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Paper 50
Entered: January 12, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORPORATION,
Petitioner,

v.

AMERICAN VEHICULAR SCIENCES LLC,
Patent Owner.

Case IPR2013-00424
Patent 5,845,000

Before JAMESON LEE, TREVOR M. JEFFERSON,
and LYNNE E. PETTIGREW, *Administrative Patent Judges*.

JEFFERSON, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Toyota Motor Corporation ("Toyota" or "Petitioner") filed a petition requesting an *inter partes* review of claims 10, 11, 16, 17, 19, 20, and 23 of U.S. Patent No. 5,845,000 (Ex. 1001, "the '000 patent"). Paper 2 ("Pet."). On January 14, 2014, we instituted an *inter partes* review of claims 10, 11, 16, 17, 19, 20, and 23 on three grounds of unpatentability. Paper 16 ("Dec. on Inst."). American Vehicular Sciences ("AVS" or "Patent Owner") filed a Patent Owner Response (Paper 29, "PO Resp.") and Petitioner filed a Reply To Patent Owner's Response (Paper 34, "Reply").

Patent Owner did not file a motion to amend the claims.

A consolidated oral hearing for IPR2013-00419 and IPR2013-00424, both involving the same Petitioner and the same Patent Owner, was held on August 18, 2014. A transcript of the joint hearing was entered in the record. Paper 49 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(c). This final written decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons that follow, we determine that Petitioner has not shown by a preponderance of the evidence that claims 10, 11, 16, 17, 19, 20, and 23 of the '000 patent are unpatentable.

A. Related Proceedings

Petitioner and Patent Owner notify us that the '000 patent has been asserted by AVS in the following district court cases: (1) *American Vehicular Sciences LLC v. Toyota Motor Corp.*, Civil Action No. 6:12-CV-406 (E.D. Tex.) (filed June 25, 2012); (2) *American Vehicular Sciences LLC* *v. BMW Grp. A/K/A BMW AG*, Civil Action No. 6:12-CV-413 (E.D. Tex.) (filed June 25, 2012); and (3) *American Vehicular Sciences LLC v. Mercedes-Benz U.S. Intl., Inc.*, Civil Action No. 6:13-CV-308 (E.D. Tex.) (filed April 3, 2013). Pet. 1; Paper 23, 2–3.

B. The '000 Patent

The '000 patent is directed to a vehicle interior monitoring system that monitors, identifies, and locates occupants and other objects in the passenger compartment of a vehicle and objects outside of the vehicle. Ex. 1001, Abstract: 1–4. Objects are illuminated with electromagnetic radiation, and a lens is used to focus the illuminated images onto the arrays of a charge coupled device (CCD). *Id*. at Abstract: 1–9, 7:26–40. Computational means using trained pattern recognition analyzes the signals received at the CCD to classify, identify, or locate the contents of external objects, which, in turn, are used to affect the operation of other vehicular systems. *Id*. at Abstract: 10–12. The '000 patent discloses that a vehicle computation system uses a "trainable or a trained pattern recognition system" which relies on pattern recognition to process signals and to "identify" an object exterior to the vehicle or an object within the vehicle's interior. *Id*. at 3:21–44.

Figures 7 and 7A, reproduced below, illustrate portions of the sensor system that use transmitters, receivers, circuitry, and processors to perform pattern recognition of external objects in anticipation of a side-impact collision:

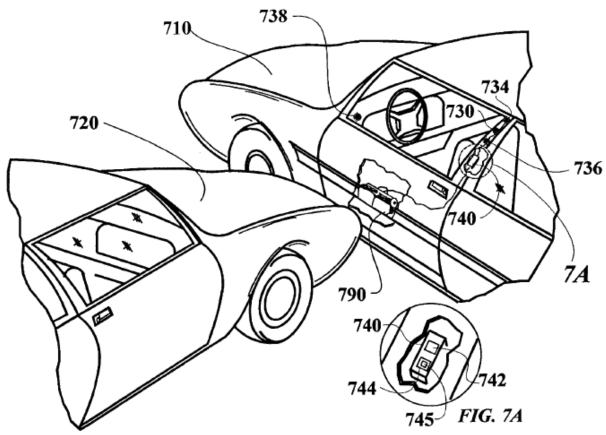

FIG. 7

Figure 7, with Figure 7A inset, depicts vehicle 720 approaching the side of another vehicle 710 and shows transmitter 730 and receivers 734 and 736. Ex. 1001, 9:48–52, 18:28–40. Figure 7A provides a detailed view of the electronics that drive transmitter 730 and circuitry 744 containing neural computer 745 to process signals returned from the receivers using pattern recognition. *Id*. at 18:33–40.

