:2; *See supra* claim 2.

Grotmol discloses these “connections” between the the correlations in the knowledgbase. Decl. ¶ 101. For example, Grotmol describes storing sequences of images with their corresponding instruction sets (*i.e.*, a sequence of knowledge cells). Ex. 1004, Abstract (“Motor commands associated with a given image may be stored.”); 38:21-42 (“The robot may comprise a controller configured to store a sequence of images obtained during training phase. In some implementations, the images may be stored in an ordered buffer in a non-volatile memory...”). An ordered buffer is a region of memory that is allocated for storing data in a specific order or sequence. Decl. ¶ 101. Grotmol describes that the training buffer may be ordered

temporally, according to when the images were acquired. *See* Ex. 1004, 39:65-40:4; Decl. ¶ 101; *see also* Ex. 1004, 39:17-19 (“Motor commands issued by a trainer corresponding to time instances when the images are acquired may be stored.”). Grotmol also describes alternative ways to order the training buffer, such as “particle filtering,” in which images “may be moved to a nearby location in the training buffer where the stored image matches closely with the newly arrived image,” and ordering at random. *See* Ex. 1004, 39:42-40:19; Decl. ¶ 101.

The training data stored in memory in an order or sequence corresponds to the claimed first and second “connections” between the first and second correlations, and the second and fourth correlations. Decl. ¶¶ 100-101.

8. Claim 8:

- a. **[8.1] The method of claim 1, further comprising: modifying the first one or more instruction sets for operating the first device learned in the learning process or a copy of the first one or more instruction sets for operating the first device learned in the learning process,**

Grotmol discloses limitation [8.1]. Decl. ¶¶ 102-104.

Grotmol discloses that autonomous operation of a robot may include modifying the instruction set to compensate for, e.g., “position mismatch” and “orientation mismatch.” Ex. 1004, 42:46-43:3; *see also id.*, Abstract (“An evaluation may be performed in order to determine if the image may correspond to a shifted (e.g., left/right) version of a stored image as previously observed. If the new image

is shifted left, right turn command may be issued. If the new image is shifted right then left turn command may be issued.”). For example, Grotmol discloses that the “motor commands at a given time step may be obtained by taking the stored motor commands from the training buffer that may correspond to the best matching stored image,” and “[t]hose motor commands may be combined with the output from the PID controller in order to stabilize operation of the robot.” *Id.*, 43:5-11. Thus, Grotmol discloses that the “first one or more instruction sets for operating the first device” are “modified.” Decl. ¶¶ 102-104.

- b. **[8.2] and wherein the executing the first one or more instruction sets for operating the first device learned in the learning process includes executing the modified the first one or more instruction sets for operating the first device learned in the learning process or the modified the copy of the first one or more instruction sets for operating the first device learned in the learning process, and wherein the performing, by the first device or by the second device, the one or more operations defined by the first one or more instruction sets for operating the first device learned in the learning process includes performing, by the first device or by the second device, one or more operations defined by the modified the first one or more instruction sets for operating the first device learned in the learning process or by the modified the copy of the first one or more instruction sets for operating the first device learned in the learning process.**

Grotmol discloses limitation [8.2]. Decl. ¶ 105.

As described above for limitations [1.5] and [1.6], Grotmol discloses that an instruction set is anticipated and executed based on a partial match between a stored image (first circumstance representation) and the current, most recent image (second circumstance representation). Decl. ¶¶ 78-82; Ex. 1004, 43:5-9, 2:29-39, 39:13-41, 40:64-41:17, 28:19-24, 41:8-17, 34:50-55, 42:46-43:3, 43:5-11. And as described above for limitation [8.1], Grotmol discloses modifying an instruction set for operating the first device. Decl. ¶¶ 102-104. A POSITA would understand that where a partial match occurs with a stored image that is associated with an instruction, and the instruction is modified, the executed instruction would be the modified instruction and the first or second device would perform the modified instruction. Decl. ¶ 105.

9. Claim 9

Grotmol discloses claim 9 that depends from claim 1 and requires “wherein the knowledgebase further includes a fourth correlation including a fourth circumstance representation correlated with a fourth one or more instruction sets for operating the first device, and wherein the fourth circumstance representation represents a fourth circumstance detected at least in part by the one or more sensors of the first device, and wherein at least a portion of the fourth correlation is learned in another learning process that includes operating the first device at least partially by the user.” Decl. ¶ 106.

As described above with respect to claim 1, Grotmol discloses that multiple images may be acquired, with images respectively stored in association with corresponding motor commands issued at the time the image was acquired. Grotmol further discloses that multiple training processes can be conducted to learn multiple tasks. Ex. 1004, 24:17-67 (describing training of “simple tasks” and “complex tasks,” including behaviors such as “fetch” and “grasping.”), 26:1-20 (describing that “[t]he system may be configured to learn the *second* behavior from the user.”). Thus, Grotmol discloses the knowledgebase includes a fourth correlation, where the fourth correlation includes a circumstance representation detected by sensor of the first device and at least a portion of the fourth correlation is learned in *another* learning process that includes operating the device by the user. Decl. ¶ 106.

10. Claim 12

- a. **[12.1] The method of claim 1, wherein the first circumstance includes one or more objects detected at least in part by the one or more sensors of the first device at a first time or during a first time period, and wherein the second circumstance includes one or more objects detected at least in part by the one or more sensors of the first device at a second time or during a second time period,**

Grotmol discloses limitation [12.1]. Decl. ¶¶ 107-110.

