

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. 11,055,583**

TABLE OF CONTENTS

	Page
I. MANDATORY NOTICES	1
A. Real Party-in-Interest	1
B. Related Matters.....	1
C. Lead and Back-up Counsel and Service Information	1
II. GROUNDS FOR STANDING.....	2
III. INTRODUCTION	2
IV. STATUTORY GROUNDS FOR THE CHALLENGES	4
V. LEVEL OF ORDINARY SKILL IN THE ART	4
VI. CLAIM CONSTRUCTION	5
VII. OVERVIEW OF THE '583 PATENT	5
VIII. OVERVIEW OF THE PRIOR ART	7
A. U.S. 9,604,359 (“Grotmol”)	7
B. U.S. 8,639,644 (“Hickman”).....	9
C. U.S. 9,283,674 (“Hoffman”).....	10
IX. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE.....	12
A. Ground 1: Claims 10 and 11 are Obvious Based on Grotmol in View of the Knowledge of a POSITA	12
1. Claim 1	12
a. [1.1] A system comprising:	12
b. [1.2] one or more processors;	12

c.	[1.3] one or more non-transitory machine readable media storing machine readable code that, when executed by the one or more processors, causes the one or more processors to perform at least:.....	13
d.	[1.4] receiving or generating a first one or more digital pictures, wherein the first one or more digital pictures depict at least a portion of a first device's surrounding;.....	14
e.	[1.5] receiving or generating a first one or more instruction sets for operating the first device; and	15
f.	[1.6] learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device.....	15
2.	Claim 4.....	18
a.	[4.1] The system of claim 1, wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:	18
b.	[4.2] receiving or generating a new one or more digital pictures;	18
c.	[4.3] determining the first one or more instruction sets for operating the first device based on at least partial match between the new one or more digital pictures and the first one or more digital pictures; and.....	19
d.	[4.4] at least in response to the determining, causing the first device or a second device to perform one or more operations defined by the first one or more instruction sets for operating the first device.	21
3.	Claim 10.....	23
4.	Claim 11	25

B.	Ground 2: Claims 25 and 27 Are Obvious Based on Grotmol in View of Hickman	27
1.	Motivation to Combine Grotmol and Hickman.....	27
2.	Claim 25	30
3.	Claim 27	34
a.	[27.1] The system of claim 4, wherein the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device are included in a knowledgebase, and wherein the knowledgebase further includes a second one or more digital pictures correlated with a second one or more instruction sets for operating a third device, ...	34
b.	[27.2] and wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least: receiving or generating an additional one or more digital pictures;.....	36
c.	[27.3] determining the second one or more instruction sets for operating the third device based on at least partial match between the additional one or more digital pictures and the second one or more digital pictures; and at least in response to the determining the second one or more instruction sets for operating the third device, causing a fourth device to perform one or more operations defined by the second one or more instruction sets for operating the third device.	36
C.	Ground 3: Claim 30 Is Obvious Based on Grotmol in View of Hoffman.....	37
1.	Motivation to Combine Grotmol and Hoffman	37
1.	Claim 29	40

2.	Claim 30.....	42
X.	CONCLUSION.....	43

PETITIONER'S EXHIBIT LIST

Exhibit No.	Description
Ex. 1001	U.S. Patent No. 11,055,583 (the “’583 patent”)
Ex. 1002	Prosecution File History of U.S. Patent No. 11,055,583
Ex. 1003	Declaration of Jason Janet, Ph.D.
Ex. 1004	Curriculum Vitae of Jason Janet, Ph.D.
Ex. 1005	U.S. Patent No. 9,604,359 (“Grotmol”)
Ex. 1006	<i>Reserved</i>
Ex. 1007	U.S. Patent No. 8,639,644 (“Hickman”)
Ex. 1008	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. 1009	U.S. Patent No. 9,283,674 (“Hoffman”)

I. MANDATORY NOTICES

A. Real Party-in-Interest

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

B. Related Matters

The '583 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. Tesla has also filed petitions for *inter partes* review involving U.S. Patent No. 10,452,974, U.S. Patent No. 11,238,344, U.S. Patent No. 10,102,449, U.S. Patent No. 10,607,134, and U.S. Patent No. 11,113,585 that were asserted in the Delaware litigation.

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II. GROUNDS FOR STANDING

Petitioner certifies that the '583 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 '583 patent was filed on September 26, 2019 and claims a system in which: (i) stored pictures correlated with instructions for operating a first device are learned; (ii) new pictures are obtained; (iii) determining instructions for operating the first device based on a least a partial match between the new pictures and the stored pictures; and (iv) causing a first device or a second device to perform operations defined by the instructions for operating the first device. As will be demonstrated in this Petition, the prior art renders obvious claims 10, 11, 25, 27, and 30 of the '583 patent.

Petitioner requests *inter partes* review based upon U.S. Patent No. 9,604,359 ("Grotmol"), U.S. Patent No. 8,639,644 ("Hickman"), and U.S. Patent No. 9,283,674 ("Hoffman"). Grotmol, Hickman, and Hoffman were not before the Examiner during prosecution. Grotmol, filed more than four years before the '583 patent, discloses the same approach to autonomous operation claimed in the '583 patent:

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. 1005, Abstract. Grotmol further teaches that a robot's "trained configuration may be stored" and "loaded [in]to one or more other robots in order to provide learned behaviors." *Id.*, 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.1006, Abstract. Even if Grotmol did not expressly disclose the sharing of learned skills between two devices—and it does—it would have been obvious in view of Hickman.

Hoffman discloses methods for "[a]utonomous and semi-autonomous robots" that can be operated "without human intervention or be teleoperated by a remote user" including via telepresence software application, whereby the user can observe the remote video window showing the camera view of the robot, rendered flythrough

view, and top down map showing a representation of the robot and surroundings of the robot. Ex. 1009, 7:25-26.

Grotmol renders obvious in combination with Hickman or Hoffman claims 10, 11, 25, 27, and 30 of the '583 patent. Petitioner respectfully requests that the Board institute review.