Figure 8 also illustrates an exterior monitoring system and is reproduced below:

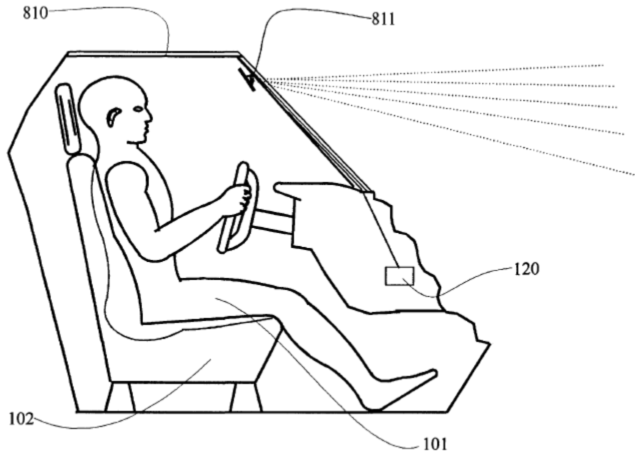

FIG. 8

Figure 8 depicts a system for detecting the headlights or taillights of other vehicles used in conjunction with an automatic headlight dimming system. Ex. 1001, 9:54–58. CCD array in Figure 8 is designed to be sensitive to visible light and does not use a separate source of illumination as depicted in Figure 7. *Id*.

The Summary of the Invention discusses an invention related to detection of objects in the interior of the vehicle and objects external to the vehicle. *Id*. at 7:25–30. Specifically, external objects are illuminated with “electromagnetic, and specifically infrared, radiation,” and lenses are used to focus images onto one or more CCD arrays. *Id*. The disclosure further states that the invention provides (1) an “anticipatory sensor” located within the vehicle to “identify about-to-impact object[s] in the presence of snow and/or fog,” (2) “a smart headlight dimmer system” to sense and identify headlights and taillights and distinguish them from other reflective surfaces, and (3) blind spot detection. *Id*. at 8:37–53.

C. Illustrative Claims

We instituted *inter partes* review of independent claims 10, 16 and 23, and dependent claims 11, 17, 19, and 20. Independent claims 10, 16, and 23, provided below with disputed limitations in italics, are illustrative of the subject matter of the ’000 patent:

> 10. In a motor vehicle having an interior and an exterior, a monitoring system for monitoring at least one object exterior to said vehicle comprising:
>
> a) transmitter means for transmitting electromagnetic waves to illuminate the at least one exterior object;
>
> b) reception means for receiving reflected electromagnetic illumination from the at least one exterior object;
>
> c) processor means coupled to said reception means for processing said received illumination and creating an electronic signal characteristic of said exterior object based thereon;
>
> d) categorization means coupled to said processor means for categorizing said electronic signal to identify said exterior object, said categorization means comprising trained pattern recognition means for processing said electronic signal based on said received illumination from said exterior object to provide an identification of said exterior object based thereon, said pattern recognition means being structured and arranged to apply *a pattern recognition algorithm generated from data of possible exterior objects and patterns of received electromagnetic illumination from the possible exterior ob*jects; and
>
> e) output means coupled to said categorization means for affecting another system in the vehicle in response to the identification of said exterior object.

> 16. In a motor vehicle having an interior and an exterior, an automatic headlight dimming system comprising:

a) reception means for receiving electromagnetic radiation from the exterior of the vehicle;

b) processor means coupled to said reception means for processing the received radiation and creating an electronic signal characteristic of the received radiation;

c) categorization means coupled to said processor means for categorizing said electronic signal to identify a source of the radiation, said categorization means comprising trained pattern recognition means for processing said electronic signal based on said received radiation to provide an identification of the source of the radiation based thereon, said pattern recognition means being structured and arranged to apply *a pattern recognition algorithm generated from data of possible sources of radiation including lights of vehicles and patterns of received radiation from the possible sources*; and

d) output means coupled to said categorization means for dimming the headlights in said vehicle in response to the identification of the source of the radiation.

23. A method for affecting a system in a vehicle based on an object exterior of the vehicle, comprising the steps of:

a) transmitting electromagnetic waves to illuminate the exterior object;

b) receiving reflected electromagnetic illumination from the object on an array;

c) processing the received illumination and creating an electronic signal characteristic of the exterior object based thereon;

d) processing the electronic signal based on the received illumination from the exterior object to identify the exterior object, said processing step comprising the steps of *generating a pattern recognition algorithm from data of possible exterior objects and patterns of received electromagnetic illumination from the possible exterior objects*, storing the algorithm within a pattern recognition system and applying the pattern

> recognition algorithm using the electronic signal as input to obtain the identification of the exterior object; and
>
> e) affecting the system in the vehicle in response to the identification of the exterior object.