The '974 patent provides examples of objects in pictures such as “person, cat, vehicle, building, street, tree, rock, etc.” Ex. 1001, 72:52-57. The '974 patent further describes various approaches to object recognition, such as “identifying and/or

analyzing object features such as lines, edges, ridges, corners, blobs, regions, and/or their relative positions, sizes, shapes, etc.” *Id.*, 75:1-5.

Similarly, Grotmol discloses that images 2000 and 2010 may “comprise representations of visual field that may be obtained at times $t_1 < t_2$, respectively.” Ex. 1004, 38:54-56. These same images 2000 and 2010 may “comprise *representations* [of] one or more objects, e.g., a tree 2002, a rectangle, a ball 2008, and/or other objects.” *Id.*, 38:56-65.

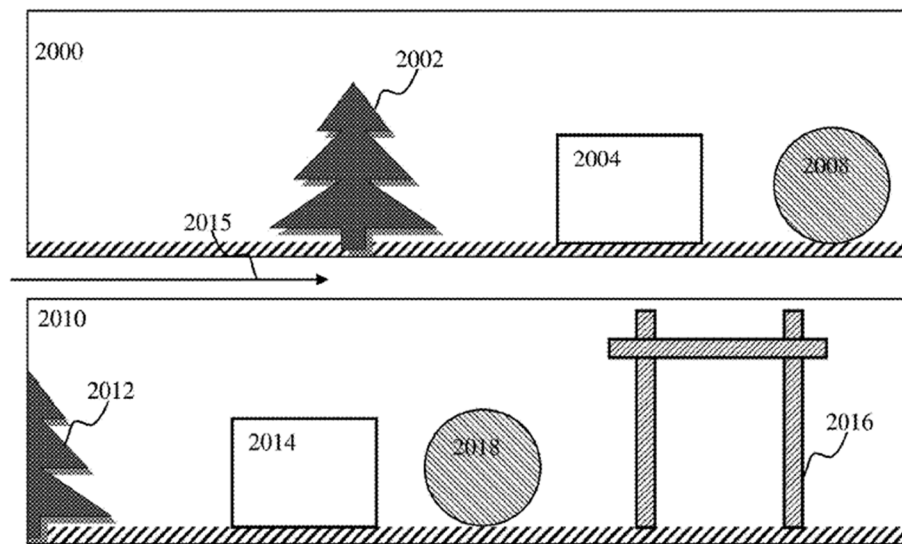


FIG. 20A
Ex. 1004, Fig. 20A

Grotmol likewise discloses that the sensor used to capture these images “may provide information associated with objects within the field-of-view In one or more implementations, such as *object recognition*, and/or obstacle avoidance, the output provided by the sensor component 166 may comprise a stream of pixel values associated with one or more digital images.” Ex. 1004, 8:57-9:13. *See, e.g., id.*, 9:41-

52 (“In one or more implementations, object recognition and/or classification may be implemented”). Grotmol, like the ’974 patent, further includes edge detection. *Id.*, 7:60-63 (“[T]he term feature may refer to a representation of an object edge”).

Grotmol describes that the autonomous operation of a robot may be based in part on recognized objects and their characteristics. *Id.*, 10:23-34 (noting that “tasks of the robot may be configured based on a context” such as “state of the environment (e.g., object size, location)”), 24:31-25:5 (describing embodiment in which a robot is trained to “find an object, grasp it, and bring it back to base”).

- b. **[12.2] and wherein the third circumstance includes: one or more objects detected at least in part by the one or more sensors of the first device at a third time or during a third time period, or one or more objects detected at least in part by the one or more sensors of the second device at a third time or during a third time period.**

Grotmol discloses that limitation [12.2]. Decl. ¶¶ 111-112.

As described above with respect to limitation [1.4] of claim 1, Grotmol discloses “generating or receiving a third circumstance representation, wherein the third circumstance representation represents a third circumstance detected at least in part by the one or more sensors of the first device.” In Grotmol, “the most recent, current” image corresponds to the claimed “third circumstance representation” and

it is compared to the stored images in the training buffer (the claimed first and second circumstance representations). Decl. ¶¶ 75-77.

As described above with respect to limitation [12.1], Grotmol further discloses that captured images include representations of objects and further discloses object detection by the sensor. Decl. ¶¶ 107-110. Accordingly, Grotmol that the third circumstance, like the first and second circumstances, comprises an image that includes one or more objects detected at a third time. Decl. ¶ 111-112.

11. Claim 13

Grotmol discloses claim 13 that depends from claim 1 and requires “wherein the first circumstance representation is a data structure including one or more data about the first circumstance of the first device, and wherein the second circumstance representation is a data structure including one or more data about the second circumstance of the first device, and wherein the third circumstance representation is a data structure including one or more data about: the third circumstance of the first device, or the third circumstance of the second device.” Decl. ¶¶ 113-115.

The '974 patent discusses that “any variety of data structures can be used such as, for example, array, list, linked list, doubly linked list, queue, tree, heap, graph, map, grid, matrix, multi-dimensional matrix, table, database, database management system (DBMS), file, neural network, and/or any other type or form of a data structure including a custom one.” Ex. 1001, 65:45-51.