IV. STATUTORY GROUNDS FOR THE CHALLENGES

Ground 1	Obviousness of claims 10 and 11 based on Grotmol in View of the Knowledge of a POSITA.
Ground 2	Obviousness of Claims 25 and 27 based on Grotmol in view of U.S. 8,639,644 (“Hickman”) (Ex. 1007).
Ground 3	Obviousness of Claim 30 based on Grotmol in view of U.S. 9,283,674 (“Hoffman”) (Ex. 1009).

V. LEVEL OF ORDINARY SKILL IN THE ART

A person having ordinary skill in the art (“POSITA”) relevant to the '583 patent as of November 26, 2017—the earliest possible priority date of the '583 patent—would have had 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. ¶ 41.

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.

VII. OVERVIEW OF THE '583 PATENT

The '583 patent was filed on September 26, 2019 and is a continuation of application no. 15/822,150, filed on November 26, 2017, now U.S. Patent No. 10,474,934. Jasmin Cosic is the sole named inventor.

The disclosure of the '583 patent generally relates to “computing enabled systems and/or devices” including embodiments where “the system captures one or more digital pictures, receives one or more instruction sets, and learns correlations between the captured pictures and the received instruction sets.” Ex. 1001, Abstract. More specifically, the '583 patent describes a method of automation comprising “learning one or more digital pictures of a device’s surrounding along with correlated instruction sets for operating the device, storing this knowledge in a knowledgebase (i.e. neural network, graph, sequences, etc.), and autonomously operating a device.” *Id.*, 59:14-18. The '583 patent refers to this approach as “visual

surrounding for autonomous device operation,” or “VSADO.” *Id.*, 58:27-29. Figure 31, copied below, illustrates this functionality.

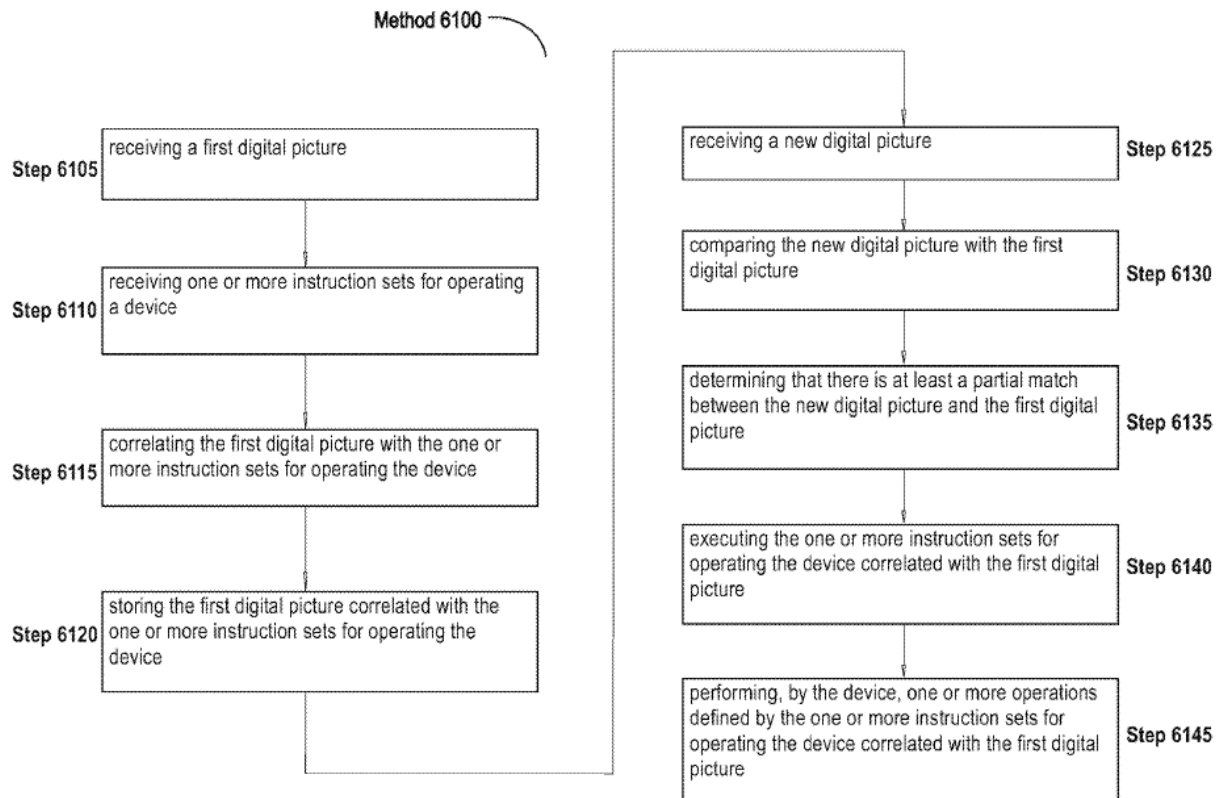


FIG. 31
Ex. 1001, Fig. 31

The '583 patent further describes that the VSADO 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 VSADO Unit 100 and the remote VSADO Unit 100 may learn their operations in various visual surroundings. In turn, any number of Devices 98 can utilize the remote VSADO Unit 100 for autonomous operation.” *Id.*, 85:54-60.

VIII. OVERVIEW OF THE PRIOR ART

This Petition relies on Grotmol, Hickman, and Hoffman. Grotmol, Hickman, and Hoffman were not considered during prosecution or cited on the face of the '583 patent.

A. U.S. 9,604,359 (“Grotmol”)

Grotmol is a U.S. patent filed on January 27, 2015, which issued on March 28, 2017. Grotmol is prior art to the '583 patent under at least 35 U.S.C. §§ 102(a) and 102(d).

Grotmol relates to “[a]n apparatus and methods for training and/or operating a robotic device to follow a trajectory.” Ex. 1005, 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.*, 23:4-12. 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.*, 39:13-14, 17-18. 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 [] 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.*, 43:4-9.

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

B. U.S. 8,639,644 (“Hickman”)

Hickman is a U.S. patent filed on May 4, 2012, which issued on January 28, 2014. Hickman is prior art to the ’583 patent under at least 35 U.S.C. §§ 102(a) and 102(d). Hickman is cited in Grotmol. *Id.*, p. 2.

The disclosure of Hickman relates to “shared robot knowledge bases for use with cloud computing systems.” Ex. 1007, 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. *See id.*, 25:3-27:26 (describing figure).