Ex. 1001, 21:35–61, 22:17–39, 23:19–24:2 (emphases added).

D. The Asserted Grounds

The asserted grounds of unpatentability in this *inter partes* review are as follows (Dec. on Inst. 45):

Reference[s]	Basis	Claims Challenged
Lemelson[1]	§ 102(e)	10, 11, 16, 17, 19, 20, and 23
Lemelson and Asayama[2]	§ 103(a)	10, 11, 19, and 23
Lemelson and Yanagawa[3]	§ 103(a)	16, 17, and 20

II. DISCUSSION

A. Claim Construction

In the Decision on Institution, we applied the broadest reasonable claim interpretation and interpreted certain claim terms as follows:

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[1] U.S. Patent No. 6,553,130, issued on April 22, 2003 (Ex. 1002, "Lemelson") from a continuation application of U.S. Application No. 08/105,304 filed on Aug. 11, 1993 (Ex. 1003, "the '304 appl.").
[2] U.S. Patent No. 5,214,408, issued on May 25, 1993 (Ex. 1004, "Asayama").
[3] Japanese Unexamined Patent Application Publication No. S62-131837, June 15, 1987 (Ex. 1008, "Yanagawa Japanese"). Citations herein are to the English translation of Ex. 1008 (Ex. 1009, "Yanagawa").

Claim Term	Construction
"pattern recognition algorithm"	"an algorithm which processes a signal that is generated by an object, or is modified by interacting with an object, for determining to which one of a set of classes the object belongs"
"trained pattern recognition means . . ."	"a neural computer or microprocessor trained for pattern recognition, and equivalents thereof"
"identify" and "identification"	"determining that the object belongs to a particular set or class"
"transmitter means for transmitting . . ."	"infrared, radar, and pulsed GaAs laser systems" and "transmitters which emit visible light"
"reception means for receiving . . ."	"a CCD array and CCD transducer"
"processor means . . . for processing"	recited processor provides sufficient structure
"categorization means . . . for categorizing"	"a neural computer, a microprocessor, and their equivalents"
"output means . . ."	"electronic circuit or circuits capable of outputting a signal to another vehicle system"
"dimming the headlights"	"decreasing the intensity or output of the headlight to a lower level of illumination"
"measurement means for measuring . . ."	recited radar provides sufficient structure
"wherein said categories further comprise radiation from taillights of a vehicle-in-front"	"categorizing radiation from taillights of a vehicle-in-front, which may include additional types of radiation"

Dec. on Inst. 9–26. AVS does not contest these constructions for purposes of this proceeding, PO Resp. 9–12, and Toyota does not dispute these constructions in its Reply. We maintain these constructions for this Final Written Decision.

B. Asserted Grounds of Unpatentability Based, in Part, on Lemelson

The central and dispositive issue in the parties' dispute as to whether the challenged claims are unpatentable based, in part, on Lemelson turns on whether or not Lemelson discloses the "generating the pattern recognition algorithm" limitations of independent claims 10 and 16 ("pattern recognition algorithm generated from . . .") and independent claim 23 ("generating a pattern recognition algorithm from . . ."). PO Resp. 12–21; Reply 3–11. Although we construed "trained pattern recognition algorithm" in our Decision on Institution, we did not provide an express construction for the "generated from" language following that term in the claims. For this Final Written Decision, we construe the "generated from" limitation according to its broadest reasonable interpretation in light of the specification of the '057 patent. *See* 37 C.F.R. § 42.100(b).

1. "a pattern recognition algorithm generated from . . ." (claims 10 and 16) and "generating a pattern recognition algorithm from . . ." (claim 23)

AVS contends that the claim limitations for generating the pattern recognition algorithm in claims 10, 16, and 23 require a specific type of training to generate the claimed algorithm. PO Resp. 7, 12. AVS relies on the Declaration of Professor Cris Koutsougeras, PhD (Ex. 2002) to support its contention that the '000 patent discloses and claims a specific method for training the algorithm using (1) data of possible exterior objects or data of possible radiation sources, and (2) patterns of received waves from the possible sources. PO Resp. 7 (citing Ex. 2002 ¶¶ 19, 20, 53). AVS asserts that the type of training the ’000 patent discloses is the use of “real radar waves” or is based on real radar waves as the received radar waves from possible objects used to generate the algorithm. *See* PO Resp. 7 (citing Ex. 2002 ¶¶ 19–20). AVS contrasts the use of real waves (or data) to train the pattern recognition system as recited in the claims with other methods of training, such as the use of simulated data (e.g., a computer simulation of radar waves). PO Resp. 7–8 (citing Ex. 2002 ¶¶ 49, 57–64).