As discussed above with respect to limitations [1.2] and [1.4] of claim 1, Grotmol discloses the first, second and third circumstance representations comprising video frame instances. Grotmol discloses that a video frame “compris[es] a plurality of pixels.” Ex. 1004, 3:31-33. Thus, the video frames disclosed by Grotmol comprise “data structures” in the context of the ’974 patent because they comprise at least an array, map, grid, or other form of pixels. Decl. ¶¶ 67-73, 75-77. Further, the entire video frame itself also comprises a “data structure” within the context of the ’974 patent because it is file including image data. The ’974 patent explains that a data structure can comprise a single file or field of data. Ex. 1001, 65:51-55 (“A data structure may include *one* or more fields or data fields that are part of or associated with the data structure. A field or data field may include *a data*, an object, a data structure, and/or any other element or a reference/pointer thereto.”) (emphasis added). Further, the ’974 patent states that data structures “can be stored in one or more memories, files, or other repositories,” (*id.*, 65:55-57) just as the video frame instances are stored in the “memory component” of Grotmol. Ex. 1004, 3:27-39.

The video frame instances of Grotmol include “one or more data” about the “circumstance[s] of the first device or second device.” Decl. ¶ 116. The video frame instances are detected by a sensor attached to the first device or a second device, and

capture images of the devices surroundings for use in object detection and avoidance. Ex. 1004, 8:57-9:3, 10:15-26, 38:52-58.

Accordingly, Grotmol discloses the first circumstance representation is a data structure including data about a first circumstance of the first device, the second circumstance representation is a data structure including data about a second circumstance of the first device, and the third circumstance representation is a data structure including data about a third circumstance of the first device or a second device. Decl. ¶¶ 113-116.

12. Claim 14

Grotmol discloses claim 14 that depends from claim 1 and requires “wherein the first circumstance representation includes: one or more object representations, or one or more collections of object representations, and wherein the second circumstance representation includes: one or more object representations, or one or more collections of object representations, and wherein the third circumstance representation includes: one or more object representations, or one or more collections of object representations.” Decl. ¶¶ 117-121.

Grotmol discloses first, second, and third circumstance representations representing first, second, and third circumstances detected at least in part by one or more sensors of the first device. *See supra*, limitations [1.2], [1.4]; Decl. ¶¶ 67-73, 75-77.

The '974 patent does not define “object representations” beyond its use in the phrase “collection of object representations,” which it defines as “one or more representations of objects detected by the sensor at a time.” Ex. 1001, 3:31-33. The “sensor” that detects the object representations may include a “[c]amera... for capturing one or more pictures” or a “motion picture camera that can capture streams of pictures (i.e. motion pictures, videos, etc.).” *Id.*, 69:45-56.

The '974 patent provides examples of objects represented in pictures such as “person, cat, vehicle, building, street, tree, rock, etc.” *Id.*, 72:52-57. The '974 patent further describes various approaches to object recognition, such as “identifying and/or analyzing object features such as lines, edges, ridges, corners, blobs, regions, and/or their relative positions, sizes, shapes, etc.” *Id.*, 75:1-5.

Similarly, Grotmol discloses that images 2000 and 2010 may “comprise representations of visual field that may be obtained at times $t_1 < t_2$, respectively.” Ex. 1004, 38:54-56. These same images 2000 and 2010 may “comprise *representations* of one or more objects, e.g., a tree 2002, a rectangle, a ball 2008, and/or other objects.” *Id.*, 38:56-65; *see also id.*, 38:65-39:12 (referring to objects shown within images 2000 and 2010 as “object representations” and “representations”).

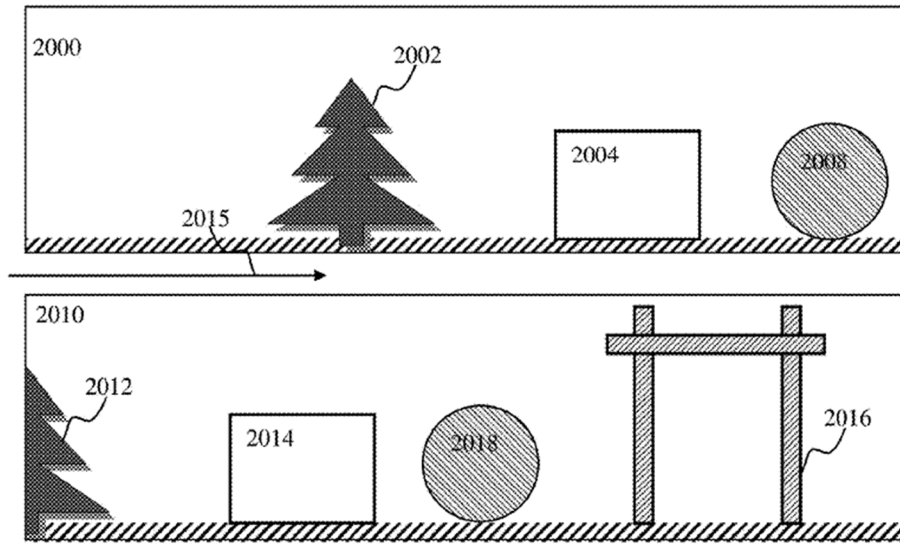


FIG. 20A
Ex. 1004, Fig. 20A

Grotmol likewise discloses that the sensor used to capture these images “may provide information associated with objects within the field-of-view In one or more implementations, such as *object recognition*, and/or obstacle avoidance, the output provided by the sensor component 166 may comprise a stream of pixel values associated with one or more digital images.” *Id.*, 8:57-9:13; *see also id.*, 9:41-52 (“In one or more implementations, object recognition and/or classification may be implemented”). Grotmol, like the ’974 patent, further includes edge detection. *Id.*, 8:60-63 (“[T]he term feature may refer to a representation of an object edge”).