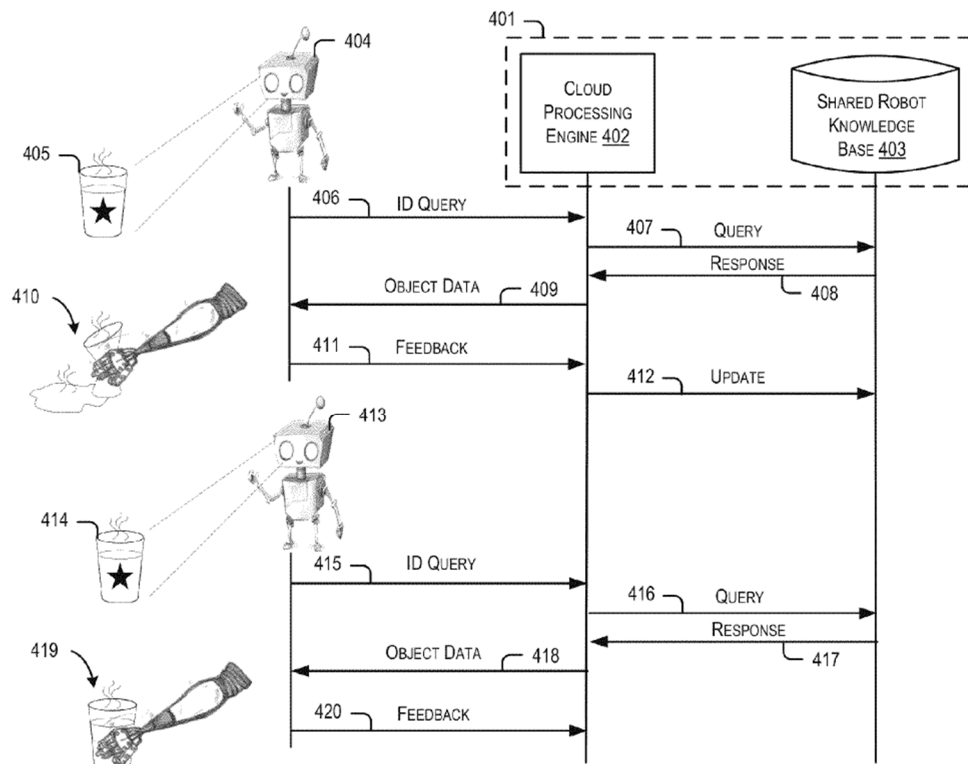


FIGURE 4
Ex. 1007, Fig. 4

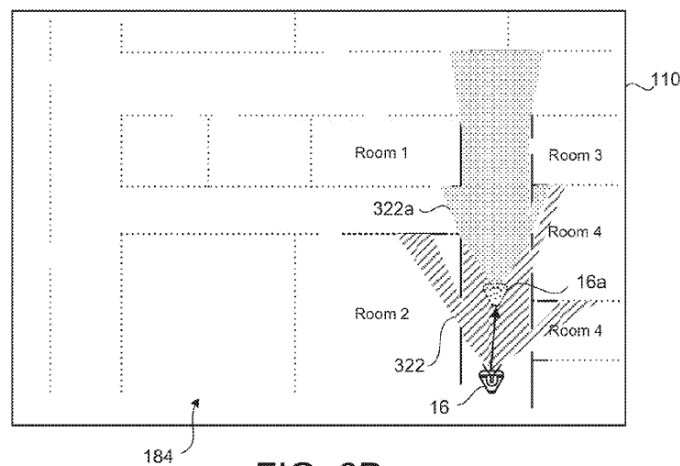
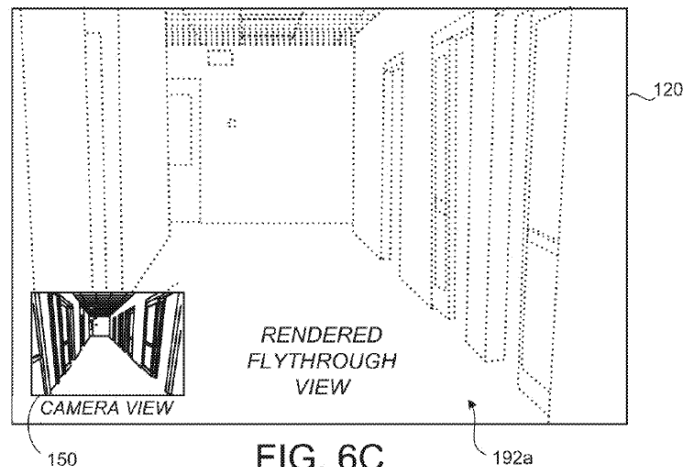
As shown above, a first robot 404 encounters an object 405 and obtains image data associated with it. *Id.*, 25:14-26. The first robot attempts to grasp the object but crushes it (410). *Id.*, 26:38-56. “When an accident happens, a human can ‘coach’ the robot on how much force to use by, for example, 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.

C. U.S. 9,283,674 (“Hoffman”)

Hoffman is a U.S. patent filed on October 6, 2014, published on July 9, 2015 as U.S. Publication No. 2015/0190925, and issued on March 15, 2016. Hoffman is prior art to the ’583 patent under at least 35 U.S.C. §§ 102(a) and 102(d).

Hoffman relates to a “method of operating a robot includ[ing] electronically receiving images and augmenting the images by overlaying a representation of the robot on the images.” Ex. 1009, Abstract. Hoffman discloses methods for “[a]utonomous and semi-autonomous robots” that can be operated “without human intervention or be teleoperated by a remote user.” *Id.*, at 7:22-26. Hoffman describes embodiments wherein the robot outputs data such as images to a cloud service that processes the data and returns to the robot a processed data set such as an

environmental map. *Id.*, 8:1-8 (“Moreover, the remote user 10 may access the received sensor data 502 for review, analysis, and control of the robot 200. In some examples, the cloud service 22 executes an application outputting data 23 that may be communicated to the robot 200. For example, the cloud service 22 may process received image data 502 (captured by the robot 200) and return a processed data set 23 (e.g., an environmental map) to the robot 200 (e.g., to a controller 400).”