Toyota argues that the “generated from” language of independent claims 10, 16 and 23, is not limited to training with real data because the claims merely require that the data and patterns used to train the algorithm *represent* possible exterior objects and received electromagnetic illumination as recited in the independent claims. Reply 5. Toyota argues that because the claims refer to “data *of*” and “patterns *of*” and not “data *from*” and “patterns *from*,” the claim language encompasses training using simulated data and patterns that *represent* possible objects and received waves, respectively. Reply 5.

As neither party asserts that these terms are defined in the specification, we refer to the terms’ ordinary and customary meaning as they would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

With respect to the ’000 patent written description, the limited discussion of training a neural network describes that a large number of real possible objects is used to train such a network to detect objects in the interior of a vehicle. Ex. 1001, 16:61–17:2 (discussing the use of real interior objects to train a neural network). Thus, the sole example of training described in the specification uses real objects.

We are not persuaded by Toyota’s arguments that the claim language reliance on the term “of” rather than “from” alters the interpretation of the claim. We determine that neither the specification nor the claim language in context supports such parsing.

In context, we find that the plain language of the limitations at issue in claims 10 and 23 expressly states that two types of training inputs are required—both “data of possible exterior objects and patterns of received electromagnetic illumination from the possible exterior objects.” Similarly, claim 16, in context, requires two types of training inputs—both “data of possible sources of radiation including lights of vehicles and patterns of received radiation from the possible sources.”

In view of the claim language and the description in the ’000 patent of a training session using signal patterns actually received from real objects, we see no reasonable basis for interpreting the “generating from . . .” limitations of claims 10 and 16 (“pattern recognition algorithm generated from . . .”) and claim 23 (“generating a pattern recognition algorithm from . . .”) to encompass training of a pattern recognition algorithm using simulated wave patterns. Therefore, the broadest reasonable construction of the claim language at issue requires a pattern recognition algorithm that has been generated using patterns of waves actually received from possible exterior objects.

2. Lemelson

Lemelson is directed to a vehicle computer system to monitor and analyze image information for external objects by identifying objects and the distance between a vehicle and external object or objects. Ex. 1002, Abstract, 1:10–16, 2:14–23, 2:39–3:39. Figure 1, reproduced below, shows a block diagram of the vehicle image analysis computer:

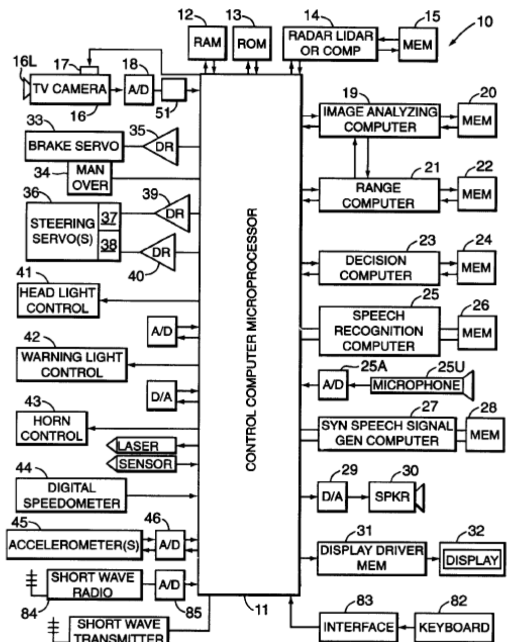

FIG. 1

Figure 1 shows computer control system 10 including microprocessor 11 and image analyzing computer 19. Image analyzing computer 19 employs neural networks and artificial intelligence along with fuzzy logic algorithms to identify objects exterior to the vehicle. *Id*. at 5:15–24, 5:30–45. The system employs camera 16 and laser scanners to generate image data which is analyzed by computer 19 to control various vehicle systems, including warning and display systems, braking systems, and headlight systems. *Id*. at 5:45–59, Fig. 1 (items 31, 32, 33, 41, and 42).

Lemelson discloses using image analysis computer 19 in a hazard or external object avoidance system. *Id*. at 4:40–43. The imaging system detects objects and the distance between the vehicle and exterior object, and affects the operation of other vehicle systems. *Id*. at 6:9–20.