Accordingly, Grotmol discloses first, second and third circumstance representations include one or more object representations, or one or more collections of object representations. Decl. ¶¶ 117-121.

13. Claim 15

- a. [15.1] The method of claim 1, wherein, to correlate the first circumstance representation with the first one or more instruction sets for operating the first device, a determination is made that the first one or more instruction sets for operating the first device temporally correspond to the first circumstance representation,

Grotmol discloses limitation [15.1]. Decl. ¶ 122.

As described above with respect to limitation [1.2], the images in Grotmol are correlated with motor control indications issued around the same time. Grotmol describes training behaviors in a robotic device by “learning *associations* between sensory context . . . and a respective action . . . during training.” Ex. 1004, 33:59-62 (emphasis added); *see also id.*, Abstract (“Motor commands *associated with* a given image may be stored.”). This association may be based on the timing of the images and the motor commands.*Id.*, 39:17-19 (“Motor commands issued by a trainer *corresponding to* time instances when the images are acquired may be stored.”). Accordingly, Grotmol discloses that a determination is made that the first instruction set temporally corresponds to the first circumstance representation. Decl. ¶¶ 67-73, 122.

- b. **[15.2] and wherein the first circumstance representation includes: one or more object representations, or one or more collections of object representations.**

As described above for claim 14, Grotmol discloses that the first circumstance representation includes one or more object representations, or one or more collections of object representations. Decl. ¶ 117-121, 123.

14. Claim 16

Grotmol discloses claim 16 that depends from claim 1 and requires “wherein the anticipating the first one or more instruction sets for operating the first device learned in the learning process based on the at least partial match between the third circumstance representation and the first circumstance representation includes determining the first one or more instruction sets for operating the first device learned in the learning process based on the at least partial match between the third circumstance representation and the first circumstance representation.” Decl. ¶ 124.

As described above for limitation [1.5], Grotmol discloses that “motor commands at a given time step may be obtained by taking the stored motor commands from the training buffer that may correspond to the *best matching* stored image.” Ex. 1004, 43:4-9. Grotmol discloses that the matching step may comprise calculating a similarity measure between a current image and a stored image, then determining whether that similarity measure breaches a threshold (i.e., “at least partial match between the third circumstance representation and the first

circumstance representation”). Thus, Grotmol discloses determining the first instruction set for operating the device based on at least a partial match between third circumstance representation and the first circumstance representation. Decl. ¶¶ 78-79, 124.

15. Claim 17

- a. **[17.1] The method of claim 1, wherein elements of the computing system are included in: a single device, or multiple devices,**

Grotmol discloses limitation [17.1]. Decl. ¶ 125.

Grotmol discloses the method of claim 1 implemented using a “self-contained robotic apparatus,” and thus, discloses that the elements of the computing system are included in a single device. Ex. 1004, 3:27-30; *see supra* limitation [1.1]; Decl. ¶¶ 65-66.

- b. **[17.2] and wherein the one or more processor circuits include: one or more microcontrollers, one or more computing circuits, or one or more electronic circuits,**

Grotmol discloses one or more processor circuits include a microcontroller, computing circuits or electronic circuits. *See supra* limitation [1.1]; Decl. ¶¶ 65-66, 126.

- c. **[17.3] and wherein the memory includes: a volatile memory, or a non-volatile memory,**

Grotmol discloses that its “memory component” may comprise a “non-volatile memory.” Ex. 1004, 38:39-42 (“In some implementations, the images may

be stored in an ordered buffer in a non-volatile memory.”); *see supra* limitation [1.2]; Decl. ¶¶ 67-73, 127.

d. **[17.4] and wherein the first device includes: a robot, a vehicle, an appliance, an electronic device, or a mechanical machine,**

Grotmol discloses a robot (“self-contained robotic apparatus”) that may include a vehicle. Ex. 1004, Abstract, 3:27-30, 38:36-39 (“In some implementations, the robot may comprise a robotic vehicle (e.g., 160 in FIG.1); *see supra* limitations [1.1]-[1.6]; Decl. ¶¶ 65-82; 128.

e. **[17.5] and wherein the second device includes: a robot, a vehicle, an appliance, an electronic device, or a mechanical machine,**

Grotmol discloses limitation [17.5]. Decl. ¶ 129.

Grotmol discloses that the training sets and training configurations from a first robot (which include the instruction sets for operating first device) can be “stored” or “saved.” Ex. 1004, 33:12-58 (discussing saved training configurations). The saved training configuration may then be “loaded into the robot being trained thereby providing one or more trained behaviors to the robot.” *Id.*, 33:27-30. Further, the “trained configuration may be loaded to one or more *other robots* in order to provide learned behaviors.” *Id.*, 33:30-32. Thus, Grotmol discloses a second device (“one or more other robots”) that can autonomously perform one or more operations defined by one or more instruction sets for operating the first device (training configuration

from first robot (e.g., training sets with circumstance representations correlated to instruction sets) that is loaded into a second one or more other robots to “provide learned behaviors.” Decl. ¶ 129.