Ex. 1009, Figs. 6C, 6D

The user, using the described telepresence software application, can observe the remote video window (Fig. 6C) showing both the camera view of the robot and rendered flythrough view. A top down view (Fig. 6D) of the robot and surroundings is also shown. *See, e.g., id.*, 17:19-18:45.

IX. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Claims 10 and 11 are Obvious Based on Grotmol in View of the Knowledge of a POSITA

As set forth below, Grotmol renders dependent claims 10 and 11 obvious in view of the knowledge of a POSITA. Claims 10 and 11 depend from claim 4, and claim 4 further depends from claim 1. Accordingly, the limitations of claim 1 and dependent claim 4 are addressed in this ground.

1. Claim 1

a. [1.1] A system comprising:

Grotmol discloses “a system” implemented as a “self-contained robotic apparatus.” Ex. 1005, 3:27-30; *see also id.*, 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. ¶¶ 178-179.

b. [1.2] one or more processors;

Grotmol discloses limitation [1.2]. Decl. ¶¶ 180-183.

Grotmol includes a “processing” unit that is connected to at least a sensory unit and a memory unit. Ex.1005, Figure 7. Grotmol defines “processor”:

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. Grotmol discloses “a self-contained robotic apparatus, the apparatus comprising...one or more physical processors configured to operate [the system].”

Id., claim 12; *see also id.*, 3:27-30, claims 1, 17. Accordingly, Grotmol discloses a system comprising “one or more processors.” Decl. ¶¶ 180-183.

c. **[1.3] one or more non-transitory machine readable media storing machine readable code that, when executed by the one or more processors, causes the one or more processors to perform at least:**

Grotmol discloses that its system includes “one or more non-transitory machine readable media storing machine readable code that, when executed by the one or more processors, causes the one or more processors to perform at least” limitations [1.4]-[1.6]. Decl. ¶¶ 184-186; Ex. 1005, claim 17 (“A non-transitory computer-readable storage medium having instructions embodied thereon, the

instructions being executable by a processor ...”); *id.*, claim 12 (“a self-contained robotic apparatus, the apparatus comprising...one or more physical processors configured to operate [the system]”); *id.*, 33:14-30, 4:13-17, claim 1; *see also infra* limitations [1.4]-[1.6].

d. **[1.4] receiving or generating a first one or more digital pictures, wherein the first one or more digital pictures depict at least a portion of a first device’s surrounding;**

Grotmol discloses limitation [1.4]. Decl. ¶¶ 187-189.

Grotmol discloses processor(s) receiving “training sets,” where each training set “may comprise an instance of the video frame,” *i.e.*, *a first one or more digital pictures*. Ex. 1005, 3:27-39.

Grotmol further describes that the images can be “of a visual scene seen when following a trajectory,” *i.e.*, *first one or more digital pictures ... depict[ing] at least a portion of a first device’s surrounding*, and are received and stored by the robot during training. *Id.*, 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.”); *id.*, 10:16-22 (“In some implementations of robotic navigation in an arbitrary environment, the sensor component 166 may comprise a camera configured to provide an output comprising a plurality of digital image frames ...”); *id.*, 8:57-9:3, 38:28-60, 39:13-22, Figure 20A.

Accordingly, Grotmol discloses processor(s) receiving or generating a first one or more digital pictures, wherein the first one or more digital pictures depict at least a portion of a first physical device's surrounding. Decl. ¶¶ 187-189.

e. **[1.5] receiving or generating a first one or more instruction sets for operating the first device; and**

Grotmol discloses limitation [1.5]. Decl. ¶¶ 190-192.

As described above in limitation [1.4], Grotmol discloses processor(s) receiving “training sets,” where each training set “may comprise ... an instance of a motor control indication configured to cause the robot to execute an action,” *i.e., a first one or more instruction sets for operating the first device*. Ex. 1005, 3:27-39; *id.*, 39:17-19 (“Motor commands issued by a trainer corresponding to time instances when the images are acquired may be stored.”); *id.*, 33:14-30, Abstract.

Accordingly, Grotmol discloses receiving or generating a first one or more instruction sets for operating the first physical device. Decl. ¶¶ 190-192.

f. **[1.6] learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device.**

Grotmol discloses limitation [1.6]. Decl. ¶¶ 193-200.

Grotmol discloses processor(s) generating and storing “training sets,” including “a memory component,” which “may be configured to store training sets,” where each training set “may comprise an instance of the video frame,” *i.e., a first one or more digital pictures*, “... and an instance of a motor control indication

configured to cause the robot to execute an action,” *i.e.*, a first one or more instruction sets for operating the first device. Ex. 1005, 3:27-39; *see supra* limitations [1.4] and [1.5]; Decl. ¶¶ 187, 190-191. The video frames in Grotmol are “associated with” or “correspond to”—*i.e.*, are correlated with¹—motor control indications issued around the same time. Decl. ¶ 195. Grotmol describes training behaviors in a robotic device by “learning of *associations* between sensory context ... and a respective action ... during training.” Ex. 1005, 33:59-62; *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. Ex. 1005, 39:17-19 (“Motor commands issued by a trainer *corresponding*² to time instances when the images are acquired may be stored.”); *see also id.*, 43:6-9 (“[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.”). Decl. ¶ 195.

¹ The ’583 patent describes that a device may “correlate Digital Pictures 525 from the stream of Digital Pictures 525 with *temporally corresponding* Instruction Sets”). Ex. 1001, 91:52-56

² Emphasis added unless otherwise noted.

Grotmol further discloses that a human (“user”³) can, by manually operating the robot, train a robot to learn pictures that are correlated with instructions (a “learning process”⁴):

Trained 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. 1005, 33:59-62. In both the “listen mode” and “override mode,” Grotmol teaches that the robot will listen to commands sent by a teacher (user) “and try to remember it for next time the same situation occurs.” *Id.*, 23:4-29; *see also id.*, 24:57-61 (“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.,

³ “User 50 (also referred to simply as user or other similar name or reference) comprises a human user or non-human user.” Ex. 1001, 69:11-13.