Figure 2, showing image analysis computer 19 of Figure 1 in further detail, is reproduced below:

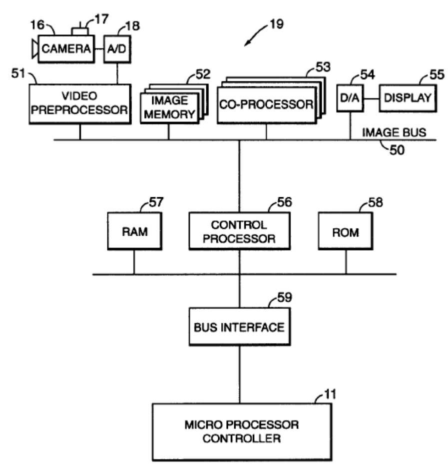

FIG. 2

Figure 2 shows a computer architecture based on neural networks that use a parallel processing system with dedicated imaging proicessing hardware. *Id*. at 6:21–27. The imaging system uses video camera 16, described as a CCD array, but also may use image intensifying electron gun and infrared imaging methods on the front, side, and rear of the vehicle to capture image data. *Id*. at 6:31–42.

Lemelson further discloses that image analyzing computer 19 uses neural network processing that is trained to recognize roadway hazards. *Id*. at 8:1–4, 7:47–50. The neural network training in Lemelson "involves *providing known inputs* to the network resulting in desired output responses" and applies various learning algorithms. *Id*. at 8:5–8 (emphasis added).

3. Anticipation by Lemelson—Claims 10, 11, 16, 17, 19, 20, and 23

To establish anticipation under § 102(e), "all of the elements and limitations of the claim must be shown in a single prior reference, arranged as in the claim." *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). "Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (citations omitted).

Toyota contends that Lemelson discloses a neural computing network that uses training involving *known inputs* and that various learning algorithms may be applied to the neural computing network. Pet. 19 (citing Ex. 1002, 7:47–8:24). Toyota relies on the declaration testimony of Dr. Nikolaos Papanikolopoulos (Ex. 1013) to establish that Lemelson discloses use of neural networks that are trained to identify and, subsequently, differentiate between the types of radiation received as inputs and that such training uses known inputs. *See* Pet. 21–22 (citing Ex. 1013 ¶¶ 56–59, 63). The support for Toyota's contention that Lemelson discloses the training of the neural network disclosed in Lemelson is the statement that "[t]raining involves providing known inputs to the network resulting in desired output responses." Ex. 1002, 8:4–6; *see* Pet. 19, 25–26; Ex. 1013 ¶ 59 (quoting same).[4] Toyota's Petition states that "Lemelson explains how [a image analyzing computer] may be implemented as a 'neural computing network' that is 'trained' using 'known inputs.'" Pet. 19 (citing Ex. 1002, 7:47–8:24).

AVS contends that Lemelson does not disclose, either expressly or inherently, the specific type of training of the pattern recognition recited in independent claims 10, 16, and 23. PO Resp. 12–13. Although AVS admits that Lemelson discloses a system for identifying objects exterior to a vehicle

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[4] The pertinent part of Lemelson cited in Toyota's claim chart for claim 10 (and related claims 16 and 23) (Pet. 26, 29, 30) states:

> Neural networks used in the vehicle [] warning system are trained to recognize roadway hazards which the vehicle is approaching including automobiles, trucks, and pedestrians. Training involves providing known inputs to the network resulting in desired output responses. The weights are automatically adjusted based on error signal measurements until the desired outputs are generated. Various learning algorithms may be applied. Adaptive operation is also possible with on-line adjustment of network weights to meet imaging requirements.

Ex. 1002, 8:1–10; *see* Pet. 26, 29, 30.

and discloses using a neural network (a type of pattern recognition algorithm) to identify such objects, AVS contends that the claim language requires a specific type of training to generate the claimed algorithm, which Lemelson fails to disclose. PO Resp. 14. AVS argues that Lemelson fails to disclose "generating" the neural network (pattern recognition algorithm). Pet. 14.

AVS further argues that because Lemelson could have involved generating the pattern recognition algorithm using completely "simulated data," it does not disclose using "data from possible exterior objects and patterns of received waves (e.g., received electromagnetic illumination) from the possible exterior objects." PO Resp. 17 (citing Ex. 2002 ¶¶ 60–64). AVS relies on the testimony of Prof. Koutsougeras to establish that "[s]imulated data is data that does not include any 'patterns of electromagnetic illumination from the possible exterior objects' or 'patterns of received radiation from the possible sources' of radiation." *Id*. Such simulated data is generated by computers to simulate sensor readings for object detection. *Id*. Such simulated data or "made-up data," AVS contends, would not constitute data from objects or patterns of waves from objects. *Id.* (quoting Ex. 2002 ¶ 58).