- f. [17.6] and wherein an instruction set of the first one or more instruction sets for operating the first device includes at least one selected from the group comprising: only one instruction, a plurality of instructions ... one or more commands, ... and one or more information, and wherein an instruction set of the second one or more instruction sets for operating the first device includes at least one selected from the group comprising: only one instruction, a plurality of instructions, ... one or more commands, ... and one or more information,

Grotmol discloses limitation [17.6]. Decl. ¶ 130.

As described above for limitation [1.2], Grotmol discloses a first and second instruction set for operating the first device, where the instruction set includes, for example, one or more instructions, one or more commands, one or more computer commands, and/or one or more information. *See e.g.*, Ex. 1004, 3:35-39, 23:3-11, 39:13-22, 43:4-11; Decl. ¶¶ 67-73.

- g. [17.7] and wherein the one or more sensors of the first device include at least one selected from the group comprising: one or more cameras, ... and one or more apparatuses for detecting objects or object properties, and wherein the one or more sensors of the second device include at least one selected from the group comprising: one or more cameras, ... and one or more apparatuses for detecting objects or object properties,

As described above for limitation [1.4] and claim 14, Grotmol discloses that a robotic vehicle includes a sensor comprising a camera for detecting objects or object properties. *See e.g.*, Ex. 1004, 8:57-9:3, 10:15-26, 38:33-58, 39:13-22; Decl. ¶¶ 75-77, 117-121. Furthermore, as described above for limitation [4.3], Grotmol discloses a second robotic vehicle that includes a camera for detecting objects or object as described above for limitation. *See e.g., id.*, 33:21-35; Decl. ¶¶ 93-94, 131-132.

- h. [17.8] and wherein the at least the portion of the first correlation includes: one portion of the first correlation, multiple portions of the first correlation, all portions of the first correlation, or the entire first correlation, and wherein the at least the portion of the second correlation includes: one portion of the second correlation, multiple portions of the second correlation, all portions of the second correlation, or the entire second correlation,

As described above for limitations [1.2] and [1.3], Grotmol discloses first and second correlations are learned during a learning process. Accordingly, Grotmol discloses wherein the at least the portion of the first correlation includes the entire

first correlation, and wherein the at least the portion of the second correlation includes the entire second correlation. Decl. ¶¶ 67-74, 133.

- i. **[17.9] and wherein an object of the first circumstance is the same as an object of the third circumstance, or multiple objects of the first circumstance are the same as multiple objects of the third circumstance, or all objects of the first circumstance are the same as all objects of the third circumstance, or all objects of the first circumstance are different than all objects of the third circumstance.**

As described above with respect to limitation [1.5] and claim 12, Grotmol discloses comparing first circumstance and third circumstance representations to determine whether there is at least a partial match, and further discloses that the first and third circumstance include one or more objects, as well as object detection. The object(s) in the first circumstance and the third circumstance can be the same or different. *See e.g.*, Ex. 1004, 38:52-39:12, Fig. 20A, Fig. 20B. Grotmol further discloses that “the similarity [between the images] may be determined by performing pixel-wise difference between the overlapping regions (e.g., the frames 2020, 2040 in FIG. 20B) of the given image and the matching image.” *Id.*, 41:10-13. The images may have one object, multiple or all objects that are the same, or have all different objects. Decl. ¶¶ 78-79, 107-112, 134.

16. Claim 18

Independent claim 18 is a machine readable code claim that corresponds to method claim 1. The analysis above explaining how Grotmol discloses the

limitations of claim 1 applies to the limitations of claim 18 as set forth in the chart below. Grotmol anticipates claim 18. Decl. ¶ 135.

Claim 18	Disclosure of Grotmol
<p>[18.1] One or more non-transitory machine readable media storing machine readable code that when executed by one or more processor circuits causes the one or more processor circuits to perform at least:</p>	<p>To the extent the preamble is limiting, Grotmol discloses Grotmol discloses a “non-transitory computer-readable storage medium having instructions embodied thereon, the instructions being executable by a processor” Ex. 1004, claim 17. As discussed above, A POSITA would have understood Grotmol’s “processor” to comprise one or more processor circuits. Decl. ¶¶ 65-66; <i>See supra</i> limitation [1.1].</p>
<p>[18.2] accessing a memory that stores at least a knowledgebase that includes: a first correlation including a first circumstance representation correlated with a first one or more instruction sets for operating a first device and a second correlation including a second circumstance representation correlated with a second one or more instruction sets for operating the first device, wherein the first circumstance representation represents a first circumstance detected at least in part by one or more sensors of the first device and the second circumstance representation represents a second circumstance detected at least in part by the one or more sensors of the first device,</p>	<p><i>See supra</i> limitation [1.2].</p>

Claim 18	Disclosure of Grotmol
[18.3] and wherein at least a portion of the first correlation and at least a portion of the second correlation are learned in a learning process that includes operating the first device at least partially by a user;	<i>See supra</i> limitation [1.3].
[18.4] generating or receiving a third circumstance representation, wherein the third circumstance representation represents a third circumstance detected at least in part by the one or more sensors of the first device or at least in part by one or more sensors of a second device;	<i>See supra</i> limitation [1.4].
[18.5] anticipating the first one or more instruction sets for operating the first device learned in the learning process based on at least partial match between the third circumstance representation and the first circumstance representation; and	<i>See supra</i> limitation [1.5]
[18.6] at least in response to the anticipating, , causing the first device or the second device to perform one or more operations defined by the first one or more instruction sets for operating the first device learned in the learning process at least by causing the one or more processor circuits or another one or more processor circuits to execute the first one or more instruction sets for operating the first device learned in the learning process.	<i>See supra</i> limitation [1.6]

17. Claim 19

Independent claim 19 is a system claim that corresponds to method claim 1. As explained in the claim construction section, a corresponding structure for the “means for generating or receiving,” “means for anticipating,” and the “means for executing” is “one or more processor circuits.” The analysis above explaining how Grotmol discloses the limitations of claim 1 applies to the limitations of claim 19 as set forth in the chart below. Grotmol anticipates claim 19. Decl. ¶ 136.