⁴ The ’583 patent does not limit “learning process” to a particular technique. *See* Ex. 1001, 95:53-64 (“The disclosed systems, devices, and methods are independent of the artificial intelligence model and/or technique used and any model and/or technique can be utilized to facilitate the functionalities described herein. Examples of these models and/or techniques include deep learning, supervising learning, unsupervised learning...”).

human) may be combined with control instructions produced by the robot controller instructions (predictions).”); *see also id.*, 33:14-30; Decl. ¶¶ 196-197.

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-nearest neighbors *learning process*”). Decl. ¶ 198.

Accordingly, Grotmol discloses “learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device.” Decl. ¶¶ 193-200.

2. Claim 4

- a. **[4.1] The system of claim 1, wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:**

Grotmol discloses “wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least” limitations [4.2]-[4.4]. *See infra* limitations [4.2]-[4.4]; Decl. ¶ 214.

- b. **[4.2] receiving or generating a new one or more digital pictures;**

Grotmol discloses limitation [4.2]. Decl. ¶¶ 215-218.

Grotmol discloses that its processor receives new digital pictures. Ex. 1005, 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.”); As Grotmol’s robotic vehicle operates, it requires receiving a new digital picture. *Id.*, 39:23-26 (“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.”); 10:15-20, 38:51-58; Decl. ¶ 216. In Grotmol, “the most recent, current” image corresponds to the claimed “new one or more digital pictures” and it is compared to the stored images in the training buffer (the first one or more digital pictures). Decl. ¶ 217.

c. **[4.3] determining the first one or more instruction sets for operating the first device based on at least partial match between the new one or more digital pictures and the first one or more digital pictures; and**

Grotmol discloses limitation [4.3]. Decl. ¶¶ 219-223.

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. 1005, 43:5-9; *see also 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.”). Grotmol discloses that the matching step may comprise calculating a similarity measure between a new image and an old image then determining whether that similarity

measure breaches a threshold (*i.e.*, “determining ... based on at least partial match between the new one or more digital pictures and the first one or more digital pictures”).

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.

Ex. 1005, 4:30-38; *see also id.*, claim 1 (reciting “*responsive to the similarity measure breaching a threshold*, selecting one or more training sets from the plurality of training feature sets”). 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 sensor signal, and an instance of a motor control indication configured to cause the apparatus to execute an action.” *id.*, claim 12. Decl. ¶¶ 219-221.

Both Grotmol and the '583 patent disclose that determining “matching portions” may comprise pixel-wise difference analysis between the two digital pictures. *Compare* Ex. 1001, 21:29-46 (discussing “portion”), 67:41-45 (discussing “matching”), 112:38-113:2 (discussing RGB pixel matching) *with* Ex. 1005, 3:14-16 (“The first input type may comprise a digital image comprising a plurality of pixel values.”), 41:8-13 (“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.”). Decl. ¶ 222.

Accordingly, Grotmol discloses determining the first one or more instruction sets for operating the first physical device based on at least partial match between the new one or more digital pictures and the first one or more digital pictures. Decl. ¶¶ 219-223.

d. **[4.4] at least in response to the determining, causing the first device or a second device to perform one or more operations defined by the first one or more instruction sets for operating the first device.**

Grotmol discloses limitation [4.4]. Decl. ¶¶ 224-227.

As described above for limitation [4.3], Grotmol discloses determining 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. Grotmol, 43:5-9, Abstract, 28:19-40; Decl. ¶¶ 219-222.

Grotmol discloses 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. 1005, 2:34-41, 3:12-13; *see also 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.”); 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.”).⁵ Decl. ¶ 225.

⁵ The ’583 patent describes that this step may comprise simply causing an application to execute an instruction. Ex. 1001, 11:1-7 (“In certain embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the

Grotmol also discloses that a second robot may execute actions learned on a first robot. Specifically, Grotmol discloses that training sets learned on a first robot may be loaded into a second robot. *See* Ex. 1005, 33:27-30 (“A saved configuration may be loaded into the robot being trained thereby providing one or more trained behaviors to the robot.”). In such a case, autonomous operation of the second robot executes actions defined by the training set learned on the first robot. Decl. ¶ 226.

Accordingly, Grotmol discloses that at least in response to the determining, causing the first device or a second device (Grotmol discloses both) to perform one or more operations defined by the first one or more instruction sets for operating the first device. Decl. ¶¶ 224-227.

3. Claim 10

Grotmol in view of the knowledge of a POSITA renders obvious claim 10, which requires: (i) first and second digital pictures correlated to first and second instruction sets, respectively, for operating a first device are included in a knowledgebase; (ii) the first correlation is learned in a first learning process that includes operating the first device at least partially by a first user; and (iii) the second

device correlated with the first digital picture includes causing an application for operating the device to execute the one or more instruction sets for operating the device correlated with the first digital picture, the application running on the processor circuit.”).

correlation is learned in a second learning process that includes operating the first device at least partially by a second user. Decl. ¶¶ 339-341.

First, Grotmol discloses that a first and second correlation are included in a knowledgebase. As described above, 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. 1005, 3:27-39; *see also id.*, 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.”); *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 knowledgebase⁶ including multiple correlations (training sets). Decl. ¶¶ 243-245, 339.

Second, 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. 1005, 23:3-11, 39:13-22; Decl. ¶¶ 193-196, 340. Furthermore, Grotmol discloses that multiple learning processes can be done to train multiple

⁶ The ’583 patent states that a “Knowledgebase 530 may be or include *any data structure or arrangement* capable of storing the knowledge of a device’s operation in various visual surroundings.” Ex. 1001, 95:20-23.

behaviors for the robot, including “simple tasks” and “complex tasks.” Ex. 1005 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. ¶ 341. 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.*

4. Claim 11

As described above in Ground 1, Grotmol anticipates claim 11. Grotmol in view of the knowledge of a POSITA also renders obvious claim 11 which requires: (i) first digital pictures correlated to first instruction set for operating a first device (i.e., first correlation) are included in a knowledgebase; (ii) second digital pictures correlated to second instruction set for operating another (third device) (i.e., second correlation) are included in a knowledgebase; (iii) first correlation is learned in a first learning process that includes operating the first device at least partially by a first user; and (iv) second correlation is learned in a second learning process that

includes operating the other (third) device at least partially by a first user (or a second user). Decl. ¶¶ 342-344.