AVS asserts that Toyota's Petition and expert testimony rely only on the reference in Lemelson to "known inputs" to train the neural computer to disclose the specified algorithm generating limitations of independent claims 10, 16, and 23. PO Resp. 14. AVS's expert, Prof. Koutsougeras, testifies that the reference to "known inputs" in Lemelson relied upon by Toyota is silent as to the type of known inputs and could encompass the use of simulated data for generating a pattern recognition algorithm. PO Resp. 17–18 (citing Ex. 2002 ¶¶ 57–64).

Similarly, AVS argues that Lemelson's reference to training with "known inputs" does not expressly or inherently disclose "data of possible exterior objects and patterns of received electromagnetic illumination from the possible exterior objects" because actual objects may not have been used to provide the inputs. PO Resp. 20 (citing Ex. 2002 ¶¶ 65, 66, 68–70).

In other words, because "known inputs" used for training in Lemelson could encompass simulated or real data, Lemelson does not anticipate the claimed training of the pattern recognition algorithm as recited in claims 10, 16, and 23.

4. Analysis

In light of our determination above that "a pattern recognition algorithm generated from . . ." (claims 10 and 16) and "generating a pattern recognition algorithm from . . ." (claim 23) limitations require training using patterns of waves actually received from possible exterior objects and the parties' contentions regarding Lemelson's disclosure, we determine that Petitioner has not demonstrated by a preponderance of the evidence that Lemelson's reference to training using "known inputs" satisfies the pattern recognition algorithm "generated from" limitations of claims 10, 16, and 23.

Toyota's Petition and expert testimony equates training with "known inputs" to the specified training in claims 10, 16, and 23, but fails to provide sufficient evidence to support a finding by a preponderance of the evidence that "known inputs" refers to training, either expressly or inherently, with actual data of possible exterior objects.

We credit the testimony of Prof. Koutsougeras that one of ordinary skill in the art would have interpreted "known inputs" used for training in Lemelson as open with respect to the type of data—real or simulated—used to train the neural network. Ex. 2002 ¶¶ 57–64. This understanding is supported by Toyota's counsel, who was asked "does the term 'known inputs' [in Lemelson] refer to just real sensor data or is it understood as both," and answered that "one of ordinary skill in the art would have understood [known inputs] as real sensor data, but it is *not to the exclusion of simulated data*." Tr. 27:25–28:6 (emphasis added). In addition, Toyota's expert acknowledges that the use of simulated data was a possibility to train pattern recognition algorithms. *See* Ex. 2003, Deposition Transcript of Dr. Papanikolopoulos, 102:5–14 (stating that "in this particular domain, you go to simulated data, or if you don't have access to real data, to real images" for training pattern recognition systems to detect automobiles); *see also* Ex. 2003, 104:9–23. Thus, the "known inputs" reference in Lemelson is equally applicable to simulated or real data.

We find Prof. Koutsougeras's testimony credible that "known inputs" as referenced in Lemelson could include real or simulated data for training the neural computer. Ex. 2002 ¶¶ 57–64; *see* Deposition of Prof. Koutsougeras, Ex. 1019 at 132:24–138:5, 157:12–159:14, 163:18–164:7. We disagree with Toyota's argument that Dr. Koutsougeras's testimony should be given little weight because he has limited experience with pattern recognition in vehicles. Reply 10–11. To the contrary, AVS's expert, Dr. Koutsougeras, testified that his dissertation was in neural networks, particularly methods of training neural networks. Ex. 1019, Koutsougeras Deposition 20:19–21:22. We are not persuaded by Toyota's argument that experience in training neural networks specifically for vehicle exterior monitoring application is necessary to support Dr. Koutsougeras's testimony regarding an ordinarily skilled artisan's understanding of the training using "known inputs" in Lemelson at the time of patenting.

Toyota's Reply introduces several arguments and supporting declaration evidence that were not present in the filed Petition. Specifically, Toyota contends (1) that a person of ordinary skill in the art would have understood that training a neural network to identify exterior objects or sources of radiation in Lemelson would have been done with real data and not with simulated or partial data (Reply 8 (citing Reply Declaration of Nikolas Papanikolopoulos, Ph.D., Ex. 1020 ¶¶ 10–24)); and (2) the "generated from" limitation is not a limitation for purposes of patentability because it is a product-by-process claim that merely specifies the method of creating an algorithm and does not structurally limit the claim in any way. Reply 3–4.[5]

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[5] Citing *SmithKline Beecham Corp. v. Apotex Corp.*, 439 F.3d 1312, 1317, 1319 (Fed. Cir. 2006); *In re Warmerdam*, 33 F.3d 1354, 1360–61 & n. 6 (Fed. Cir. 1994); *Greenliant Sys., Inc. v. Xicor LLC*, 692 F.3d 1261, 1268 (Fed. Cir. 2012).