Claim 19	Disclosure of Grotmol
[19.1] A system comprising:	To the extent the preamble is limiting, Grotmol discloses a system implemented as a “self-contained robot apparatus.” Ex. 1004, 3:27-30; <i>see also</i> Abstract (“An apparatus and methods for training and/or operating a robotic device to follow a trajectory.”); 10:45-48. Accordingly, Grotmol discloses a system. Decl. ¶ 137.

Claim 19	Disclosure of Grotmol
<p>[19.2] a memory that stores at least a knowledgebase that includes: a first correlation including a first circumstance representation correlated with a first one or more instruction sets for operating a first device and a second correlation including a second circumstance representation correlated with a second one or more instruction sets for operating the first device, wherein the first circumstance representation represents a first circumstance detected at least in part by one or more sensors of the first device and the second circumstance representation represents a second circumstance detected at least in part by the one or more sensors of the first device,</p>	<p><i>See supra</i> limitation [1.2]</p>
<p>[19.3] and wherein at least a portion of the first correlation and at least a portion of the second correlation are learned in a learning process that includes operating the first device at least partially by a user;</p>	<p><i>See supra</i> limitation [1.3]</p>

Claim 19	Disclosure of Grotmol
[19.4] means for generating or receiving ⁸ a third circumstance representation, wherein the third circumstance representation represents a third circumstance detected at least in part by the one or more sensors of the first device or at least in part by one or more sensors of a second device;	<i>See supra</i> limitations [1.1] and [1.4]
[19.5] means for anticipating ⁹ the first one or more instruction sets for operating the first device learned in the learning process based on at least partial match between the third circumstance representation and the first circumstance representation; and	<i>See supra</i> limitations [1.1] and [1.5]
[19.6] means for executing, at least in response to the anticipating, the first one or more instruction sets for operating the first device learned in the learning process, wherein the first device or the second device autonomously.	<i>See supra</i> limitations [1.1] and [1.6]

18. Claim 20

Claim 20 depends from claim 19 and requires that the “means for generating or receiving,” the “means for anticipating,” and the “means for executing” include

⁸ A corresponding structure for the “means for generating” is “one or more processor circuits.”

⁹ A corresponding structure for the “means for anticipating” is “one or more processor circuits.”

“one or more processor circuits.” As explained above for claim 19, a corresponding structure for the “means for anticipating,” and the “means for executing” is “one or more processor circuits.” Accordingly, claim 20 is anticipated by Grotmol for the same reasons as claim 19. Decl. ¶ 137.

B. Ground 2

Grotmol in view of the knowledge of a POSITA renders claims 10 and 11 obvious.

1. Claim 10

Grotmol in view of the knowledge of a POSITA renders obvious claim 10, which requires (i) learning another correlation between a circumstance representation detected by a sensor of a first device and an instruction set for operating the first device; and (ii) the correlation is learned during an additional learning process that involves a operating the first device by another user. Decl. ¶ 139.

As described above in Ground 1, Grotmol discloses that a human trainer (“user”) can operate a robot during a training process for learning correlations. Ex. 1004, 23:3-11, 39:13-22. Furthermore, Grotmol discloses that multiple learning processes can be done to train multiple behaviors for the robot, including “simple tasks” and “complex tasks.” *Id.*, 24:17-67, 26:1-20. Grotmol does not limit the number of users that can train the multiple behaviors for the robot, and a POSITA

would have understood that different users can train different behaviors, particularly given that Grotmol describes the training of both simple and complex tasks. Decl. ¶ 139. It would have been obvious to a POSITA that different trainers could be used to train behaviors involving different levels of complexity in order to take advantage of the varying skills and knowledge of trainers. *Id.* Thus, it would be obvious based on Grotmol in view of the knowledge of a POSITA to have a second user perform an additional training resulting in an additional correlation stored in the knowledgebase. *Id.*

2. Claim 11

Grotmol in view of the knowledge of a POSITA renders obvious claim 11, which requires (i) learning another correlation between a circumstance representation detected by a sensor of a second device and an instruction set for operating the second device; and (ii) the correlation is learned during an additional learning process that involves a operating the second device by another user. Decl. ¶ 140.

As described above for claim 10, Grotmol discloses that multiple learning processes can be done to train multiple behaviors, and that it would be obvious that the multiple learning processes could be done by different users operating the robot. Decl. ¶ 139. A POSITA would also understand that Grotmol discloses that a robot can be loaded with a first trained configuration learned during a training process

involving operation of that robot by a user, and the robot can also be loaded with another trained configuration learned during training process involving operation of a different (second) robot by a user. Ex. 1004, 33:24-35; Decl. ¶ 140. For the same reasons discussed with respect to claim 10, it would be obvious to a POSITA that the training process involving operation of the first robot (resulting in the first trained configuration), and the training process involving operation of the second robot (resulting in another trained configuration) could be done by different users. Decl. ¶ 140.