Grotmol teaches that the training sets and training configurations from a first robot can be “stored” or “saved.” Ex. 1005, 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; Decl. ¶ 342.

A POSITA would also understand that, based on Grotmol’s disclosure that a robot can be loaded with a trained configuration, it would have been obvious that Grotmol’s robot can be loaded with a second, third, or more configurations trained on other robots. *Id.*; Decl. ¶ 343. For example, a POSITA would have recognized that it would have been desirable to replace a robot’s training with a second, third, or more configurations to customize the robot to a particular task – e.g., a first trained configuration may be appropriate for certain tasks while a second or third configuration is more suited for another task. Decl. ¶ 343. And a POSITA would have recognized the advantages of training across multiple robots – e.g., to enable continued training while a robot was undergoing maintenance and increase the amount of training that could be done. Decl. ¶ 343.

B. Ground 2: Claims 25 and 27 Are Obvious Based on Grotmol in View of Hickman

Grotmol renders claims 25 and 27 obvious in view of Hickman. Claims 25 and 27 depend from claim 4, and claim 4 further depends from claim 1. Grotmol discloses claims 1 and 4, as explained above in Ground 1. *See supra* claims 1 and 4.

Hickman discloses a “shared robot knowledgebase [that] is updated based on robot experiences so that any particular robot may benefit from prior experiences of other robots.” Ex. 1007, Abstract. As detailed below, a POSITA would be motivated to combine Grotmol’s autonomous robotic system with Hickman’s shared robot knowledgebase. Accordingly, the combination of Grotmol and Hickman renders obvious the dependent claims 25 and 27 that are directed to a knowledgebase that includes correlations learned by operating a first device as well as a correlation learned by operating a second device.

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 knowledgebase of Hickman. Decl. ¶¶ 159-166.

Grotmol teaches that the training sets and training configurations from a first robot can be “stored” or “saved.” Ex. 1005, 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.

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. 1007, 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.*, 5:41-46. 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. ¶¶ 159, 161, 166. 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. 1008.002. Decl. ¶ 165. In addition, the two references are directed to the same field of the training and autonomous operation of robots (Decl. ¶ 159), and Hickman is listed on the face of Grotmol as a cited U.S. patent document. Ex. 1005.002.

In addition, Grotmol and Hickman both address a similar problem in which a robot learns how to “fetch” from a human. *Compare* Ex. 1007, 23:49-24:25 *with* Ex. 1005, 24:31-48, 27:28-40, Figure 9. Grotmol describes the task as “quite complex.” Ex. 1005, 24:31-33. Hickman teaches that the fetch task can be “optimiz[ed] . . . based on the collective experiences of many different robots.” Ex. 1007, 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. ¶ 166. 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.

For at least these reasons, it would have been obvious to a POSITA to combine Grotmol and Hickman. Decl. ¶¶ 159-166.

2. **Claim 25: The system of claim 4, wherein the system further comprising: a server that receives from the first device at least one of: the first one or more digital pictures, or the first one or more instruction sets for operating the first device, and wherein the second device receives from the server at least one of: the first one or more digital picture % or the first one or more instruction sets for operating the first device, and wherein the second device is caused to perform the one or more operations defined by the first one or more instruction sets for operating the first device.**

Dependent claim 25 adds: (i) a server that receives one of a first digital pictures or first instruction sets for operating the first device from the first device; (ii) the second device receives the first digital pictures or first instruction sets from the server; and (iii) the second device is caused to perform one or more operations defined by the first one or more instruction sets for operating the first device. Grotmol in combination with Hickman renders claim 25 obvious. Decl. ¶¶ 347-357.

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. 1005, 16:2-14, 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. Grotmol also discloses that training sets are used for autonomous operation of the robots by comparing acquired images with images from the stored training set to determine the most likely match and the corresponding instruction to perform. *See e.g., id.*, 33:24-35, Abstract. Thus, Grotmol discloses storing a first digital picture and first one or more instruction sets for operating a first device and a second device receiving the first digital picture or first one or more instruction sets for operating the first device. Decl. ¶ 347; *see also* Ex. 1005, 33:24-35, Abstract.

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). *Id.*, 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. ¶ 349.

Hickman discloses such a system wherein learned robot behaviors are uploaded to a shared knowledge base for use in other robots. Decl. ¶ 352. 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 ... [and] sends instructions to a robot for executing an application based on information stored in the shared robot knowledge base.” Ex. 1007, Abstract. Hickman discloses using a cloud computing system, where “[t]he ‘cloud’ may refer to a service or a group of services accessible over a network (e.g., the Internet) by clients, *server devices*, and cloud computing systems.” *Id.*, 5:20-23. Moreover, “[t]he cloud computing system may be configured to (i) send and receive data and queries to and from multiple robots, (ii) send data retrieved from the shared robot knowledge base to robots, and (iii) update data in the shared robot knowledge base on data received from robots.” *Id.*, 5:7-11; *see also id.*, Figure 6.

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.*, Abstract. Hickman describes 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. Hickman further discloses that when a robot queries the cloud processing engine,

“the cloud computing system sends data associated with the object of the second query to the second robot in response to the second query received from the second robot at block 606. The data may include...instructions for interacting with the object of the second query.” *Id.*, 29:33-41; *see also* Decl. ¶¶ 350-354.

In the combination of Grotmol and Hickman, the training configuration learned by operation of a robot described in Grotmol would be uploaded to the server containing the “shared robot knowledge base” described in Hickman, and a second robot would receive the digital pictures and instructions stored in the knowledge base in order to perform the autonomous operation. Decl. ¶¶ 356-357. Thus, the combination of Grotmol and Hickman discloses: (i) a server that receives digital picture and instructions for operating a first device from the first device; (ii) a second device receiving from the server the digital picture and instruction; and (iii) the second device is caused to perform one or more operations defined by the first one or more instruction sets for operating the first device. Decl. ¶¶ 347-357.

3. Claim 27

- a. [27.1] The system of claim 4, wherein the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device are included in a knowledgebase, and wherein the knowledgebase further includes a second one or more digital pictures correlated with a second one or more instruction sets for operating a third device,

Grotmol in view of Hickman renders obvious limitation [27.1]. Decl. ¶¶ 358-361.