A Reply affords the Petitioner an opportunity to refute arguments and evidence advanced by the Patent Owner, not an opportunity to cure deficiencies in its Petition. 37 C.F.R. § 42.23(b); Rules of Practice for Trials Before the Patent Trial and Appeal Board and Judicial Review of Patent Trial and Appeal Board Decisions; Final Rule, 77 Fed. Reg. 48,612, 48,620 (Aug. 14, 2012) ("Section 42.23 provides that oppositions and replies must comply with the content requirements for a motion and that a reply may only respond to arguments raised in the corresponding opposition. Oppositions and replies may rely upon appropriate evidence to support the positions asserted. Reply evidence, however, must be responsive and not merely new evidence that could have been presented earlier to support the movant's motion."). Replies that raise new issues or belatedly present evidence will not be considered. 77 Fed. Reg. at 48,767 (stating that "[w]hile replies can help crystalize issues for decision, a reply that raises a new issue or belatedly presents evidence will not be considered and may be returned").

With respect to Toyota's evidence in support of its argument that a person of ordinary skill in the art would have interpreted "known inputs" in Lemelson as referring to actual or real data, Toyota cannot rely belatedly on this evidence in its Reply and Reply Declaration of Nikolaos Papaniokolopoulos, PhD (Ex. 1020) to make up for the deficiencies in its Petition. *See*, *e.g.*, 37 C.F.R. § 42.23(b) (noting that "[a]ll arguments for the relief requested in a motion must be made in the motion," and that a "reply may only respond to arguments raised in the corresponding opposition or patent owner response").

Even if timely, Petitioner has not shown by a preponderance of the evidence that one of ordinary skill in the art would have understood that training a neural network to identify exterior objects or sources of radiation in Lemelson would have been done with real data and not with simulated or partial data. Reply 8. Toyota's belated expert testimony indicates only that one of ordinary skill in the art may have preferred real over simulated or partial data for various applications, but does not explain how the reference to known inputs in Lemelson in context would *expressly* disclose to one of ordinary skill in the art such a preference. *See* Ex. 1020 ¶¶ 10–20. A preference for real data over simulated or partially simulated data does not show by a preponderance of the evidence that Lemelson discloses the use of real data or actual received waves from possible objects to train the neural computer.

In addition, Petitioner's untimely citation to portions of Lemelson that discuss "adaptive operation" and "online adjustment" of a neural network refer to alterations to the neural network *after* training has occurred. Reply 10 (citing Ex. 1002, 8:9–10). Thus, Toyota's evidence of real world data being used to adjust operations of a neural network does not meet the burden of showing by a preponderance of the evidence that Lemelson discloses *training* with real world data.

We also find untimely Toyota's argument that the "generated from" limitation is not a limitation for purposes of patentability because it is a process step within an apparatus claim and should not be given patentable weight to distinguish the Lemelson reference. Reply 3–4. We note that

Toyota's Petition did not treat the "generated from" language of claims 10, 16, and 23 as if they were not limitations. *See* Pet. 19, 25–26. Toyota's Petition made no argument that certain limitations of the challenged claims were product-by-process language and, thus, not limitations.

Even if Toyota's product-by-process argument was not untimely, however, we are not persuaded by Toyota's argument (Reply 4) that the pattern recognition algorithm that is trainable using real or simulated data results in the same product (or pattern recognition algorithm) regardless of the type of data that is used to train the algorithm. *See In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985) (stating that "[i]f the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process"). We find that Toyota's proffered expert testimony and attorney argument indicate that the resulting pattern recognition algorithm trained with real data differs from one that is trained using simulated data. Ex. 1020 ¶¶ 13–24; *see* Tr. 33:1–9 (citing testimony from Dr. Papanikolopoulos that simulated data and partial data would have been ineffective for training and distinguishing between types of objects).