C. Ground 3

Grotmol in view of Hickman renders claims 4 and 11 obvious. Hickman discloses a “shared robot knowledge base [that] is updated based on robot experiences so that any particular robot may benefit from the prior experiences of other robots.” Ex. 1005, Abstract. As detailed below, a POSITA would be motivated to combine Grotmol’s autonomous robotic system with Hickman’s shared robot knowledge base.

1. Motivation to Combine Grotmol and Hickman

A person of ordinary skill in the art would have been motivated to combine the autonomous robotic system of Grotmol with the shared robot knowledge base of Hickman. Decl. ¶¶ 142-149.

Grotmol teaches that the training sets and training configurations from a first robot can be “stored” or “saved.” Ex. 1004, 33:12-58 (discussing saved training configurations). The saved training configuration may then be “loaded into the robot being trained thereby providing one or more trained behaviors to the robot.” *Id.*, 33:27-30. Further, the “trained configuration may be loaded to one or more *other robots* in order to provide learned behaviors.” *Id.*, 33:30-32 (emphasis added).

Hickman teaches a shared robot knowledge base that could advantageously be paired with Grotmol’s autonomous robotic system in order to further facilitate the sharing of learned behaviors.

The advantages of a shared robot knowledge base 306 multiply as robots are deployed around the world. If information about a particular object is “public” and therefore accessible by all robots, then information that a single robot learns about that object and uploads to the shared robot knowledge base 306 may be accessible by other robots all around the world. In operation, many millions or even many billions of robots may ultimately access the shared robot knowledge base 306. As a result, the shared robot knowledge base 306 enables robots to benefit from the collective information learned by many other robots.

Ex. 1005, 11:31-41. Hickman additionally teaches that “dividing application execution and storage between client devices and the cloud computing system allows more processing to be performed by the cloud computing system, thereby taking advantage of the cloud computing system’s processing power and capability, for example.” *Id.*, 5:42-46. Hickman further teaches that cloud computing may “free

users from certain hardware and software installation and maintenance tasks.” *Id.*, 1:38-41.

A POSITA would have been familiar with the teachings of both Grotmol and Hickman and would have readily appreciated the advantages of their combination. Decl. ¶¶ 142-149. Indeed, a 2014 Science article—which included an interview with the CEO of Brain Corporation, i.e., the assignee of Grotmol—expressly contemplated the benefits of the kinds of shared robot learning described in Hickman:

Efficient chips can run complex—and normally power-hungry—algorithms that enable robots to learn. The Internet, in turn, will allow far-flung robots to share those lessons and skills. A robot that learns how to pick a strawberry without crushing it, for instance, could uplink that skill for the benefit of its kind around the globe. That means neuromorphic computing could offer robots something far more profound than enhanced perceptual skills. When humans collectively pass along life lessons, we call that culture.

Ex. 1006 at 183. Decl. ¶ 148. In addition, the two references are directed to the same field of the training and autonomous operation of robots (Decl. ¶¶ 142-147), and Hickman is listed on the face of Grotmol as a cited U.S. patent document. Grotmol and Hickman also describe a similar problem in which a robot learns how to “fetch” from a human. *Compare* Ex. 1005, 23:49-24:25 *with* Ex. 1004, 24:31-48; 27:28-40, Fig. 9. Grotmol describes the task as “quite complex.” Ex. 1004, 24:31-33. Hickman

teaches that the fetch task can be “optimiz[ed] . . . based on the collective experience of many different robots.” Ex. 1005, 24:18-25.

The resulting combination of Grotmol’s autonomous robotic system and Hickman’s shared robot knowledgebase would have been expected and predictable. Decl. ¶ 150. Grotmol expressly contemplates the sharing of trained configurations among robots, and Hickman’s expansion upon this idea does not interfere with Grotmol’s autonomous robotic system. Decl. ¶¶ 142-149.

For at least these reasons, it would have been obvious to a POSITA to combine Grotmol and Hickman.

2. Claim 4

As described above in Ground 1, Grotmol discloses the claimed first and second circumstance representations correlated with, respectively, the first and second instruction sets for operating a first device. *See supra* limitations [1.2], [1.3]. Grotmol also discloses generating or receiving the first and second circumstance representations, and obtaining or receiving first and second instruction sets. *See supra* limitations [1.2], [1.3]; Decl. ¶¶ 67-74. Grotmol in combination with Hickman renders obvious the additional requirement of claim 4 that the knowledgebase includes a fourth correlation, which includes a circumstance representation detected by sensors of a second device correlated with an instruction set for operating the second device. Decl. ¶¶ 150-155.

Grotmol discloses that the training sets and training configurations from a robot (which include the instruction sets for operating first device) can be “stored” or “saved.” Ex. 1004, 33:12-58 (discussing saved training configurations). The saved training configuration may then be “loaded into the robot being trained thereby providing one or more trained behaviors to the robot.” *Id.*, 33:27-30. Further, the “trained configuration may be loaded to one or more *other robots* in order to provide learned behaviors.” *Id.*, 33:30-32. Thus, Grotmol discloses that the memory component of a first robot can store the claimed first and second correlations as well as a fourth correlation learned from operating a second robot—i.e., a circumstance detected by the sensor of a second robot correlated with instructions for operating that second robot. Decl. ¶ 152.

Grotmol discloses, for example, situations in which the user may wish to train the robot to “find an object, grasp it, and bring it back” (i.e., fetch). Ex. 1004, 24:31-25:5. Grotmol describes that this “task of playing fetch may be quite complex” and outlines numerous user training steps that would be needed in order to teach this skill to the robot. *Id.* A POSITA would understand that it would be advantageous to share learned skills among robots. Decl. ¶ 153.