As described above in Grounds 1 and 2, Grotmol discloses: (i) training a robot wherein digital pictures 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. Ex. 1005, 33:24-35, Abstract; Decl. ¶¶ 194-199, 226, 244-245. Thus, the knowledgebase in Grotmol can store additional correlations, including a second correlation (second digital pictures correlated to second instruction set for operating another device). Decl. ¶ 358.

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 ... [and] sends instructions to a robot for executing an application based on information stored in the shared robot knowledge base.” Ex. 1007, 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. ¶ 359. 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. Ex. 1007, 26:21-27:21.

As explained above, it would have been obvious to combine Hickman’s shared robot knowledge base with Grotmol’s autonomous robotic system such that the shared knowledge base includes the training of multiple robots by multiple users. Decl. ¶ 353, 357. The combination discloses a knowledge base that includes digital pictures correlated with instructions for operating a first robot, and digital pictures correlated with instructions for operating a second robot. Decl. ¶¶ 360-361.

- b. **[27.2] and wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least: receiving or generating an additional one or more digital pictures;**

Grotmol discloses receiving or generating additional digital pictures. *See supra* limitations [1.4], [4.2]; Decl. ¶¶ 187-188, 215-216. Likewise, Hickman discloses that the robot can include a processor that receives additional digital pictures from a camera Ex. 1007, 8:28-35. Decl. ¶ 362.

- c. **[27.3] determining the second one or more instruction sets for operating the third device based on at least partial match between the additional one or more digital pictures and the second one or more digital pictures; and at least in response to the determining the second one or more instruction sets for operating the third device, causing a fourth device to perform one or more operations defined by the second one or more instruction sets for operating the third device.**

As described above, in the combination of Grotmol and Hickman, the knowledgebase would include training sets learned from operating multiple robot devices (i.e., digital pictures correlated with instructions for operating a first device, second device, third device, etc.). Decl. ¶¶ 347, 350, 352-354. Grotmol discloses that autonomous operation of a robot involves determining an instruction set based on a least a partial match between a new picture and a stored picture in the knowledgebase. *See supra* limitation [4.3] Decl. ¶¶ 219-222, 363. In the combination of Grotmol and Hickman any number of robots would be autonomously

operated using the shared knowledgebase, such as a fourth robot. Decl. ¶ 364. The autonomous operation would involve determining an instruction based on a partial match between a new picture and stored picture correlated with an instruction for operating a first, second or third device, and then causing the fourth robot to perform the operation defined by the determined instruction. *Id.*

C. Ground 3: Claim 30 Is Obvious Based on Grotmol in View of Hoffman

Grotmol renders claim 30 obvious in view of Hoffman. Claim 30 depends from claim 29, claim 29 further depends from claim 4, and claim 4 further depends from claim 1. Grotmol discloses claims 1 and 4, as explained above in Ground 1. *See supra* claims 1 and 4. Further, Grotmol discloses claim 29 as explained below.

1. Motivation to Combine Grotmol and Hoffman

A person of ordinary skill in the art would have been motivated to combine the autonomous robotic system of Grotmol with the handheld device and augmented display of Hoffman. Decl. ¶¶ 366-371.

Grotmol teaches using a control screen, such as on an iPhone App, that can be used by a user to send commands to the robot. Ex. 1005, 22:55-23:2; *id.*, 25:30-37 (“The system may be configured to learn from user commands to control the environment (e.g. robot) by paying attention to features provided by the first and the last feature extractor. For example, the user may control the robot using a gamepad (or other input device used to provide ‘user commands’) to approach the

target while avoiding the obstacles ('Behavior 1') using input from target tracker ('FE 1') and from obstacle detector ('FE 1')."), 33:17-23 ("A user may control/training the robot with a remote device (e.g., comprising a Gamepad[®] controller and an iOS[®] application, and/or a handset device (e.g., a smartphone). Training of the robot's controller may be based on the user observing robot's actions and sending one or more target control commands to the robot via the training handset."); *see also id.*, 23:31-38, 25:10-25, 26:21-33. Grotmol also discloses that its control screen can include a "touchscreen interface" which can include a "touchfader combiner [that] may comprise overriding control methods" such that "the user can implement 'virtual additive' function by touching the screen just a bit to the left or to the right of the slider's current position." Ex. 1005, 36:62-37:7.

Grotmol further describes using its camera to capture its surroundings in a 360 degree view field which can "provide additional information about robot's environment." *Id.*, 38:47-51. Grotmol further describes implementations whereby the user interface includes "a head-mounted device such as an Oculus Rift." *Id.*, 45:37-51.

Hoffman also teaches controlling a robot remotely using a handheld device (controller unit) that can receive and display images from the robot, including augmented images that overlay a representation of the robot on the images. *See, e.g.*, Ex. 1009, 2:62-67 ("Another aspect of the disclosure provides an operator

controller unit for controlling a robot. The operator controller unit includes a screen and a processor in communication with the screen. The processor is configured to electronically receive images and augment the images by overlaying a representation of the robot on the images.”); *see also id.*, 3:2-10. “The robot representation includes user-selectable portions corresponding to movable portions of the robot” which allows the user to remotely manipulate the robot from the controller unit. *Id.*, 2:67-3:2; *see also id.*, 3:2-24. The augmented images can include a “processed data set” of images from the robot used to generate a map layout of the area surrounding the robot. Ex. 1009, 8:1-8. *Id.* (“Moreover, the remote user 10 may access the received sensor data 502 for review, analysis, and control of the robot 200. In some examples, the cloud service 22 executes an application outputting data 23 that may be communicated to the robot 200. For example, the cloud service 22 may process received image data 502 (captured by the robot 200) and return a processed data set 23 (e.g., a layout map of the environment) to the robot 200 (e.g., to a controller 400).”).

A POSITA would have been familiar with the teachings of both Grotmol and Hoffman and would have readily appreciated the advantages of their combination. Decl. ¶ 370. In addition, the two references are directed to the same field of semi-autonomous and autonomous operations of robots. Decl. ¶ 370. A POSITA would have been motivated to combine Hoffman’s augmented map generation with

Grotmol's autonomous robotic system in order to provide more detailed information about the robot's surroundings to the user. Such combination would have simply been the use of a known technique to improve a similar device in the same way. Decl. ¶ 370.