We also note that the Federal Circuit has stated that "there is an exception to [the] general rule that the process by which the product is made is irrelevant." *Greenliant Sys., Inc. v. Xicor LLC*, 692 F.3d 1261, 1268 (Fed. Cir. 2012). The court states that "if the process by which a product is made imparts 'structural and functional differences' distinguishing the claimed product from the prior art, then those differences 'are relevant as evidence of no anticipation' although they 'are not explicitly part of the claim.'" *Greenliant Sys*., 692 F.3d at 1268 (quoting *Amgen Inc. v. F. Hoffman–La Roche Ltd*., 580 F.3d 1340, 1370 (Fed. Cir. 2009)); *see also SmithKline,* 439 F.3d at 1319 (stating that "[i]f those product-by-process claims produced a different product than that disclosed by the [prior art], there would be an argument that the [prior art] did not anticipate."). In the present case, Petitioner's belated evidence and argument reject the use of partial data to train neural networks in Lemelson. Reply 10 n.1 (citing Ex. 1020 ¶¶13–17). Thus, Toyota's own evidence indicates that there may be structural or functional differences between the resulting pattern recognition algorithms trained with real, simulated or partial data.

We are not persuaded by Petitioner's evidence that the resulting pattern recognition algorithm in the '000 patent is the same regardless of the type of data used to train the pattern recognition algorithm. Accordingly, we do not find that the "generated from" language of claims 10, 16, and 23 is not a limitation for purposes of patentability.

Based on the foregoing, Toyota's Petition and supporting evidence fail to establish that the reference to training with "known inputs" in Lemelson expressly or inherently discloses training with actual data of possible exterior objects. Petitioner's Reply fails to provide timely and persuasive evidence or argument that a person of ordinary skill in the art would understand training a neural computer using "known inputs" to disclose "generating a pattern recognition algorithm generated from . . ."

(claims 10 and 16) and "generating a pattern recognition algorithm from . . ." (claim 23).

Accordingly, Petitioner has not established that Lemelson discloses the "pattern recognition algorithm generated from . . ." (claims 10 and 16) and "generating a pattern recognition algorithm from . . ." (claim 23) limitations of independent claims 10, 16, and 23 and dependent claims 11, 17, 19, and 20. Petitioner has not demonstrated by a preponderance of the evidence that claims 10, 11, 16, 17, 19, 20, and 23, are unpatentable as anticipated by Lemelson.

C. Claims 10, 11, 19, and 23—Obviousness over Lemelson and Asayama

Petitioner's grounds for unpatentability for independent claims 10, and 23 and dependent claims 11 and 19 (which depend directly from claim 10) rely on the same contentions discussed above with respect to "a pattern recognition algorithm generated from . . ." (claim 10) and "generating a pattern recognition algorithm from . . ." (claim 23) limitations. Pet. 30–32. Toyota's Petition does not rely on Asayama to teach or suggest the "pattern recognition algorithm" generated from "data of possible exterior objects and patterns of received electromagnetic illumination from the possible exterior objects." *Id*. Accordingly, for the same reasons discussed above with respect to anticipation of independent claims 10 and 23, Petitioner has not demonstrated by a preponderance of the evidence that claims 10, 11, 19, and 23 are unpatentable over Lemelson and Asayama.

D. Claims 16, 17, and 20—Obviousness over Lemelson and Yanagawa

Petitioner's grounds for unpatentability for independent claim 16 and dependent claims 17 and 20 (which depend directly from claim 16) rely on the same contentions discussed above with respect to the "pattern recognition algorithm generated from . . ." (claim 16) limitation. Pet. 57–59. Our prior Decision found that Yanagawa did not disclose or teach a "trained pattern recognition means" or "pattern recognition algorithm." Dec. on Inst. 44. Toyota's Petition does not rely on Yanagawa to teach or suggest the "pattern recognition algorithm" generated from "data of possible exterior objects and patterns of received electromagnetic illumination from the possible exterior objects." Pet. 57–59. Accordingly, for the same reasons discussed above with respect to anticipation of independent claim 16, Petitioner has not demonstrated by a preponderance of the evidence that claims 16, 17, and 20 are unpatentable over Lemelson and Yanagawa.

III. CONCLUSION

Based on the evidence and arguments, Petitioner has not demonstrated by a preponderance of the evidence that:

(1) claims 10, 11, 19, and 23 of the '000 patent are unpatentable, under 35 U.S.C. § 102, as anticipated by Lemelson;

(2) 10, 11, 19, and 23 of the '000 patent are unpatentable, under 35 U.S.C. § 103, as obvious over Lemelson and Asayama; and

(3) claims 16, 17 and 20 of the '000 patent are unpatentable, under 35 U.S.C. § 103, as obvious over Lemelson and Yanagawa.

IV. ORDER

Accordingly, in consideration of the foregoing, it is hereby:

ORDERED that claims 10, 11, 16, 17, 19, 20, and 23 of the ’000 patent have not been shown by a preponderance of the evidence to be unpatentable.

This is a final decision. Parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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