Hickman discloses such a system wherein learned robot behaviors are uploaded to a shared knowledge base for use in other robots. Hickman discloses “a shared robot knowledge bases for use with cloud computing systems” that “collects

data from a robot about an object the robot has encountered in its environment, and stores the received data in the shared robot knowledge base ... sends instructions for interacting with an object to a robot ... sends instructions to a robot for executing an application based on information stored in the shared robot knowledge base.” Ex. 1005, Abstract. As noted in Hickman, the “information in the shared robot knowledge bases is updated based on robot experiences so that any particular robot may benefit from prior experiences of other robots.” *Id.* Hickman discloses that “robot experiences” may include “‘coaching’ from humans” (*Id.*, 23:36-48), similar to the training described in Grotmol. Decl. ¶ 155. For example, similar to the “fetch” behavior described in Grotmol, Hickman describes a human coach training a robot how to properly grasp objects such as a cup, uploading and storing this information on a shared knowledge base (memory), then having another robot obtain these instructions from the memory and executing the instructions. *Id.*, 26:21-27:21.

In the combination of Grotmol and Hickman, the shared knowledge based would include multiple training sets (i.e., circumstance representations correlated with instruction set) learned during the operation of multiple devices. Accordingly, the shared knowledge based would include training sets learned during operating of a first device (i.e., first and second circumstance representations correlated with first and second instruction sets for operating a first device) as well as trainings sets

learned during operation of another device (i.e., fourth circumstance representation correlated with instruction set for operating a second device). Decl. ¶¶ 150-155.

3. Claim 11

Grotmol in view of Hickman renders obvious claim 11, which requires (i) learning a correlation between a circumstance representation detected by a sensor of another (second) device and an instruction set for operating the second device; and (ii) the correlation is learned during an additional learning process that involves a operating the another (second) device by another user. Decl. ¶¶ 156-157.

As described above for Grounds 1 and 2, Grotmol discloses (i) training a robot wherein images (circumstance representations) detected by a camera during operation of the robot are correlated with motor commands (instructions); (ii) multiple training (learning) processes can be done to train multiple behaviors; and (iii) a robot can be loaded with a first trained configuration learned during a training process involving operation of that robot by a user, and can also be loaded with another trained configuration from a training process involving operation of a different robot by a user. Ex. 1004, 33:24-35; Decl. ¶ 156.

Hickman discloses “a shared robot knowledge bases for use with cloud computing systems” that “collects data from a robot about an object the robot has encountered in its environment, and stores the received data in the shared robot knowledge base ... sends instructions for interacting with an object to a robot ...

sends instructions to a robot for executing an application based on information stored in the shared robot knowledge base.” Ex. 1005, abstract. As noted in Hickman, the “information in the shared robot knowledge bases is updated based on robot experiences so that any particular robot may benefit from prior experiences of other robots.” *Id.* Hickman discloses that “robot experiences” may include “‘coaching’ from *humans*” (*Id.*, 23:36-48), like the training described in Grotmol. Decl. ¶ 156. For example, similar to the “fetch” behavior described in Grotmol, Hickman describes a human coach training a robot how to properly grasp objects such as a cup, uploading and storing this information on a shared knowledge base (memory), then having another robot obtain these instructions from the memory and executing the instructions. Hickman at 26:21-27:21.

As explained above, it would have been obvious to combine Hickman’s shared robot knowledge base with Grotmol’s autonomous robot system such that the shared knowledgebase includes the training of multiple robots by multiple users. Decl. ¶ 157. The combination discloses and renders obvious a knowledgebase that includes circumstance representations correlated with instructions for operating a first device (i.e., claimed first and second circumstance representations correlated with first and second instruction set for operating the first device) learned during a training using the first device, and also includes a circumstance representation correlated with instructions for operating a different device (i.e., claimed fourth

circumstance representation correlated with fourth instruction set for operating a second device) learned during a training using the different device. Decl. ¶¶ 156-157.

X. CONCLUSION

For the foregoing reasons, *inter partes* review should be instituted and claims 1-20 of the '974 patent should be cancelled as unpatentable.

Respectfully submitted,

Dated: June 9, 2023

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CERTIFICATE OF COMPLIANCE

1. The undersigned certifies that this brief complies with the type volume limitations of 37 CFR § 42.24(a)(1)(i). This brief contains 13,980 words (excluding the table of contents, the table of authorities, mandatory notices under 37 CFR § 42.8, the certificate of service, certificate of compliance, and appendix of exhibits), as calculated by the “Word Count” feature of Microsoft Word 2016, the word processing program used to create it.

2. The undersigned further certifies that this brief complies with the typeface requirements of 37 CFR § 42.6(a)(2)(ii) and typestyle requirements of 37 CFR § 42.6(a)(2)(iii). This brief has been prepared in a proportionally spaced typeface using Microsoft Word 2016 in Times New Roman 14 point font.

Respectfully submitted,

Dated: June 9, 2023

By: /s/ Anish Desai

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.105 and § 42.6(e), the undersigned certifies that on June 9, 2023, a complete and entire copy of this **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,452,974, PETITIONER TESLA, INC.'S POWER OF ATTORNEY, and all supporting exhibits** were sent via FedEx next business day delivery to the following:

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/s/ Timothy J. Andersen/
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