The resulting combination of Grotmol's autonomous robotic system and Hoffman's handheld device and augmented display would have been expected and predictable. Decl. ¶ 370. Grotmol expressly discloses controlling and training the robot via a handheld device, such as a gamepad, and Hoffman's expansion upon this feature does not interfere with Grotmol's autonomous robotic system. Decl. ¶ 370.

For at least these reasons, it would have been obvious to a POSITA to combine Grotmol and Hoffman. Decl. ¶¶ 366-371.

1. Claim 29

Grotmol discloses "wherein the generating the new one or more digital pictures includes: detecting one or more objects in the first device's surrounding or the second device's surrounding; generating one or more representations of the one or more objects; and generating the new one or more digital pictures that include the one or more representations of the one or more objects." Decl. ¶¶ 326-330.

As noted above, the '583 patent provides examples of objects in pictures such as "car, pedestrian, door, building, animal, person, etc." Ex. 1001, 88:22-37. The '583 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.*

Similarly, Grotmol discloses that 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.” Ex. 1005, 38:56-65.

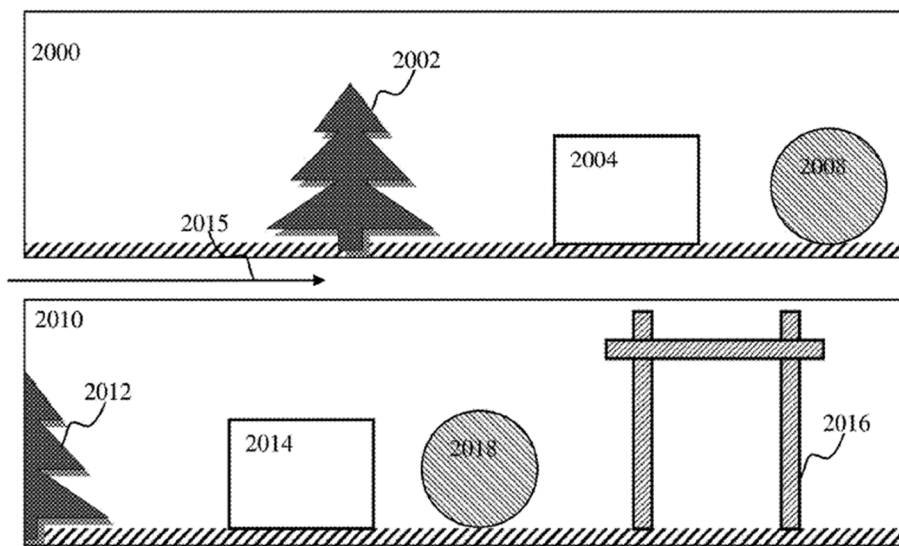


FIG. 20A
Ex. 1005, Fig. 20A

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. 1005, 8:57-9:3. *See, e.g., id.*, 9:41-52 (“In one or more implementations, object recognition and/or classification may be implemented”). Grotmol, like the ’583 patent, further includes edge

detection. Ex. 1005, 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 and that the images may include representations of the objects detected in the device’s surroundings. *E.g., 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”). Decl. ¶ 329.

2. Claim 30

Grotmol in view of Hoffman renders obvious “wherein the detecting the one or more objects in the first device’s surrounding or the second device’s surrounding includes detecting at least one or more locations of the one or more objects, and wherein the new one or more digital pictures include a top-down view of the one or more representations of the one or more objects.” Decl. ¶¶ 372-375.

As described above with respect to claim 29, Grotmol discloses detecting one or more objects in the first device’s surrounding, which would include detecting the locations of the one or more objects. Decl. ¶¶ 326-329; Ex. 1005, 38:56-65, Figure 20A, 8:57-9:3, 9:41-52, 7:60-64, 10:23-34. Grotmol does not expressly disclose that the new one or more digital pictures include a top-down view of the one or more

representations of the one or more objects, but this would have been obvious in view of Hoffman.

Hoffman describes generating an augmented map of a robot's surroundings (top-down view) that includes the locations of representations of objects, such as walls and obstacles. Ex. 1009, 8:1-8; Decl. ¶ 372. This is illustrated in particular in Figure 6F of Hoffman:

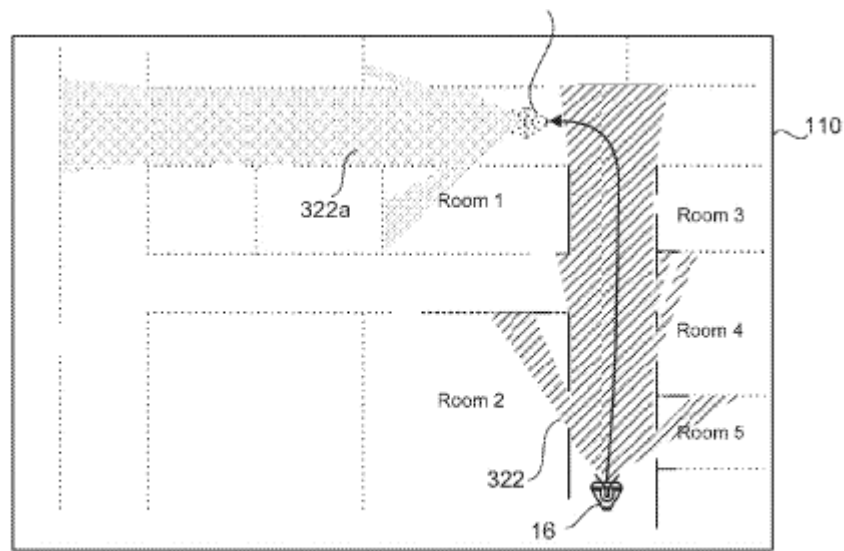


FIG. 6F

Ex. 1009, Fig. 6F

X. CONCLUSION

For the foregoing reasons, the *inter partes* review should be instituted and claims 10, 11, 25, 27, and 30 of the '583 patent should be cancelled as unpatentable.

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Respectfully submitted,

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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 9,101 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.

Dated: June 30, 2023

Respectfully submitted,

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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 30, 2023, a complete and entire copy of this **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,055,583, 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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